TIERRA SOUTH FLORIDA, INC.

May 8, 2024

Inwood Consulting Engineers, Inc.
3000 Dovera Drive, Suite 200
Oviedo, Florida 32765

Attn: David Dangel
Email: ddangel@inwoodinc.com

RE: **Geotechnical Services - PD&E**
Cove Rd. from SR-76/Kanner Hwy to SR-5/US-1
Martin County, Florida
FPID 441700-1-22-02
TSFGeo File No. 7111-22-342

Dear David:

Tierra South Florida, Inc. (TSFGeo) has completed a roadway soil survey for the subject project. The soil survey was performed in general accordance with FDOT procedures. The results of our exploration program and subsequent geotechnical recommendations are presented in this report.

If you have any questions or comments regarding this report, please contact our office at your earliest convenience.

Sincerely,

TSFGeo

Ramakumar Vedula, P.E.
Principal Engineer
FL Registration No. 54873

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1.0 PROJECT DESCRIPTION

The project is a PD&E Study for Cove Road from SR-76/Kanner Hwy to SR-5/US-1 in Martin County, Florida.

The purpose of this study was to provide Geotechnical (i.e., soils and groundwater) input to the design team to assist in the evaluation of the merits of the potential roadway improvements.

2.0 SCOPE OF SERVICES

The study was performed to obtain information on the existing subsurface conditions at the proposed project site to assist in the PD&E Study. The following services were provided:

1. Reviewed readily available published topographic and soils information. This information was obtained from the Soil Survey of Martin County, Florida, published by the United States Department of Agriculture (USDA) Natural Resources Conservation Services (NRCS), and USGS Maps.

2. Performed a Geotechnical field study that included thirty-five (35) Standard Penetration Test (SPT) borings to a depth of approximately 10 to 20 feet below the topsoil/asphalt layers.

3. Performed a total of five (5) Permeability (BHP) Tests, which each included an auger boring to a depth of approximately 10 feet below existing grade.

4. Classified soil samples using the ASTM Soil Classification System.

5. Performed a limited amount of laboratory testing on selected soil samples for classification purposes, including grain size analysis, organic content, and moisture content testing.

6. Prepared this Geotechnical Services Report for the project.

These geotechnical services were performed in general accordance with the FDOT Soils and Foundations Handbook.

3.0 REVIEW OF AVAILABLE SOIL AND TOPOGRAPHIC INFORMATION

3.1 USDA Soil Survey

Based on a review of the Martin County Soil Survey created by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), it appears that the improvement area is mapped as follows:

Map Unit 2 – Lawnwood and Myakka fine sands

Lawnwood Component

The Lawnwood component makes up 41 percent of the map unit. Slopes are 0 to 2 percent. This component is on coastal plains on marine terraces on flatwoods. The parent material

consists of sandy marine deposits. Depth to a root restrictive layer, ortstein, is 20 to 30 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 (or restricted depth) is very 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. Organic matter content in the surface horizon is about 2 percent.

Myakka Component

The Myakka component makes up 39 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 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 (or restricted depth) 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. Organic matter content in the surface horizon is about 3 percent.

Map Unit 4 – Waveland and Immokalee fine sands

Waveland Component

The Waveland component makes up 41 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 marine deposits. Depth to a root restrictive layer, ortstein, is 30 to 50 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 (or restricted depth) is very 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. Organic matter content in the surface horizon is about 2 percent.

Immokalee Component

The Immokalee component makes up 39 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 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 (or restricted depth) 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. Organic matter content in the surface horizon is about 2 percent.

Map Unit 5 – Waveland and Lawnwood fine sands, depressional

Waveland Component

The Waveland component makes up 41 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, ortstein, is 30 to 50 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 (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is frequently ponded. A seasonal zone of water saturation is at 0 inches during June, July, August, September, October, November, December. Organic matter content in the surface horizon is about 2 percent.

Lawnwood Component

The Lawnwood component makes up 39 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, ortstein, is 20 to 30 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 (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is frequently ponded. A seasonal zone of water saturation is at 0 inches during June, July, August, September, October, November, December. Organic matter content in the surface horizon is about 2 percent.

Map Unit 36 – Arents, 0 to 2 percent slopes

The Arents component makes up 100 percent of the map unit. Slopes are 0 to 2 percent. This component is on fills, rises on marine terraces on coastal plains. The parent material consists of altered 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 high. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 27 inches during June, July, August, September, October, November. Organic matter content in the surface horizon is about 0 percent.

Map Unit 61 – Hobe fine sand, 0 to 5 percent slopes

The Hobe component makes up 80 percent of the map unit. Slopes are 0 to 5 percent. This component is on ridges 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 somewhat excessively drained. Water movement in the most restrictive layer is very high. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 66 inches during June, July, August, September, October. Organic matter content in the surface horizon is about 2 percent.

Map Unit 99 – Water

Water is a miscellaneous area. No soil data is available for miscellaneous areas.

A portion of the USDA map for the project area is included as **Soil Map, Martin County, Florida.**

3.2 USGS Soil Data

The geological information available was reviewed for the general soil information in Martin County, Florida, from the USGS. The following geological information is presented.

Shelly sediments of Plio-Pleistocene age (Pliocene/Pleistocene) at surface, covers 58 % of this area

> Tertiary-Quaternary Fossiliferous Sediments of Southern Florida - Molluskbearing sediments of southern Florida contain some of the most abundant and diverse fossil faunas in the world. The origin of these accumulations of fossil mollusks is imprecisely known (Allmon, 1992). The shell beds have attracted much attention due to the abundance and preservation of the fossils but the biostratigraphy and lithostratigraphy of the units has not been well defined (Scott, 1992). Scott and Wingard (1995) discussed the problems associated with biostratigraphy and lithostratigraphy of the Plio-Pleistocene in southern Florida. These "formations" are biostratigraphic units. The "formations" previously recognized within the latest Tertiary-Quaternary section of southern Florida include the latest Pliocene - early Pleistocene Caloosahatchee Formation, the early Pleistocene Bermont formation (informal) and the late Pleistocene Fort Thompson Formation. This section consists of fossiliferous sands and carbonates. The identification of these units is problematic unless the significant molluscan species are recognized. Often exposures are not extensive enough to facilitate the collection of representative faunal samples to properly discern the biostratigraphic identification of the formation. In an attempt to alleviate the inherent problems in the biostratigraphic recognition of lithostratigraphic units, Scott (1992) suggested grouping the latest Pliocene through late Pleistocene Caloosahatchee, Bermont and Fort Thompson Formations in to a single lithostratigraphic entity, the Okeechobee formation (informal). In mapping the shelly sands and carbonates, a generalized grouping as Tertiary-Quaternary shell units (TQsu) was utilized. This is equivalent to the informal Okeechobee formation. The distribution of the Caloosahatchee and Fort Thompson Formation are shown on previous geologic maps by Cooke (1945), Vernon and Puri (1964) and Brooks (1982). The Nashua Formation occurs within the Pliocene - Pleistocene in northern Florida. However, it crops out or is near the surface is an area too small to be shown on a map of this scale. Lithologically these sediments are complex, varying from unconsolidated, variably calcareous and fossiliferous quartz sands to well indurated, sandy, fossiliferous limestones (both marine and freshwater). Clayey sands and sandy clays are present. These sediments form part of the surficial aquifer system.

Anastasia Formation (Pleistocene) at surface, covers 32 % of this area

The Atlantic Coastal Ridge is underlain by the Anastasia Formation from St. Johns County southward to Palm Beach County. Excellent exposures occur in Flagler County in Washington Oaks State Park, in Martin County at the House of Refuge on Hutchinson Island and at Blowing Rocks in Palm Beach County. An impressive exposure of Anastasia Formation sediments occurs along Country Club Road in Palm Beach County (Lovejoy, 1992). The Anastasia Formation generally is recognized near the coast but extends inland as much as 20 miles (32 kilometers) in St. Lucie and Martin Counties. The Anastasia Formation, named by Sellards (1912),is composed of interbedded sands and coquinoid limestones. The most recognized facies of the Anastasia sediments is an orangish brown, unindurated to moderately indurated, coquina of whole and fragmented mollusk shells in a matrix of sand often cemented by sparry calcite. Sands occur as light gray to tan and orangish brown, unconsolidated to moderately indurated, unfossiliferous to very fossiliferous beds. The Anastasia Formation forms part of the surficial aquifer system.

Beach ridge and dune (Pleistocene/Holocene) at surface, covers 9 % of this area

Undifferentiated Quaternary Sediments - Much of Florida's surface is covered by a varying thickness of undifferentiated sediments consisting of siliciclastics, organics and freshwater carbonates. Where these sediments exceed 20 feet (6.1 meters) thick, they were mapped as discrete units. In an effort to subdivide the undifferentiated sediments, those sediments occurring in flood plains were mapped as alluvial and flood plain deposits (Qal). Sediments showing surficial expression of beach ridges and dunes were mapped separately (Qbd) as were the sediments composing Trail Ridge (Qtr). Terrace sands were not mapped (refer to Healy [1975] for a discussion of the terraces in Florida). The subdivisions of the Undifferentiated Quaternary Sediments (Qu) are not lithostratigraphic units but are utilized in order to facilitate a better understanding of the State's geology. The siliciclastics are light gray, tan, brown to black, unconsolidated to poorly consolidated, clean to clayey, silty, unfossiliferous, variably organic-bearing sands to blue green to olive green, poorly to moderately consolidated, sandy, silty clays. Gravel is occasionally present in the panhandle. Organics occur as plant debris, roots, disseminated organic matrix and beds of peat. Freshwater carbonates, often referred to as marls in the literature, are scattered over much of the State. In southern Florida, freshwater carbonates are nearly ubiquitous in the Everglades. These sediments are buff colored to tan, unconsolidated to poorly consolidated, fossiliferous carbonate muds. Sand, silt and clay may be present in limited quantities. These carbonates often contain organics. The dominant fossils in the freshwater carbonates are mollusks.

Holocene sediments (Holocene) at surface, covers 0.9 % of this area

The Holocene sediments in Florida occur near the present coastline at elevations generally less than 5 feet (1.5 meters). The sediments include quartz sands, carbonate sands and muds, and organics.

Undifferentiated sediments (Pleistocene/Holocene) at surface, covers 0.1 % of this area

Undifferentiated Quaternary Sediments - Much of Florida's surface is covered by a varying thickness of undifferentiated sediments consisting of siliciclastics, organics and freshwater carbonates. Where these sediments exceed 20 feet (6.1 meters) thick, they were mapped as discrete units. In an effort to subdivide the undifferentiated sediments, those sediments occurring in flood plains were mapped as alluvial and flood plain deposits (Qal). Sediments showing surficial expression of beach ridges and dunes were mapped separately (Qbd) as were the sediments composing Trail Ridge (Qtr). Terrace sands were not mapped (refer to Healy [1975] for a discussion of the terraces in Florida). The subdivisions of the Undifferentiated Quaternary Sediments (Qu) are not lithostratigraphic units but are utilized in order to facilitate a better understanding of the State's geology. The siliciclastics are light gray, tan, brown to black, unconsolidated to poorly consolidated, clean to clayey, silty, unfossiliferous, variably organic-bearing sands to blue green to olive green, poorly to moderately consolidated, sandy, silty clays. Gravel is occasionally present in the panhandle. Organics occur as plant debris, roots, disseminated organic matrix and beds of peat. Freshwater carbonates, often referred to as marls in the literature, are scattered over much of the State. In southern Florida, freshwater carbonates are nearly ubiquitous in the Everglades. These sediments are buff colored to tan, unconsolidated to poorly consolidated, fossiliferous carbonate muds. Sand, silt and clay may be present in limited quantities. These carbonates often contain organics. The dominant fossils in the freshwater carbonates are mollusks.

A portion of Geological Map titled “Florida Geological Survey” for Martin County is presented as the Site Geological Map in Appendix A. It appears that based on the USGS website, the project site is covered only with the Anastasia Formation at the surface.

4.0 RESULTS OF SUBSURFACE EXPLORATION

4.1 Field Explorations

The subsurface conditions along the project interchange were explored by thirty-five (35) borings, completed utilizing the Standard Penetration Test (SPT) procedure, with depths to approximately 10 to 20 feet below existing grades.

The boring field locations were determined by TSFGeo personnel using a hand-held GPS system. The SPT borings were drilled using a truck-mounted drill rigs, with mud-rotary procedures. In the SPT boring process sampling, the in-place materials were obtained continuously in the upper 10 feet. The SPT sampling was performed in accordance ASTM D 1586.

Approximate locations of the borings performed are presented in the **Boring Location Plan** included in **Appendix A.** The soil samples were returned to our laboratory for classification by a geotechnical engineer. The samples were visually classified in the laboratory in general accordance with the AASHTO Soil Classification System.

4.2 General Soil Conditions

The subsurface conditions were explored by SPT borings drilled to depths of 10 to 20 feet below existing grades. The boring locations were marked in the field by TSFGeo personnel using hand-held GPS system. Approximate locations of the borings are presented in the Appendix. The samples of the in-place soils were placed in airtight jars and returned to our laboratory for classification by a Geotechnical Engineer. The samples were visually classified in general accordance with the AASHTO Soil Classification System.

The soil types encountered in the borings have been assigned a stratum number. The stratum numbers and soil types encountered are listed below. Soil profiles encountered in the borings are presented in the Appendix.

Stratum Number	Typical Soil Description	AASHTO Classification	FDOT Soil Designation
1	Topsoil	A-8	Unsuitable
2	Asphalt	-	-
3	Light Gray to Brown to Light Brown Sand Occasionally with Shell	A-3	SELECT
4	Light Brown to Brown Sand with Limerock Occasionally with Shell (Fill)	A-1-b/A-3	SELECT
5	Light Brown to Brown Silty Sand	A-2-4	SELECT
6	Dark Brown Organic Sand with Silt	A-8	Unsuitable
7	Crushed Concrete (Base)	-	SELECT
Note: Alpha characters added to the right of stratum numbers on the cross-section profiles are included to note observances of trace materials in the soils as follows: A – Trace Concrete			

A Geotechnical Engineer classifies soils based on a visual review of the recovered samples, laboratory testing and interpretation of the field boring logs. The boring stratification lines represent the approximate boundaries between soil types of significantly different engineering properties; however, the actual transition may be gradual. In some cases, small variations in properties not considered pertinent to our engineering evaluation were abbreviated or omitted for clarity. The boring profiles represent the conditions at each boring location, variations do occur and should be expected among the borings.

4.3 Borehole Permeability (BHP) Test Results

Five (5) BHP tests were performed using the usual open-hole, constant head methodology. The holes were advanced to approximately 10 feet below the existing grade and were drilled with a hollow stem auger so that soil samples could be retrieved for visual classification by an engineer. The borings were completed as open well with gravel pack (6-20 silica sand). The well-screen slot widths were 0.020 inches. Water from the drill rig tank was then pumped into the open well, and the amount of water required maintaining a constant head was recorded. The test results are presented in **Appendix B** as **Summary of Exfiltration Test Results**.

5.0 LABORATORY TESTING

5.1 Classification Testing

Representative soil samples collected from the borings were classified and stratified in general accordance with the AASHTO Soil Classification System. Our classification was based on visual inspection, using the results from the laboratory testing as confirmation. The laboratory tests performed included: natural moisture content, grain size analysis, and organic content testing. Laboratory test results are presented in the Appendix. Tests were performed in general accordance with the test methods noted Table 5.1 below.

Table 5.1 – Soil Sample Testing Methods	
Test Type	**Test Method**
Sieve Analysis	ASTM C 136 (AASHTO T 27)
Moisture Content	ASTM D 2216 (AASHTO T 265)
Organic Content	ASTM D 2974 (AASHTO T 267)

5.2 Environmental Corrosion Testing

Environmental corrosion tests were performed on selected soil samples recovered from borings drilled along the project alignment. Environmental corrosion tests include parameters such as pH, resistivity, chloride and sulfate content. These laboratory test results were used to perform the environmental classification in accordance with Section 1.3 of FDOT Structures Design Guidelines. Tests were performed in general accordance with test methods noted in Table 5.2 below. The test results are provided in the Appendix.

Table 5.2 Test Methods for Corrosion Series	
Test Type	**Test Method**
pH of Soils	FM 5-550
Chloride Ion in Soil	FM 5-552
Sulfates in Soil	FM 5-553
Electrical Resistance of Soil	FM 5-551

6.0 GROUNDWATER CONDITIONS

6.1 Groundwater

The groundwater level was measured at the boring locations following the termination of the boring. The depth to groundwater was encountered at approximate depths of 2½ to 6½ feet. Groundwater conditions will vary with environmental variations and seasonal conditions, such as the frequency and magnitude of rainfall patterns, as well as man-made influences (i.e., existing canals, swells, drainage ponds, underdrains, and areas of covered soils like paved parking lots and sidewalks). Fluctuation should be anticipated. We recommend that the Contractor determine the actual groundwater levels at the time of construction to determine groundwater impact on construction procedures.

6.2 Estimated Seasonal High Groundwater Table

Estimated Seasonal High Groundwater table levels are expected to be at approximate elevations listed in the table below:

Approximate Begin Station	Approximate End Station	Approximate Seasonal High Groundwater Table Elevation (NAVD)
160+53	182+00	+9
182+00	207+00	+11
207+00	227+00	+14
227+00	282+00	+16
282+00	330+37	+15

This estimate is primarily based on the Water Table Map, City of Stuart Area, June 1978, the water table levels observed, and soil borings. The elevations from the referenced map were converted to NAVD by subtracting 1.5 feet from the NGVD elevation given. We recommend the project design be also coordinated with the existing permits from previous constructions, profiles of existing roadway and drainage structures, and the SHGWT and Design High Water (DHW) elevations be adjusted accordingly

7.0 ENGINEERING EVALUATIONS AND RECOMMENDATIONS

7.1 General and Treatment of Organic Soils

In general, the existing shallow subsurface soils encountered in the borings are suitable for supporting the proposed roadway widening after proper subgrade preparation. Organic soils (Stratum 6/A-8 materials) were encountered in a few borings between a depth of about 2 and 8 feet below existing grade. Removal and replacement in accordance with the Standard Index would potentially require deep excavations and associated shoring. Further muck delineation studies will be required to address this material. Site preparation should consist of normal clearing and grubbing, removal, and replacement of plastic or organic soils followed by compaction of subgrade soils. The removal of organic and plastic soils when required should be accomplished in accordance with the FDOT Index 120-002 of Standard Plans for Road Construction. Backfill should consist of materials conforming to FDOT Index 120-001 of Standard Plans for Road Construction and compacted in accordance with Section 120-9 of the Standard Specification for Road and Bridge Construction, latest edition.

7.2 Permanent Cut and Fill Slopes

We anticipate fills will be required for the proposed improvements. Assuming proper subgrade preparation and adequate fill materials are utilized, we recommend that all proposed permanent side slopes be constructed on 2.0 horizontal to 1.0 vertical (2H:1V) or flatter. To prevent minor

sloughing at the surface, we recommend that the slopes be seeded, mulched and maintained to enhance slope stability soon after being completion.

7.3 Excavations

All excavations should be performed in accordance with FDOT Index 120-002 of Standard Plans for Road Construction, the latest Standard Specifications for Road and Bridge Construction, and in accordance with OSHA Standards. We recommend that sides of temporary excavations be sloped to 2H:1V or flatter or supported by temporary shoring.

7.4 Groundwater Control

In our opinion, groundwater may not have an impact on the proposed roadway improvements provided the proposed finish level is at the existing roadway level. However, depending upon groundwater levels at the time of construction, some form of dewatering may be required for utility excavations. We recommend that the Contractor determine the actual groundwater levels at the time of construction to determine potential groundwater impacts on construction procedures.

7.5 Pavement Design Considerations

We anticipate that the proposed pavement structure will be a semi-flexible asphaltic concrete section. Soils existing along the majority of the project alignments should have modest subgrade strength for pavement support.

For a stabilized subgrade, we recommend a sand-gravel mixture, 12 inches thick, with a minimum design LBR of 40. Base course should consist of limerock, shellrock or coquina, meeting the minimum requirements of the FDOT "Standard Specifications for Road and Bridge Construction," Sections 911, 913 or 915, respectively. The limerock should have a minimum LBR value of 100. Both the base and stabilized subgrade should be compacted to at least 98 percent of maximum dry density (AASHTO T-180).

Asphalt thickness should be determined considering the anticipated traffic loading conditions and expected life expectancy of the pavement section.

7.6 On-Site Soil Suitability

The following notes are included on the Roadway Soil Survey Sheet, in Appendix A, with some minor edits in this written report for clarity.

Stratum 1 consists of Topsoil (A-8) and should be stripped from the proposed widening and new pavement areas in accordance with standard specifications Section 120- Excavation and Embankment.

Stratum 2 consists of Asphalt and should be stripped from the proposed widening and new pavement areas in accordance with standard specifications Section 120- Excavation and Embankment.

Stratum 3 consists of Light Gray to Brown to Light Brown Sand occasionally with Shell (A-3). These materials appear to be suitable to use in subgrade and embankment and should be utilized according to Standard Plans Index 120-001.

Stratum 4 consists of Light Brown to Brown Sand with Limerock occasionally with Shell (A-1-b/A-3). These materials appear to be suitable to use in subgrade and embankment and should be utilized according to Standard Plans Index 120-001.

Stratum 5 consists of Light Brown to Brown Silty Sand (A-2-4). These materials appear to be suitable to use in subgrade and embankment and should be utilized according to Standard Plans Index 120-001. However, this material is likely to retain excess moisture and may be difficult to dry and compact. It should be used in the embankment above the water level existing at the time of construction. If placed below the existing water level, it must be non-plastic and contain less than 15% passing the No. 200 US Standard Sieve.

Stratum 6 consists of Dark Brown Organic Sand with Silt (A-8). Further muck delineation studies will be required to address this material.

Stratum 7 consists of Crushed Concrete. This material may be utilized as a base course for the roadway in accordance with Standard Specifications Section 911.

Alpha characters added to the right stratum numbers in the cross-section profiles are included to note observances of trace materials in the soils as follows: A – Trace Concrete.

7.7 Vibration and Settlement Monitoring and Pre & Post Construction Survey

Vibration producing construction activities such as pile driving, sheet pile installation, and extraction, drilled shaft casing installation and extraction, drilled shaft excavations, and compaction with vibratory rollers can cause vibration and vibration induced settlement and damage to the adjacent structures. Hence, inspection, vibration and settlement monitoring of existing structures will be required in accordance with Standard Specifications Section 108.

8.0 REPORT LIMITATIONS

Our Geotechnical engineering evaluation of the site and subsurface conditions with respect to the planned roadway improvements and our recommendations for site preparation and foundation construction are based upon the followings: (1) site observations, (2) the field exploratory test data obtained during the geotechnical study, and (3) our understanding of the project information and anticipated final grades as presented in this report.

If the final grades vary considerably from those stated, or when final cross-sectional data becomes available, please contact our offices so that we can review our recommendations. Furthermore, upon the discovery of any site or subsurface conditions during construction, which appears to deviate from the data obtained during this geotechnical exploration, please contact us immediately so that we may visit the site, observe the differing conditions, and evaluate the new information with regards to our evaluation and recommendations contained herein.

The recommendations presented herein represent design and construction techniques that we feel are both applicable and feasible for the planned construction. We recommend, however, that we be provided the opportunity to review the final construction plans and the earthwork/roadway embankment construction specifications to evaluate whether our recommendations have been properly interpreted and implemented.

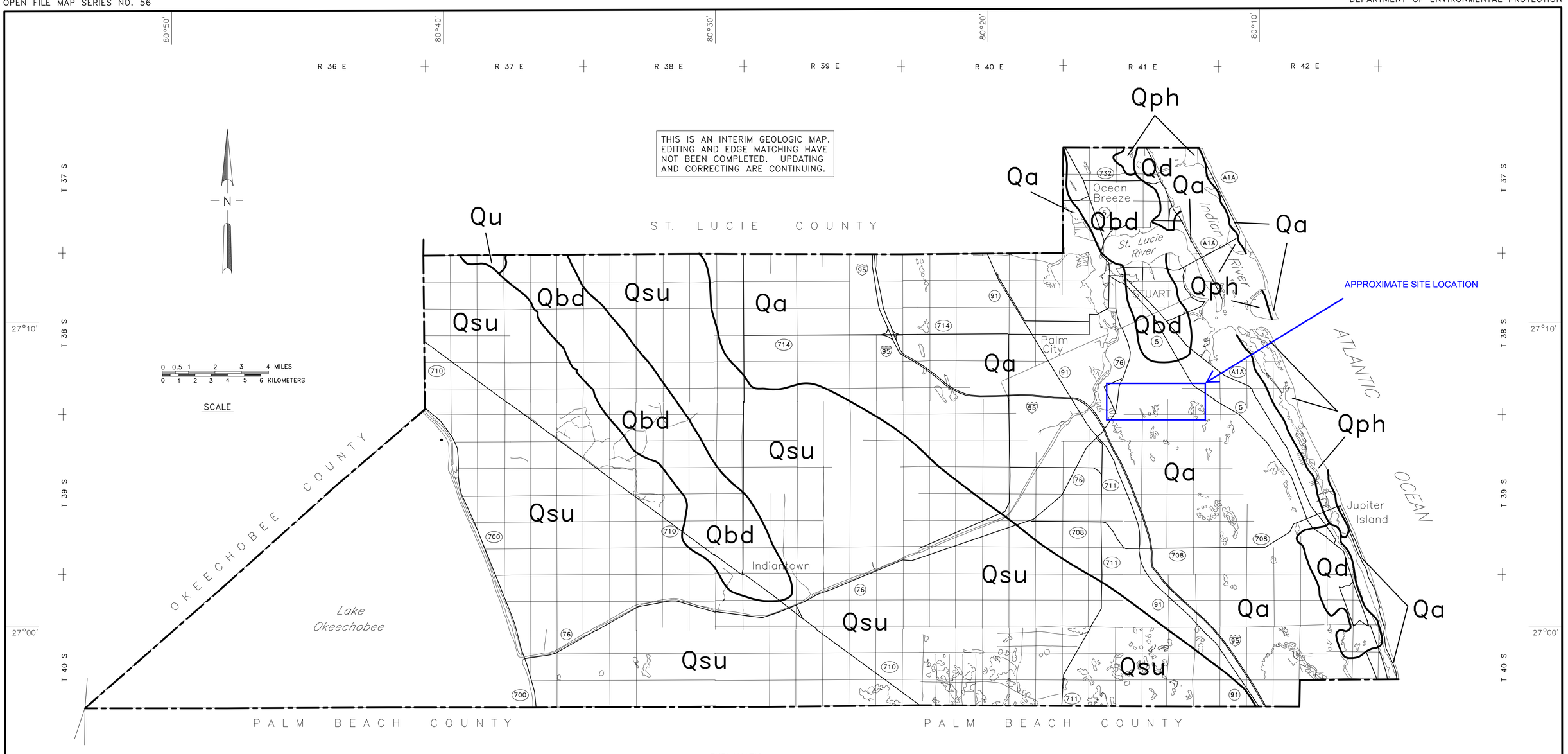
APPENDIX A

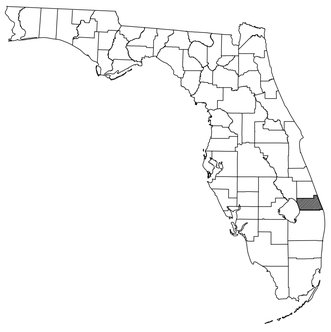
Site Geological Map
USGS Topographic Map
Soil Map – Martin County, Florida
Boring Location Plan
Roadway Soil Survey
Report of Core Borings

FGS070793
OPEN FILE MAP SERIES NO. 56

FLORIDA GEOLOGICAL SURVEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION

THIS IS AN INTERIM GEOLOGIC MAP. EDITING AND EDGE MATCHING HAVE NOT BEEN COMPLETED. UPDATING AND CORRECTING ARE CONTINUING.





EXPLANATION

QUATERNARY

Qa– Anastasia Fm.. Variably lithified coquina of shells and sands and unlithified fossiliferous sand.

Qbd– Quartz sands with surface expression of beach ridges and dunes. A geomorphic unit on undifferentiated, often clean, quartz sands. Generally fine to medium grained. No formations recognized. May contain shell.

Qd– quartz sands with surface expression of dunes. A geomorphic unit on undifferentiated, often clean quartz sands. Generally fine to medium grained.

Qh/Qph– Holocene sediments consisting of quartz sand with minor amounts of organic matter and clay associated with lagoonal deposits. Mostly beach and dune sands along present coastline. No formations recognized.

Qsu– Shell beds, undifferentiated. Includes sediments previously placed in units primarily differentiated by the included fauna (e.g. the Caloosahatchee, Ft. Thompson, and Nashua Formations, Pinecrest Beds).

Qu– Undifferentiated surficial sands, clayey sands, clays, marls and peats >20 feet thick. No formations recognized.

GEOLOGIC MAP OF MARTIN COUNTY

FLORIDA

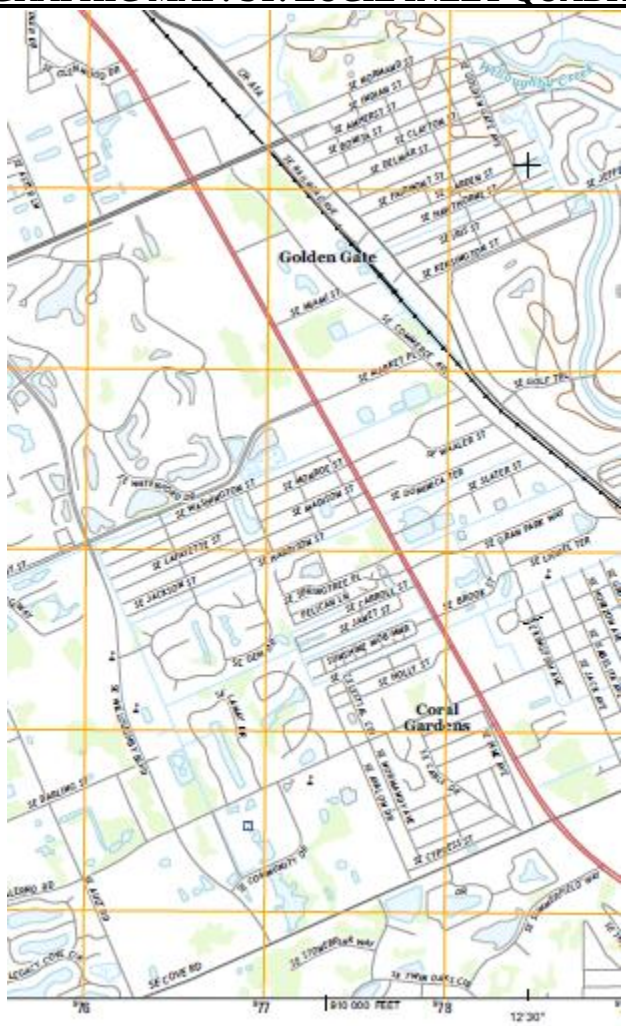
BY
JOEL DUNCAN, P.G.# 396 and TOM SCOTT

1993

WALTER SCHMIDT
STATE GEOLOGIST AND CHIEF

CARTOGRAPHY BY JIM JONES & TED KIPER

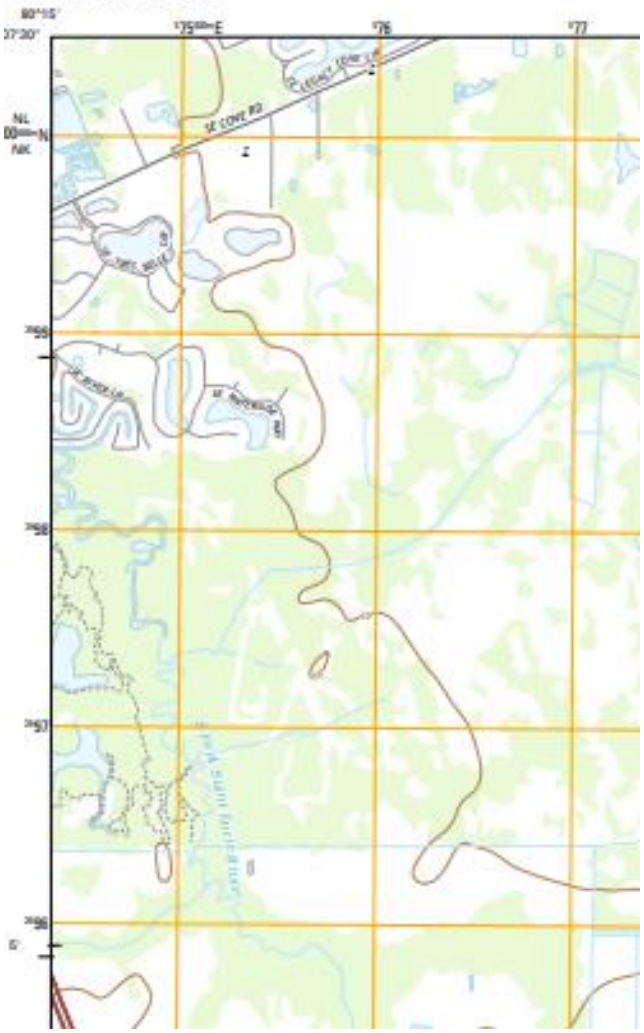
Cove Rd. from SR-76/Kanner Hwy to SR-5/US-1
Martin County, Florida
TSFGeo File No. 7111-22-342
USGS TOPOGRAPHIC MAP: ST. LUCIE INLET QUADRANGLE, 2015



CONTOUR INTERVAL 10 FEET, NAVD 88

NOT TO SCALE

USGS TOPOGRAPHIC MAP: GOMEZ QUADRANGLE, 2015



CONTOUR INTERVAL 10 FEET, NAVD 88

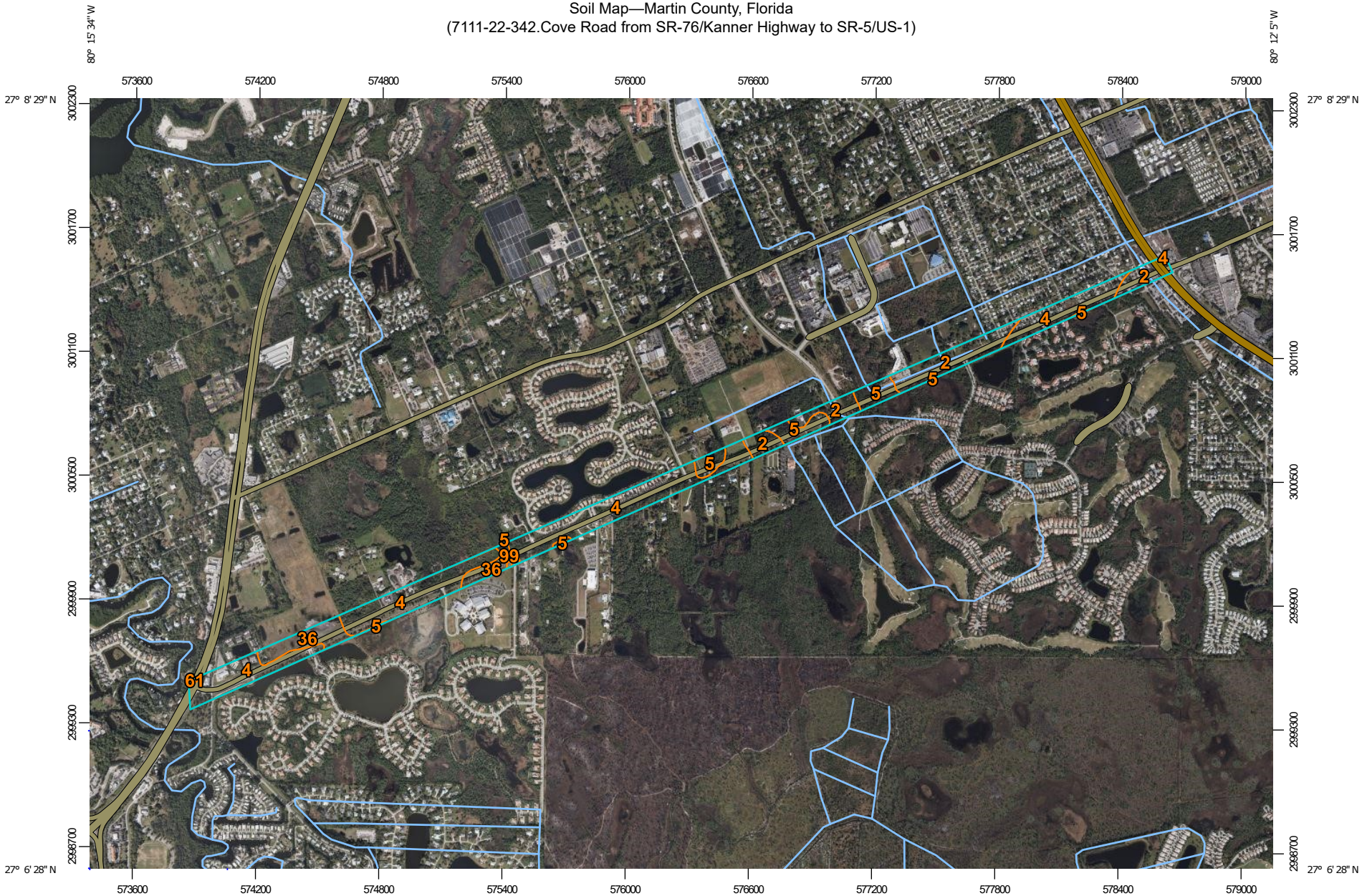
NOT TO SCALE

USGS TOPOGRAPHIC MAP: INDIANTOWN SE QUADRANGLE, 2015

CONTOUR INTERVAL 10 FEET, NAVD 88

NOT TO SCALE

Soil Map—Martin County, Florida
(7111-22-342.Cove Road from SR-76/Kanner Highway to SR-5/US-1)



Map Scale: 1:26,400 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 350 700 1400 2100

Feet
0 1000 2000 4000 6000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Martin County, Florida
Survey Area Data: Version 22, Sep 6, 2023

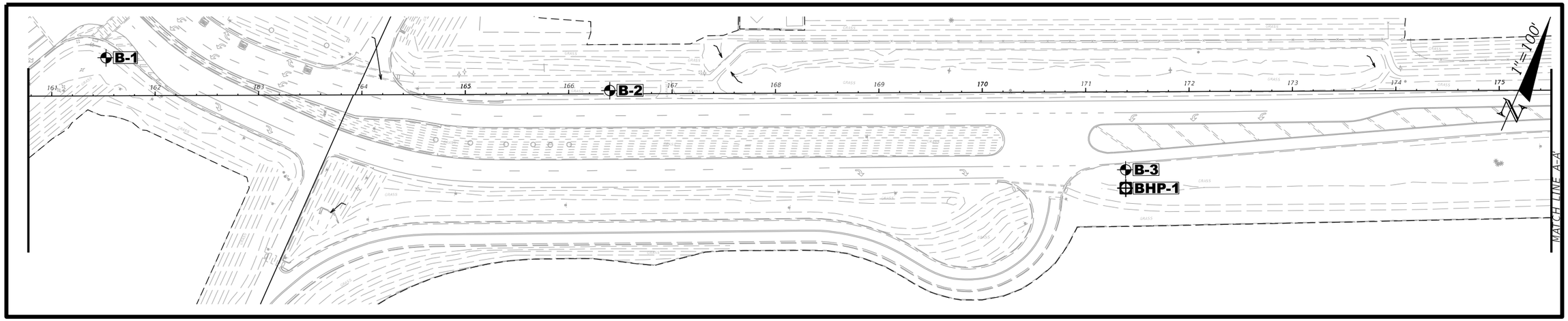
Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

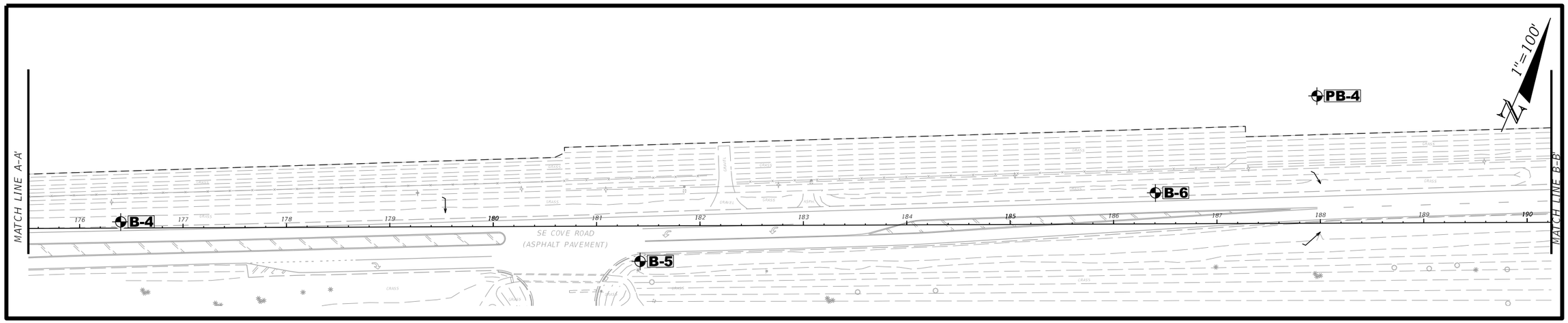
Date(s) aerial images were photographed: Jan 21, 2021—Feb 4, 2021

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
2	Lawnwood and Myakka fine sands	30.4	21.5%
4	Waveland and Immokalee fine sands	81.7	57.7%
5	Waveland and Lawnwood fine sands, depressional	14.5	10.2%
36	Arents, 0 to 2 percent slopes	14.2	10.0%
61	Hobe fine sand, 0 to 5 percent slopes	0.3	0.2%
99	Water	0.1	0.1%
Totals for Area of Interest		**141.5**	**100.0%**





Approximate Location of SPT Boring

Approximate Location of BHP Test

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

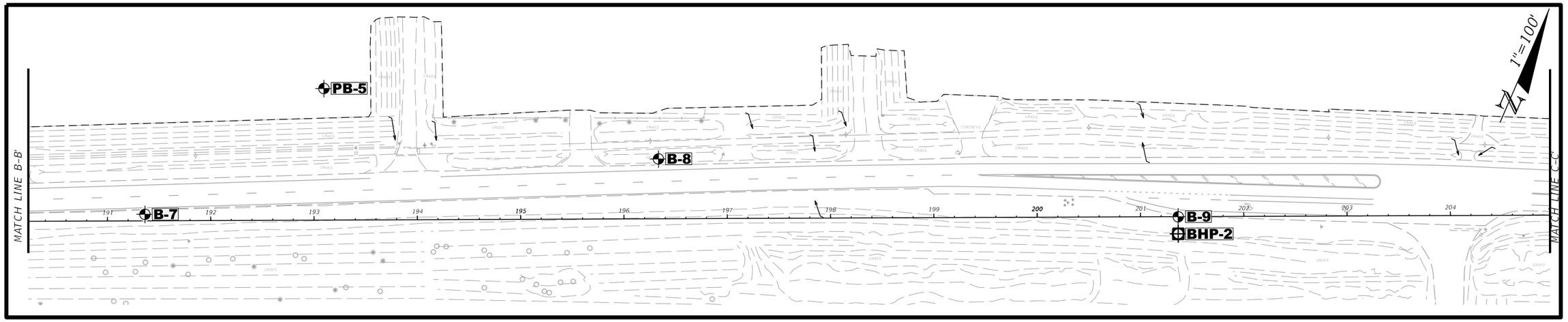
ENGINEER OF RECORD
RAMAKUMAR VEDULA, P.E.
LICENSE NUMBER 54873
TIERRA SOUTH FLORIDA, INC.
2765 VISTA PARKWAY
SUITE H10
WEST PALM BEACH, FL 33411

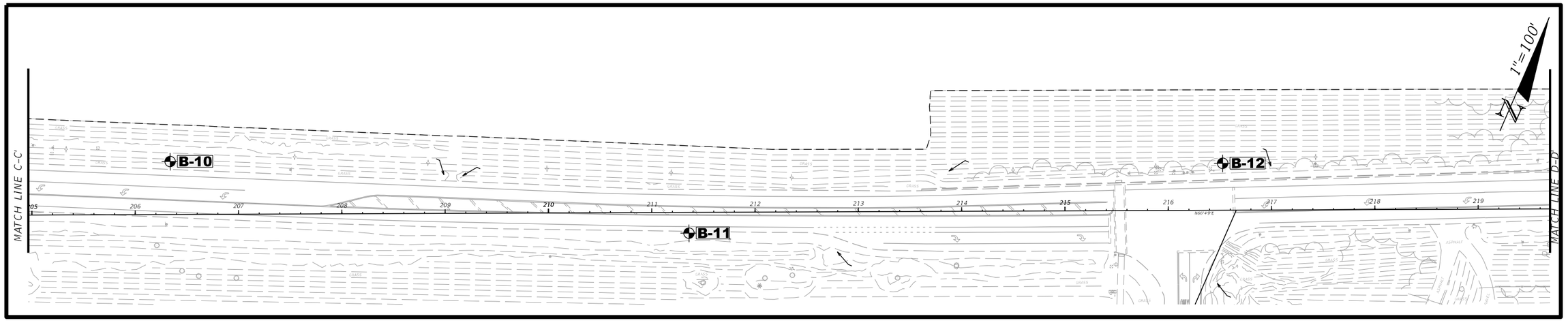
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
COVE RD	MARTIN	441700-1-22-02

ROADWAY BORINGS LOCATION PLAN

SHEET NO. 1





Approximate Location of SPT Boring

Approximate Location of BHP Test

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

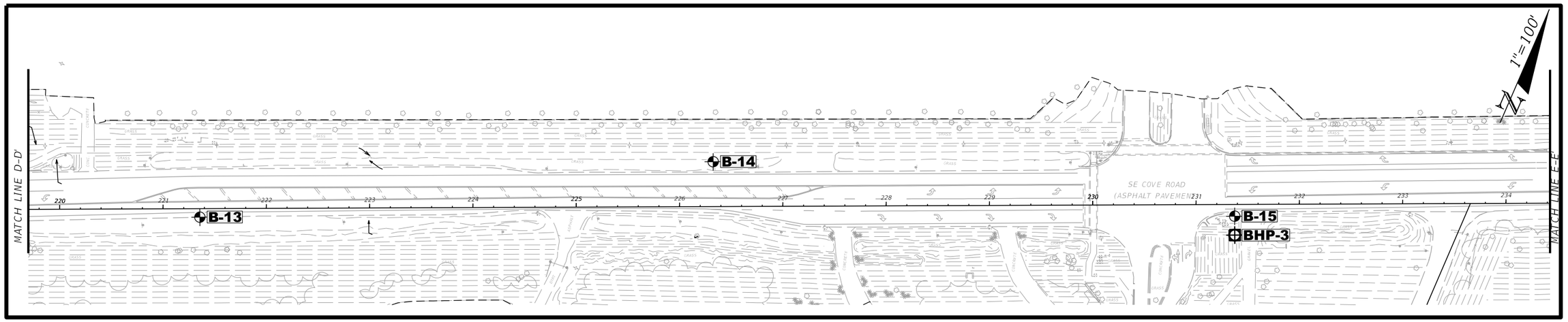
ENGINEER OF RECORD
RAMAKUMAR VEDULA, P.E.
LICENSE NUMBER 54873
TIERRA SOUTH FLORIDA, INC.
2765 VISTA PARKWAY
SUITE H10
WEST PALM BEACH, FL 33411

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
COVE RD	MARTIN	441700-1-22-02

ROADWAY BORINGS LOCATION PLAN

SHEET NO. 2



Approximate Location of SPT Boring

Approximate Location of BHP Test

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD
RAMAKUMAR VEDULA, P.E.
LICENSE NUMBER 54873
TIERRA SOUTH FLORIDA, INC.
2765 VISTA PARKWAY
SUITE H10
WEST PALM BEACH, FL 33411

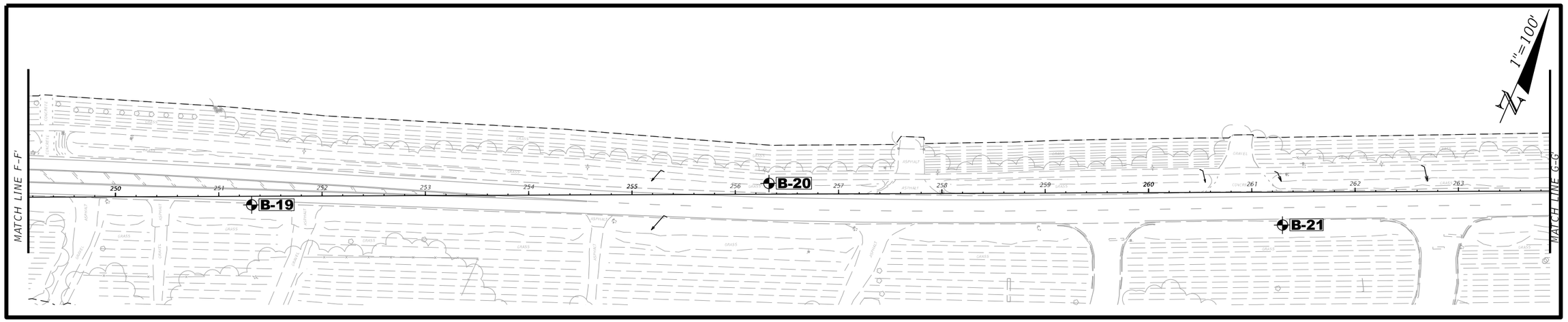
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

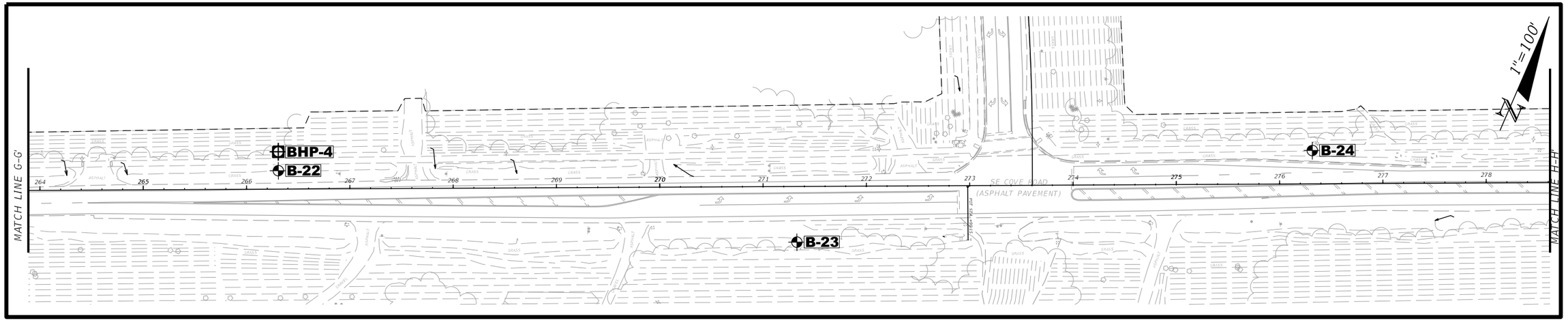
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
COVE RD	MARTIN	441700-1-22-02

ROADWAY BORINGS LOCATION PLAN

SHEET NO. 3

3/29/2024 8:44:40 AM jolivia
J:\Tierra Documents\Projects\TSF 2022\7111-22-342.Cove Rd. from SR-76_Kanner Highway to SR-5_US-1 (Inwood)\441700-1-22-02\Geotechnical\ABORRD50.dgn





Approximate Location of SPT Boring

Approximate Location of BHP Test

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

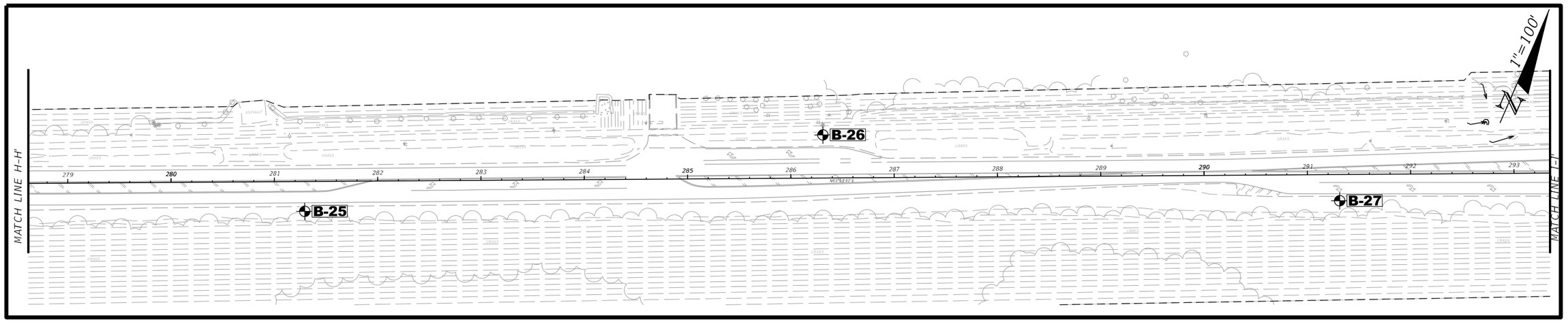
ENGINEER OF RECORD
RAMAKUMAR VEDULA, P.E.
LICENSE NUMBER 54873
TIERRA SOUTH FLORIDA, INC.
2765 VISTA PARKWAY
SUITE H10
WEST PALM BEACH, FL 33411

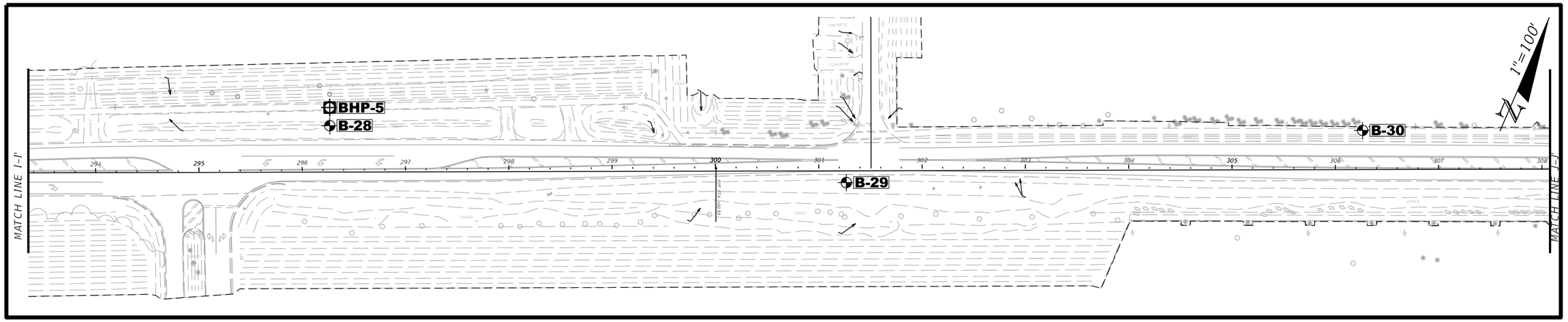
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
COVE RD	MARTIN	441700-1-22-02

ROADWAY BORINGS LOCATION PLAN

SHEET NO. 4





Approximate Location of SPT Boring

Approximate Location of BHP Test

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD
RAMAKUMAR VEDULA, P.E.
LICENSE NUMBER 54873
TIERRA SOUTH FLORIDA, INC.
2765 VISTA PARKWAY
SUITE H10
WEST PALM BEACH, FL 33411

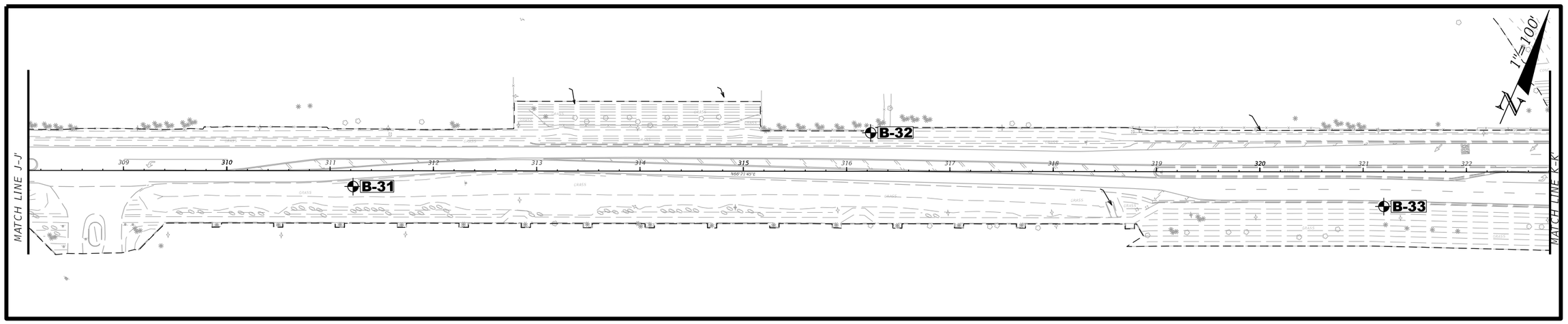
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

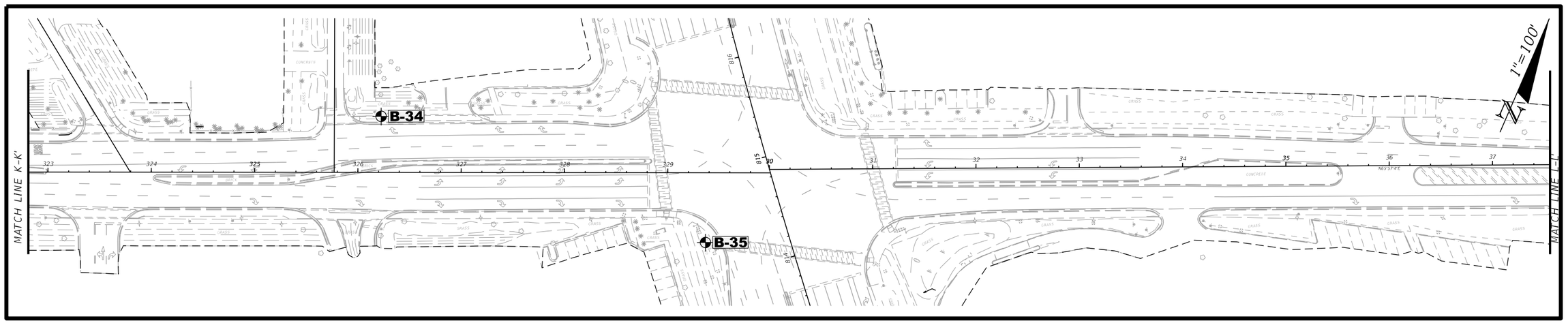
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
COVE RD	MARTIN	441700-1-22-02

ROADWAY BORINGS LOCATION PLAN

SHEET NO. 5

3/29/2024 8:44:54 AM jolivia
J:\Tierra Documents\Projects\TSF 2022\7111-22-342.Cove Rd. from SR-76_Kanner Highway to SR-5_US-1 (Inwood)\441700-1-22-02\Geotechnical\ABORR050.dgn





Approximate Location of SPT Boring

Approximate Location of BHP Test

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD
RAMAKUMAR VEDULA, P.E.
LICENSE NUMBER 54873
TIERRA SOUTH FLORIDA, INC.
2765 VISTA PARKWAY
SUITE H10
WEST PALM BEACH, FL 33411

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
COVE RD	MARTIN	441700-1-22-02

ROADWAY BORINGS LOCATION PLAN

SHEET NO. 6

3/29/2024 8:45:01 AM jolivia
J:\Tierra Documents\Projects\TSF 2022\7111-22-342\Cove Rd. from SR-76_Kanner Highway to SR-5_US-1 (Inwood)\441700-1-22-02\Geotechnical\ABORRD50.dgn

DATE OF SURVEY: FEBRUARY 2024
SURVEY MADE BY: TIERRA SOUTH FLORIDA, INC.
SUBMITTED BY: TIERRA SOUTH FLORIDA, INC.

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION
MATERIALS AND RESEARCH

DISTRICT: 4
ROAD NO.: COVE ROAD
COUNTY: MARTIN

PROJECT NAME: COVE ROAD FROM SR-76/KANNER HIGHWAY TO SR-5/US-1

FINANCIAL PROJECT ID: 441700-1-22-02

CROSS SECTION SOIL SURVEY FOR THE DESIGN OF ROADS

SURVEY BEGINS STA.: 160+53 SURVEY ENDS STA.: 330+37

REFERENCE: BLS

	ORGANIC CONTENT		MOISTURE CONTENT		SIEVE ANALYSIS RESULTS % PASS						ATTERBERG LIMITS (%)					CORROSION TEST RESULTS				
STRATUM NO.	NO. OF TESTS	% ORGANIC	NO. OF TESTS	% MOISTURE	NO. OF TESTS	10 MESH	40 MESH	60 MESH	100 MESH	200 MESH	NO. OF TESTS	LIQUID LIMIT	PLASTIC INDEX	AASHTO GROUP	DESCRIPTION	NO. OF TESTS	RESISTIVITY ohms-cm	CHLORIDE ppm	SULFATES ppm	pH
1	-	-	-	-	-	-	-	-	-	-	-	-	-	A-8	TOPSOIL	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ASPHALT	-	-	-	-	-
3	2	0-0.5	2	16.2-18.2	2	100	82-91	30-57	9-25	4	-	-	-	A-3	LIGHT GRAY TO BROWN TO LIGHT BROWN SAND OCCASIONALLY WITH SHELL	2	11,000-21,000	105	0-6	6.6-7.0
4	1	0.8	3	7.8-11.1	3	62-92	50-83	43-56	27-37	5-14	-	-	-	A-1-b/ A-3	LIGHT BROWN TO BROWN SAND WITH LIMEROCK OCCASIONALLY WITH SHELL (FILL)	-	-	-	-	-
5	3	0.8-3.8	3	16.4-17.4	3	100	92-94	65-69	43-47	12-20	-	-	-	A-2-4	LIGHT BROWN TO BROWN SILTY SAND	-	-	-	-	-
6	5	6.0-12.9	5	24.2-36.7	5	100	88-97	59-74	26-49	5-13	-	-	-	A-8	DARK BROWN ORGANIC SAND WITH SILT	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	CRUSHED CONCRETE (BASE)	-	-	-	-	-

EMBANKMENT AND SUBGRADE MATERIAL

1. STRATA BOUNDARIES ARE APPROXIMATE AND REPRESENT SOIL STRATA AT EACH BORING LOCATION ONLY. ANY SUBSOIL CONNECTING LINES SHOWN ARE FOR ESTIMATING EARTHWORK ONLY AND DO NOT INDICATE ACTUAL STRATUM LIMITS. SUBSURFACE VARIATIONS BETWEEN BORINGS SHOULD BE ANTICIPATED AS INDICATED IN STANDARD SPECIFICATIONS SECTION 2-4. FOR FURTHER DETAILS SEE SECTION 120-3.
2. GROUNDWATER LEVEL SHOWN AS (▽) WHERE ENCOUNTERED. GROUNDWATER NOT ENCOUNTERED SHOWN AS "GNE".
3. REMOVAL OF MUCK AND PLASTIC MATERIAL OCCURRING WITHIN ROADWAY SHALL BE ACCOMPLISHED IN ACCORDANCE WITH STANDARD PLANS INDEX 120-002, UNLESS OTHERWISE SHOWN ON THE PLANS. THE MATERIAL UTILIZED IN EMBANKMENT CONSTRUCTION SHALL BE IN ACCORDANCE WITH STANDARD PLANS INDEX 120-001.
4. SOIL ANALYSIS INCLUDES DATA FROM ROADWAY AREAS AS NOTED IN LIMITS ABOVE.
5. THE SYMBOL "-" REPRESENTS AN UNMEASURED PARAMETER.NP REPRESENTS NON-PLASTIC.
6. STRATUM 1 CONSIST OF TOPSOIL (A-8) AND SHOULD BE STRIPPED FROM THE PROPOSED WIDENING AND NEW PAVEMENT AREAS IN ACCORDANCE WITH STANDARD SPECIFICATIONS SECTION 120-EXCAVATION AND EMBANKMENT.
7. STRATUM 2 CONSISTS OF ASPHALT AND SHOULD BE STRIPPED FROM THE PROPOSED WIDENING AND NEW PAVEMENT AREAS IN ACCORDANCE WITH STANDARD SPECIFICATIONS SECTION 120-EXCAVATION AND EMBANKMENT.
8. STRATUM 3 CONSISTS OF LIGHT GRAY TO BROWN TO LIGHT BROWN SAND OCCASIONALLY WITH SHELL (A-3). THESE MATERIALS APPEAR TO BE SUITABLE TO USE IN SUBGRADE AND EMBANKMENT AND SHOULD BE UTILIZED ACCORDING TO STANDARD PLANS INDEX 120-001.
9. STRATUM 4 CONSISTS OF LIGHT BROWN TO BROWN SAND WITH LIMEROCK OCCASIONALLY WITH SHELL (FILL)(A-1-b/A-3). THESE MATERIALS APPEAR TO BE SUITABLE TO USE IN SUBGRADE AND EMBANKMENT AND SHOULD BE UTILIZED ACCORDING TO STANDARD PLANS INDEX 120-001.
10. STRATUM 5 CONSISTS OF LIGHT BROWN TO BROWN SILTY SAND (A-2-4). THIS MATERIAL APPEARS TO BE SUITABLE TO USE IN SUBGRADE AND EMBANKMENT SUPPORT AND SHOULD BE UTILIZED ACCORDING TO STANDARD PLANS INDEX 120-001. HOWEVER, THIS MATERIAL IS LIKELY TO RETAIN EXCESS MOISTURE AND MAY BE DIFFICULT TO DRY AND COMPACT. IT MAY BE USED IN THE EMBANKMENT ABOVE THE WATER LEVEL EXISTING AT THE TIME OF CONSTRUCTION AND SHOULD BE USED ACCORDING TO STANDARD PLANS INDEX 120-001. IT MAY BE USED IN THE SUBGRADE PORTION OF THE ROADBED WHEN APPROVED BY THE DISTRICT MATERIALS ENGINEER. MATERIAL PLACED BELOW THE EXISTING WATER LEVEL MUST BE NON-PLASTIC AND CONTAIN LESS THAN 15% PASSING THE NUMBER 200 U.S.STANDARD SIEVE
11. STRATUM 6 CONSISTS OF DARK BROWN ORGANIC SAND WITH SILT (A-8). FURTHER MUCK DELINEATION STUDIES WILL BE REQUIRED TO ADDRESS THIS MATERIAL.
12. STRATUM 7 CONSISTS OF CRUSHED CONCRETE. THIS MATERIAL MAY BE UTILIZED AS A BASE COURSE FOR THE ROADWAY IN ACCORDANCE WITH STANDARD SPECIFICATIONS SECTION 911.

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD
RAMAKUMAR VEDULA, P.E.
LICENSE NUMBER 54873
TIERRA SOUTH FLORIDA, INC.
2765 VISTA PARKWAY
SUITE H10
WEST PALM BEACH, FL 33411

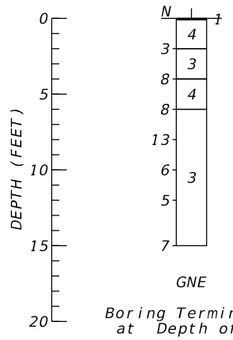
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
COVE RD	MARTIN	441700-1-22-02

ROADWAY PROFILES

SHEET NO. GR-1

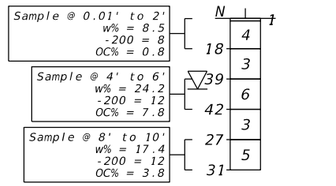
Bore # B-1
Reference BL SURVEY
Station 161+53
Offset 37 FT LT
Date 2/7/2024
Driller Y.PINO
Hammer Auto
Rig B-57
Latitude 27.11552
Longitude -80.254269



GNE

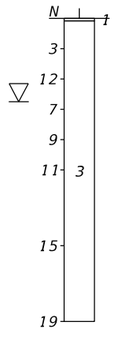
Boring Terminated at Depth of15ft

Bore # B-2
Reference BL SURVEY
Station 166+40
Offset 3 FT LT
Date 2/7/2024
Driller J.CARLOS
Hammer Auto
Rig CME-45
Latitude 27.115969
Longitude -80.252857



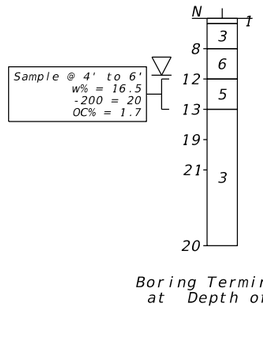
Boring Terminated at Depth of10ft

Bore # B-3 (BHP-1)
Reference BL SURVEY
Station 171+38
Offset 75 FT RT
Date 2/7/2024
Driller Y.PINO
Hammer Auto
Rig B-57
Latitude 27.116327
Longitude -80.251351



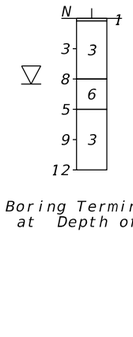
Boring Terminated at Depth of20ft

Bore # B-4
Reference BL SURVEY
Station 176+40
Offset 6 FT LT
Date 2/7/2024
Driller J.CARLOS
Hammer Auto
Rig CME-45
Latitude 27.117079
Longitude -80.250041



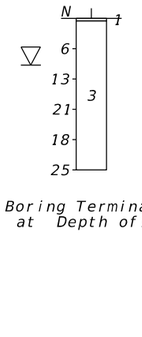
Boring Terminated at Depth of15ft

Bore # B-5
Reference BL SURVEY
Station 181+42
Offset 34 FT RT
Date 2/9/2024
Driller Y.PINO
Hammer Auto
Rig B-57
Latitude 27.117534
Longitude -80.248581



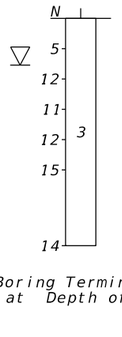
Boring Terminated at Depth of10ft

Bore # B-6
Reference BL SURVEY
Station 186+41
Offset 30 FT LT
Date 2/7/2024
Driller J.CARLOS
Hammer Auto
Rig CME-45
Latitude 27.118244
Longitude -80.247255



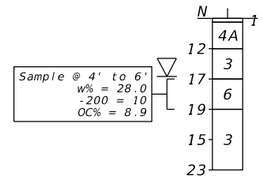
Boring Terminated at Depth of10ft

Bore # B-7
Reference BL SURVEY
Station 191+36
Offset 6 FT LT
Date 2/9/2024
Driller Y.PINO
Hammer Auto
Rig B-57
Latitude 27.11873
Longitude -80.245822

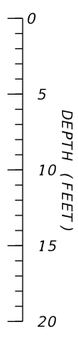


Boring Terminated at Depth of15ft

Bore # B-8
Reference BL SURVEY
Station 196+34
Offset 58 FT LT
Date 2/7/2024
Driller J.CARLOS
Hammer Auto
Rig CME-45
Latitude 27.119403
Longitude -80.244484



Boring Terminated at Depth of10ft



LEGEND

▽	Encountered Groundwater Table
GNE	Groundwater Not Encountered
(A-3)	AASHTO Classification System
N	Indicate SPT Value (12" Penetration-140 lb Hammer)

1. Topsoil (A-8)
2. Asphalt
3. Light Gray to Brown to Light Brown Sand ocassionally with shell (A-3)
4. Light Brown to Brown Sand with limerock occassionally with shell (Fill)(A-1-b/A-3)
5. Light Brown to Brown Silty Sand (A-2-4)
6. Dark Brown Organic Sand with Silt (A-8)
7. Crushed Concrete (Base)

A. trace Concrete

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD
RAMAKUMAR VEDULA, P.E.
LICENSE NUMBER 54873
TIERRA SOUTH FLORIDA, INC.
2765 VISTA PARKWAY
SUITE H10
WEST PALM BEACH, FL 33411

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
COVE RD	MARTIN	441700-1-22-02

ROADWAY PROFILES

SHEET NO. GR-2

Bore # B-9 (BHP-2)
Reference BL SURVEY
Station 201+36
Offset 0 FT LT
Date 2/5/2024
Driller Y.PINO
Hammer Auto
Rig B-57
Latitude 27.1198
Longitude -80.243004

Bore # B-10
Reference BL SURVEY
Station 206+34
Offset 51 FT LT
Date 2/7/2024
Driller J.CARLOS
Hammer Auto
Rig CME-45
Latitude 27.12048
Longitude -80.241656

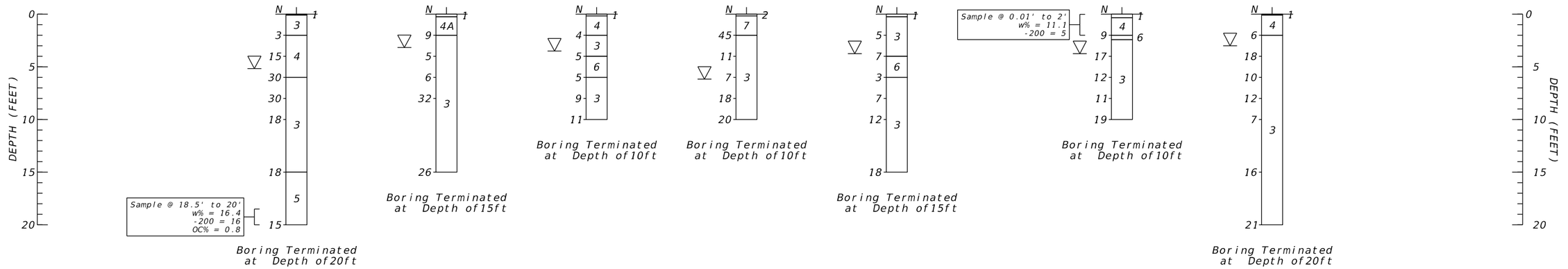
Bore # B-11
Reference BL SURVEY
Station 211+36
Offset 20 FT RT
Date 2/9/2024
Driller Y.PINO
Hammer Auto
Rig B-57
Latitude 27.120845
Longitude -80.240164

Bore # B-12
Reference BL SURVEY
Station 216+53
Offset 45 FT LT
Date 2/7/2024
Driller J.CARLOS
Hammer Auto
Rig CME-45
Latitude 27.121586
Longitude -80.238782

Bore # B-13
Reference BL SURVEY
Station 221+36
Offset 8 FT RT
Date 2/9/2024
Driller Y.PINO
Hammer Auto
Rig B-57
Latitude 27.121975
Longitude -80.23736

Bore # B-14
Reference BL SURVEY
Station 226+33
Offset 43 FT LT
Date 2/7/2024
Driller J.CARLOS
Hammer Auto
Rig CME-45
Latitude 27.122653
Longitude -80.236015

Bore # B-15 (BHP-3)
Reference BL SURVEY
Station 231+37
Offset 11 FT RT
Date 2/5/2024
Driller Y.PINO
Hammer Auto
Rig B-57
Latitude 27.123074
Longitude -80.234525



LEGEND

∇ Encountered Groundwater Table
GNE Groundwater Not Encountered
(A-3) AASHTO Classification System
N Indicate SPT Value (12" Penetration-140 lb Hammer)

1. Topsoil (A-8)
2. Asphalt
3. Light Gray to Brown to Light Brown Sand ocassionally with shell (A-3)
4. Light Brown to Brown Sand with limerock occassionally with shell (Fill)(A-1-b/A-3)
5. Light Brown to Brown Silty Sand (A-2-4)
6. Dark Brown Organic Sand with Silt (A-8)
7. Crushed Concrete (Base)

A. trace Concrete

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD
RAMAKUMAR VEDULA, P.E.
LICENSE NUMBER 54873
TIERRA SOUTH FLORIDA, INC.
2765 VISTA PARKWAY
SUITE H10
WEST PALM BEACH, FL 33411

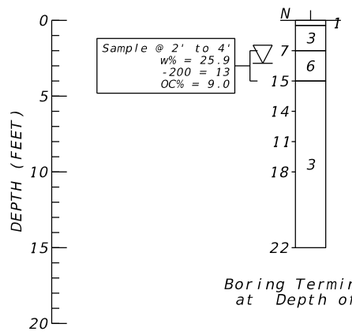
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
COVE RD	MARTIN	441700-1-22-02

ROADWAY PROFILES

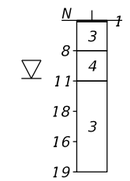
SHEET NO. GR-3

Bore # B-16
Reference BL SURVEY
Station 236+38
Offset 48 FT LT
Date 2/7/2024
Driller J.CARLOS
Hammer Auto
Rig CME-45
Latitude 27.123775
Longitude -80.233198



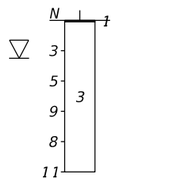
Boring Terminated at Depth of15ft

Bore # B-17
Reference BL SURVEY
Station 241+35
Offset 6 FT LT
Date 2/5/2024
Driller Y.PINO
Hammer Auto
Rig B-57
Latitude 27.124211
Longitude -80.23174



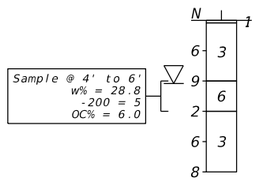
Boring Terminated at Depth of10ft

Bore # B-18
Reference BL SURVEY
Station 246+28
Offset 59 FT LT
Date 2/7/2024
Driller Y.PINO
Hammer Auto
Rig B-57
Latitude 27.124892
Longitude -80.230418



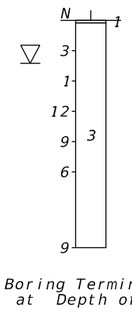
Boring Terminated at Depth of10ft

Bore # B-19
Reference BL SURVEY
Station 251+32
Offset 8 FT RT
Date 2/9/2024
Driller Y.PINO
Hammer Auto
Rig B-57
Latitude 27.125275
Longitude -80.228918



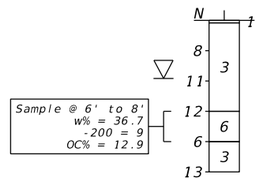
Boring Terminated at Depth of10ft

Bore # B-20
Reference BL SURVEY
Station 256+33
Offset 10 FT LT
Date 2/7/2024
Driller Y.PINO
Hammer Auto
Rig B-57
Latitude 27.125872
Longitude -80.227527



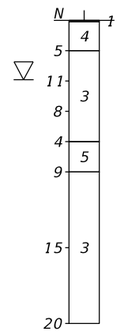
Boring Terminated at Depth of15ft

Bore # B-21
Reference BL SURVEY
Station 261+30
Offset 32 FT RT
Date 2/9/2024
Driller Y.PINO
Hammer Auto
Rig B-57
Latitude 27.126317
Longitude -80.226074



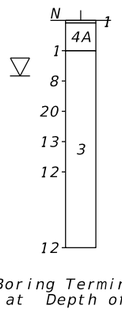
Boring Terminated at Depth of10ft

Bore # B-22 (BHP-4)
Reference BL SURVEY
Station 266+31
Offset 18 FT LT
Date 2/7/2024
Driller Y.PINO
Hammer Auto
Rig B-57
Latitude 27.126991
Longitude -80.224728

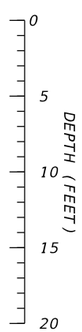


Boring Terminated at Depth of20ft

Bore # B-23
Reference BL SURVEY
Station 271+33
Offset 53 FT RT
Date 2/5/2024
Driller Y.PINO
Hammer Auto
Rig B-57
Latitude 27.127364
Longitude -80.223222



Boring Terminated at Depth of15ft



LEGEND

- ∇ Encountered Groundwater Table
- GNE Groundwater Not Encountered
- (A-3) AASHTO Classification System
- N Indicate SPT Value (12" Penetration-140 lb Hammer)

1. Topsoil (A-8)
2. Asphalt
3. Light Gray to Brown to Light Brown Sand ocassionally with shell (A-3)
4. Light Brown to Brown Sand with limerock occassionally with shell (Fill)(A-1-b/A-3)
5. Light Brown to Brown Silty Sand (A-2-4)
6. Dark Brown Organic Sand with Silt (A-8)
7. Crushed Concrete (Base)

A. trace Concrete

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD
RAMAKUMAR VEDULA, P.E.
LICENSE NUMBER 54873
TIERRA SOUTH FLORIDA, INC.
2765 VISTA PARKWAY
SUITE H10
WEST PALM BEACH, FL 33411

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
COVE RD	MARTIN	441700-1-22-02

ROADWAY PROFILES

SHEET NO. GR-4

Bore # B-24
Reference BL SURVEY
Station 276+32
Offset 33 FT LT
Date 2/7/2024
Driller Y.PINO
Hammer Auto
Rig B-57
Latitude 27.12813
Longitude -80.221924

Bore # B-25
Reference BL SURVEY
Station 281+29
Offset 29 FT RT
Date 2/6/2024
Driller Y.PINO
Hammer Auto
Rig B-57
Latitude 27.128525
Longitude -80.220449

Bore # B-26
Reference BL SURVEY
Station 286+31
Offset 42 FT LT
Date 2/7/2024
Driller Y.PINO
Hammer Auto
Rig B-57
Latitude 27.129263
Longitude -80.219124

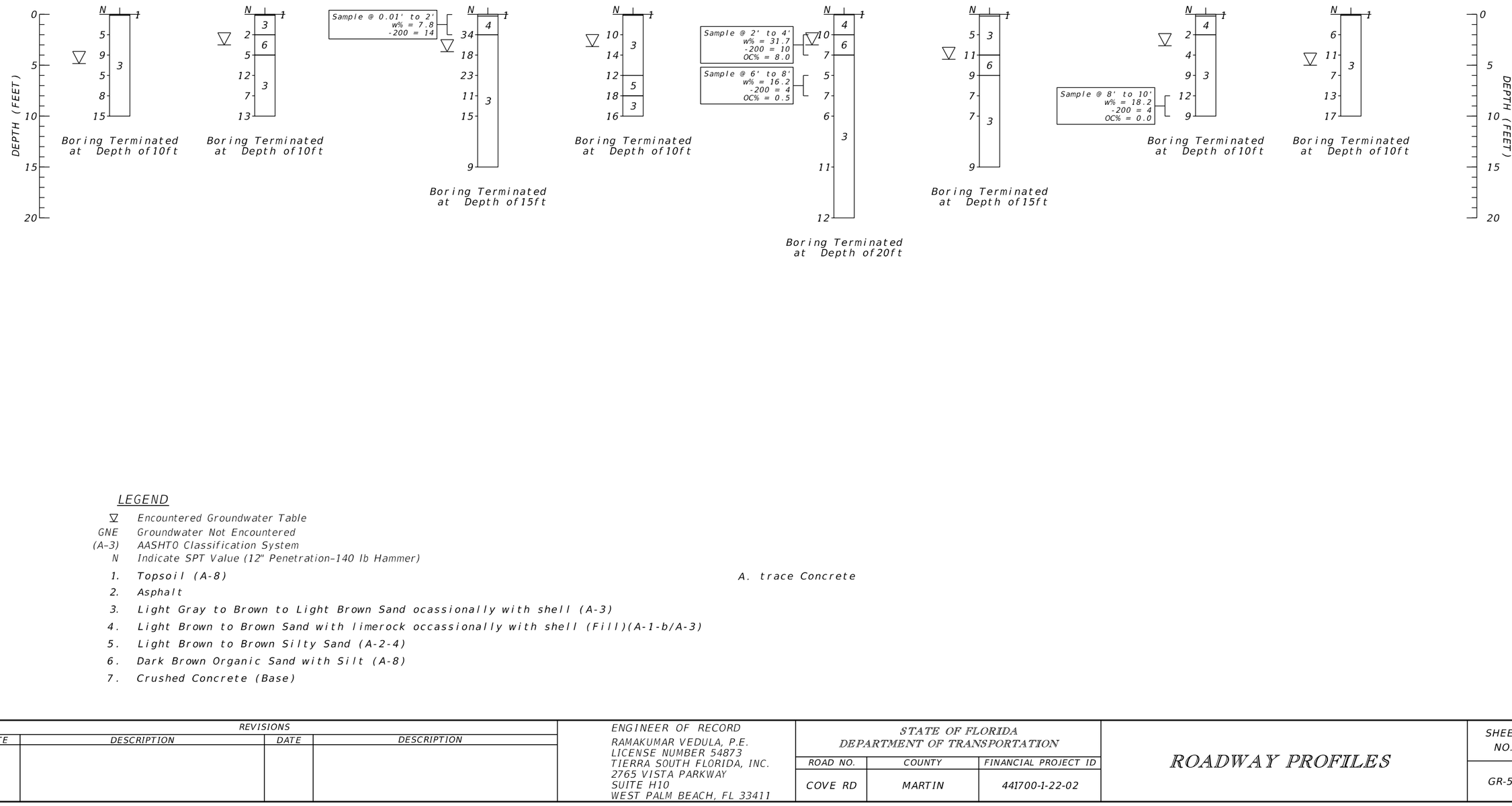
Bore # B-27
Reference BL SURVEY
Station 291+31
Offset 26 FT RT
Date 2/6/2024
Driller Y.PINO
Hammer Auto
Rig B-57
Latitude 27.129647
Longitude -80.217637

Bore # B-28 (BHP-5)
Reference BL SURVEY
Station 296+27
Offset 44 FT LT
Date 2/6/2024
Driller Y.PINO
Hammer Auto
Rig B-57
Latitude 27.130374
Longitude -80.216315

Bore # B-29
Reference BL SURVEY
Station 301+27
Offset 14 FT RT
Date 2/6/2024
Driller Y.PINO
Hammer Auto
Rig B-57
Latitude 27.130772
Longitude -80.214838

Bore # B-30
Reference BL SURVEY
Station 306+27
Offset 37 FT LT
Date 2/6/2024
Driller Y.PINO
Hammer Auto
Rig B-57
Latitude 27.131445
Longitude -80.213486

Bore # B-31
Reference BL SURVEY
Station 311+22
Offset 15 FT RT
Date 2/6/2024
Driller Y.PINO
Hammer Auto
Rig B-57
Latitude 27.13186
Longitude -80.212014



LEGEND

∇ Encountered Groundwater Table
GNE Groundwater Not Encountered
(A-3) AASHTO Classification System
N Indicate SPT Value (12" Penetration-140 lb Hammer)

1. Topsoil (A-8)
2. Asphalt
3. Light Gray to Brown to Light Brown Sand ocassionally with shell (A-3)
4. Light Brown to Brown Sand with limerock occassionally with shell (Fill)(A-1-b/A-3)
5. Light Brown to Brown Silty Sand (A-2-4)
6. Dark Brown Organic Sand with Silt (A-8)
7. Crushed Concrete (Base)

A. trace Concrete

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD
RAMAKUMAR VEDULA, P.E.
LICENSE NUMBER 54873
TIERRA SOUTH FLORIDA, INC.
2765 VISTA PARKWAY
SUITE H10
WEST PALM BEACH, FL 33411

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
COVE RD	MARTIN	441700-1-22-02

ROADWAY PROFILES

SHEET NO.
GR-5

Bore # B-32
Reference BL SURVEY
Station 316+23
Offset 37 FT LT
Date 2/6/2024
Driller Y.PINO
Hammer Auto
Rig B-57
Latitude 27.132527
Longitude -80.210665

Bore # B-33
Reference BL SURVEY
Station 321+20
Offset 33 FT RT
Date 2/6/2024
Driller Y.PINO
Hammer Auto
Rig B-57
Latitude 27.132894
Longitude -80.209173

Bore # B-34
Reference BL SURVEY
Station 326+23
Offset 54 FT LT
Date 2/6/2024
Driller Y.PINO
Hammer Auto
Rig B-57
Latitude 27.133656
Longitude -80.207859

Bore # B-35
Reference BL SURVEY
Station 329+37
Offset 67 FT RT
Date 2/6/2024
Driller Y.PINO
Hammer Auto
Rig B-57
Latitude 27.133691
Longitude -80.20683

LEGEND

∇ Encountered Groundwater Table
GNE Groundwater Not Encountered
(A-3) AASHTO Classification System
N Indicate SPT Value (12" Penetration-140 lb Hammer)

1. Topsoil (A-8)
2. Asphalt
3. Light Gray to Brown to Light Brown Sand ocassionally with shell (A-3)
4. Light Brown to Brown Sand with limerock occassionally with shell (Fill)(A-1-b/A-3)
5. Light Brown to Brown Silty Sand (A-2-4)
6. Dark Brown Organic Sand with Silt (A-8)
7. Crushed Concrete (Base)

A. trace Concrete

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD
RAMAKUMAR VEDULA, P.E.
LICENSE NUMBER 54873
TIERRA SOUTH FLORIDA, INC.
2765 VISTA PARKWAY
SUITE H10
WEST PALM BEACH, FL 33411

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
COVE RD	MARTIN	441700-1-22-02

ROADWAY PROFILES

SHEET NO.
GR-6

APPENDIX B

Summary of Exfiltration Test Results
Summary of Laboratory Tests
Grain Size Data Sheets
Summary of Corrosion Test Results
GIS Data Entry Sheet

Summary of Exfiltration Test Results

Geotechnical Services
Cove Road from SR-76/Kanner Highway to SR-5/US-1
Martin County, Florida
TSFGeo Project No. 7111-22-342

Test Location	Date Performed	Diameter		Depth of Hole	Depth to Groundwater Level Below Ground Surface (Feet)		Hydraulic Head, H_2	Saturated Hole Depth, Ds	Average Flow Rate, Q	Horizontal Hydraulic Conductivity (K)
		Hole (Inches)	Casing (Inches)	(Feet)	Prior to Test	During Test	(Feet)	(Feet)	(gpm)	($ft^3/sec/ft^2$-ft Head)
BHP-1	2/7/2024	6	4	10.0	5.5	0.0	5.5	4.5	0.60	3.17E-05
BHP-2	2/5/2024	6	4	10.0	5.2	0.0	5.2	4.8	0.30	1.65E-05
BHP-3	2/5/2024	6	4	10.0	3.0	0.0	3.0	7.0	0.40	3.31E-05
BHP-4	2/8/2024	6	4	10.0	3.9	0.0	3.9	6.1	0.40	2.67E-05
BHP-5	2/6/2024	6	4	10.0	3.0	0.0	3.0	7.0	0.30	2.48E-05

Note:

(1) The above hydraulic conductivity values represent an ultimate value. The designer should decide on the required factor of safety

(2) The hydraulic conductivity values were calculated based on the South Florida Water Management Districts's USUAL OPEN HOLE CONSTANT HEAD percolation test procedure.

(3) Casing diameter was used for the calculation of hydraulic conductivity values.

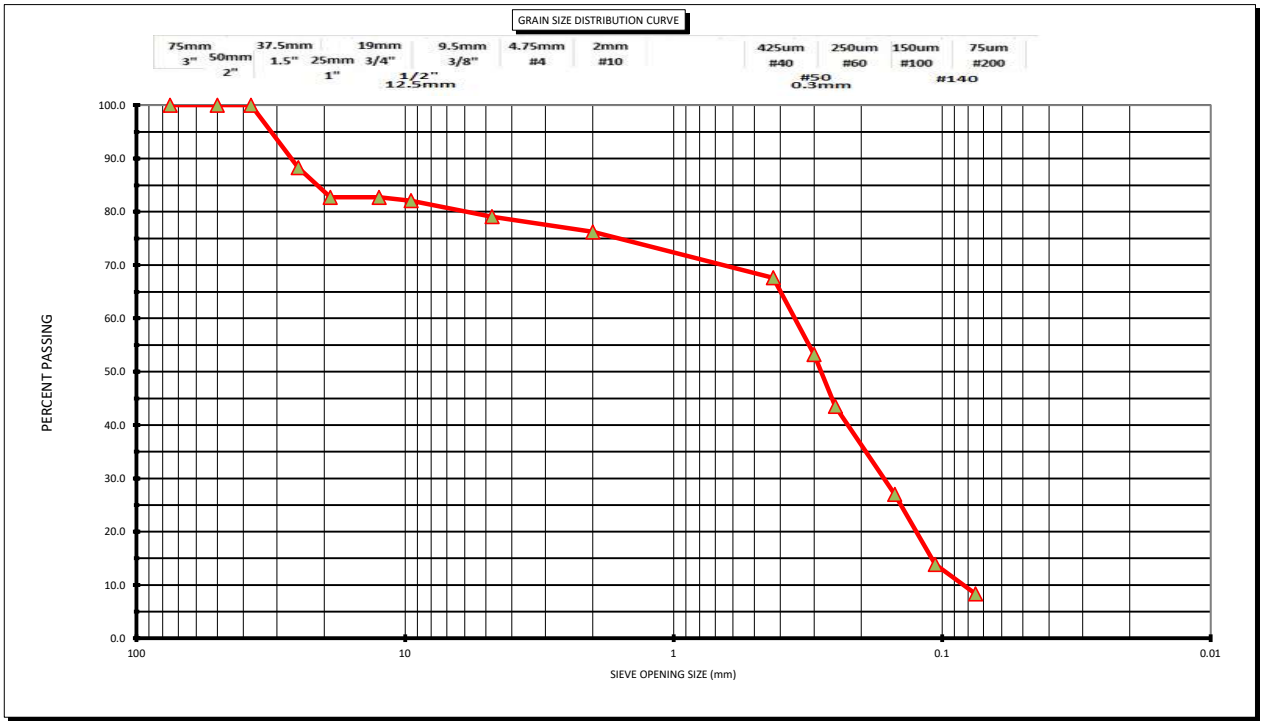
SUMMARY OF LABORATORY TESTS
Geotechnical Services
Cove Road from SR-76/Kanner Highway to SR-5/US-1
Martin County, Florida
FPID 441700-1-22-02
TSFGeo Project No. 7111-22-342

Boring Number	Sample Number	Sample Depth (ft)	Stratum Number	AASHTO Symbol	Sieve Analysis, Percentage Passing											Written Description	Organic Content (%)	Natural Moisture Content (%)
					3/4"	1/2"	3/8"	#4	#10	#40	#50	#60	#100	#140	#200			
B-02	1	0 TO 2	4	A-3	83	83	82	79	76	68	53	43	27	14	8	LIGHT BROWN TO BROWN SAND WITH LIMEROCK OCCASIONALLY WITH SHELL (FILL) (A-1-b/A-3)	0.8	8.5
B-02	3	4 TO 6	6	A-8	100	100	100	100	100	94	83	74	49	21	12	DARK BROWN ORGANIC SAND WITH SILT (A-8)	7.8	24.2
B-02	5	8 TO 10	5	A-2-4	100	100	100	100	100	94	80	69	44	21	12	LIGHT BROWN TO BROWN SILTY SAND (A-2-4)	3.8	17.4
B-04	3	4 TO 6	5	A-2-4	100	100	100	100	100	92	78	68	47	28	20	LIGHT BROWN TO BROWN SILTY SAND (A-2-4)	1.7	16.5
B-08	3	4 TO 6	6	A-8	100	100	100	100	100	97	76	65	37	15	10	DARK BROWN ORGANIC SAND WITH SILT (A-8)	8.9	28.0
B-09	7	20.0	5	A-2-4	100	100	100	100	100	93	76	65	43	28	16	LIGHT BROWN TO BROWN SILTY SAND (A-2-4)	0.8	16.4
B-14	1	0 TO 2	4	A-3	100	96	95	93	92	83	67	56	30	10	5	LIGHT BROWN TO BROWN SAND WITH LIMEROCK OCCASIONALLY WITH SHELL (FILL) (A-1-b/A-3)		11.1
B-16	2	2 TO 4	6	A-8	100	100	100	100	100	92	76	64	36	18	13	DARK BROWN ORGANIC SAND WITH SILT (A-8)	9.0	25.9
B-19	3	4 TO 6	6	A-8	100	100	100	100	100	92	73	59	26	9	5	DARK BROWN ORGANIC SAND WITH SILT (A-8)	6.0	28.8
B-21	4	6 TO 8	6	A-8	100	100	100	100	100	90	74	62	33	14	9	DARK BROWN ORGANIC SAND WITH SILT (A-8)	12.9	36.7
B-26	1	0 TO 2	4	A-1-b	96	91	86	76	62	50	48	47	37	21	14	LIGHT BROWN TO BROWN SAND WITH LIMEROCK OCCASIONALLY WITH SHELL (FILL) (A-1-b/A-3)		7.8
B-28	2	2 TO 4	6	A-8	100	100	100	100	100	88	72	60	31	14	10	DARK BROWN ORGANIC SAND WITH SILT (A-8)	8.0	31.7
B-28	4	6 TO 8	3	A-3	100	100	100	100	100	91	71	57	25	7	4	LIGHT GRAY TO BROWN TO LIGHT BROWN SAND OCCASIONALLY WITH SHELL (A-3)	0.5	16.2
B-30	5	8 TO 10	3	A-3	100	100	100	100	100	82	48	30	9	4	4	LIGHT GRAY TO BROWN TO LIGHT BROWN SAND OCCASIONALLY WITH SHELL (A-3)	0.0	18.2

GRAIN SIZE DATA SHEET

PROJECT INFORMATION
Geotechnical Services
Cove Road from SR-76/Kanner Highway to SR-5/US-1
Martin County, Florida
FPID 441700-1-22-02
TSFGeo Project No. 7111-22-342

DATE: 2/14/2024



ASTM D 2487 Classification of Soil for Engineering Purposes			Coarse Sand	< #4 and > #10	Cu = D60 / D10 = 4.2
Coarse Gravel	< 3" and > 3/4"		Medium Sand	< #10 and > #40	Cc = (D30)^2 / (D10 x D60) =1
Fine Gravel	< 3/4" and > #4		Fine Sand	< #40 and > #200	

BORING # B-02 **SAMPLE #** 1 **DEPTH (ft):** 0 TO 2

STRATUM: 4

SOIL CLASSIFICATION: A-3

MC% 8.5

OC% 0.79

-200% 8

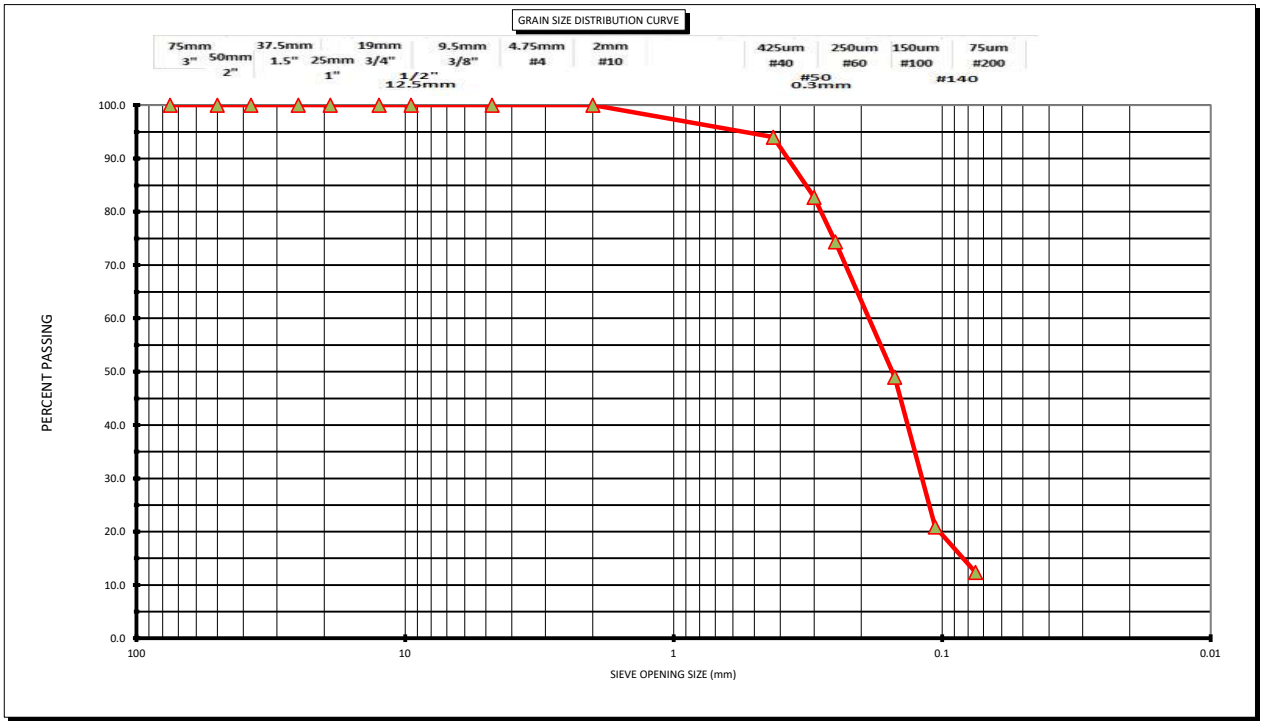
LIGHT BROWN TO BROWN SAND WITH LIMEROCK OCCASIONALLY WITH SHELL (FILL)
(A-1-b/A-3)

ATTERBERG LIMIT (- #40 Material)	
LIQUID LIMIT	
PLASTIC LIMIT	
PLASTIC INDEX	

GRAIN SIZE DATA SHEET

PROJECT INFORMATION
Geotechnical Services
Cove Road from SR-76/Kanner Highway to SR-5/US-1
Martin County, Florida
FPID 441700-1-22-02
TSFGeo Project No. 7111-22-342

DATE: 2/14/2024



ASTM D 2487 Classification of Soil for Engineering Purposes			Coarse Sand	< #4 and > #10	Cu = D60 / D10 = 3.7
Coarse Gravel	< 3" and > 3/4"		Medium Sand	< #10 and > #40	Cc = (D30)^2 / (D10 x D60) =0.3
Fine Gravel	< 3/4" and > #4		Fine Sand	< #40 and > #200	

BORING # B-02 **SAMPLE #** 3 **DEPTH (ft):** 4 TO 6

STRATUM: 6

SOIL CLASSIFICATION: A-8

MC% 24.2
OC% 7.82
-200% 12

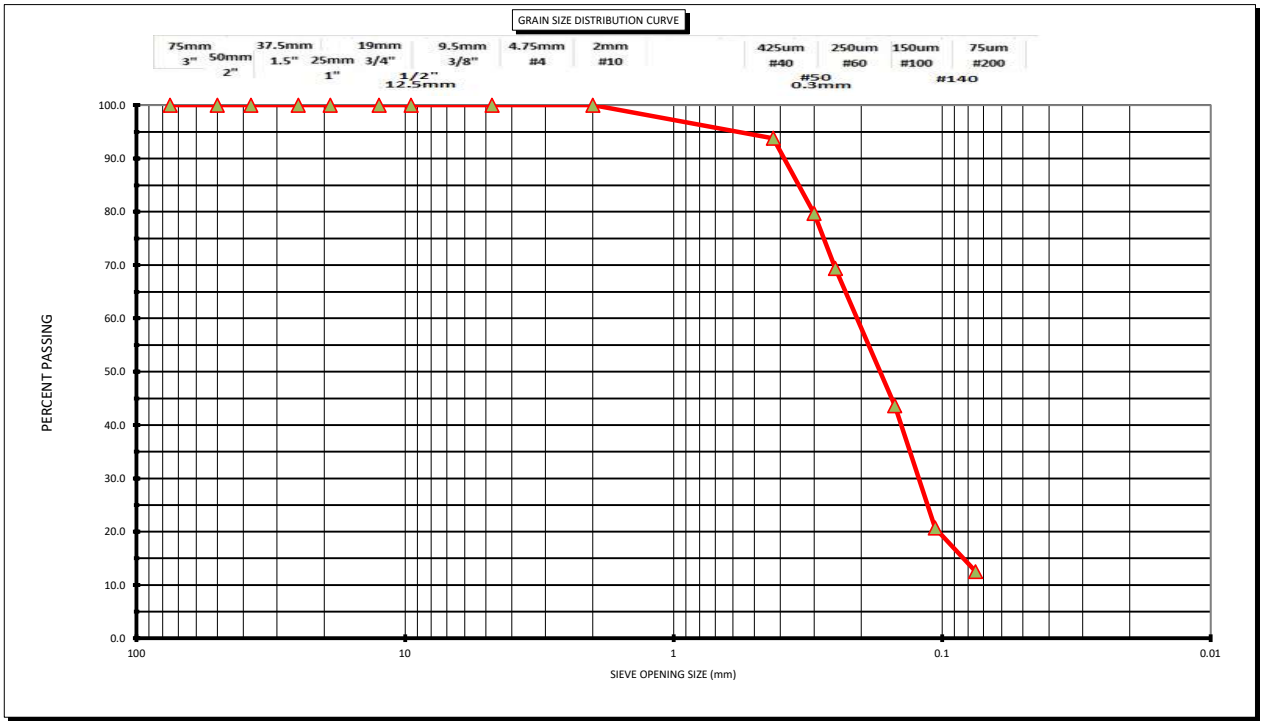
DARK BROWN ORGANIC SAND WITH SILT (A-8)

ATTERBERG LIMIT (- #40 Material)	
LIQUID LIMIT	
PLASTIC LIMIT	
PLASTIC INDEX	

GRAIN SIZE DATA SHEET

PROJECT INFORMATION
Geotechnical Services
Cove Road from SR-76/Kanner Highway to SR-5/US-1
Martin County, Florida
FPID 441700-1-22-02
TSFGeo Project No. 7111-22-342

DATE: 2/14/2024



ASTM D 2487 Classification of Soil for Engineering Purposes			Coarse Sand	< #4 and > #10	Cu = D60 / D10 = 3.7
Coarse Gravel	< 3" and > 3/4"		Medium Sand	< #10 and > #40	Cc = (D30)^2 / (D10 x D60) =0.3
Fine Gravel	< 3/4" and > #4		Fine Sand	< #40 and > #200	

BORING # B-02 **SAMPLE #** 5 **DEPTH (ft):** 8 TO 10

STRATUM: 5

SOIL CLASSIFICATION: A-2-4

MC% 17.4
OC% 3.78
-200% 12

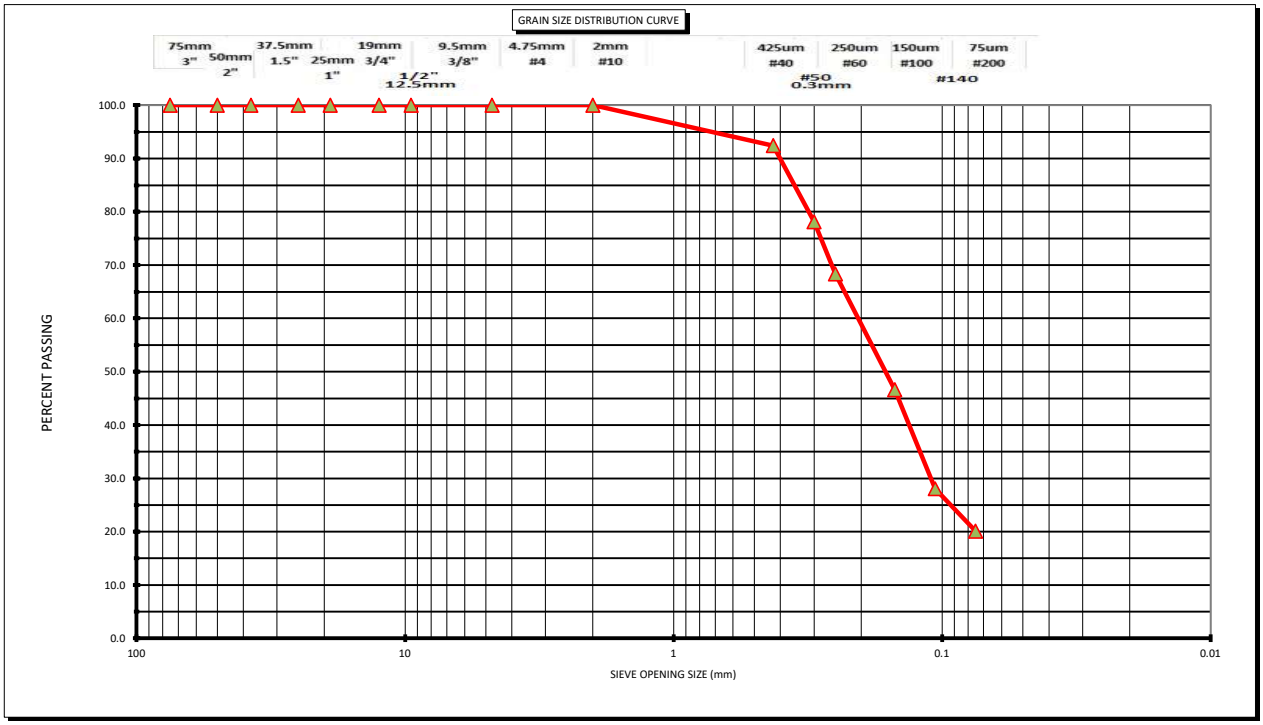
LIGHT BROWN TO BROWN SILTY SAND (A-2-4)

ATTERBERG LIMIT (- #40 Material)	
LIQUID LIMIT	
PLASTIC LIMIT	
PLASTIC INDEX	

GRAIN SIZE DATA SHEET

PROJECT INFORMATION
Geotechnical Services
Cove Road from SR-76/Kanner Highway to SR-5/US-1
Martin County, Florida
FPID 441700-1-22-02
TSFGeo Project No. 7111-22-342

DATE: 2/14/2024



ASTM D 2487 Classification of Soil for Engineering Purposes			Coarse Sand	< #4 and > #10	Cu = D60 / D10 = 3.7
Coarse Gravel	< 3" and > 3/4"		Medium Sand	< #10 and > #40	Cc = (D30)^2 / (D10 x D60) =0.3
Fine Gravel	< 3/4" and > #4		Fine Sand	< #40 and > #200	

BORING # B-04 **SAMPLE #** 3 **DEPTH (ft):** 4 TO 6

STRATUM: 5

SOIL CLASSIFICATION: A-2-4

MC% 16.5
OC% 1.69
-200% 20

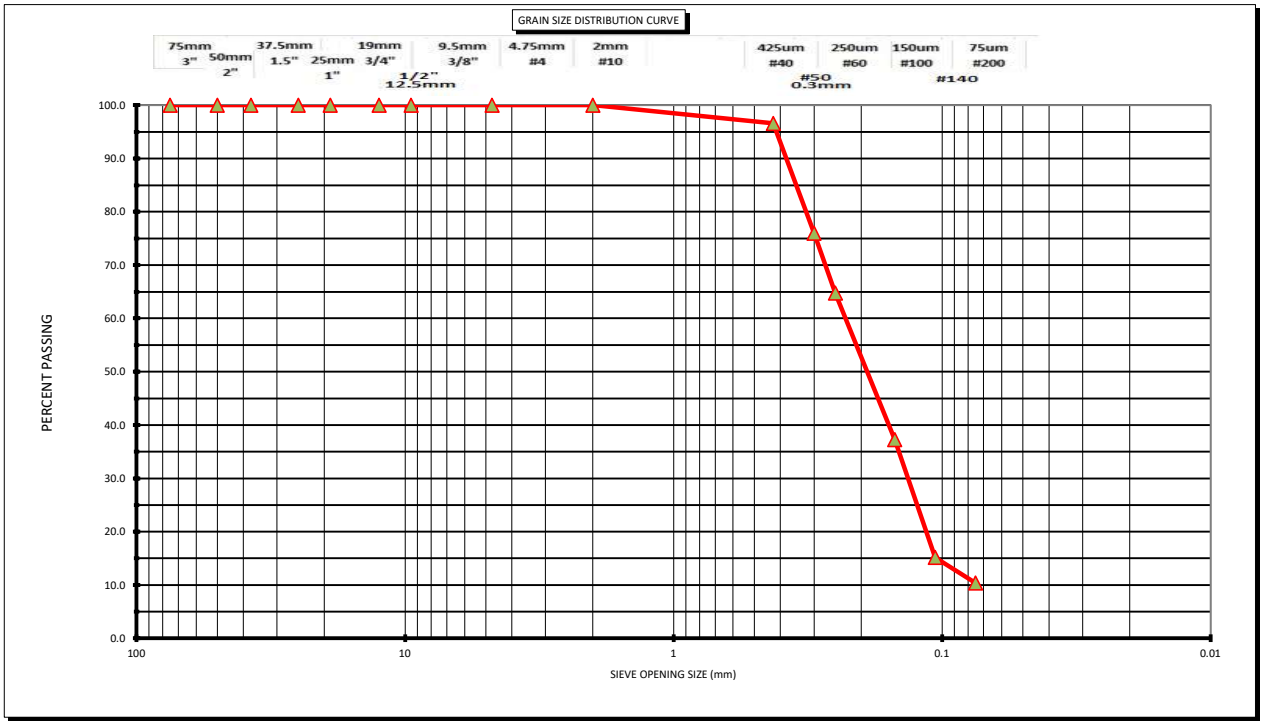
LIGHT BROWN TO BROWN SILTY SAND (A-2-4)

ATTERBERG LIMIT (- #40 Material)	
LIQUID LIMIT	
PLASTIC LIMIT	
PLASTIC INDEX	

GRAIN SIZE DATA SHEET

PROJECT INFORMATION
Geotechnical Services
Cove Road from SR-76/Kanner Highway to SR-5/US-1
Martin County, Florida
FPID 441700-1-22-02
TSFGeo Project No. 7111-22-342

DATE: 2/14/2024



ASTM D 2487 Classification of Soil for Engineering Purposes			Coarse Sand	< #4 and > #10	Cu = D60 / D10 = 3.7
Coarse Gravel	< 3" and > 3/4"		Medium Sand	< #10 and > #40	Cc = (D30)^2 / (D10 x D60) =0.3
Fine Gravel	< 3/4" and > #4		Fine Sand	< #40 and > #200	

BORING # B-08 **SAMPLE #** 3 **DEPTH (ft):** 4 TO 6

STRATUM: 6

SOIL CLASSIFICATION: A-8

MC% 28.0
OC% 8.92
-200% 10

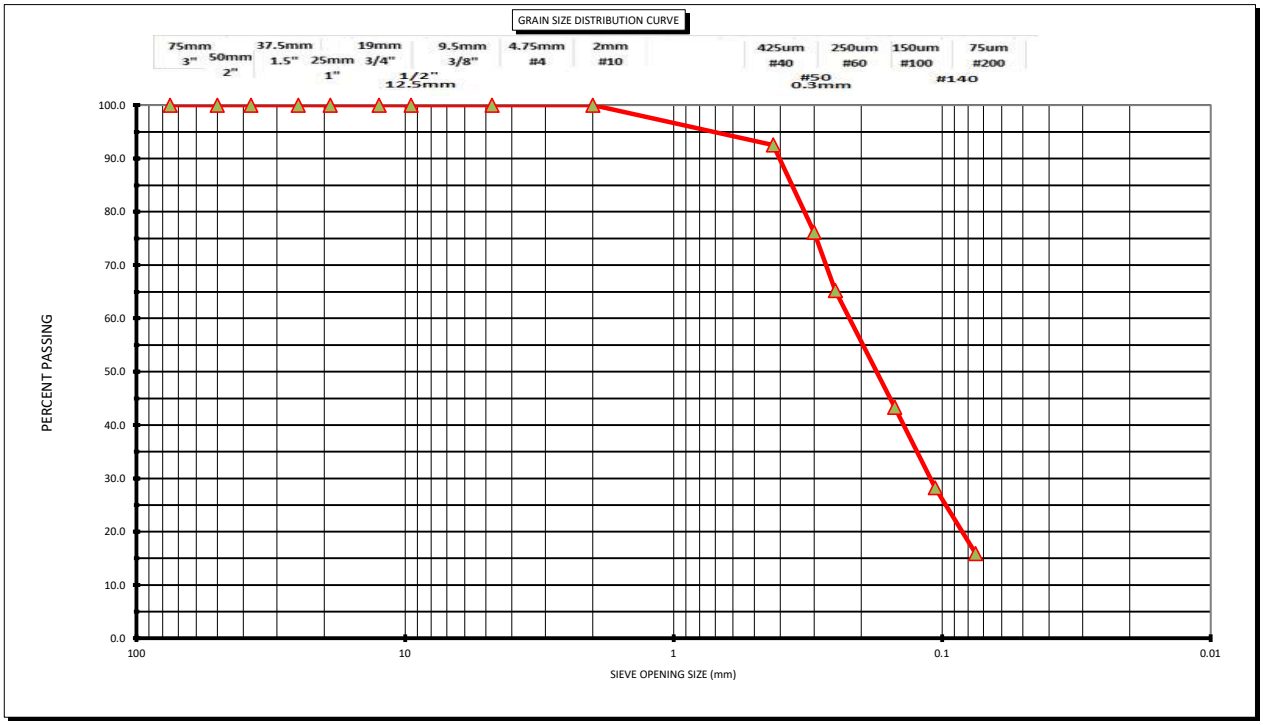
DARK BROWN ORGANIC SAND WITH SILT (A-8)

ATTERBERG LIMIT (- #40 Material)	
LIQUID LIMIT	
PLASTIC LIMIT	
PLASTIC INDEX	

GRAIN SIZE DATA SHEET

PROJECT INFORMATION
Geotechnical Services
Cove Road from SR-76/Kanner Highway to SR-5/US-1
Martin County, Florida
FPID 441700-1-22-02
TSFGeo Project No. 7111-22-342

DATE: 2/14/2024



ASTM D 2487 Classification of Soil for Engineering Purposes			Coarse Sand	< #4 and > #10	Cu = D60 / D10 = 3.7
Coarse Gravel	< 3" and > 3/4"		Medium Sand	< #10 and > #40	Cc = (D30)^2 / (D10 x D60) =0.3
Fine Gravel	< 3/4" and > #4		Fine Sand	< #40 and > #200	

BORING # B-09 **SAMPLE #** 7 **DEPTH (ft):** 20.00

STRATUM: 5

SOIL CLASSIFICATION: A-2-4

MC% 16.4
OC% 0.77
-200% 16

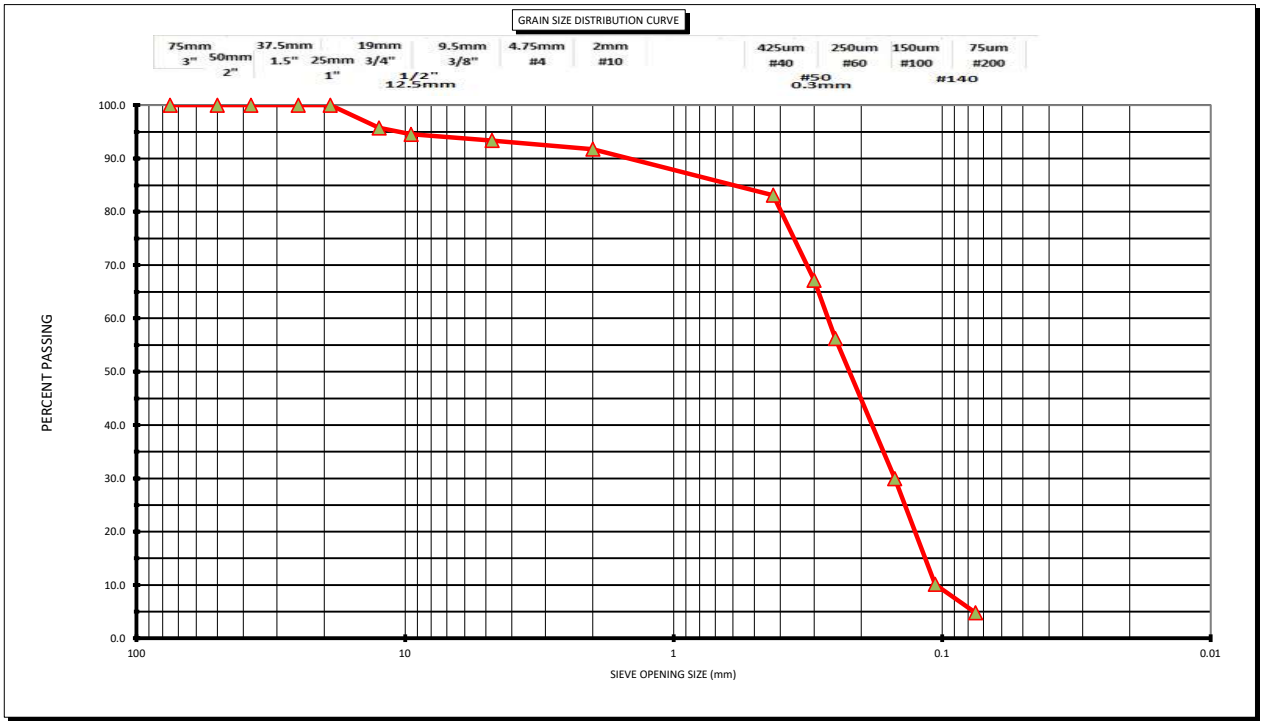
LIGHT BROWN TO BROWN SILTY SAND (A-2-4)

ATTERBERG LIMIT (- #40 Material)	
LIQUID LIMIT	
PLASTIC LIMIT	
PLASTIC INDEX	

GRAIN SIZE DATA SHEET

PROJECT INFORMATION
Geotechnical Services
Cove Road from SR-76/Kanner Highway to SR-5/US-1
Martin County, Florida
FPID 441700-1-22-02
TSFGeo Project No. 7111-22-342

DATE: 3/11/2024



ASTM D 2487 Classification of Soil for Engineering Purposes			Coarse Sand	< #4 and > #10	Cu = D60 / D10 = 2.5
Coarse Gravel	< 3" and > 3/4"		Medium Sand	< #10 and > #40	Cc = (D30)^2 / (D10 x D60) =0.9
Fine Gravel	< 3/4" and > #4		Fine Sand	< #40 and > #200	

BORING # B-14 **SAMPLE #** 1 **DEPTH (ft):** 0 TO 2

STRATUM: 4

SOIL CLASSIFICATION: A-3

MC% 11.1

OC%

-200% 5

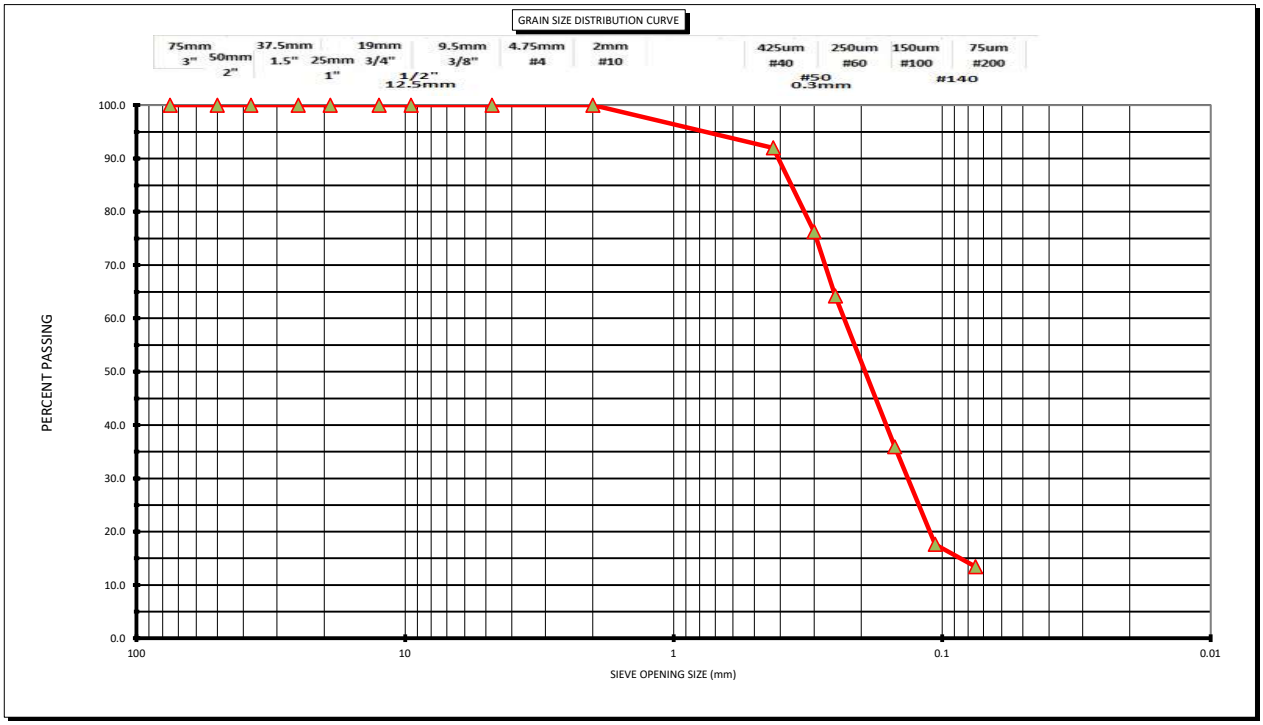
LIGHT BROWN TO BROWN SAND WITH LIMEROCK OCCASIONALLY WITH SHELL (FILL)
(A-1-b/A-3)

ATTERBERG LIMIT (- #40 Material)	
LIQUID LIMIT	
PLASTIC LIMIT	
PLASTIC INDEX	

GRAIN SIZE DATA SHEET

PROJECT INFORMATION
Geotechnical Services
Cove Road from SR-76/Kanner Highway to SR-5/US-1
Martin County, Florida
FPID 441700-1-22-02
TSFGeo Project No. 7111-22-342

DATE: 2/14/2024



ASTM D 2487 Classification of Soil for Engineering Purposes			Coarse Sand	< #4 and > #10	Cu = D60 / D10 = 3.7
Coarse Gravel	< 3" and > 3/4"		Medium Sand	< #10 and > #40	Cc = (D30)^2 / (D10 x D60) =0.3
Fine Gravel	< 3/4" and > #4		Fine Sand	< #40 and > #200	

BORING # B-16 **SAMPLE #** 2 **DEPTH (ft):** 2 TO 4

STRATUM: 6

SOIL CLASSIFICATION: A-8

MC% 25.9
OC% 8.98
-200% 13

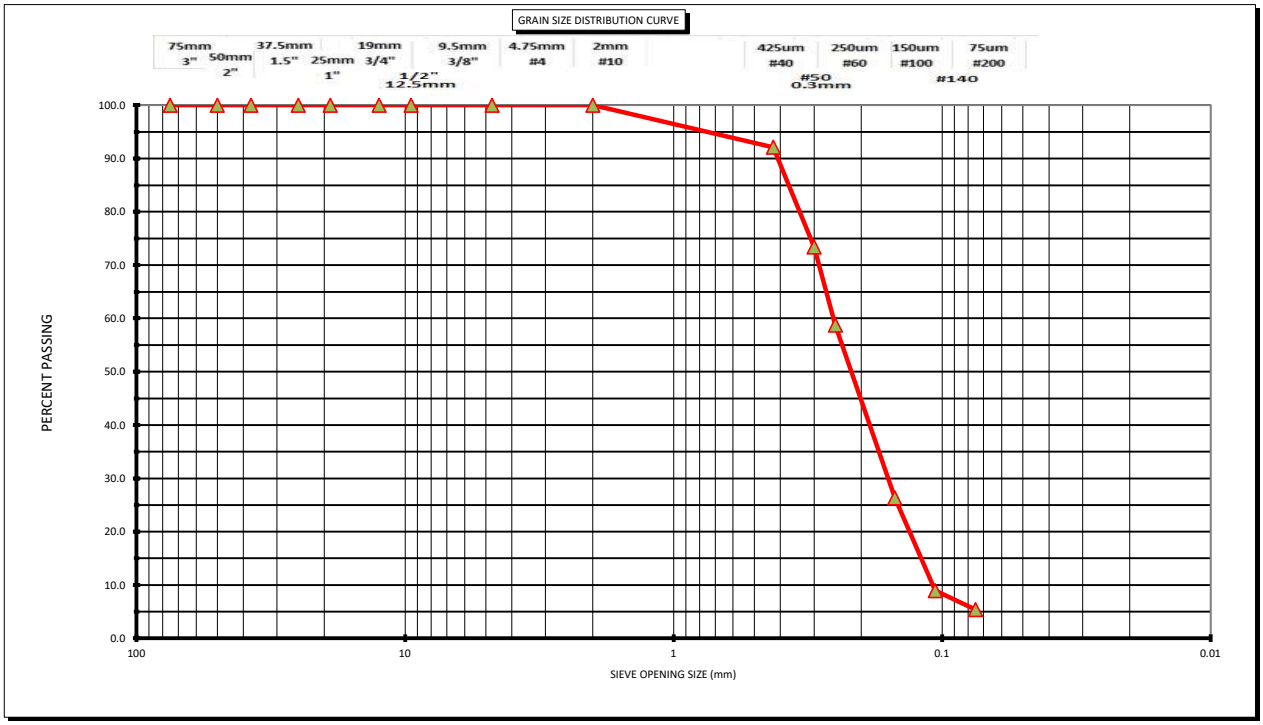
DARK BROWN ORGANIC SAND WITH SILT (A-8)

ATTERBERG LIMIT (- #40 Material)	
LIQUID LIMIT	
PLASTIC LIMIT	
PLASTIC INDEX	

GRAIN SIZE DATA SHEET

PROJECT INFORMATION
Geotechnical Services
Cove Road from SR-76/Kanner Highway to SR-5/US-1
Martin County, Florida
FPID 441700-1-22-02
TSFGeo Project No. 7111-22-342

DATE: 2/14/2024



ASTM D 2487 Classification of Soil for Engineering Purposes			Coarse Sand	< #4 and > #10	Cu = D60 / D10 = 2.4
Coarse Gravel	< 3" and > 3/4"		Medium Sand	< #10 and > #40	Cc = (D30)^2 / (D10 x D60) =1
Fine Gravel	< 3/4" and > #4		Fine Sand	< #40 and > #200	

BORING # B-19 **SAMPLE #** 3 **DEPTH (ft):** 4 TO 6

STRATUM: 6

SOIL CLASSIFICATION: A-8

MC% 28.8

OC% 5.98

-200% 5

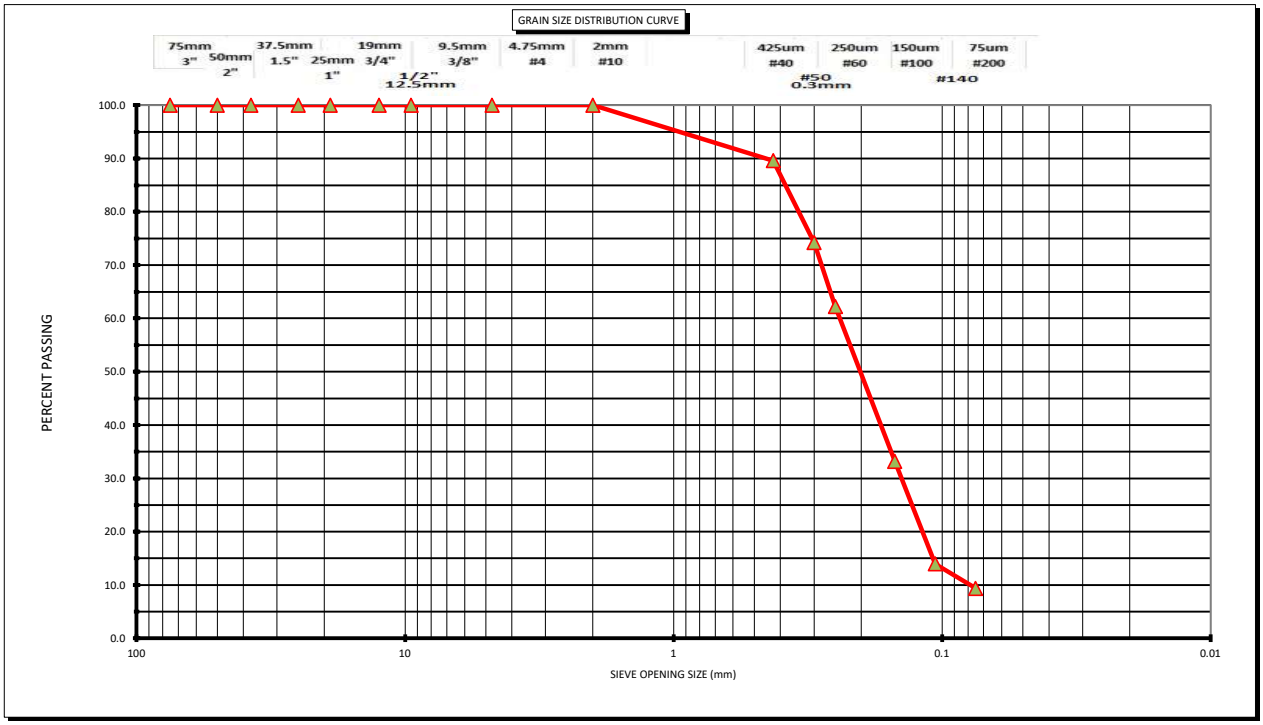
DARK BROWN ORGANIC SAND WITH SILT (A-8)

ATTERBERG LIMIT (- #40 Material)	
LIQUID LIMIT	
PLASTIC LIMIT	
PLASTIC INDEX	

GRAIN SIZE DATA SHEET

PROJECT INFORMATION
Geotechnical Services
Cove Road from SR-76/Kanner Highway to SR-5/US-1
Martin County, Florida
FPID 441700-1-22-02
TSFGeo Project No. 7111-22-342

DATE: 2/14/2024



ASTM D 2487 Classification of Soil for Engineering Purposes			Coarse Sand	< #4 and > #10	Cu = D60 / D10 = 3.2
Coarse Gravel	< 3" and > 3/4"		Medium Sand	< #10 and > #40	Cc = (D30)^2 / (D10 x D60) =1.2
Fine Gravel	< 3/4" and > #4		Fine Sand	< #40 and > #200	

BORING # B-21 **SAMPLE #** 4 **DEPTH (ft):** 6 TO 8

STRATUM: 6

SOIL CLASSIFICATION: A-8

MC% 36.7
OC% 12.87
-200% 9

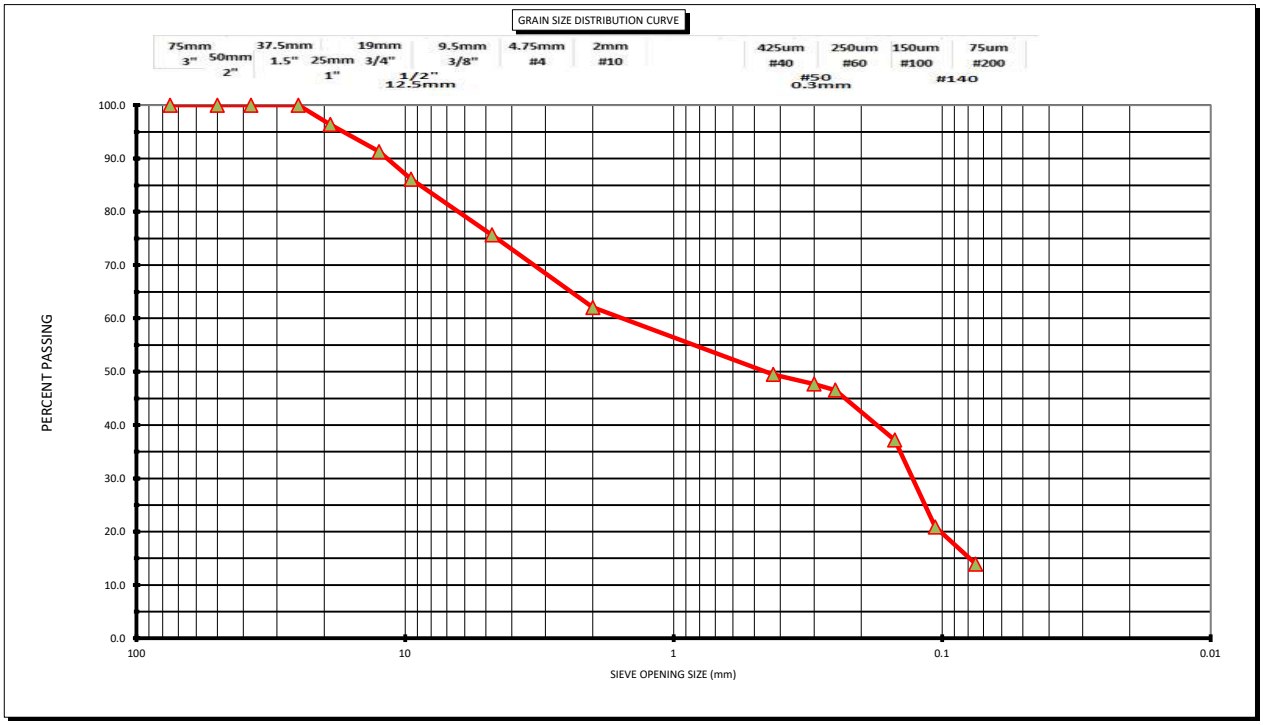
DARK BROWN ORGANIC SAND WITH SILT (A-8)

ATTERBERG LIMIT (- #40 Material)	
LIQUID LIMIT	
PLASTIC LIMIT	
PLASTIC INDEX	

GRAIN SIZE DATA SHEET

PROJECT INFORMATION
Geotechnical Services
Cove Road from SR-76/Kanner Highway to SR-5/US-1
Martin County, Florida
FPID 441700-1-22-02
TSFGeo Project No. 7111-22-342

DATE: 3/11/2024



ASTM D 2487 Classification of Soil for Engineering Purposes			Coarse Sand	< #4 and > #10	Cu = D60 / D10 = 3.7
Coarse Gravel	< 3" and > 3/4"		Medium Sand	< #10 and > #40	Cc = (D30)^2 / (D10 x D60) =0.3
Fine Gravel	< 3/4" and > #4		Fine Sand	< #40 and > #200	

BORING # B-26 **SAMPLE #** 1 **DEPTH (ft):** 0 TO 2

STRATUM: 4

SOIL CLASSIFICATION: A-1-b

MC% 7.8

OC%

-200% 14

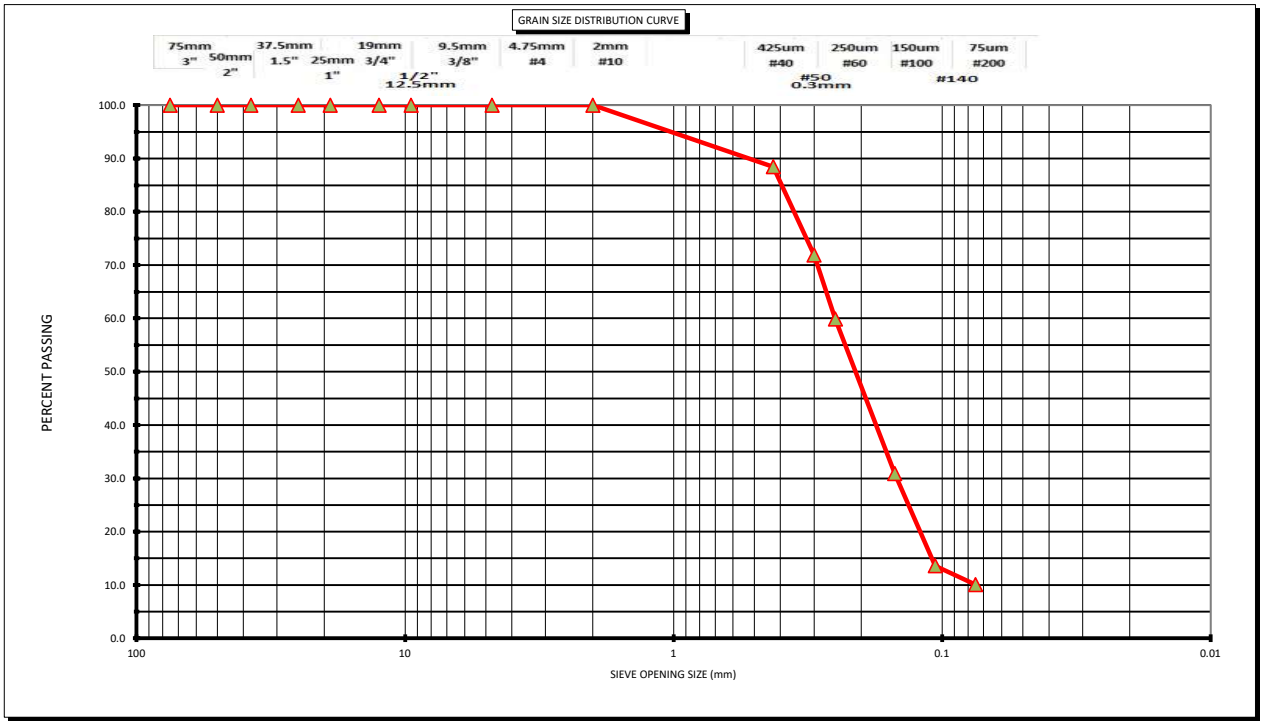
LIGHT BROWN TO BROWN SAND WITH LIMEROCK OCCASIONALLY WITH SHELL (FILL)
(A-1-b/A-3)

ATTERBERG LIMIT (- #40 Material)	
LIQUID LIMIT	
PLASTIC LIMIT	
PLASTIC INDEX	

GRAIN SIZE DATA SHEET

PROJECT INFORMATION
Geotechnical Services
Cove Road from SR-76/Kanner Highway to SR-5/US-1
Martin County, Florida
FPID 441700-1-22-02
TSFGeo Project No. 7111-22-342

DATE: 2/14/2024



ASTM D 2487 Classification of Soil for Engineering Purposes			Coarse Sand	< #4 and > #10	Cu = D60 / D10 = 3.7
Coarse Gravel	< 3" and > 3/4"		Medium Sand	< #10 and > #40	Cc = (D30)^2 / (D10 x D60) =0.3
Fine Gravel	< 3/4" and > #4		Fine Sand	< #40 and > #200	

BORING # B-28 **SAMPLE #** 2 **DEPTH (ft):** 2 TO 4

STRATUM: 6

SOIL CLASSIFICATION: A-8

MC% 31.7
OC% 7.98
-200% 10

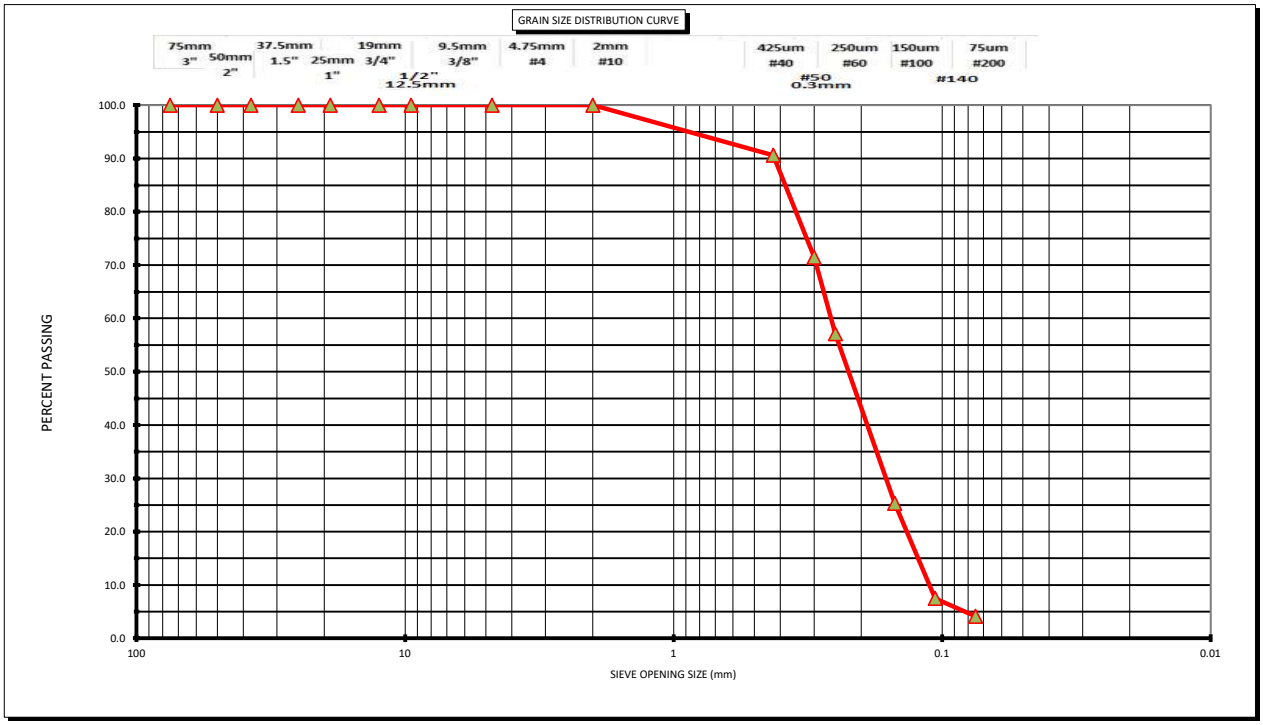
DARK BROWN ORGANIC SAND WITH SILT (A-8)

ATTERBERG LIMIT (- #40 Material)	
LIQUID LIMIT	
PLASTIC LIMIT	
PLASTIC INDEX	

GRAIN SIZE DATA SHEET

PROJECT INFORMATION
Geotechnical Services
Cove Road from SR-76/Kanner Highway to SR-5/US-1
Martin County, Florida
FPID 441700-1-22-02
TSFGeo Project No. 7111-22-342

DATE: 2/14/2024



ASTM D 2487 Classification of Soil for Engineering Purposes			Coarse Sand	< #4 and > #10	Cu = D60 / D10 = 2.2
Coarse Gravel	< 3" and > 3/4"		Medium Sand	< #10 and > #40	Cc = (D30)^2 / (D10 x D60) =0.6
Fine Gravel	< 3/4" and > #4		Fine Sand	< #40 and > #200	

BORING # B-28 **SAMPLE #** 4 **DEPTH (ft):** 6 TO 8

STRATUM: 3

SOIL CLASSIFICATION: A-3

MC% 16.2
OC% 0.54
-200% 4

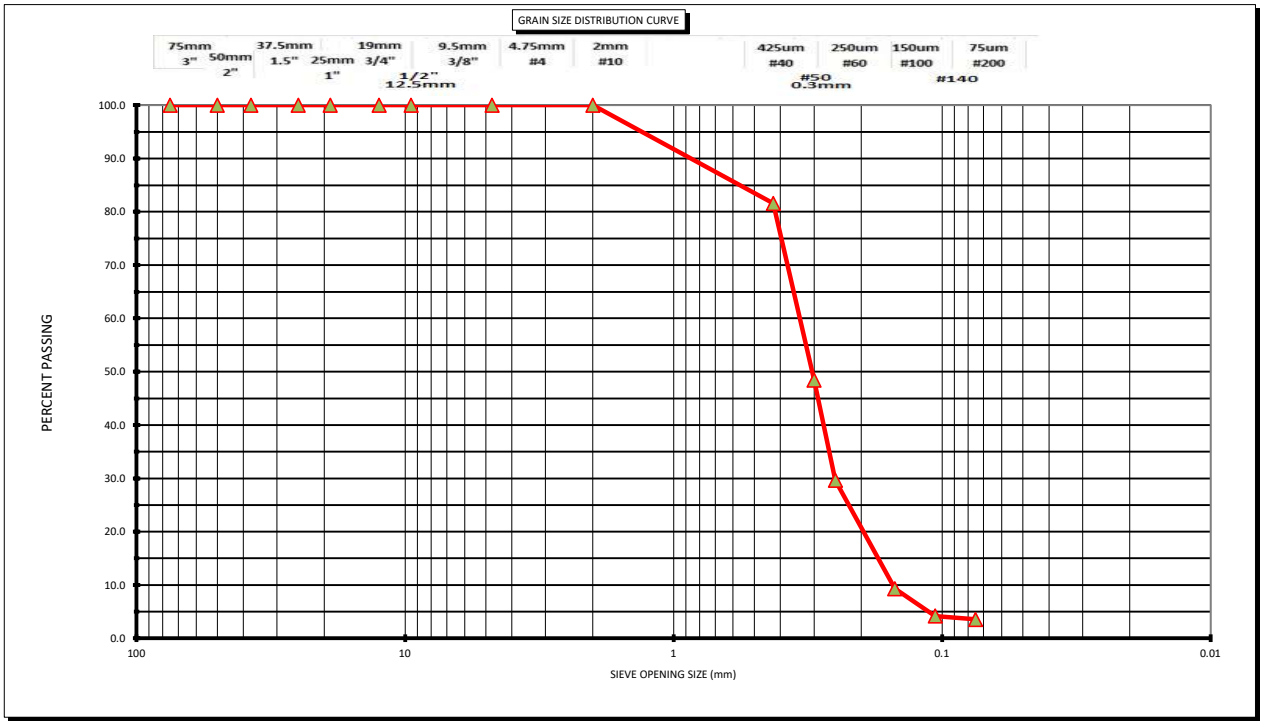
LIGHT GRAY TO BROWN TO LIGHT BROWN SAND OCCASIONALLY WITH SHELL (A-3)

ATTERBERG LIMIT (- #40 Material)	
LIQUID LIMIT	
PLASTIC LIMIT	
PLASTIC INDEX	

GRAIN SIZE DATA SHEET

PROJECT INFORMATION
Geotechnical Services
Cove Road from SR-76/Kanner Highway to SR-5/US-1
Martin County, Florida
FPID 441700-1-22-02
TSFGeo Project No. 7111-22-342

DATE: 2/14/2024



ASTM D 2487 Classification of Soil for Engineering Purposes			Coarse Sand	< #4 and > #10	Cu = D60 / D10 = 2.1
Coarse Gravel	< 3" and > 3/4"		Medium Sand	< #10 and > #40	Cc = (D30)^2 / (D10 x D60) =1.2
Fine Gravel	< 3/4" and > #4		Fine Sand	< #40 and > #200	

BORING # B-30 **SAMPLE #** 5 **DEPTH (ft):** 8 TO 10

STRATUM: 3

SOIL CLASSIFICATION: A-3

MC% 18.2
OC% 0.00
-200% 4

LIGHT GRAY TO BROWN TO LIGHT BROWN SAND OCCASIONALLY WITH SHELL (A-3)

ATTERBERG LIMIT (- #40 Material)	
LIQUID LIMIT	
PLASTIC LIMIT	
PLASTIC INDEX	

TIERRA SOUTH FLORIDA

SUMMARY OF CORROSION TEST RESULTS
Geotechnical Services
Cove Road from SR-76/Kanner Highway to SR-5/US-1
Martin County, Florida
FPID 441700-1-22-02
TSFGeo Project No. 7111-22-342

Boring Number	Depth (ft)	pH (FM 5-550)	Resistivity (ohm-cm) (FM 5-551)	Chlorides (ppm) (FM 5-552)	Sulfates (ppm) (FM 5-553)	Environmental Classification* (Soil)	
						Steel	Concrete
B-8	2 - 4	7.0	21,000	105	0	Slightly Aggressive	Slightly Aggressive
B-33	4 - 6	6.6	11,000	105	6	Moderately Aggressive	Slightly Aggressive

* As per FDOT Structures Design Guidelines, Table 1.3.2-1, Updated January, 2023
**** Any reading represented as "0.0" is below the detection limit of 4.8 ppm**

Table 1.3.2-1 Criteria for Substructure Environmental Classifications

Classification	Environmental Condition	Units	Steel		Concrete	
			Water	Soil	Water	Soil
Extremely Aggressive (If any of these conditions exist)	pH		< 6.0		< 5.0	
	Cl	ppm	> 2,000		> 2,000	
	SO_4	ppm	N.A.		> 1,500	> 2,000
	Resistivity	Ohm-cm	< 1,000		< 500	
Slightly Aggressive (If all of these conditions exist)	pH		> 7.0		> 6.0	
	Cl	ppm	< 500		< 500	
	SO_4	ppm	N.A.		< 150	< 1,000
	Resistivity	Ohm-cm	> 5,000		> 3,000	
Moderately Aggressive	This classification must be used at all sites not meeting requirements for either slightly aggressive or extremely aggressive environments.					

pH = acidity ($-\log_{10}H^+$; potential of Hydrogen), Cl = chloride content, SO_4 = Sulfate content.

DATA ENTRY SHEET

Project FM# - 4417001 , District: D4

Cove Rd from SR-76/Kanner Hwy to SR-5/US-1

Martin County, Florida

Test No.	Test Type	Latitude	Longitude	Test Date MM/DD/YYYY	Elevation ft.	Groundwater Depth ft.	Percolation Test Results	PDF Name
B-1	Roadway Boring	27.11552000	-80.25426900	2/7/2024				4417001D4C42aTi.05082024.1
B-2	Roadway Boring	27.11596900	-80.25285700	2/7/2024		4.7		4417001D4C42aTi.05082024.1
B-3 (BHP-1)	Roadway Boring	27.11632700	-80.25135100	2/7/2024		5.5	3.17E-05	4417001D4C42aTi.05082024.1
B-4	Roadway Boring	27.11707900	-80.25004100	2/7/2024		3.8		4417001D4C42aTi.05082024.1
B-5	Roadway Boring	27.11753400	-80.24858100	2/9/2024		4.3		4417001D4C42aTi.05082024.1
B-6	Roadway Boring	27.11824400	-80.24725500	2/7/2024		3.1		4417001D4C42aTi.05082024.1
B-7	Roadway Boring	27.11873000	-80.24582200	2/9/2024		3.1		4417001D4C42aTi.05082024.1
B-8	Roadway Boring	27.11940300	-80.24448400	2/7/2024		3.8		4417001D4C42aTi.05082024.1
B-9 (BHP-2)	Roadway Boring	27.11980000	-80.24300400	2/5/2024		5.2	1.65E-05	4417001D4C42aTi.05082024.2
B-10	Roadway Boring	27.12048000	-80.24165600	2/7/2024		3.2		4417001D4C42aTi.05082024.2
B-11	Roadway Boring	27.12084500	-80.24016400	2/9/2024		3.5		4417001D4C42aTi.05082024.2
B-12	Roadway Boring	27.12158600	-80.23878200	2/7/2024		6.2		4417001D4C42aTi.05082024.2
B-13	Roadway Boring	27.12197500	-80.23736000	2/9/2024		3.8		4417001D4C42aTi.05082024.2
B-14	Roadway Boring	27.12265300	-80.23601500	2/7/2024		3.8		4417001D4C42aTi.05082024.2
B-15 (BHP-3)	Roadway Boring	27.12307400	-80.23452500	2/5/2024		3.0	3.31E-05	4417001D4C42aTi.05082024.2
B-16	Roadway Boring	27.12377500	-80.23319800	2/7/2024		2.8		4417001D4C42aTi.05082024.3
B-17	Roadway Boring	27.12421100	-80.23174000	2/5/2024		3.8		4417001D4C42aTi.05082024.3
B-18	Roadway Boring	27.12489200	-80.23041800	2/7/2024		2.5		4417001D4C42aTi.05082024.3
B-19	Roadway Boring	27.12527500	-80.22891800	2/9/2024		4.2		4417001D4C42aTi.05082024.3
B-20	Roadway Boring	27.12587200	-80.22752700	2/7/2024		2.8		4417001D4C42aTi.05082024.3
B-21	Roadway Boring	27.12631700	-80.22607400	2/9/2024		3.8		4417001D4C42aTi.05082024.3
B-22 (BHP-4)	Roadway Boring	27.12699100	-80.22472800	2/7/2024		3.9	2.67E-05	4417001D4C42aTi.05082024.3
B-23	Roadway Boring	27.12736400	-80.22322200	2/5/2024		3.7		4417001D4C42aTi.05082024.3
B-24	Roadway Boring	27.12813000	-80.22192400	2/7/2024		4.8		4417001D4C42aTi.05082024.4
B-25	Roadway Boring	27.12852500	-80.22044900	2/6/2024		3.0		4417001D4C42aTi.05082024.4
B-26	Roadway Boring	27.12926300	-80.21912400	2/7/2024		3.7		4417001D4C42aTi.05082024.4
B-27	Roadway Boring	27.12964700	-80.21763700	2/6/2024		3.2		4417001D4C42aTi.05082024.4
B-28 (BHP-5)	Roadway Boring	27.13037400	-80.21631500	2/6/2024		3.0	2.48E-05	4417001D4C42aTi.05082024.4
B-29	Roadway Boring	27.13077200	-80.21483800	2/6/2024		4.4		4417001D4C42aTi.05082024.4
B-30	Roadway Boring	27.13144500	-80.21348600	2/6/2024		3.1		4417001D4C42aTi.05082024.4
B-31	Roadway Boring	27.13186000	-80.21201400	2/6/2024		5.0		4417001D4C42aTi.05082024.4
B-32	Roadway Boring	27.13252700	-80.21066500	2/6/2024		3.3		4417001D4C42aTi.05082024.5

DATA ENTRY SHEET

Project FM# - 4417001 , District: D4

Cove Rd from SR-76/Kanner Hwy to SR-5/US-1

Martin County, Florida

B-33	Roadway Boring	27.13289400	-80.20917300	2/6/2024	5.7	4417001D4C42aTi.05082024.5
B-34	Roadway Boring	27.13365600	-80.20785900	2/6/2024	5.8	4417001D4C42aTi.05082024.5
B-35	Roadway Boring	27.13369100	-80.20683000	2/6/2024	6.8	4417001D4C42aTi.05082024.5