EXHIBIT 8

# Geotechnical Engineering Report

**Canal Road – Phase 1**
**Palmetto, Manatee County, Florida**
June 1, 2021
Terracon Project No. HC185036

**Prepared for:**
HDR, Inc.
Sarasota, FL

**Prepared by:**
Terracon Consultants, Inc.
Sarasota, Florida

June 1, 2021

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

Attn: Mr. Jason Starr, P.E.
P: (941) 342-2711
E: Jason.Starr@hdrinc.com

Re: Geotechnical Engineering Report
Canal Road – Phase 1
Palmetto, Manatee County, Florida
Terracon Project No. HC185036

Dear Mr. Starr:

We have completed the Geotechnical Engineering services for the above referenced project. This study was performed in general accordance with Terracon Proposal for Supplemental Geotechnical Engineering Services dated February 20, 2020 and authorized on July 23, 2020. This report presents the findings of the subsurface exploration and provides geotechnical recommendations to aid in the design of the roadway.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

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

James M. Jackson, P.E.
Department Manager 6/1/2021
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This item has been digitally signed and sealed by James M. Jackson, P.E. on the date adjacent to the seal.
Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

SME Review By: Keith D. Bennett, P.E.

# REPORT TOPICS



**Note:** This report was originally delivered in a web-based format. **Orange Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the ***GeoReport*** logo will bring you back to this page. For more interactive features, please view your project online at client.terracon.com.

# APPENDICES



**Note:** Refer to each individual Attachment for a listing of contents.

# REPORT SUMMARY

| Topic [1] | Overview Statement [2] |
|---|---|
| **Project Description** | The approximately 0.87-mile segment (Phase 1) of Canal Road is to be widened from two lanes to a four-lane divided section. Associated drainage improvements (ponds and stormwater conveyance system) are planned as part of the roadway improvements. |
| **Subsurface Conditions** | In general, the borings found a thin layer of fine sand with varying thicknesses of silt and clay over soft to hard limestone which was recovered from the split-spoon samples as calcareous silt. Groundwater was found at depths ranging from the surface to about 3 to 8 feet bgs. As an exception, organic soils were found in roadway boring AB-109R and pond boring BC-CR1C-1 at depths ranging from about 0 to 4 feet bgs. |
| **Roadway Embankment** | This section provides recommendations for roadway embankment soils. |
| **Earthwork** | Remove topsoil, organic soils, and other large vegetative matter from the planned pavement areas in accordance with FDOT Standard Plans. Densify the existing sandy soils for support of the proposed pavements. |
| **Stormwater Retention** | This section provides recommendations for potential re-use of the excavated soils as borrow along with anticipated excavation conditions. |
| **Below Grade Structures** | This section provides lateral earth pressure parameters and foundation design parameters to aid in the design of below-grade structures (box culverts and temporary walls). |
| **General Comments** | This section contains important information about the limitations of this geotechnical engineering report. |

1. If the reader is reviewing this report as a pdf, the topics above can be used to access the appropriate section of the report by simply clicking on the topic itself.
2. This summary is for convenience only. It should be used in conjunction with the entire report for design purposes.

# Geotechnical Engineering Report

## Canal Road – Phase 1

## Palmetto, Manatee County, Florida

**Terracon Project No. HC185036**

**June 1, 2021**

## 1.0 INTRODUCTION

Terracon Consultants, Inc. (Terracon) is pleased to submit this report detailing the completed geotechnical engineering services performed for the proposed improvements to Canal Road from US-301 to 22nd Lane East in Palmetto, Manatee County, Florida. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Site preparation and earthwork
- Roadway subgrade
- Groundwater conditions
- Lateral earth pressure parameters

Our geotechnical engineering scope of work for this phase of the project included the following:

- Drilling 24 SPT box culvert borings to depths ranging from about 30 to 40 feet below the existing ground surface (bgs);
- Drilling 45 roadway auger borings to depths ranging from about 1½ to 5 feet bgs;
- Drilling four SPT pond borings to depths of about 16 feet bgs;
- Drilling three SPT signal borings to depths of about 30 feet bgs;
- Installing shallow groundwater monitoring wells at each of the pond boring locations and at seven locations along the roadway to allow for stabilized groundwater level measurements;
- Borehole Permeability (BHP) testing at the four pond boring locations;
- Laboratory Limerock Bearing Ratio (LBR) testing of five subgrade soil samples;
- Laboratory moisture content, sieve analysis, and Atterberg limits testing of soil samples;
- Laboratory corrosion series (pH, sulfate, chloride, and electrical resistivity) testing of soil samples;
- Preparation of this report.

The locations of the borings are shown on the Exploration Plans (Exhibits A-4A through A-4C) in Appendix A. Logs of each boring are also included in Appendix A. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the boring logs and in Appendix B.

# 2.0 PROJECT INFORMATION

## 2.1 Project Description

| Item | Description |
|---|---|
| **Proposed Project** | The existing two-lane road is to be demolished and a new, four-lane road with a center median is to be constructed. The project has been separated into three phases. This report has been prepared for Phase 1 which is approximately 0.87 miles in length and generally located between US-301 and 22nd Lane East. |
| **Proposed Structures** | New mast arm signal poles supported on drilled shaft foundations, a box culvert, and temporary sheet pile or soldier pile walls are also planned. The new signal poles are planned for the following intersections in Phase 1:<br>n US-301 – 3 poles<br>n 17th Street East – 4 poles<br>The locations of the signal poles have not been finalized at the 17th Street East intersection. Therefore, recommendations for the signal pole foundations at that intersection will be provided in an addendum report. |
| **Below Grade Structures** | A box culvert is planned to replace the existing canal on the west side of the road. Additionally, sheet pile retaining walls are to be designed to temporarily support excavations required for culvert placement. |
| **Grading/Slopes** | We anticipate fill thicknesses to be moderate on the east side (about 3 to 4 feet) and significant (deep or thick) on the west side where an existing canal is to be replaced by a box culvert. |
| **Pavements** | We understand the pavement design will be completed by HDR. Terracon has provided LBR information for the existing subgrade soils. |
| **Stormwater Management** | Two stormwater ponds are planned for this phase of the design. Pond CR1B2 is about 1.4-acres in size and Pond CR1C is about 6 acres. |

## 2.2 Site Location and Description

| ITEM | DESCRIPTION |
|---|---|
| **Location** | The project is located along Canal Road on the north side of US-301 in Palmetto, Manatee County, Florida. Phase 1 is located between US-301 and 22nd Lane East. |
| **Existing improvements** | Canal Road is a paved two-lane roadway with turn lanes and drainage ditches. A railroad crossing exists between 12th Street East and Oakwood Avenue. |

| ITEM | DESCRIPTION |
|---|---|
| **Current ground cover** | The site is currently covered in short grasses. |
| **Existing topography** | The *Plan and Profile Sheets 3 to 11, Sta. 100+00 to 152+17.65* dated January 2019 by Manatee County show existing ground surface elevations ranging from about +8 feet-NAVD at the south end of the site to about +17 feet-NAVD at the north end of the site. The bottom of the existing canal located on the west side of the road ranged from an elevation of about +1 feet-NAVD at the south end to about +8 feet-NAVD at the north end. |

### 2.3 Historical Aerial Review

Historical aerial photographs from the Agricultural Stabilization and Conservation Service (ASCS), United States Geological Survey (USGS), Florida Department of Transportation (FDOT), and the United States Department of Agriculture (USDA) were reviewed. A listing of the aerial photographs that were reviewed is provided below:

- ASCS: 1940, 1951, 1957
- USGS: 1962,1969, 1984, 1995, 1998
- FDOT: 1991
- USDA: 2005-2007, 2010, 2013, 2015, 2017, 2019

The aerial photographs depict Canal Road and the existing drainage canal in place from at least 1940. The railroad crossing located about ¼ mile north of US-301 is also apparent in the 1940 aerial photograph. The surrounding area consists of pasture land and citrus groves from at least 1940 to 1962, when a residential subdivision was constructed at the northeast corner of Canal Road and 17th Street East. Several additional commercial, residential, and warehouse buildings were constructed along Canal Road from 1969 to the present day. The L-shaped stormwater retention pond located adjacent to planned pond CR1B2 was constructed sometime between 1998 and 2005. An additional pond was constructed between 2005 and 2006 as part of the residential development located at the north end of Phase 1 at 22nd Lane East. The aerial photographs are included in the **Supporting Information** Section.

## 3.0 SUBSURFACE CONDITIONS

### 3.1 Site Geology

Florida is the emergent part of a large platform, called the Floridian Plateau, which projects southward from the continental mass and separates the deep water of the Atlantic Ocean from that of the Gulf of Mexico.

The geology of the site, based on review of Bulletin No. 59, *The Lithostratigraphy of the Hawthorn Group (Miocene) of Florida* (1988) is generally characterized as undifferentiated sand from the surface to about 0 feet-NAVD. The Arcadia Formation is found below the upper sands and generally consists of limestone/dolostone hard clays and silts. Below the Arcadia Formation is the Tampa Member at an elevation of about -250 feet-NAVD. The Tampa Member generally consists of limestone with subordinate dolostone, sands, and clays. The Tampa Member is underlain by Suwannee Limestone at an elevation of about -350 feet-NAVD.

## 3.2 Soil Survey

The Soil Survey for Manatee County, Florida, as prepared by the United States Department of Agriculture (USDA), Soil Conservation Service (now renamed the Natural Resource Conservation Service - NRCS), identifies three soil types at the subject site as shown in the table below.

The Web Soil Survey (WSS) map of the project area was reviewed and a map encompassing the project area is included as Exhibit A-2 in Appendix A. The WSS presents shallow (typically upper 80 inches) soil stratification information produced and compiled by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). Exhibit A-2 identifies the soil map units documented by the NRCS in the project area. The typical stratification, typical values/ranges of permeability, and estimated seasonal high groundwater levels for the map units, are given in the following table.

**Summary of Soils in Project Vicinity – From NRCS Web Soil Survey**

| Map Unit No. and Name | Stratification | | | Estimated Seasonal High Groundwater Level (feet-bgs) |
|---|---|---|---|---|
| | Depth Range | Unified Soil Classification | Permeability (in/hr) | |
| 5 – Bradenton fine sand, limestone substratum | 0 – 6<br>6 – 13<br>13 – 47<br>47 – 77<br>77 – 80 | A-3, A-2-4<br>A-3, A-2-4<br>A-2-4, A-2-6<br>Limestone<br>A-3, A-2-4, A-2-6, A-6 | 6.0 – 20<br>6.0 – 20<br>0.6 – 2.0<br>-<br>0.6 – 6.0 | < 0.8 |
| 13 – Chobee loamy sand, frequently ponded | 0 – 8<br>8 – 51<br>51 – 80 | A-2-4<br>A-2-6, A-2-7, A-6, A-7<br>A-2-4, A-2-6, A-6, A-7 | 2.0 – 6.0<br>< 0.2<br>0.2 – 6.0 | < 0.8 |
| 14 – Chobee variant sandy clay loam | 0 – 20<br>20 – 35<br>35 – 40<br>40 – 80 | A-6, A-7<br>A-6, A-7<br>A-2-4, A-2-6, A-6, A-7<br>A-3, A-2-4 | 0.06 – 0.2<br>0.06 – 0.2<br>0.06 – 0.6<br>6.0 - 20 | < 0.8 |

In general, the soil survey maps the site as silty/clayey sands and sandy clays over limestone with a near-surface groundwater level.

It should be noted that the NRCS 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 relative to the soil types likely to be encountered. Boundaries between adjacent soil types on the NRSC Soil Survey maps are approximate. In general, the shallow subsurface conditions identified in the borings conducted for this project generally agree with the NRCS Soil Survey.

### 3.3 Typical Subsurface Profile

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting and our understanding of the project. Conditions encountered at each exploration point are indicated on the individual logs. The individual logs can be found in the **Exploration Results** section along with the Roadway Soil Survey.

As part of our analyses, we identified the following soil strata within the subsurface profile.

| Stratum No. | Layer Name | General Description |
|---|---|---|
| **1** | **Organic Material** | Dark brown to black slightly silty fine sand with organics (A-8) |
| **2** | **Silty Sand** | Light brown to brown silty fine sand with limestone fragments (A-2-4) |
| **3** | **Clayey Sand** | Brown, dark brown, and gray clayey fine sand with limestone fragments (A-2-6) |
| **4** | **Sandy Clay** | Dark brown and dark gray sandy clay with limestone fragments (A-7-6) |
| **5** | **Limestone** | Limestone, soft to hard[1], recovered in the split-spoon sampler as calcareous silt with occasional clay seams |

1. Soft limestone refers to material containing limestone fragments with SPT N-values less than or equal to 50 blows per foot (ref. Florida Department of Transportation Soils and Foundations Handbook, 2020). Hard limestone corresponds to N-values > 50 blows per foot. The description of "relative hardness" should not be applied to constructability items such as excavating, pile driving and/or pile augering.

It should be noted that the "Soft Limestone" designation does not necessarily mean that the limestone will be easy to excavate and/or drill as part of the construction activities. Difficult excavation/drilling should be anticipated throughout the limestone layer.

Specific conditions encountered at each auger and SPT boring are indicated on the individual logs included in Appendix A of this report. Stratification boundaries on the logs and profiles represent the approximate location of changes in soil types; in-situ, the transition between materials may be more gradual.

## 3.4 Groundwater

Shallow groundwater monitoring wells were installed in the planned stormwater ponds and at select locations along the roadway alignment for the collection of stabilized groundwater levels. Groundwater level measurements were made on a weekly basis during the month of October 2020 at the pond locations and twice during the month of December 2020 in the roadway locations. The results of the weekly groundwater level measurements along with our estimated Seasonal High Groundwater Levels (SHGWLs) are summarized on the following tables.

| Estimated SHGWL - Ponds | | | | | | |
|---|---|---|---|---|---|---|
| **Location** | **Approximate Elevation of Ground Surface[1] (Feet-NAVD)** | **Encountered Groundwater Elevation[1] (Feet-NAVD)** | | | | **Estimated Seasonal High Groundwater Level (Feet-NAVD)** |
| | | **10-7-20** | **10-16-20** | **10-22-20** | **10-28-20** | |
| **Pond CR1B2** | | | | | | |
| B-1B2-1 | +9.02 | +4.52 | +4.12 | +4.00 | +4.02 | +7.4 |
| B-1B2-1 | +9.86 | +5.36 | +4.86 | +4.77 | +4.76 | |
| **Pond CR1C** | | | | | | |
| B-1C-1 | +7.83 | +6.73 | +6.03 | +5.83 | +5.83 | +8.8 |
| B-1C-3 | +11.80 | +6.90 | +9.20 | +5.85 | +5.70 | |

1. Elevations were provided by Florida Design Consultants, Inc.

| Estimated SHGWL - Roadway | | | | |
|---|---|---|---|---|
| **Location** | **Approximate Elevation of Ground Surface[1] (Feet-NAVD)** | **Encountered Groundwater Elevation[1] (Feet-NAVD)** | | **Estimated Seasonal High Groundwater Level (Feet-NAVD)** |
| | | **12-2-20** | **12-11-20** | |
| AB-104R | +6.62 | +4.45 | +4.45 | +5.5 |
| AB-109R | +7.50 | +3.90 | +3.90 | +6.3 |
| AB-113R | +8.37 | +3.47 | +3.67 | +6.9 |
| AB-128R | +12.07 | +5.37 | +5.77 | +9.1 |
| AB-134R | +16.09 | +7.29 | +7.39 | +10.0 |

| Estimated SHGWL - Roadway | | | | |
|---|---|---|---|---|
| Location | Approximate Elevation of Ground Surface[1] (Feet-NAVD) | Encountered Groundwater Elevation[1] (Feet-NAVD) | | Estimated Seasonal High Groundwater Level (Feet-NAVD) |
| | | 12-2-20 | 12-11-20 | |
| AB-140R | +15.64 | +8.84 | +8.84 | +11.5 |
| AB-144R | +14.21 | +8.81 | +8.71 | +11.5 |

1. Elevations were provided by Florida Design Consultants, Inc.

As presented herein, the SHGWL is the highest sustained groundwater elevation during a typical (normal or average rainfall amount) wet season and not the peak groundwater elevation immediately following a major storm event. Therefore, the SHGWL referred to in this report is an average, high value and not necessarily a peak (upper bound) value. The SHGWL generally occurs at the end of the wet season which the Southwest Florida Water Management District (SWFWMD) identifies as the four months of June through September.

The best and most accurate method of determining the SHGWL is to obtain real-time site-specific groundwater data through an entire hydro period (dry and wet seasons) during a year with normal rainfall. However, due to the project's design schedule, this was not feasible. Therefore, our SHGWL estimates are based on the stabilized groundwater measurements made in October and December 2020, review of existing permitted stormwater pond information located along the project alignment, and review of rainfall data published by the SWFWMD.

The L-shaped pond located adjacent to planned pond CR1B2 has a design SHGWL of +7.4 feet-NAVD and the pond at the north end of Phase 1, near 22nd Lane East has a design SHGWL of +11.5 feet-NAVD. Based on this information, groundwater levels appear to have a north-to-south gradient declining towards the Manatee River. This is further supported by water level elevations that were surveyed in the existing canal ranging from about +10 feet-NAVD at the north end and +1.7 feet-NAVD at the south end of Phase 1. The water levels were measured on November 3, 2020 by Florida Design Consultants, Inc.

The *Hydrologic Conditions* reports for October and November 2020 published by the SWFWMD show indicate October rainfall was "Normal" and November rainfall was "Very Wet". Additionally, the calendar year cumulative rainfall for 2020 is 50.36 inches and the historical cumulative rainfall is 51.42 inches. The report indicates that the rainfall total for the year is "Normal". Based on this information, our groundwater level measurements made in October and December 2020 were made during a time of relatively "normal" rainfall.

The data discussed above suggests that the groundwater levels along the roadway alignment fall from the north to south end at a rate of about 0.15 feet per 100 linear feet. This gradient, along with the permitted SHGWLs of the existing ponds and our stabilized groundwater level measurements, served as the basis of our SHGWL estimate. In the absence of data collected during the wet season, we consider the accuracy of our SHGWL estimates at ±½ foot.

## 3.5 Field Permeability Test Results

Soils at the piezometer locations were tested for field permeability using the constant head test, where each piezometer pipe was filled with water to the top of casing and maintained at that level using a measured volume of water over a finite period of time. Using the "packer" analogy, the data was then input to an equation developed by the U. S. Bureau of Reclamation, and presented by Harry Cedergren in his text "Seepage, Drainage and Flow Nets", published in 1977, which is as follows:

$$k_h = \frac{q}{2p\,Lh} \log_e \frac{L}{r} \qquad \text{For } L >= 10r$$

Where: $k_h$ = Horiz. permeability, feet/sec; q = flow, cubic feet per second, cfs
L = Screen length, feet; h = head, feet
r = Borehole radius, feet

Field data from the permeability testing is included in Appendix A and summarized in the following table.

| Location | Depth of Screened Interval (feet) | Horizontal Permeability, $k_h$ (feet/day) |
|---|---|---|
| B1B2-1 | 11 to 16 | 0.4 |
| B1B2-2 | 11 to 16 | 0.6 |
| B1C1-1 | 11 to 16 | 10.7 |
| B1C1-2 | 11 to 16 | 0.5 |

A factor of safety should be applied to these values when designing the storm water management system for this project. The relatively higher value found at location B1C1-1 could be attributed to a void or fissure in the limestone formation. We recommend using the lower values for design.

## 3.6 Corrosivity

The results of the FDOT corrosion series tests are summarized in the table below.

| Corrosivity Test Results Summary | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Boring | Sample Depth (feet) | Soil Description | Sulfate (ppm) | Chloride (ppm) | Electrical Resistivity (Ω-cm) | pH | Environmental Classification (FDOT Criteria) | |
| | | | | | | | Concrete | Steel |
| BC-2 | 1 to 2 | A-2-4 | 420 | 75 | 3,100 | 8.32 | Slightly Aggressive | Moderately Aggressive |
| BC-6 | 1 to 2 | A-2-6 | 201 | 75 | 13,400 | 8.27 | Slightly Aggressive | Slightly Aggressive |
| BC-6 | 6 to 15 | Limestone | 510 | 105 | 2,150 | 8.28 | Moderately Aggressive | Moderately Aggressive |
| BC-7 | 4 to 10 | Limestone | 228 | 60 | 2,760 | 8.48 | Moderately Aggressive | Moderately Aggressive |
| BC-8 | 4 to 10 | Limestone | 390 | 75 | 2,680 | 8.64 | Moderately Aggressive | Moderately Aggressive |
| BC-9 | 1 to 2 | A-2-4 | 360 | 75 | 4,580 | 8.22 | Slightly Aggressive | Moderately Aggressive |
| BC-9 | 8 to 20 | Limestone | 420 | 75 | 6,890 | 8.31 | Slightly Aggressive | Slightly Aggressive |
| BC-11 | 1 to 2 | A-2-4 | 6 | 30 | 5,300 | 8.41 | Slightly Aggressive | Slightly Aggressive |
| BC-11 | 13 to 25 | Limestone | 320 | 60 | 1,530 | 8.08 | Moderately Aggressive | Moderately Aggressive |
| BC-13 | 1 to 2 | A-2-4 | 724 | 15 | 12,600 | 7.45 | Slightly Aggressive | Slightly Aggressive |

## 3.7 Soil Properties

Selected soils samples from the borings were tested for moisture content, organic content, gradation, and Atterberg limits. The range of values for the various strata are summarized below. The complete test results are included in Appendix B.

| Index Property Test Results Summary | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Stratum No. | AASHTO Classification | Moisture Content (%) | Organic Content (%) | Atterberg Limits | | Amount Passing U.S. Standard Sieve (%) | | | |
| | | | | LL (%) | PI (%) | No. 4 | No. 10 | No. 40 | No. 200 |
| 1 | A-8 | 25 to 28 | 8.4 to 8.5 | - | - | - | - | - | 18 to 26 |
| 2 | A-2-4 | 20 to 56 | - | - | - | 73 | 67 | 63 | 10 to 11 |
| 3 | A-2-6 | 16 to 31 | 4.4 | - | - | 82 to 94 | 75 to 90 | 68 to 85 | 10 to 30 |

| Index Property Test Results Summary | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Stratum No. | AASHTO Classification | Moisture Content (%) | Organic Content (%) | Atterberg Limits | | Amount Passing U.S. Standard Sieve (%) | | | |
| | | | | LL (%) | PI (%) | No. 4 | No. 10 | No. 40 | No. 200 |
| 4 | A-7-6 | 23 to 34 | - | 43 to 44 | 24 | 84 | 77 to 90 | 66 to 80 | 37 to 44 |
| 5 | Limestone | - | - | - | - | - | -- | | - |

# 4.0 SUMMARY AND RECOMMENDATIONS

## 4.1 Geotechnical Considerations

The soils along Phase 1 of the Canal Road corridor generally consist of silty/clayey sands underlain by soft to hard limestone. Embankment construction for this project may proceed after clearing, grubbing, stripping and removal of surficial soils and root material is completed in accordance with FDOT Standard Specification 110. Some of the existing clayey soils may need to be removed by over-excavation prior to construction of embankments when they are located within 48 inches of the bottom of the base course in accordance with FDOT Standard Index 120-001. Embankment fills should consist of sands (AASHTO A-3 and A-2-4 soils) meeting the requirements of the FDOT Standard Index 120. The embankment fill should be compacted to at least 98 percent of maximum dry density as determined by AASHTO T-180 (note the modification for Manatee County versus the FDOT standard requirements).

Soils found along the alignment were subdivided into five different strata, as described in an earlier section of this report (**Section 3.3 Typical Subsurface Profile**) and summarized below.

- The Stratum No. 1 soils are organic materials and should be removed in accordance with FDOT Standard Index 120-002. The organic soils were found in borings AB-109R and BC-CR1C-1 from about 0 to 4 feet-bgs (+7½ to +4 feet-NAVD). Based on the data collected as part of this study, we suggest that the area of unsuitable soils within the roadway be assumed to extend to the nearest borings that did not encounter A-8 soil types. This would make the limits for unsuitable soil removal to extend from Station 107+86 (location of BC-4) to Station 110+15 (location of BC-5). Additional borings could be drilled if a more detailed delineation is needed.
- The Stratum No. 2 soils are granular and are considered “Select” for use within an embankment section pursuant to Standard Plan No. 120-001 of the FDOT 2020-21 Design Standards. However, this material is fine-grained and could retain excess moisture and be difficult to dry and compact. It should be used in the embankment above the water level existing at the time of construction.

- The Strata No. 3 and 4 soils are considered to be plastic and highly plastic, respectively, per Index No. 120-001, and the FDOT requires removal of plastic soils when existing within 48 inches of the bottom of the base course. However, placement of embankment fill for the new lanes should provide sufficient vertical separation between the clayey soils and the base course. Removal and replacement of the Strata No. 3 and 4 soils should not be required for this project as they were encountered at depths of about 3 to 15 feet below the existing roadway which should place them more than 48 inches below the bottom of the proposed base course level. However, this should be confirmed with the final design cross-sections. These Stratum could also be encountered in excavations for utilities, drainage piping, or culverts. If permitted, the materials might be used in non-load bearing berms or some other non-structural portion of the roadway to reduce disposal costs. However, the contractor should be aware that the workability of these soils is limited in wet weather months. The contractor is responsible to dispose of any excess materials in accordance with local ordinances.
- Stratum No. 5 is a limestone material. The limestone is generally hard and would require more than normal effort (i.e. time and wear and tear on equipment) during excavation. A note to this effect should be placed in the plans. When found, the excavated limestone material should not be re-used for embankment. If permitted, the materials might be used in non-load bearing berms or some other non-structural portion of the roadway to reduce disposal costs. The contractor is responsible to dispose of any excess materials in accordance with local ordinances.

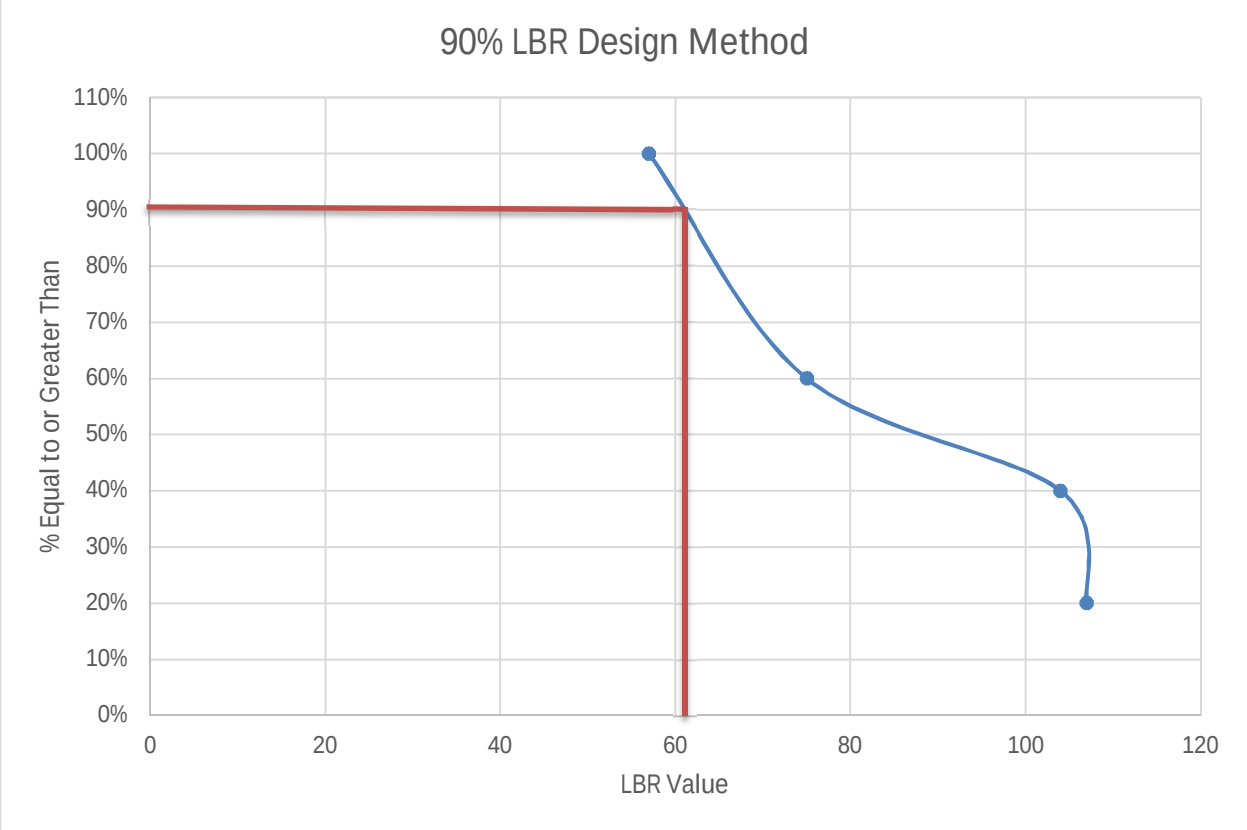
## 4.2 Roadway Embankments

Five samples of the existing soils were collected from both sides of the existing roadway and at depths of about 0 to 1-foot bgs. The samples consisted of A-2-4 soils with varying amounts of shell and gravel. The design LBR value was determined according to the Florida Department of Transportation (FDOT) Soils and Foundations Handbook (2020) Section 8.1.2. The LBR values corresponding to moisture contents at 2% above and 2% below the moisture content at the maximum LBR value were averaged to determine a limiting LBR value (±2% of Optimum Method) and are presented in the following table:

| +/-2% of Optimum Moisture Method Calculation | | | |
|---|---|---|---|
| Test No. | Maximum LBR | LBR at Moisture Contents (of Optimum LBR) | |
| | | -2% | +2% |
| LBR-1 (AB-102R) | 57 | 14 | 54 |
| LBR-2 (AB-112L) | 75 | 54 | 42 |
| LBR-3 (AB-121R) | 57 | 57 | 28 |
| LBR-4 (AB-131L) | 107 | 64 | 14 |

| +/-2% of Optimum Moisture Method Calculation | | | |
|---|---|---|---|
| **Test No.** | **Maximum LBR** | **LBR at Moisture Contents (of Optimum LBR)** | |
| | | **-2%** | **+2%** |
| LBR-5 (AB-144R) | 104 | 59 | 19 |
| Mean LBR Value | 80 | 50 | 31 |
| | | Average = 41 | |

The maximum LBR values were also sorted into ascending order and the percentage of values that were equal to or greater than each LBR value were calculated. The percentages were plotted versus the maximum LBR values and the LBR value corresponding to 90% is the design value (see chart below) according to the Soils and Foundations Handbook 90% Method.




Per the FDOT guidelines, the final design LBR value is taken as the lower of the values determined by each of these two methods. Therefore, we recommend that pavement designs include a limiting LBR value of 41, as determined by the 2% Method, for the existing embankment (subgrade) soils. This corresponds to a Resilient Modulus ($M_R$) of about 12,000 pounds per square inch (psi) per Table 5.1 of the FDOT Flexible Pavement Design Manual (2020).

## 4.3 Earthwork

### 4.3.1 General

The site work conditions will be largely dependent on the weather conditions and the contractor's means and methods in controlling surface drainage and protecting the subgrade. **The near-surface silty/clayey soils encountered in the borings will generally be difficult to compact at moisture contents greater than optimum. Additionally, these soils will be slow to drain and will likely require more than normal effort to maintain at optimum moisture levels following rainfall events**. Site preparation is anticipated to include clearing and grubbing, excavations, and fill placement. The following sections provide recommendations for use in the preparation of specifications for the work. Recommendations include necessary quality criteria, as necessary, to render the site in the state considered in our geotechnical engineering evaluation for the proposed pavements and drainage structures.

### 4.3.2 Site Drainage

During construction, the contractor may want to consider implementing a program to lower groundwater to facilitate access and mobilization around the site. If such a program is implemented, groundwater levels should be lowered to a depth of at least two feet below the surface of any vibratory compaction operations. If work is completed during the typical wet season (June through September), the site will likely be very wet with areas of standing water.

If required, the drainage system may consist of pumping equipment (sump pumps or well points) to effectively drain water away from the site, especially during the rainy season. The site should be graded to shed water and avoid ponding over the subgrade.

### 4.3.3 Site Preparation

Earthwork operations should begin with the stripping of any surficial organic soils (topsoil) from the planned roadway areas in accordance with FDOT Section 110 (revised to comply with Manatee County requirement, if different).

### 4.3.4 Fill Material Considerations

Engineered fill should meet the following material property requirements:

| Fill Type [1] | AASHTO Classification | Acceptable Location for Placement |
|---|---|---|
| Select [1] | A-3 and A-2-4 (fines content < 15 percent, maximum particle size < 2 inches, organic content < 3 percent) | All locations and elevations |

1. Stratum 2 soils at this site appear to meet this criterion. Soils with fines content > 10 percent may retain moisture and be difficult to compact and achieve specified density and stability. These soils may need to be maintained dry of optimum to properly compact. Imported soils (whether from ponds excavations or offsite borrow) should also meet these requirements.

### 4.3.5 Fill Compaction Requirements

Engineered fill should meet the following compaction requirements:

| Item | Description |
|---|---|
| **Fill Lift Thickness** | In Accordance with FDOT Section 120. |
| **Minimum Compaction Requirements [1]** | At least 98 percent of the maximum dry density as determined by the modified Proctor Test (AASHTO T-180) as required by Manatee County. |
| **Moisture Content** | Moisture content should be maintained such that satisfactory compaction can be achieved in accordance with FDOT Section 120. |
| **Minimum Testing Frequency** | As required in FDOT Section 120. |

1. The moisture content and compaction should be measured for each lift of engineered fill during placement. Should the results of the in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified moisture and compaction requirements are achieved.

### 4.3.6 Utility Trench Backfill

All trench excavations should be made with sufficient working space to permit construction including backfill placement and compaction. Backfill for utility trenches located beneath pavements should be compacted to at least 98% of the maximum dry density as determined by the modified Proctor Test (AASHTO T-180) per the Manatee County Utility Design Standards (June 2015). Utility trenches located outside of pavement areas should be compacted to at least 95% of the modified Proctor maximum dry density.

### 4.3.7 Earthwork Construction Considerations

Excavations are anticipated to be accomplished with conventional construction equipment. The site should be graded to prevent ponding of surface water on the prepared subgrades or in excavations. Water collecting over, or adjacent to, construction areas should be removed. If the subgrade desiccates, saturates, or is disturbed, the affected material should be removed, or the materials should be scarified, moisture conditioned, and re-compacted.

The groundwater table will affect excavation efforts, especially for storm drain or utility construction. A temporary dewatering system consisting of well points or sumps with pumps will be necessary to achieve the recommended compaction in excavation trenches.

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, "Excavations" and its appendices, and in accordance with any applicable local, and/or state regulations.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean Terracon is assuming responsibility for construction site safety, or the contractor's activities; such responsibility shall neither be implied nor inferred.

### 4.3.8 Construction Observation and Testing

The earthwork efforts should be monitored under the direction of the Geotechnical Engineer. Monitoring should include documentation of adequate removal of vegetation and top soil, proof-rolling and mitigation of areas delineated by the proof-roll to require mitigation.

Each lift of compacted fill should be tested, evaluated, and reworked as necessary until approved by the Geotechnical Engineer prior to placement of additional lifts.

If unanticipated conditions are encountered, the Geotechnical Engineer should be consulted for mitigation options.

In addition to the documentation of the essential parameters necessary for construction, the continuation of the Geotechnical Engineer into the construction phase of the project provides the continuity to maintain the Geotechnical Engineer's evaluation of subsurface conditions, including assessing variations and associated design changes.

## 4.4 Stormwater Retention - Borrow

In general, the borings that were completed in the planned stormwater pond locations found clayey soils (A-2-6) above the limestone formation (which was recovered in the split spoon sampler as calcareous silt). The clayey soils are not expected to produce borrow material that is suitable for use within 4 feet of the bottom of the roadway base layer. Additionally, difficult excavation should be anticipated once the limestone formation is encountered.

## 4.5 Below Grade Structures (Box Culvert/Temporary Walls)

### 4.5.1 Lateral Earth Pressure Parameters

The soil parameters shown in the table below are based on empirical correlations with SPT blow counts (N-values) and should be assumed for design of below grade structures.

| Stratum[1] | USCS | SPT N-Values | Total Weight (pcf) | Submerged Weight (pcf) | Friction Angle (phi)[2] | Cohesion (psf)[3] | Coefficients | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Active ($K_a$) | Passive ($K_p$) | At-Rest ($K_0$) |
| Granular Backfill | SP, SP-SM | N/A | 110 | 48 | 30 | 0 | 0.333 | 3.00 | 0.500 |
| 2 | SP-SM | 4 to 10 | 105 | 43 | 29 | 0 | 0.347 | 2.88 | 0.515 |
| 2 | SP-SM | 11 to 25 | 110 | 48 | 31 | 0 | 0.320 | 3.12 | 0.485 |
| 3 | SC | 3 to 10 | 105 | 43 | 26 | 0 | 0.390 | 2.56 | 0.562 |
| 3 | SC | 11 to 20 | 110 | 48 | 28 | 0 | 0.361 | 2.77 | 0.531 |
| 3 | SC | 21 to 30 | 115 | 53 | 30 | 0 | 0.333 | 3.00 | 0.500 |
| 5 | LS | <10 | 120 | 58 | 0 | 0 | 1.00 | 1.00 | 1.00 |
| 4 | LS | 10 to 20 | 125 | 63 | 0 | 2,000 | 1.00 | 1.00 | 1.00 |
| 4 | LS | 20 to 50 | 130 | 68 | 0 | 4,000 | 1.00 | 1.00 | 1.00 |
| 4 | LS | >50 | 135 | 73 | 0 | 7,500 | 1.00 | 1.00 | 1.00 |

1. Refer to individual boring logs for depths/elevations.
2. Based on FDOT Soils and Foundations Handbook (2020).
3. Based on Essentials of Soil Mechanics and Foundations, 7th Edition by David F. McCarthy.

Backfill placed against structures should consist of granular soils. For the granular values to be valid, the granular backfill must extend out and up from the base of the wall at an angle of at least 45 and 60 degrees from vertical for the active and passive cases, respectively. Additionally, only walk-behind compacting equipment (weighing less than 1,000 pounds) should be used within 3 feet of the back of the structures.

The recommended design lateral earth pressure parameters do not include a factor of safety and do not provide for possible hydrostatic pressure on the walls.

### 4.5.2 Foundation Design Parameters (Box Culverts)

| Item | Description |
|---|---|
| **Nominal Bearing Resistance** [1, 2] | 10,000 psf |
| **Estimated Modulus of Subgrade Reaction** [3] | 260 pounds per square inch per inch (psi/in) for point loads |
| **Estimated Soil Friction Angle** | 35 degrees |
| **Required Bearing Stratum** [4] | In-situ limestone |
| **Minimum Foundation Dimensions** | Continuous: 18 inches |
| **Ultimate Coefficient of Sliding Friction** [5] | 0.45 |

| Item | Description |
|---|---|
| **Minimum Embedment below Finished Grade** [5] | 18 inches |
| **Estimated Total Settlement from Structural Loads** [2] | 1 inch |
| **Estimated Differential Settlement** [2, 6] | ¾ inch |
| **Long-Term Differential Settlement** [6] | <⅛ inch |

1. The nominal bearing resistance is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. **An appropriate load factor should be applied to the nominal value provided**. It may be increased by 33% for transient loads, including wind.
2. Values provided are for maximum loads noted in **Project Description**.
3. Modulus of subgrade reaction is an estimated value based upon our experience with the subgrade condition, the requirements noted in **Earthwork**, and the floor slab support as noted in this table. It is provided for point loads. For large area loads the modulus of subgrade reaction would be lower.
4. Can be used to compute sliding resistance where foundations are placed on suitable soil/materials. Should be neglected for foundations subject to net uplift conditions.
5. Embedment necessary to minimize the effects the surface water flow.
6. Differential settlements are as measured over a span of 30 feet.

### 4.6 Signal Pole Foundations

The table on the Report of Core Borings for Signals, Exhibit A-17, presents design parameters for the different soil strata encountered at the boring locations. The soil parameters (unit weight, friction angles, ultimate shear strength, and soil moduli) were based on empirical correlations (ref: Florida Department of Transportation Soils and Foundations Handbook, 2020) with average SPT blow counts (N-Values) for the different soil strata. Lateral earth pressure coefficients were based on the estimated friction angles. It is our understanding that the pole foundations will be drilled shafts designed by others.

The pole foundations should be designed based on frictional resistance (side shear) only, neglecting end bearing, using the soil parameters provided on the exhibit.

## 5.0 GENERAL COMMENTS

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between exploration point locations 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. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If

variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

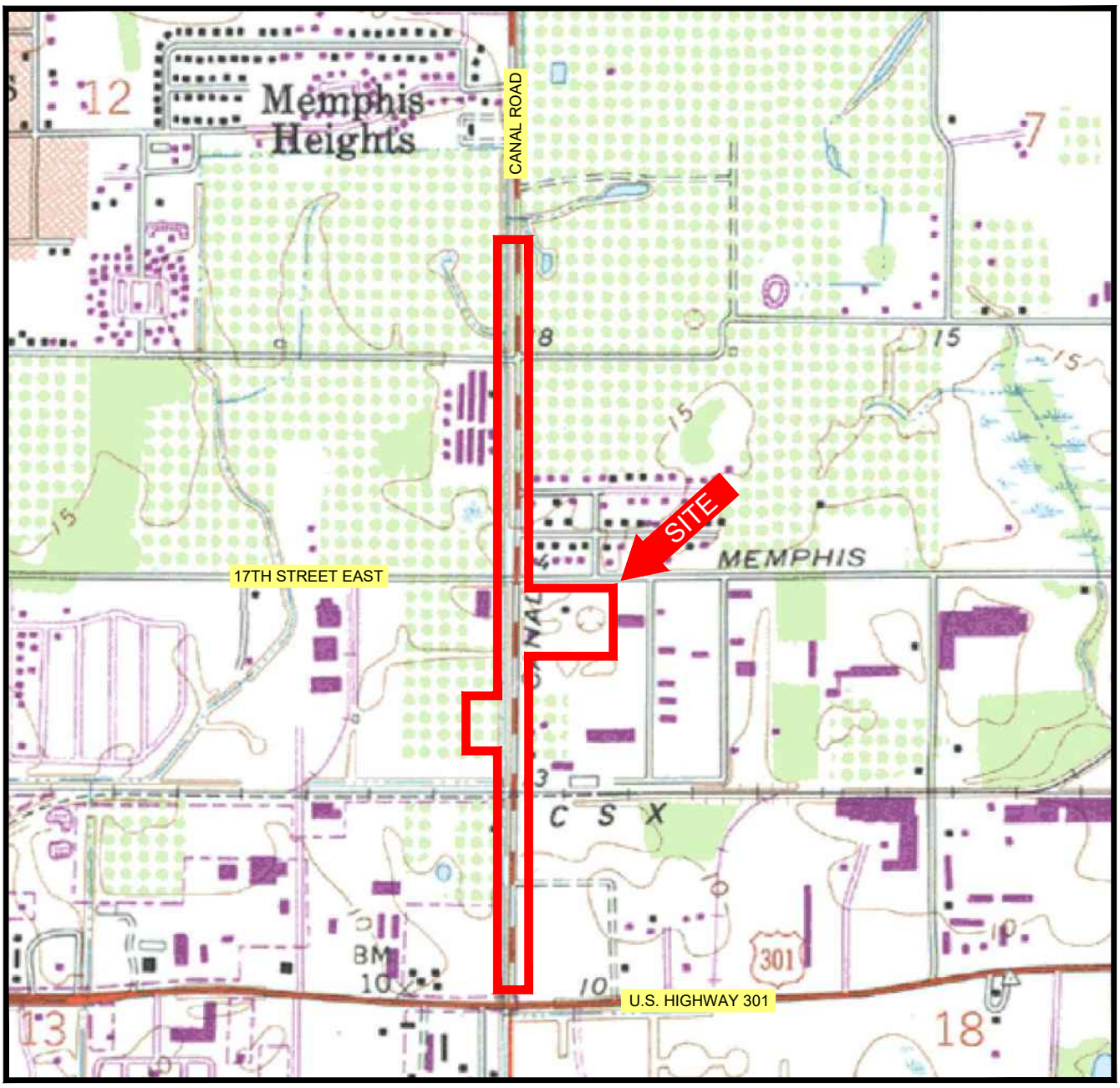
Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

# ATTACHMENTS

# APPENDIX A – FIELD EXPLORATION

**Contents:**

UNITED STATES – DEPARTMENT OF THE INTERIOR – GEOLOGICAL SURVEY

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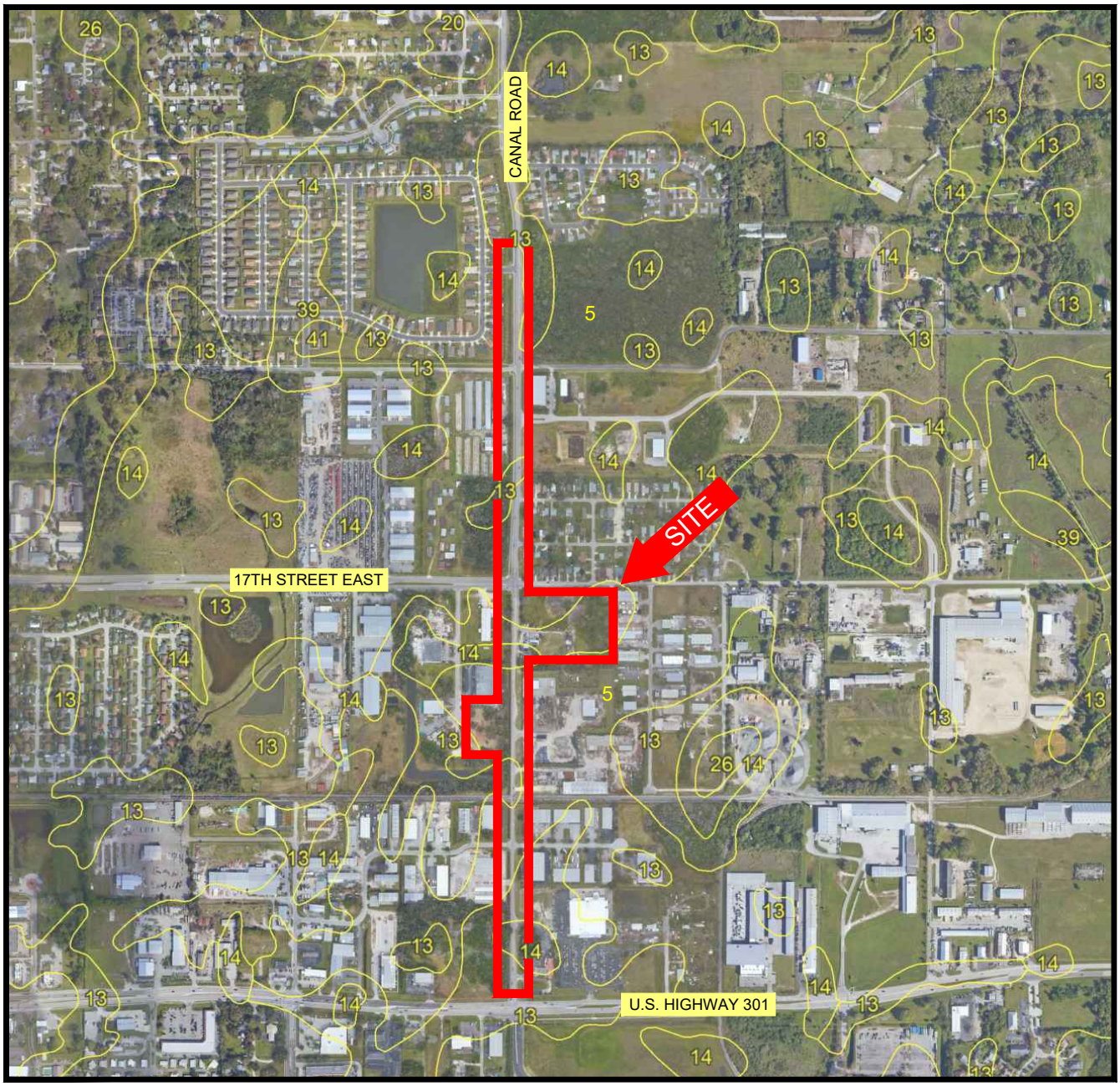
PALMETTO, FLORIDA
ISSUED: 1987
7.5 MINUTE SERIES (QUADRANGLE)

N

| | | | |
|---|---|---|---|
| Project Mngr: JJ | Project No. HC185036 | Terracon Consulting Engineers and Scientists | TOPOGRAPHIC VICINITY MAP |
| Drawn By: AS | Scale: AS SHOWN | 8260 VICO COURT, UNIT B SARASOTA, FLORIDA 34240 | GEOTECHNICAL ENGINEERING REPORT |
| Checked By: JJ | File No. HC185036 | PH. (941) 379-0621 FAX. (941) 379-5061 | CANAL ROAD |
| Approved By: KB | Date: 11-18-20 | | ELLENTON, MANATEE COUNTY, FLORIDA |

EXHIBIT A-1

N:\Projects–Other Offices\Sarasota\2018\HC185036\Cad\HC185036 Quad Map.dwg

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# U.S.D.A. SOIL SURVEY FOR MANATEE COUNTY, FLORIDA

N

SOIL LEGEND

| | |
|---|---|
| 5 | BRADENTON FINE SAND, LIMESTONE SUBSTRATUM |
| 13 | CHOBEE LOAMY FINE SAND, FREQUENTLY PONDED, 0 TO 1 PERCENT SLOPES |
| 14 | CHOBEE VARIANT SANDY CLAY LOAM |

| | |
|---|---|
| Project Mngr: | JJ |
| Drawn By: | AS |
| Checked By: | JJ |
| Approved By: | KB |

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|---|---|
| Project No. | HC185036 |
| Scale: | AS SHOWN |
| File No. | HC185036 |
| Date: | 11-18-20 |

Terracon
Consulting Engineers and Scientists
8260 VICO COURT, UNIT B SARASOTA, FLORIDA 34240
PH. (941) 379-0621 FAX. (941) 379-5061

SOILS MAP
GEOTECHNICAL ENGINEERING REPORT
CANAL ROAD
ELLENTON, MANATEE COUNTY, FLORIDA

EXHIBIT
A-2

N:\Projects-Other Offices\Sarasota\2018\HC185036\Cad\HC185036 Soil Map.dwg

## Field Exploration Description

| Number of Explorations | Type of Exploration | Depth or "a" Spacing (feet) | Location |
|---|---|---|---|
| 45 | Roadway Auger Borings | 1½ to 5 | Approximately 100-foot centers along the roadway alignment |
| 24 | SPT Boring | 30 to 40 | Approximately 150-foot centers along the roadway alignment |
| 4 | SPT Boring | 16 | Planned pond areas |
| 7 | Piezometer | 10 | Along the roadway |
| 4 | Piezometer | 15 | Planned pond areas |
| 4 | Permeability Tests | 15 | Planned pond areas |

1. Below ground surface.

**Boring Layout and Elevations:** Unless otherwise noted, Terracon personnel provided the boring layout. Coordinates were obtained with a handheld GPS unit (estimated horizontal accuracy of about ±10 feet) and elevations were interpolated from the topographic survey.

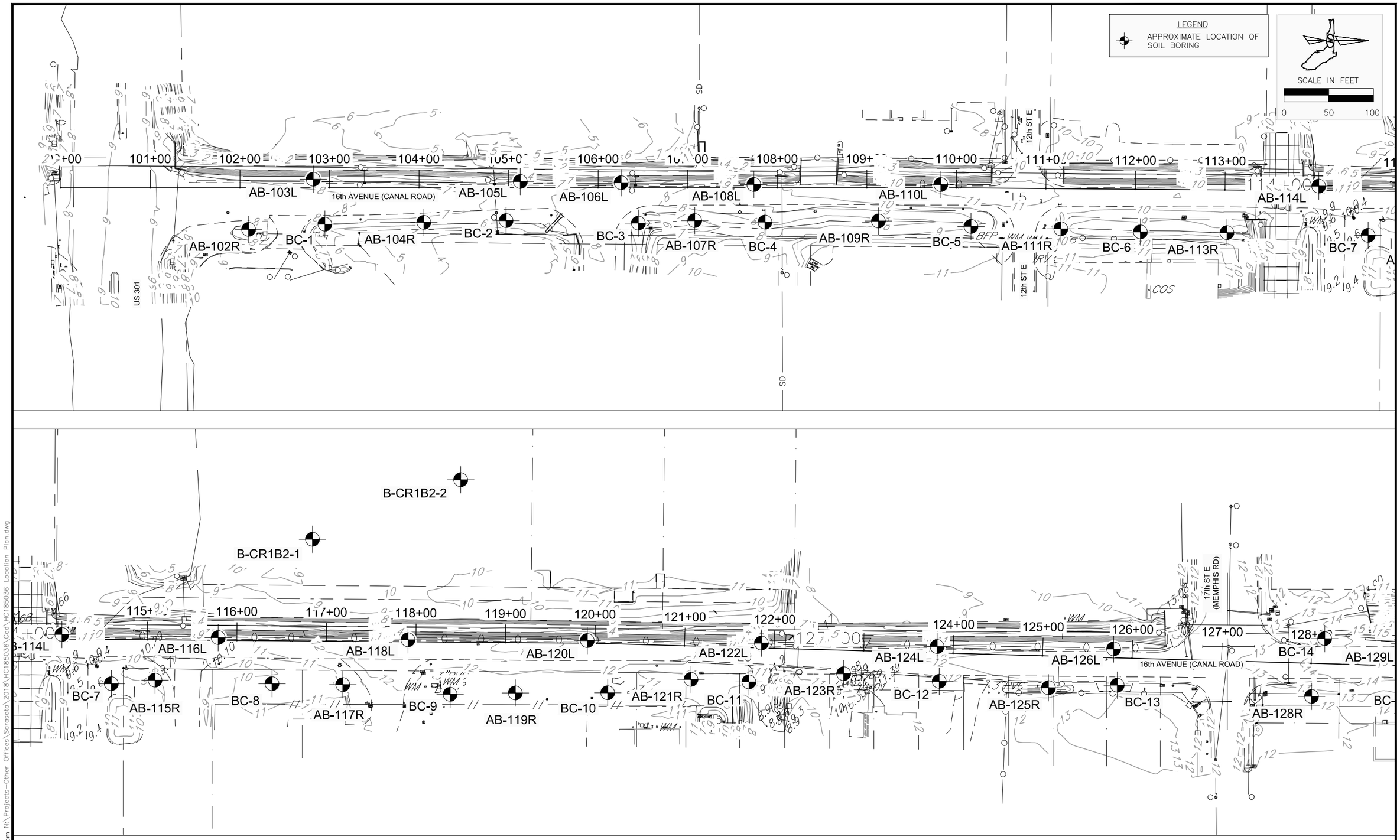
**Auger Borings:** The auger borings were advanced with hand-turned augering equipment. Samples were collected from the auger bucket at each noticeable change in soil strata. Additionally, since groundwater was not encountered during drilling or 24-hours after completion to a depth of 5 feet, seven of the locations had shallow groundwater monitoring wells installed. The wells were installed to a depth of about 10 feet to allow for stabilized groundwater level measurements.

**SPT Borings:** The SPT soil borings utilized a track-mounted, rotary drilling rig equipped with a rope and cathead operated safety hammer. The boreholes were advanced with a cutting head and stabilized with the use of bentonite (drillers' mud). In the split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon was driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon for each six-inch penetration is recorded. The 2$^{nd}$ and 3$^{rd}$ six-increments are added together and reported as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring log at the test depths. 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 placed 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 backfilled with soil cuttings.

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.

**Field Permeability Tests:** Temporary piezometers were installed at each pond boring location to depths of 15 feet for the subsequent performance of field permeability testing. The piezometers consisted of 2-inch diameter Schedule 40 PVC pipe. A four-inch outside drill bit was used for piezometer installation. Each piezometer consisted of a section of machine slotted PVC well screen (0.020-inch slot width) flush joint coupled to a riser pipe of similar composition. A “Gravel pack” surrounding the well screen consisted of clean silica sand, having a gradation of 6/20, and the “gravel pack” extended to approximately one foot above the top of the well screen. A one to two-foot thick fine sand (30/50) plug was placed above the “gravel pack”, and the remainder of the well annulus was backfilled with bentonite chips. The top of each piezometer is approximately 1 foot above the surrounding ground level.

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JAMES JACKSON, P.E.
P.E. LICENSE NUMBER 77733
TERRACON
8260 VICO COURT
SARASOTA, FLORIDA 34240


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| DRAWN BY: | MG 12-16-20 |
| CHECKED BY: | JJ 12-16-20 |
| DESIGNED BY: | |
| CHECKED BY: | |

STATE OF FLORIDA
DEPARTMENT OF TRANSPORATATION

| ROAD NO. | COUNTY | FINANCIAL PROJECT ID |
|---|---|---|
| CANAL | MANATEE | – |

SHEET TITLE: BORING LOCATION PLAN

REF. DWG. NO.:

PROJECT NAME: CANAL ROAD – PHASE 1
FROM US 301 TO 22ND LANE EAST

SHEET NO.: –

TERRACON No. HC185036 EXHIBIT: A-4A

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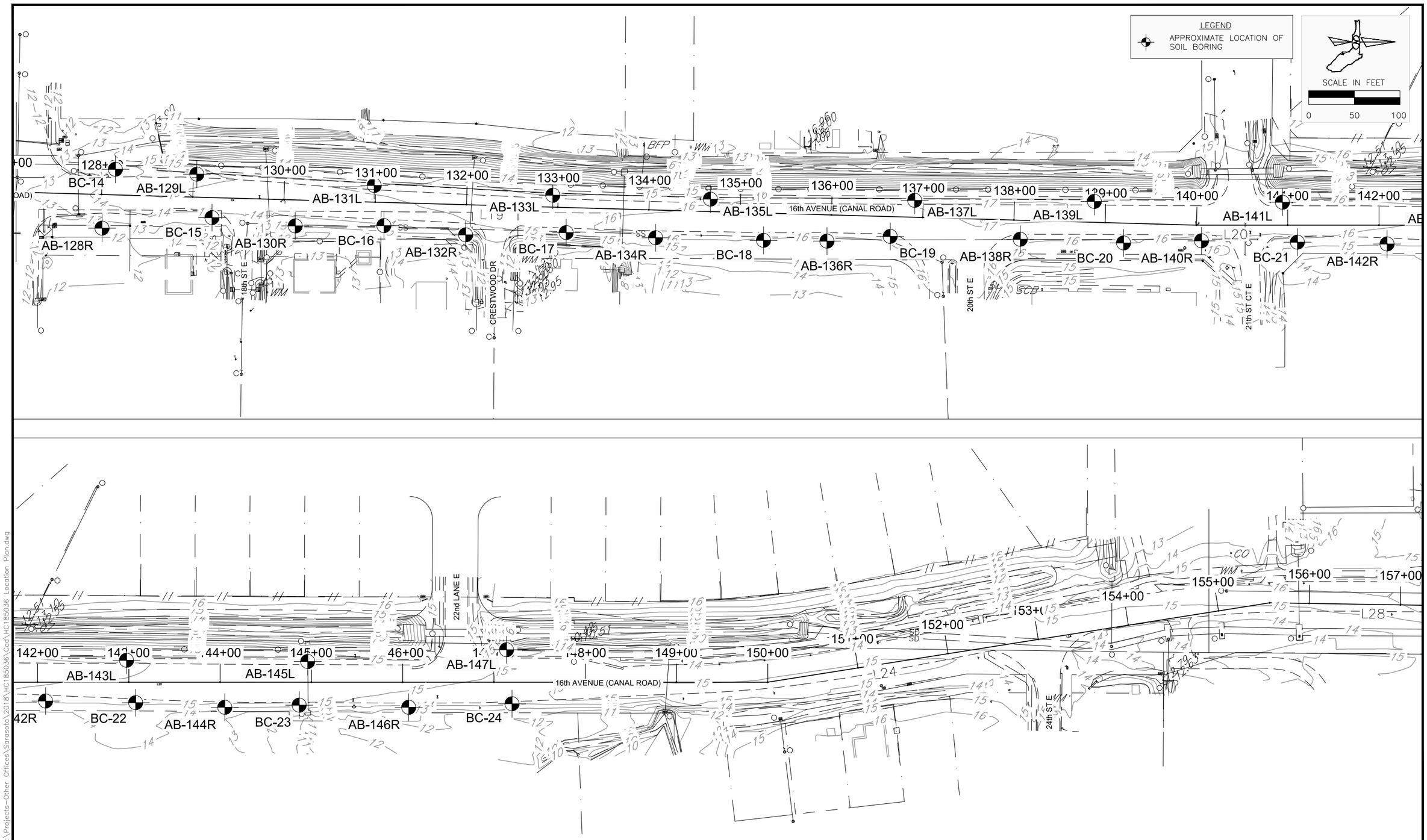


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JAMES JACKSON, P.E.
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8260 VICO COURT
SARASOTA, FLORIDA 34240


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STATE OF FLORIDA
DEPARTMENT OF TRANSPORATATION

| ROAD NO. | COUNTY | FINANCIAL PROJECT ID |
|---|---|---|
| CANAL | MANATEE | – |

SHEET TITLE: BORING LOCATION PLAN

REF. DWG. NO.:

PROJECT NAME: CANAL ROAD – PHASE 1
FROM US 301 TO 22ND LANE EAST

SHEET NO.: –

TERRACON No. HC185036 EXHIBIT: A-4B

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LEGEND

APPROXIMATE LOCATION OF SOIL BORING

SCALE IN FEET

0 50 100

B-CR1B2-2

B-CR1B2-1

115+00 116+00 117+00 118+00 119+00 120+00 121+00 122+00 124+00 125+00 126+00 127+00 128+00

AB-114L AB-116L AB-118L AB-120L AB-122L AB-124L AB-126L

BC-7 AB-115R BC-8 AB-117R BC-9 AB-119R BC-10 AB-121R BC-11 AB-123R BC-12 AB-125R BC-13 BC-14 AB-128R

17th ST E (MEMPHIS RD)

16th AVENUE (CANAL ROAD)

SS

B-CR1C-3

B-CR1C-4

| REVISIONS | | | | | |
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| DATE | BY | DESCRIPTION | DATE | BY | DESCRIPTION |
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JAMES JACKSON, P.E.
P.E. LICENSE NUMBER 77733
TERRACON
8260 VICO COURT
SARASOTA, FLORIDA 34240


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| DRAWN BY: MG 12-16-20 | |
| CHECKED BY: JJ 12-16-20 | |
| DESIGNED BY: | |
| CHECKED BY: | |

STATE OF FLORIDA
DEPARTMENT OF TRANSPORATATION

| ROAD NO. | COUNTY | FINANCIAL PROJECT ID |
|---|---|---|
| CANAL | MANATEE | – |

SHEET TITLE: BORING LOCATION PLAN

REF. DWG. NO.:

PROJECT NAME: CANAL ROAD – PHASE 1
FROM US 301 TO 22ND LANE EAST

SHEET NO.: –

TERRACON No. HC185036 EXHIBIT: A-4C

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# STATE OF FLORIDA
# DEPARTMENT OF TRANSPORTATION
# MATERIALS AND RESEARCH

DATE OF SURVEY: OCTOBER–NOVEMBER 2020
SURVEY MADE BY: TERRACON CONSULTANTS, INC.
SUBMITTED BY: JAMES M. JACKSON, P.E.

FINANCIAL PROJECT NO.: –

DISTRICT: ONE
ROAD NO.: SR
COUNTY: MANATEE

CROSS SECTION SOIL SURVEY FOR THE DESIGN OF ROADS

SURVEY BEGINS STA.: 102+10 SURVEY ENDS STA.: 147+14

REFERENCE: CANAL ROAD

| | ORGANIC CONTENT | | MOISTURE CONTENT | | SIEVE ANALYSIS RESULTS % PASS | | | | | | ATTERBERG LIMITS (%) | | | | | CORROSION TEST RESULTS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STRATUM NO. | NO. OF TESTS | % ORGANIC | NO. OF TESTS | MOISTURE CONTENT | NO. OF TESTS | 10 MESH | 40 MESH | 60 MESH | 100 MESH | 200 MESH | NO. OF TESTS | LIQUID LIMIT | PLASTIC INDEX | AASHTO GROUP | MATERIAL DESCRIPTION | NO. OF TESTS | RESISTIVITY ohm–cm | CHLORIDES ppm | SULFATES ppm | pH |
| 1 | 2 | 8.4–8.5 | 2 | 25–28 | 2 | – | – | – | – | 18–26 | – | – | – | A–8 | ORGANIC MATERIAL – DARK BROWN, BLACK SLIGHTLY SILTY FINE SAND WITH ORGANICS | – | – | – | – | – |
| 2 | – | – | 2 | 20–56 | 2 | 67 | 63 | 57 | 36 | 10–11 | – | – | – | A–2–4 | LIGHT BROWN, BROWN SILTY FINE SAND WITH LIMESTONE FRAGMENTS | 3 | 724–4,580 | 15–75 | 360–12,600 | 7.45–8.32 |
| 3 | 1 | 4.4 | 7 | 16–31 | 7 | 75–90 | 68–85 | 61–78 | 42–57 | 10–30 | – | – | – | A–2–6 | BROWN, DARK BROWN, GRAY CLAYEY FINE SAND WITH LIMESTONE FRAGMENTS | – | – | – | – | – |
| 4 | – | – | 4 | 23–34 | 4 | 77–90 | 66–80 | 61–76 | 52–70 | 37–54 | 2 | 43–44 | 24 | A–7–6 | DARK BROWN, DARK GRAY SANDY CLAY WITH LIMESTONE FRAGMENTS | 2 | 5,300–13,400 | 30–75 | 6–201 | 8.27–8.41 |
| 5 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | LIGHT BROWN, LIGHT GRAY LIMESTONE FORMATION WITH CALCAREOUS SILT AND OCCASIONAL SEAMS OF GRAY CLAY OR SAND–SIZED PHOSPHATE GRAINS | 5 | 1,530–6,890 | 60–105 | 228–510 | 8.04–8.64 |

EMBANKMENT AND SUBGRADE MATERIAL

STRATA BOUNDARIES ARE APPROXIMATE MAKE FINAL CHECK AFTER GRADING

▼ = WATER TABLE ENCOUNTERED
▽ = SEASONAL HIGH WATER TABLE
GNE = GROUNDWATER NOT ENCOUNTERED

NOTES:

1) SOIL BOUNDARIES ARE APPROXIMATE AND REPRESENT SOIL STRATA AT EACH BORING LOCATION ONLY.
2) SOIL ANALYSIS INCLUDES DATA FROM ROADWAY AND STORMWATER RETENTION, AND BOX CULVERT AREAS ONLY.
3) THE SYMBOL "–" REPRESENTS AN UNMEASURED PARAMETER.
4) THE MATERIAL FROM STRATUM NUMBER 1 IS ORGANIC MATERIAL AND SHALL BE REMOVED IN ACCORDANCE WITH STANDARD PLANS INDEX 120–002.
5) THE MATERIAL FROM STRATUM NUMBER 2 IS SELECT MATERIAL AND APPEARS SATISFACTORY FOR USE IN THE EMBANKMENT WHEN UTILIZED IN ACCORDANCE WITH STANDARD PLANS INDEX 120–001. HOWEVER, THIS MATERIAL IS LIKELY TO RETAIN EXCESS MOISTURE AND BE DIFFICULT TO DRY AND COMPACT. IT SHOULD BE USED IN THE EMBANKMENT ABOVE THE WATER LEVEL EXISTING AT THE TIME OF CONSTRUCTION.
6) THE MATERIAL FROM STRATA NUMBERS 3 AND 4 IS PLASTIC MATERIAL AND SHALL BE REMOVED IN ACCORDANCE WITH STANDARD PLANS INDEX 120–002. IT MAY BE PLACED ABOVE THE EXISTING WATER LEVEL (AT THE TIME OF CONSTRUCTION) TO WITHIN 4 FEET OF THE PROPOSED BASE. IT SHOULD BE PLACED UNIFORMLY IN THE LOWER PORTION OF THE EMBANKMENT FOR SOME DISTANCE ALONG THE PROJECT RATHER THAN FULL DEPTH FOR SHORTER DISTANCES.
7) THE MATERIAL FROM STRATUM NUMBER 5 A LIMESTONE MATERIAL. THE LIMESTONE IS GENERALLY HARD AND WOULD REQUIRE MORE THAN NORMAL EFFORT DURING ECAVATION. WHEN FOUND, THE EXCAVATED MATERIAL SHOULD NOT BE USED FOR FILL.

Dec28, 2020–11:35am

| REVISIONS | | | | | |
|---|---|---|---|---|---|
| DATE | BY | DESCRIPTION | DATE | BY | DESCRIPTION |
| | | | | | |

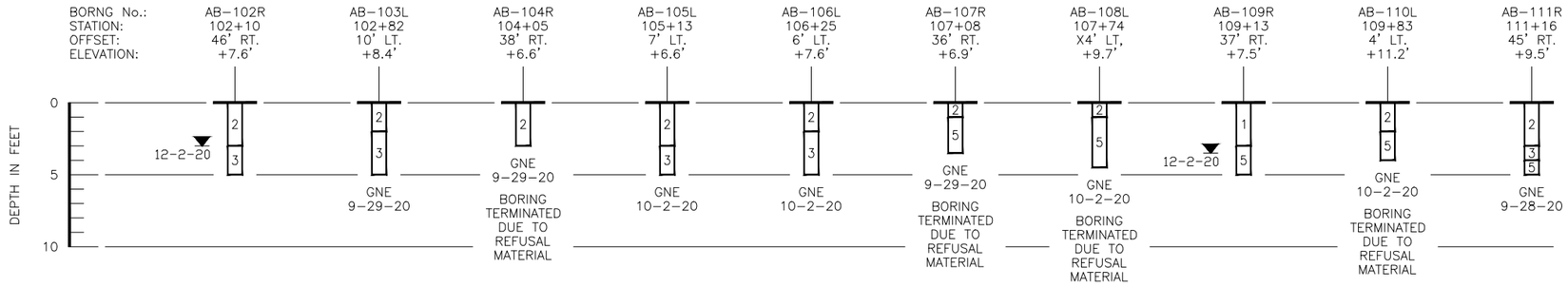

JAMES JACKSON, P.E.
P.E. LICENSE NUMBER 77733
TERRACON
8260 VICO COURT
SARASOTA, FLORIDA 34240

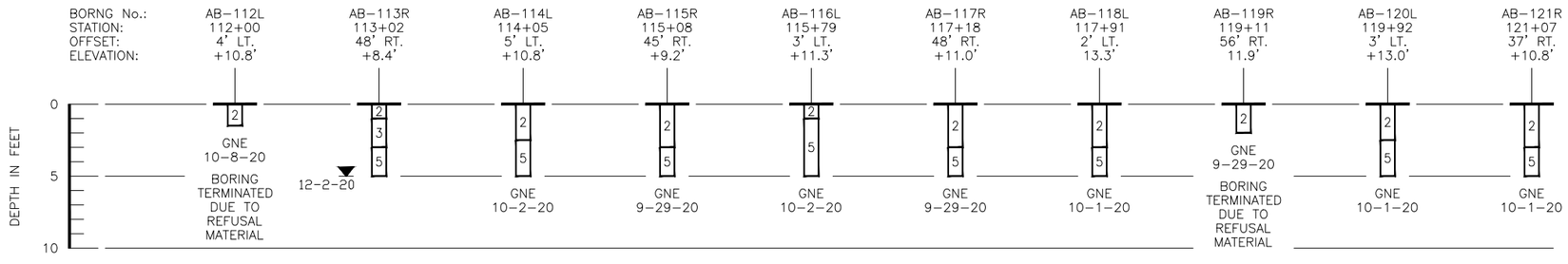

DRAWN BY: MG 12–16–20
CHECKED BY: JJ 12–16–20
DESIGNED BY:
CHECKED BY:

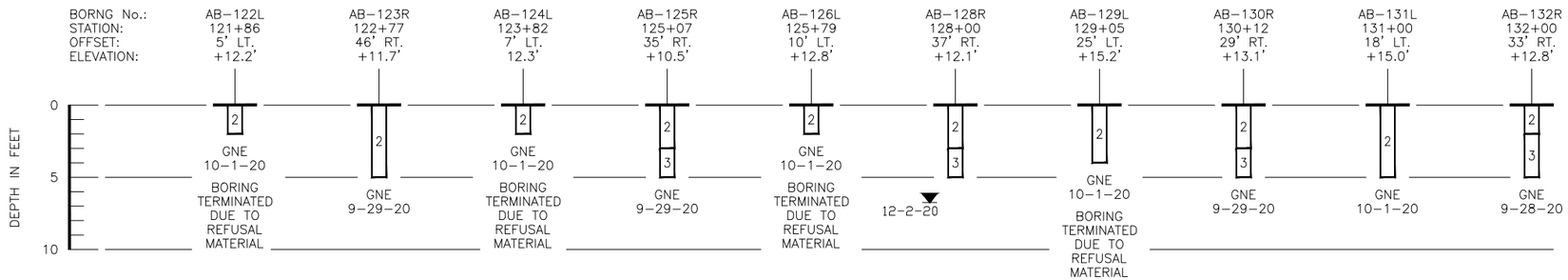
STATE OF FLORIDA
DEPARTMENT OF TRANSPORATATION

| ROAD NO. | COUNTY | FINANCIAL PROJECT ID |
|---|---|---|
| CANAL | MANATEE | – |

SHEET TITLE: SOIL SURVEY
REF. DWG. NO.:
PROJECT NAME: CANAL ROAD – PHASE 1 FROM US 301 TO 22ND LANE EAST
SHEET NO.: –




LEGEND

| | |
|---|---|
| 1 | ORGANIC MATERIAL – DARK BROWN, BLACK SLIGHTLY SILTY FINE SAND WITH ORGANICS (A–8) |
| 2 | LIGHT BROWN, BROWN SILTY FINE SAND WITH LIMESTONE FRAGMENTS (A–2–4) |
| 3 | BROWN, DARK BROWN, GRAY CLAYEY FINE SAND WITH LIMESTONE FRAGMENTS (A–2–6) |
| 4 | DARK BROWN, DARK GRAY SANDY CLAY WITH LIMESTONE FRAGMENTS (A–7–6) |
| 5 | LIGHT BROWN, LIGHT GRAY LIMESTONE FORMATION WITH CALCAREOUS SILT AND OCCASIONAL SEAMS OF GRAY CLAY OR SAND–SIZED PHOSPHATE GRAINS |
| (A–2–4) | A.A.S.H.T.O. SOIL CLASSIFICATION GROUP SYMBOL AS DETERMINED BY VISUAL EXAMINATION |
| ▼ 12-2-20 | ENCOUNTERED GROUNDWATER LEVEL WITH OF READING |
| GNE | GROUNDWATER NOT OBSERVED TO DEPTH OF BORING |

REVISIONS

| DATE | BY | DESCRIPTION | DATE | BY | DESCRIPTION |
|---|---|---|---|---|---|
| | | | | | |


JAMES JACKSON, P.E.
P.E. LICENSE NUMBER 77733
TERRACON
8260 VICO COURT
SARASOTA, FLORIDA 34240


DRAWN BY: MG 12–16–20
CHECKED BY: JJ 12–16–20
DESIGNED BY:
CHECKED BY:

STATE OF FLORIDA
DEPARTMENT OF TRANSPORATATION

| ROAD NO. | COUNTY | FINANCIAL PROJECT ID |
|---|---|---|
| CANAL | MANATEE | – |

SHEET TITLE: REPORT OF AUGER BORINGS FOR ROADWAY

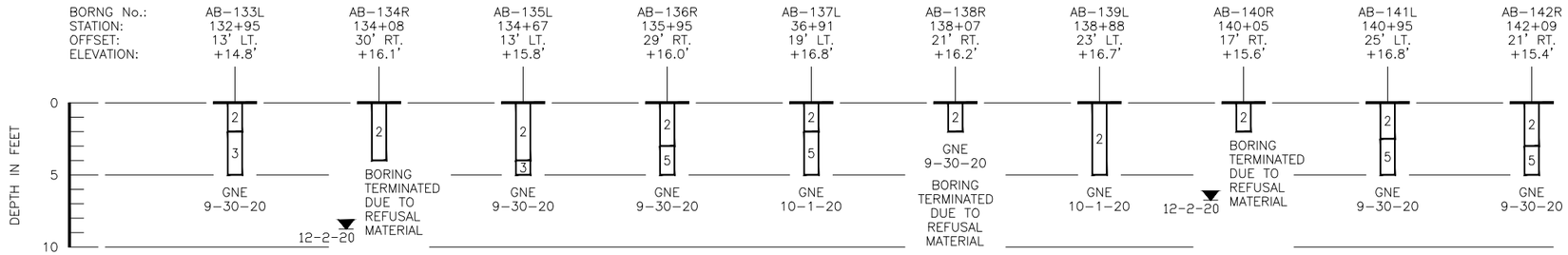
PROJECT NAME: CANAL ROAD – PHASE 1
FROM US 301 TO 22ND LANE EAST

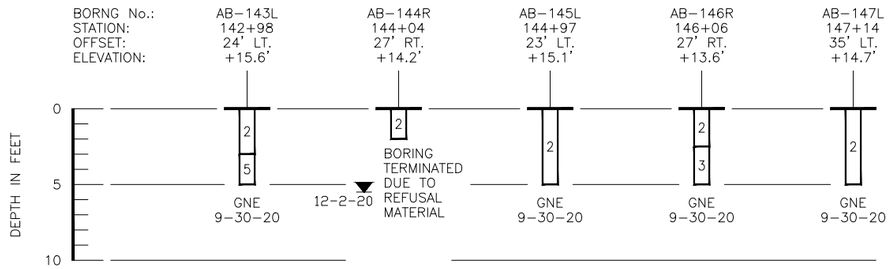
REF. DWG. NO.:

SHEET NO.: –

TERRACON No. HC185036 EXHIBIT: A–6

Dec28, 2020–11:45am




LEGEND

| | |
|---|---|
| 1 | ORGANIC MATERIAL – DARK BROWN, BLACK SLIGHTLY SILTY FINE SAND WITH ORGANICS (A-8) |
| 2 | LIGHT BROWN, BROWN SILTY FINE SAND WITH LIMESTONE FRAGMENTS (A-2-4) |
| 3 | BROWN, DARK BROWN, GRAY CLAYEY FINE SAND WITH LIMESTONE FRAGMENTS (A-2-6) |
| 4 | DARK BROWN, DARK GRAY SANDY CLAY WITH LIMESTONE FRAGMENTS (A-7-6) |
| 5 | LIGHT BROWN, LIGHT GRAY LIMESTONE FORMATION WITH CALCAREOUS SILT AND OCCASIONAL SEAMS OF GRAY CLAY OR SAND-SIZED PHOSPHATE GRAINS |
| (A-2-4) | A.A.S.H.T.O. SOIL CLASSIFICATION GROUP SYMBOL AS DETERMINED BY VISUAL EXAMINATION |
| ▼ 12-2-20 | ENCOUNTERED GROUNDWATER LEVEL WITH OF READING |
| GNE | GROUNDWATER NOT OBSERVED TO DEPTH OF BORING |

REVISIONS

| DATE | BY | DESCRIPTION | DATE | BY | DESCRIPTION |
|---|---|---|---|---|---|
| | | | | | |

JAMES JACKSON, P.E.
P.E. LICENSE NUMBER 77733
TERRACON
8260 VICO COURT
SARASOTA, FLORIDA 34240

DRAWN BY: MG 12-16-20
CHECKED BY: JJ 12-16-20
DESIGNED BY:
CHECKED BY:

STATE OF FLORIDA
DEPARTMENT OF TRANSPORATATION

| ROAD NO. | COUNTY | FINANCIAL PROJECT ID |
|---|---|---|
| CANAL | MANATEE | – |

SHEET TITLE: REPORT OF AUGER BORINGS FOR ROADWAY

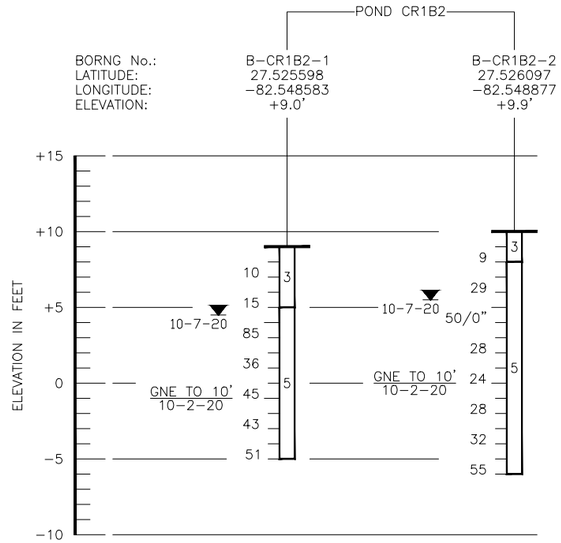
REF. DWG. NO.:

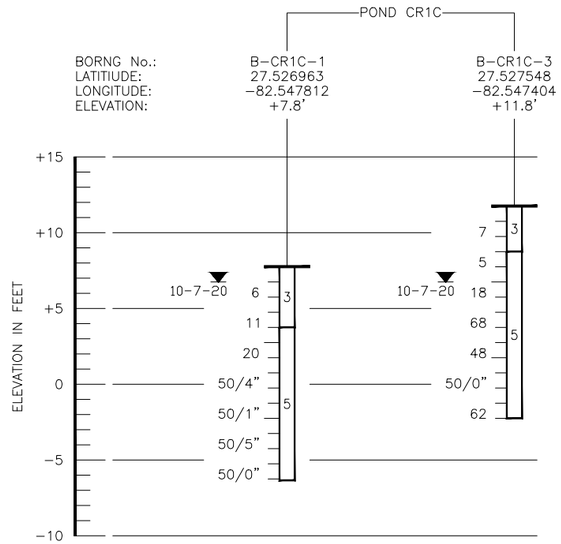
PROJECT NAME: CANAL ROAD – PHASE 1
FROM US 301 TO 22ND LANE EAST

SHEET NO.: –

TERRACON No. HC185036 EXHIBIT: A-7

Dec28, 2020-11:49am N:\Projects-Other Offices\Sarasota\2018\HC185036\Cad\HC185036 Roadway Borings 2.dwg




LEGEND

| | |
|---|---|
| 1 | ORGANIC MATERIAL – DARK BROWN, BLACK SLIGHTLY SILTY FINE SAND WITH ORGANICS (A-8) |
| 2 | LIGHT BROWN, BROWN SILTY FINE SAND WITH LIMESTONE FRAGMENTS (A-2-4) |
| 3 | BROWN, DARK BROWN, GRAY CLAYEY FINE SAND WITH LIMESTONE FRAGMENTS (A-2-6) |
| 4 | DARK BROWN, DARK GRAY SANDY CLAY WITH LIMESTONE FRAGMENTS (A-7-6) |
| 5 | LIGHT BROWN, LIGHT GRAY LIMESTONE FORMATION WITH CALCAREOUS SILT AND OCCASIONAL SEAMS OF GRAY CLAY OR SAND-SIZED PHOSPHATE GRAINS |
| (A-2-4) | A.A.S.H.T.O. SOIL CLASSIFICATION GROUP SYMBOL AS DETERMINED BY VISUAL EXAMINATION |
| ▼ 12-2-20 | ENCOUNTERED GROUNDWATER LEVEL WITH OF READING |
| GNE | GROUNDWATER NOT OBSERVED TO DEPTH OF BORING |

Dec28, 2020-11:53am N:\Projects-Other Offices\Sarasota\2018\HC185036\Cad\HC185036 Pond Borings 1.dwg

REVISIONS

| DATE | BY | DESCRIPTION | DATE | BY | DESCRIPTION |
|---|---|---|---|---|---|
| | | | | | |


JAMES JACKSON, P.E.
P.E. LICENSE NUMBER 77733
TERRACON
8260 VICO COURT
SARASOTA, FLORIDA 34240


DRAWN BY: MG 12-16-20
CHECKED BY: JJ 12-16-20
DESIGNED BY:
CHECKED BY:

STATE OF FLORIDA
DEPARTMENT OF TRANSPORATATION

| ROAD NO. | COUNTY | FINANCIAL PROJECT ID |
|---|---|---|
| CANAL | MANATEE | – |

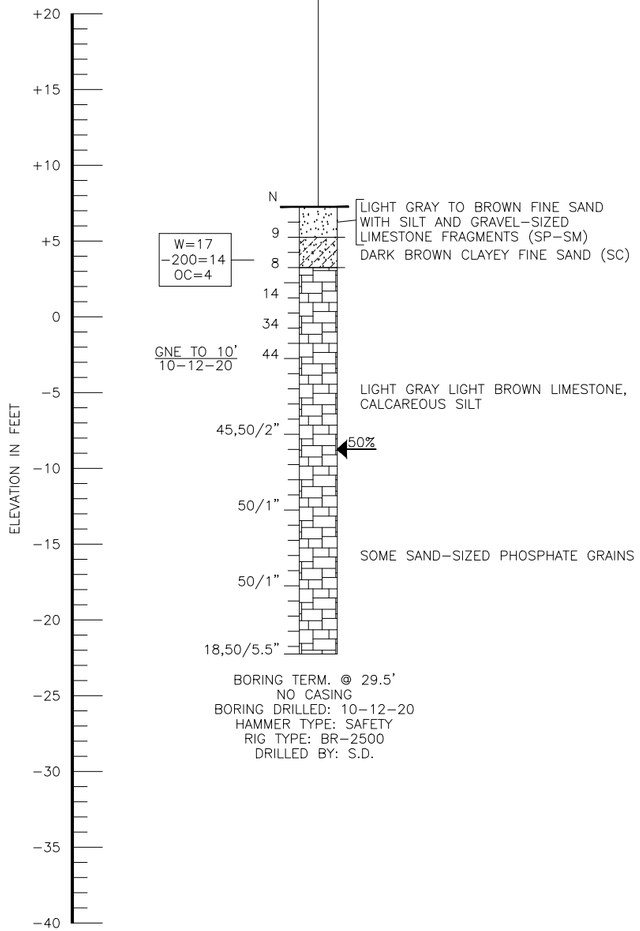
SHEET TITLE: REPORT OF SPT BORINGS FOR PONDS

PROJECT NAME: CANAL ROAD – PHASE 1
FROM US 301 TO 22ND LANE EAST

REF. DWG. NO.

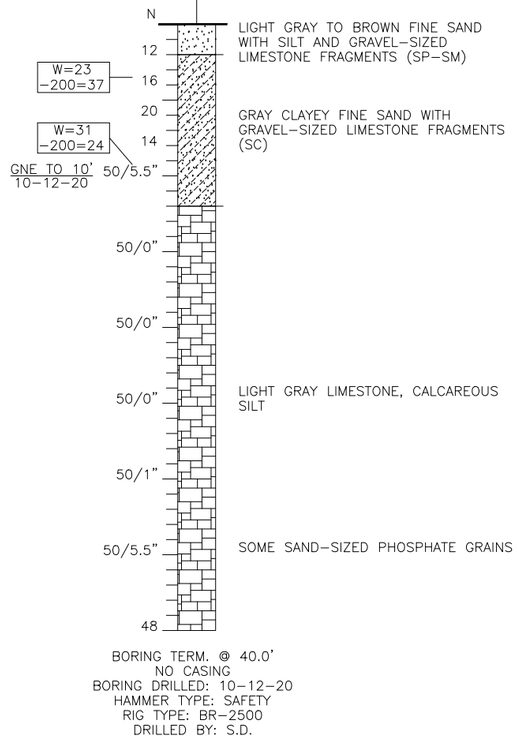
SHEET NO. –

BORING No.: BC–1
STATION: 102+95
OFFSET: 41' RT.
LATITUDE: 27.521786
LONGITUDE: –82.548143
ELEVATION: +7.3'



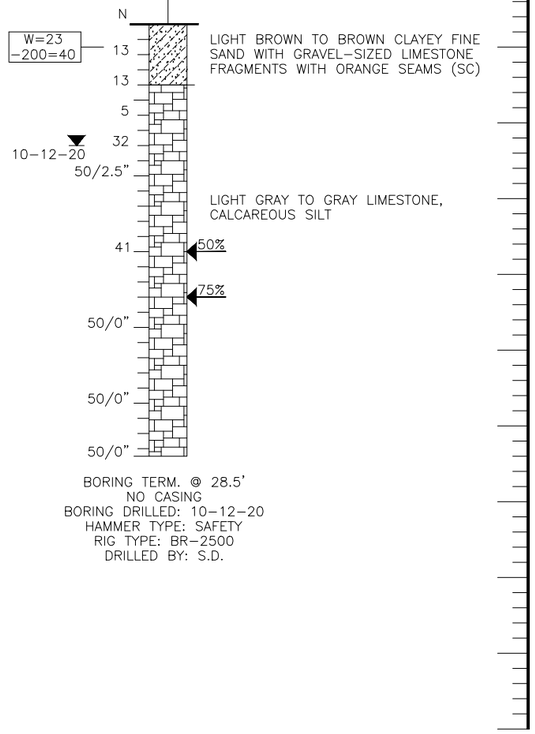

BORING TERM. @ 29.5'
NO CASING
BORING DRILLED: 10–12–20
HAMMER TYPE: SAFETY
RIG TYPE: BR–2500
DRILLED BY: S.D.

BORING No.: BC–2
STATION: 104+97
OFFSET: 37' RT.
LATITUDE: 27.522317
LONGITUDE: –82.548164
ELEVATION: +6.4'




BORING TERM. @ 40.0'
NO CASING
BORING DRILLED: 10–12–20
HAMMER TYPE: SAFETY
RIG TYPE: BR–2500
DRILLED BY: S.D.

BORING No.: BC–3
STATION: 106+45
OFFSET: 40' RT.
LATITUDE: 27.522738
LONGITUDE: –82.548146
ELEVATION: +6.6'




BORING TERM. @ 28.5'
NO CASING
BORING DRILLED: 10–12–20
HAMMER TYPE: SAFETY
RIG TYPE: BR–2500
DRILLED BY: S.D.

LEGEND

- SAND
- CLAYEY SAND
- LIMESTONE
- (SP) UNIFIED SOIL CLASSIFICATION GROUP SYMBOL
- 10–12–20 ENCOUNTERED GROUNDWATER LEVEL (DATE OF READING)
- GNE TO 10' GROUNDWATER NOT ENCOUNTERED TO THE DEPTH OF 10.0 FEET
- W=0 –200=0 OC=0 NATURAL MOISTURE CONTENT (%) FINES PASSING No. 200 SIEVE (%) ORGANIC CONTENT (%)
- N STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT UNLESS OTHERWISE NOTED
- 50/6" NUMBER OF BLOWS REQUIRED (50) TO DRIVE SAMPLING SPOON (6) INCHES
- DRILLING FLUID CIRCULATION LOSS

MANUAL HAMMER

STANDARD PENETRATION TEST DATA

| | |
|---|---|
| SPOON INSIDE DIA. | 1 3/8 in. |
| SPOON OUTSIDE DIA. | 2 in. |
| ASTM STANDARD DROP SAFETY HAMMER (ROPE–CATHEAD) | |
| AVG. HAMMER DROP | 30 in. |
| HAMMER WEIGHT | 140 lbs. |

GRANULAR MATERIALS

| RELATIVE DENSITY | SPT (BLOWS/FOOT) |
|---|---|
| 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 (BLOWS/FOOT) |
|---|---|
| VERY SOFT | LESS THAN 2 |
| SOFT | 2–4 |
| FIRM | 4–8 |
| STIFF | 8–15 |
| VERY STIFF | 15–30 |
| HARD | GREATER THAN 30 |

NOTES:

1) LAYER BOUNDARIES ARE APPROXIMATE AND REPRESENT SOIL LAYERS AT EACH TEST HOLE LOCATION ONLY. SUBSURFACE VARIATIONS BETWEEN BORINGS SHOULD BE ANTICIPATED.

ENVIRONMENTAL CLASSIFICATION:

SUPERSTRUCTURE: SLIGHTLY AGGRESSIVE
SUBSTRUCTURE:
STEEL: SLIGHTLY AGGRESSIVE
CONCRETE: SLIGHTLY AGGRESSIVE

REVISIONS

| DATE | BY | DESCRIPTION | DATE | BY | DESCRIPTION |
|---|---|---|---|---|---|
| | | | | | |


JAMES JACKSON, P.E.
P.E. LICENSE NUMBER 77733
TERRACON
8260 VICO COURT
SARASOTA, FLORIDA 34240


DRAWN BY: MG 12–16–20
CHECKED BY: JJ 12–16–20
DESIGNED BY:
CHECKED BY:

STATE OF FLORIDA
DEPARTMENT OF TRANSPORATATION

| ROAD NO. | COUNTY | FINANCIAL PROJECT ID |
|---|---|---|
| CANAL | MANATEE | – |

SHEET TITLE: REPORT OF CORE BORINGS FOR CULVERTS
REF. DWG. NO.:
PROJECT NAME: CANAL ROAD – PHASE 1
FROM US 301 TO 22ND LANE EAST
SHEET NO.: –

TERRACON No. HC185036 EXHIBIT: A–9

Dec28, 2020–11:59am N:\Projects–Other Offices\Sarasota\2018\HC185036\Cad\HC185036 Culvert Borings 1.dwg

BORING No.: BC-4
STATION: 107+86
OFFSET: 38' RT.
LATITUDE: 27.523189
LONGITUDE: -82.548145
ELEVATION: +8.3'

N
8
50/1"
40
30
GNE TO 10'
10-8-20
20
20,50/0.5"
50/0"
50/0"
50/0"
50/0"
50/1"

BROWN FINE SAND WITH SILT (SP-SM)

TAN TO LIGHT GRAY LIMESTONE, CALCAREOUS SILT

BORING TERM. @ 38.6'
NO CASING
BORING DRILLED: 10-8-20
HAMMER TYPE: SAFETY
RIG TYPE: BR-2500
DRILLED BY: S.D.

BORING No.: BC-5
STATION: 110+15
OFFSET: 43' RT.
LATITUDE: 27.523742
LONGITUDE: -82.548174
ELEVATION: +8.6'

N
10
20
50/5"
19
GNE TO 10'
10-8-20
25
18
50/5"
50/0"
50/0"
11,50/3"
50/2"

BROWN FINE SAND WITH SILT (SP-SM)
LIGHT GRAY CLAYEY FINE SAND WITH GRAVEL-SIZED LIMESTONE FRAGMENTS (SC)

40%

LIGHT GRAY LIMESTONE, CALCAREOUS SILT

BORING TERM. @ 38.7'
NO CASING
BORING DRILLED: 10-8-20
HAMMER TYPE: SAFETY
RIG TYPE: BR-2500
DRILLED BY: S.D.

BORING No.: BC-6
STATION: 112+05
OFFSET: 48' RT.
LATITUDE: 27.524258
LONGITUDE: -82.548172
ELEVATION: +8.2'

N
6
9
50/3"
7
GNE TO 10'
10-8-20
50/6"
26
50/4"
50/0"
50/1"
13,50/3"
20

GRAY CLAYEY FINE SAND WITH SHELL AND LIMESTONE FRAGMENTS (SC)

50%

LIGHT BROWN TO LIGHT GRAY LIMESTONE, CALCAREOUS SILT

SOME SAND-SIZED PHOSPHATE GRAINS

BORING TERM. @ 40.0'
NO CASING
BORING DRILLED: 10-8-20
HAMMER TYPE: SAFETY
RIG TYPE: BR-2500
DRILLED BY: S.D.

ELEVATION IN FEET
+20 +15 +10 +5 0 -5 -10 -15 -20 -25 -30 -35 -40

## LEGEND

- SAND
- CLAYEY SAND
- LIMESTONE
- (SP) UNIFIED SOIL CLASSIFICATION GROUP SYMBOL
- 10-12-20 ENCOUNTERED GROUNDWATER LEVEL (DATE OF READING)
- GNE TO 10' GROUNDWATER NOT ENCOUNTERED TO THE DEPTH OF 10.0 FEET
- W=0 -200=0 OC=0 NATURAL MOISTURE CONTENT (%) FINES PASSING No. 200 SIEVE (%) ORGANIC CONTENT (%)
- N STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT UNLESS OTHERWISE NOTED
- 50/6" NUMBER OF BLOWS REQUIRED (50) TO DRIVE SAMPLING SPOON (6) INCHES
- ← DRILLING FLUID CIRCULATION LOSS

MANUAL HAMMER

STANDARD PENETRATION TEST DATA

| | |
|---|---|
| SPOON INSIDE DIA. | 1 3/8 in. |
| SPOON OUTSIDE DIA. | 2 in. |
| ASTM STANDARD DROP SAFETY HAMMER (ROPE-CATHEAD) | |
| AVG. HAMMER DROP | 30 in. |
| HAMMER WEIGHT | 140 lbs. |

GRANULAR MATERIALS

| RELATIVE DENSITY | SPT (BLOWS/FOOT) |
|---|---|
| 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 (BLOWS/FOOT) |
|---|---|
| VERY SOFT | LESS THAN 2 |
| SOFT | 2-4 |
| FIRM | 4-8 |
| STIFF | 8-15 |
| VERY STIFF | 15-30 |
| HARD | GREATER THAN 30 |

NOTES:

1) LAYER BOUNDARIES ARE APPROXIMATE AND REPRESENT SOIL LAYERS AT EACH TEST HOLE LOCATION ONLY. SUBSURFACE VARIATIONS BETWEEN BORINGS SHOULD BE ANTICIPATED.

ENVIRONMENTAL CLASSIFICATION:

SUPERSTRUCTURE: SLIGHTLY AGGRESSIVE
SUBSTRUCTURE:
STEEL: MODERATELY AGGRESSIVE
CONCRETE: MODERATELY AGGRESSIVE

REVISIONS

| DATE | BY | DESCRIPTION | DATE | BY | DESCRIPTION |
|---|---|---|---|---|---|
| | | | | | |

JAMES JACKSON, P.E.
P.E. LICENSE NUMBER 77733
TERRACON
8260 VICO COURT
SARASOTA, FLORIDA 34240

DRAWN BY: MG 12-16-20
CHECKED BY: JJ 12-16-20
DESIGNED BY:
CHECKED BY:

STATE OF FLORIDA
DEPARTMENT OF TRANSPORATATION

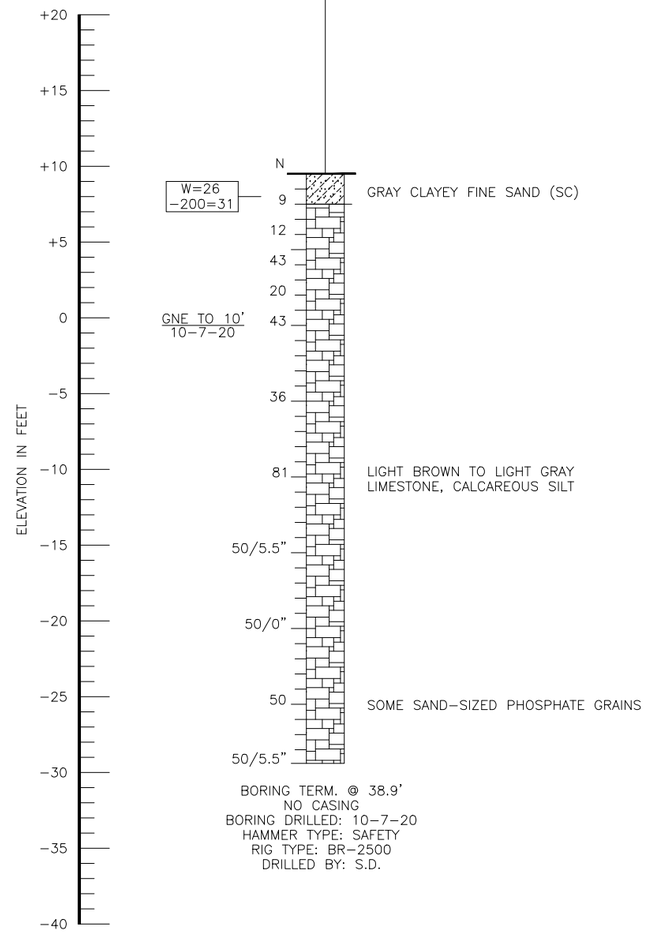
| ROAD NO. | COUNTY | FINANCIAL PROJECT ID |
|---|---|---|
| CANAL | MANATEE | - |

SHEET TITLE: REPORT OF CORE BORINGS FOR CULVERTS
PROJECT NAME: CANAL ROAD - PHASE 1 FROM US 301 TO 22ND LANE EAST
REF. DWG. NO.:
SHEET NO.: -

TERRACON No. HC185036 EXHIBIT: A-10

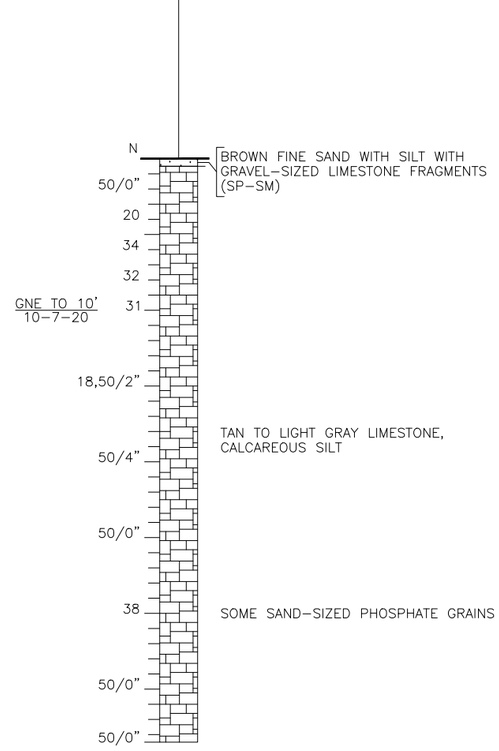
Dec28, 2020-12:01pm N:\Projects-Other Offices\Sarasota\2018\HC185036\Cad\HC185036 Culvert Borings 2.dwg

BORING No.: BC-7
STATION: 114+59
OFFSET: 49' RT.
LATITUDE: 27.524943
LONGITUDE: -82.548172
ELEVATION: +9.4'



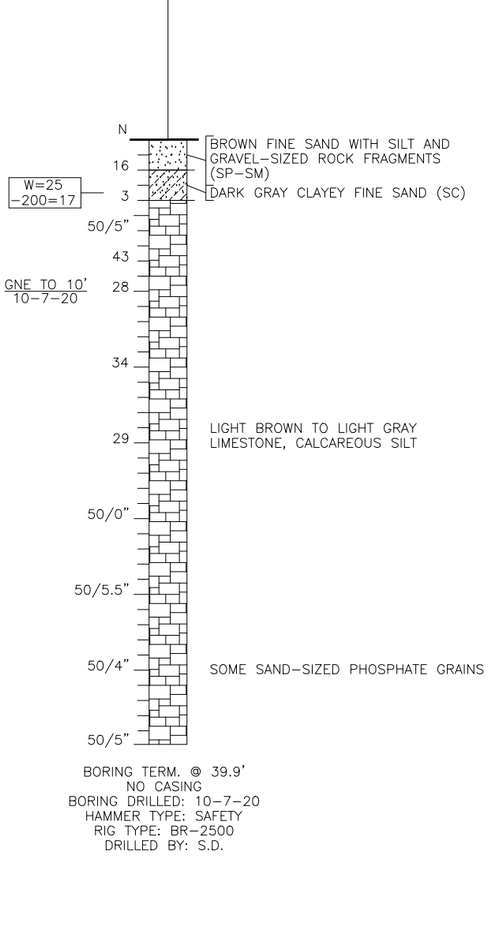

BORING TERM. @ 38.9'
NO CASING
BORING DRILLED: 10-7-20
HAMMER TYPE: SAFETY
RIG TYPE: BR-2500
DRILLED BY: S.D.

BORING No.: BC-8
STATION: 116+39
OFFSET: 48'RT.
LATITUDE: 27.525476
LONGITUDE: -82.548175
ELEVATION: +10.4'




BORING TERM. @ 38.5'
NO CASING
BORING DRILLED: 10-7-20
HAMMER TYPE: SAFETY
RIG TYPE: BR-2500
DRILLED BY: S.D.

BORING No.: BC-9
STATION: 118+38
OFFSET: 58' RT.
LATITUDE: 27.525983
LONGITUDE: -82.548166
ELEVATION: +11.8'




BORING TERM. @ 39.9'
NO CASING
BORING DRILLED: 10-7-20
HAMMER TYPE: SAFETY
RIG TYPE: BR-2500
DRILLED BY: S.D.

LEGEND

- SAND
- CLAYEY SAND
- LIMESTONE
- (SP) UNIFIED SOIL CLASSIFICATION GROUP SYMBOL
- 10-12-20 ENCOUNTERED GROUNDWATER LEVEL (DATE OF READING)
- GNE TO 10' GROUNDWATER NOT ENCOUNTERED TO THE DEPTH OF 10.0 FEET
- W=0 -200=0 OC=0 NATURAL MOISTURE CONTENT (%) FINES PASSING No. 200 SIEVE (%) ORGANIC CONTENT (%)
- N STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT UNLESS OTHERWISE NOTED
- 50/6" NUMBER OF BLOWS REQUIRED (50) TO DRIVE SAMPLING SPOON (6) INCHES
- DRILLING FLUID CIRCULATION LOSS

MANUAL HAMMER

STANDARD PENETRATION TEST DATA

| | |
|---|---|
| SPOON INSIDE DIA. | 1 3/8 in. |
| SPOON OUTSIDE DIA. | 2 in. |
| ASTM STANDARD DROP SAFETY HAMMER (ROPE-CATHEAD) | |
| AVG. HAMMER DROP | 30 in. |
| HAMMER WEIGHT | 140 lbs. |

GRANULAR MATERIALS

| RELATIVE DENSITY | SPT (BLOWS/FOOT) |
|---|---|
| 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 (BLOWS/FOOT) |
|---|---|
| VERY SOFT | LESS THAN 2 |
| SOFT | 2-4 |
| FIRM | 4-8 |
| STIFF | 8-15 |
| VERY STIFF | 15-30 |
| HARD | GREATER THAN 30 |

NOTES:

1) LAYER BOUNDARIES ARE APPROXIMATE AND REPRESENT SOIL LAYERS AT EACH TEST HOLE LOCATION ONLY. SUBSURFACE VARIATIONS BETWEEN BORINGS SHOULD BE ANTICIPATED.

ENVIRONMENTAL CLASSIFICATION:

SUPERSTRUCTURE: SLIGHTLY AGGRESSIVE
SUBSTRUCTURE:
STEEL: MODERATELY AGGRESSIVE
CONCRETE: MODERATELY AGGRESSIVE

REVISIONS

| DATE | BY | DESCRIPTION | DATE | BY | DESCRIPTION |
|---|---|---|---|---|---|
| | | | | | |


JAMES JACKSON, P.E.
P.E. LICENSE NUMBER 77733
TERRACON
8260 VICO COURT
SARASOTA, FLORIDA 34240


DRAWN BY: MG 12-16-20
CHECKED BY: JJ 12-16-20
DESIGNED BY:
CHECKED BY:

STATE OF FLORIDA
DEPARTMENT OF TRANSPORATATION

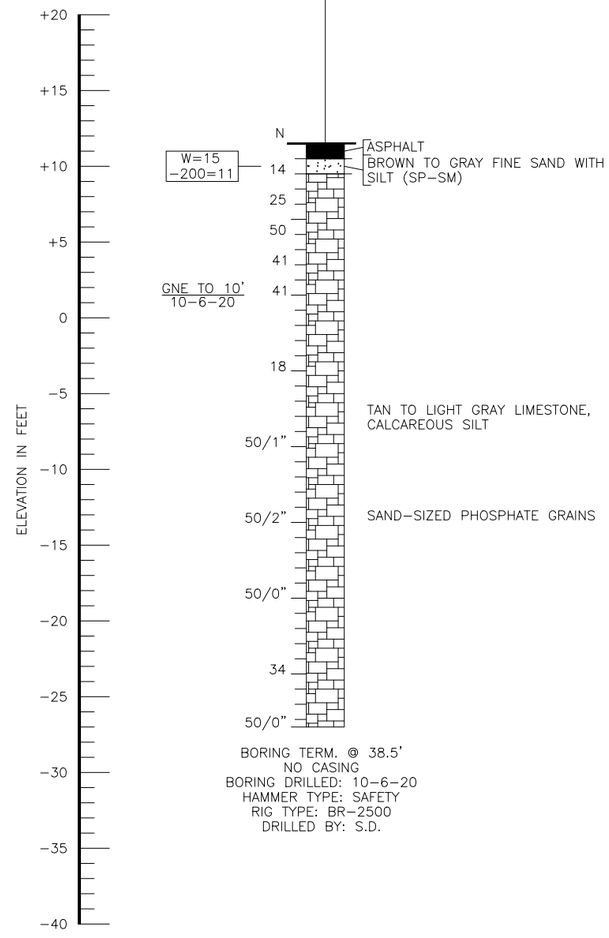
| ROAD NO. | COUNTY | FINANCIAL PROJECT ID |
|---|---|---|
| CANAL | MANATEE | - |

SHEET TITLE: REPORT OF CORE BORINGS CULVERTS
REF. DWG. NO.:
PROJECT NAME: CANAL ROAD - PHASE 1
FROM US 301 TO 22ND LANE EAST
SHEET NO.: -

TERRACON No. HC185036 EXHIBIT: A-11

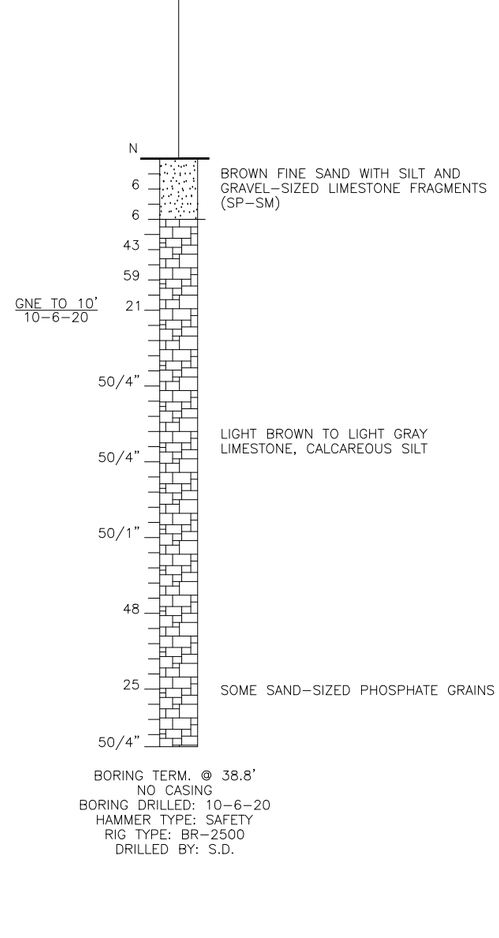
Dec28, 2020-12:02pm N:\Projects-Other Offices\Sarasota\2018\HC185036\Cad\HC185036 Culvert Borings 3.dwg

BORING No.: BC–10
STATION: 120+14
OFFSET: 55' RT.
LATITUDE: 27.526473
LONGITUDE: –82.548173
ELEVATION: +11.4'



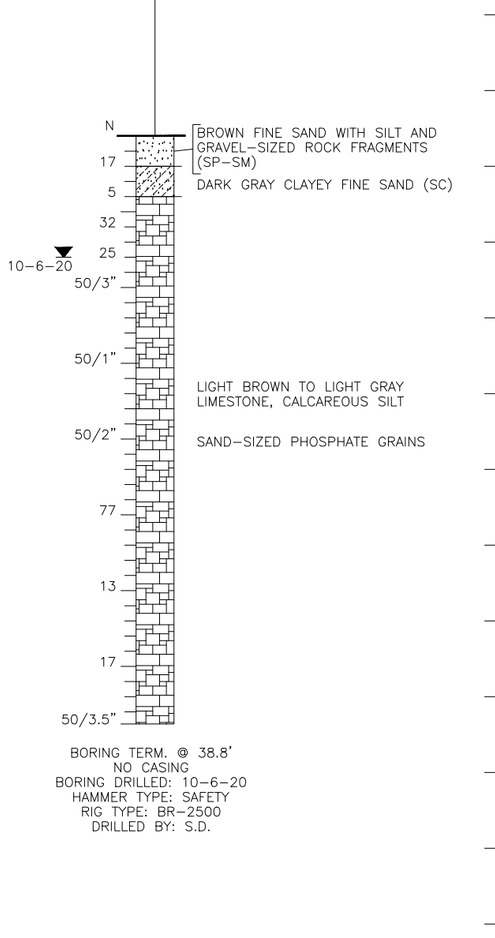

BORING TERM. @ 38.5'
NO CASING
BORING DRILLED: 10–6–20
HAMMER TYPE: SAFETY
RIG TYPE: BR–2500
DRILLED BY: S.D.

BORING No.: BC–11
STATION: 121+72
OFFSET: 38' RT.
LATITUDE: 27.527017
LONGITUDE: –82.548141
ELEVATION: +10.3'




BORING TERM. @ 38.8'
NO CASING
BORING DRILLED: 10–6–20
HAMMER TYPE: SAFETY
RIG TYPE: BR–2500
DRILLED BY: S.D.

BORING No.: BC–12
STATION: 123+84
OFFSET: 32' RT.
LATITUDE: 27.527550
LONGITUDE: –82.548122
ELEVATION: +11.9'




BORING TERM. @ 38.8'
NO CASING
BORING DRILLED: 10–6–20
HAMMER TYPE: SAFETY
RIG TYPE: BR–2500
DRILLED BY: S.D.

LEGEND

- SAND
- CLAYEY SAND
- LIMESTONE
- (SP) — UNIFIED SOIL CLASSIFICATION GROUP SYMBOL
- 10–12–20 — ENCOUNTERED GROUNDWATER LEVEL (DATE OF READING)
- GNE TO 10' — GROUNDWATER NOT ENCOUNTERED TO THE DEPTH OF 10.0 FEET
- W=0 / –200=0 / OC=0 — NATURAL MOISTURE CONTENT (%) / FINES PASSING No. 200 SIEVE (%) / ORGANIC CONTENT (%)
- N — STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT UNLESS OTHERWISE NOTED
- 50/6" — NUMBER OF BLOWS REQUIRED (50) TO DRIVE SAMPLING SPOON (6) INCHES
- ← DRILLING FLUID CIRCULATION LOSS

MANUAL HAMMER

STANDARD PENETRATION TEST DATA

| | |
|---|---|
| SPOON INSIDE DIA. | 1 3/8 in. |
| SPOON OUTSIDE DIA. | 2 in. |
| ASTM STANDARD DROP SAFETY HAMMER (ROPE–CATHEAD) | |
| AVG. HAMMER DROP | 30 in. |
| HAMMER WEIGHT | 140 lbs. |

GRANULAR MATERIALS

| RELATIVE DENSITY | SPT (BLOWS/FOOT) |
|---|---|
| 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 (BLOWS/FOOT) |
|---|---|
| VERY SOFT | LESS THAN 2 |
| SOFT | 2–4 |
| FIRM | 4–8 |
| STIFF | 8–15 |
| VERY STIFF | 15–30 |
| HARD | GREATER THAN 30 |

NOTES:

1) LAYER BOUNDARIES ARE APPROXIMATE AND REPRESENT SOIL LAYERS AT EACH TEST HOLE LOCATION ONLY. SUBSURFACE VARIATIONS BETWEEN BORINGS SHOULD BE ANTICIPATED.

ENVIRONMENTAL CLASSIFICATION:

SUPERSTRUCTURE: SLIGHTLY AGGRESSIVE
SUBSTRUCTURE:
STEEL: MODERATELY AGGRESSIVE
CONCRETE: MODERATELY AGGRESSIVE

REVISIONS

| DATE | BY | DESCRIPTION | DATE | BY | DESCRIPTION |
|---|---|---|---|---|---|
| | | | | | |


JAMES JACKSON, P.E.
P.E. LICENSE NUMBER 77733
TERRACON
8260 VICO COURT
SARASOTA, FLORIDA 34240


DRAWN BY: MG 12–16–20
CHECKED BY: JJ 12–16–20
DESIGNED BY:
CHECKED BY:

STATE OF FLORIDA
DEPARTMENT OF TRANSPORATATION

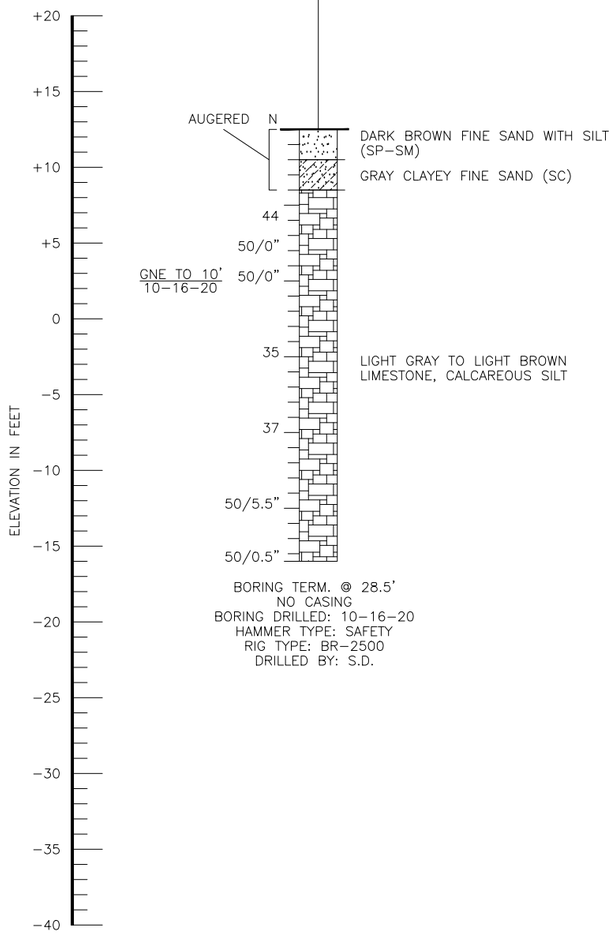
| ROAD NO. | COUNTY | FINANCIAL PROJECT ID |
|---|---|---|
| CANAL | MANATEE | – |

SHEET TITLE: REPORT OF CORE BORINGS FOR CULVERTS
PROJECT NAME: CANAL ROAD – PHASE 1 FROM US 301 TO 22ND LANE EAST
REF. DWG. NO.:
SHEET NO.: –

TERRACON No. HC185036 EXHIBIT: A–12

Dec28, 2020–12:04pm N:\Projects–Other Offices\Sarasota\2018\HC185036\Cad\HC185036 Culvert Borings 4.dwg

BORING No.: BC-13
STATION: 125+84
OFFSET: 30' RT.
LATITUDE: 27.528060
LONGITUDE: -82.548121
ELEVATION: +12.5'



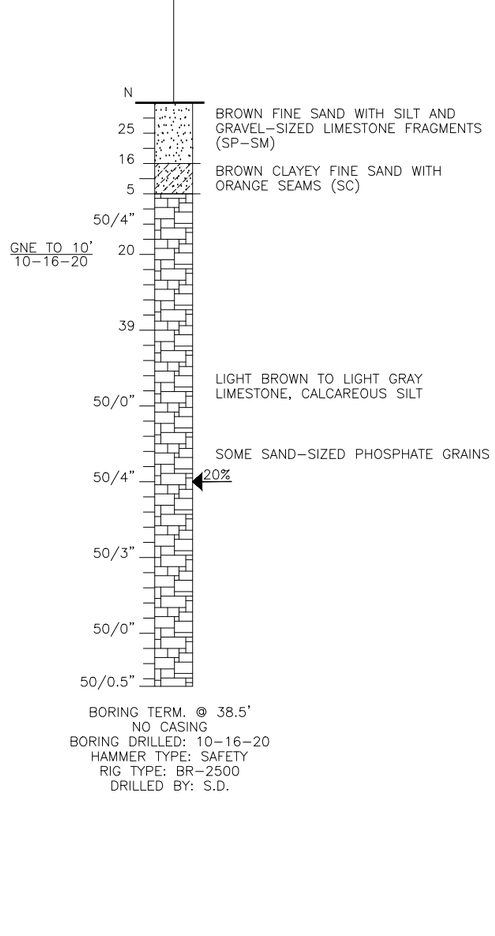

DARK BROWN FINE SAND WITH SILT (SP-SM)

GRAY CLAYEY FINE SAND (SC)

LIGHT GRAY TO LIGHT BROWN LIMESTONE, CALCAREOUS SILT

BORING TERM. @ 28.5'
NO CASING
BORING DRILLED: 10-16-20
HAMMER TYPE: SAFETY
RIG TYPE: BR-2500
DRILLED BY: S.D.

BORING No.: BC-14
STATION: 128+16
OFFSET: 28' LT.
LATITUDE: 27.528624
LONGITUDE: -82.548285
ELEVATION: +14.3'




BROWN FINE SAND WITH SILT AND GRAVEL-SIZED LIMESTONE FRAGMENTS (SP-SM)

BROWN CLAYEY FINE SAND WITH ORANGE SEAMS (SC)

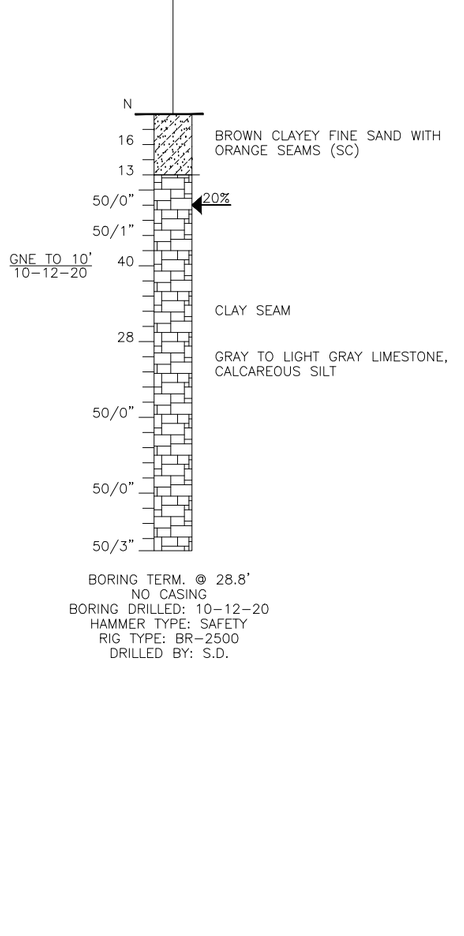
LIGHT BROWN TO LIGHT GRAY LIMESTONE, CALCAREOUS SILT

SOME SAND-SIZED PHOSPHATE GRAINS

20%

BORING TERM. @ 38.5'
NO CASING
BORING DRILLED: 10-16-20
HAMMER TYPE: SAFETY
RIG TYPE: BR-2500
DRILLED BY: S.D.

BORING No.: BC-15
STATION: 129+21
OFFSET: 22' RT.
LATITUDE: 27.528992
LONGITUDE: -82.548111
ELEVATION: +13.5'



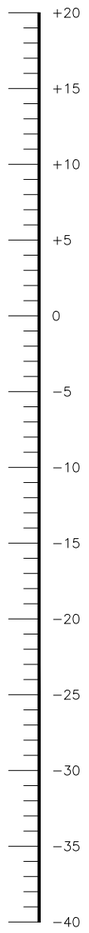

BROWN CLAYEY FINE SAND WITH ORANGE SEAMS (SC)

20%

CLAY SEAM

GRAY TO LIGHT GRAY LIMESTONE, CALCAREOUS SILT

BORING TERM. @ 28.8'
NO CASING
BORING DRILLED: 10-12-20
HAMMER TYPE: SAFETY
RIG TYPE: BR-2500
DRILLED BY: S.D.




## LEGEND

- SAND
- CLAYEY SAND
- LIMESTONE
- (SP) — UNIFIED SOIL CLASSIFICATION GROUP SYMBOL
- 10-12-20 — ENCOUNTERED GROUNDWATER LEVEL (DATE OF READING)
- GNE TO 10' — GROUNDWATER NOT ENCOUNTERED TO THE DEPTH OF 10.0 FEET
- W=0 / -200=0 / OC=0 — NATURAL MOISTURE CONTENT (%) / FINES PASSING No. 200 SIEVE (%) / ORGANIC CONTENT (%)
- N — STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT UNLESS OTHERWISE NOTED
- 50/6" — NUMBER OF BLOWS REQUIRED (50) TO DRIVE SAMPLING SPOON (6) INCHES
- DRILLING FLUID CIRCULATION LOSS

MANUAL HAMMER

STANDARD PENETRATION TEST DATA

| | |
|---|---|
| SPOON INSIDE DIA. | 1 3/8 in. |
| SPOON OUTSIDE DIA. | 2 in. |
| ASTM STANDARD DROP SAFETY HAMMER (ROPE-CATHEAD) | |
| AVG. HAMMER DROP | 30 in. |
| HAMMER WEIGHT | 140 lbs. |

GRANULAR MATERIALS

| RELATIVE DENSITY | SPT (BLOWS/FOOT) |
|---|---|
| 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 (BLOWS/FOOT) |
|---|---|
| VERY SOFT | LESS THAN 2 |
| SOFT | 2-4 |
| FIRM | 4-8 |
| STIFF | 8-15 |
| VERY STIFF | 15-30 |
| HARD | GREATER THAN 30 |

NOTES:

1) LAYER BOUNDARIES ARE APPROXIMATE AND REPRESENT SOIL LAYERS AT EACH TEST HOLE LOCATION ONLY. SUBSURFACE VARIATIONS BETWEEN BORINGS SHOULD BE ANTICIPATED.

ENVIRONMENTAL CLASSIFICATION:

SUPERSTRUCTURE: SLIGHTLY AGGRESSIVE
SUBSTRUCTURE:
STEEL: SLIGHTLY AGGRESSIVE
CONCRETE: SLIGHTLY AGGRESSIVE

Dec28, 2020 - 12:05pm N:\Projects-Other Offices\Sarasota\2018\HC185036\Cad\HC185036 Culvert Borings 5.dwg

REVISIONS

| DATE | BY | DESCRIPTION | DATE | BY | DESCRIPTION |
|---|---|---|---|---|---|
| | | | | | |


JAMES JACKSON, P.E.
P.E. LICENSE NUMBER 77733
TERRACON
8260 VICO COURT
SARASOTA, FLORIDA 34240


DRAWN BY: MG 12-16-20
CHECKED BY: JJ 12-16-20
DESIGNED BY:
CHECKED BY:

STATE OF FLORIDA
DEPARTMENT OF TRANSPORATATION

| ROAD NO. | COUNTY | FINANCIAL PROJECT ID |
|---|---|---|
| CANAL | MANATEE | - |

SHEET TITLE: REPORT OF CORE BORINGS FOR CULVERTS

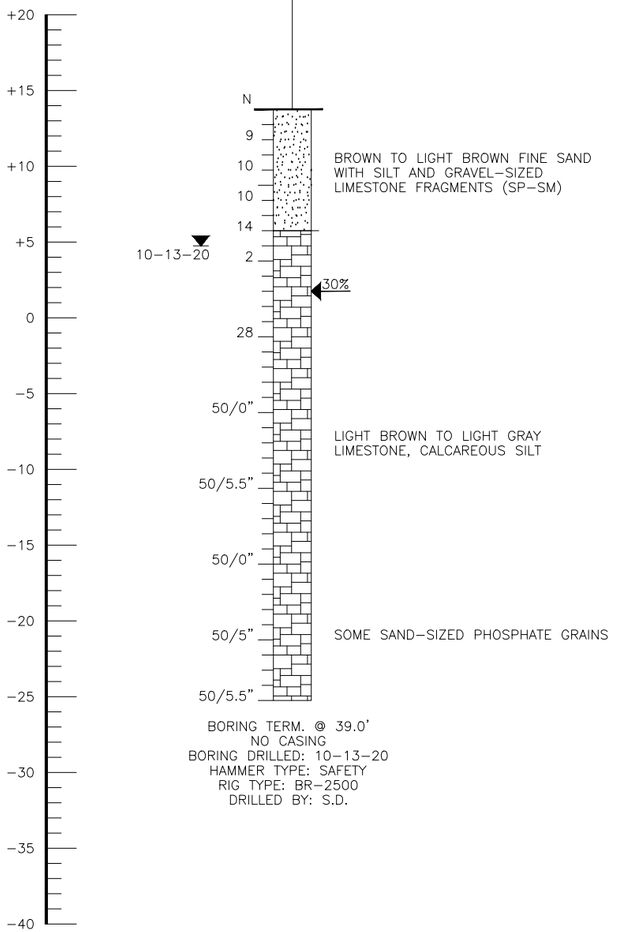
REF. DWG. NO.:

PROJECT NAME: CANAL ROAD - PHASE 1
FROM US 301 TO 22ND LANE EAST

SHEET NO.: -

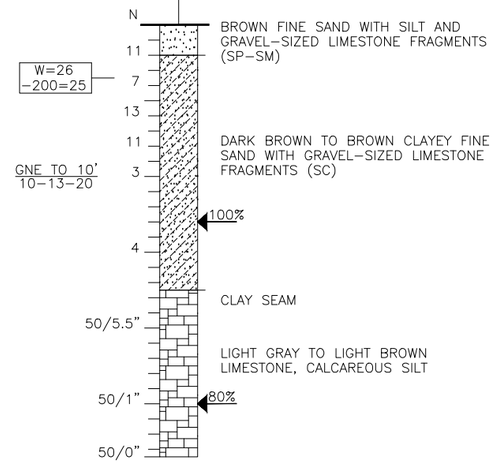
TERRACON No. HC185036 EXHIBIT: A-13

BORING No.: BC-16
STATION: 131+10
OFFSET: 28' LT.
LATITUDE: 27.529522
LONGITUDE: -82.548089
ELEVATION: +13.8'



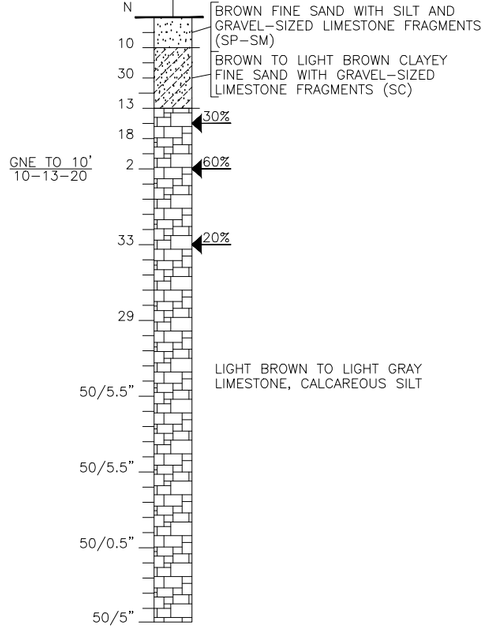

BORING TERM. @ 39.0'
NO CASING
BORING DRILLED: 10-13-20
HAMMER TYPE: SAFETY
RIG TYPE: BR-2500
DRILLED BY: S.D.

BORING No.: BC-17
STATION: 133+10
OFFSET: 28' RT.
LATITUDE: 27.530051
LONGITUDE: -82.548071
ELEVATION: +15.4'




BORING TERM. @ 28.5'
NO CASING
BORING DRILLED: 10-13-20
HAMMER TYPE: SAFETY
RIG TYPE: BR-2500
DRILLED BY: S.D.

BORING No.: BC-18
STATION: 135+25
OFFSET: 30' RT.
LATITUDE: 27.530595
LONGITUDE: -82.548060
ELEVATION: +15.9'




BORING TERM. @ 39.9'
NO CASING
BORING DRILLED: 10-13-20
HAMMER TYPE: SAFETY
RIG TYPE: BR-2500
DRILLED BY: S.D.

LEGEND

- SAND
- CLAYEY SAND
- LIMESTONE
- (SP) UNIFIED SOIL CLASSIFICATION GROUP SYMBOL
- 10-12-20 ENCOUNTERED GROUNDWATER LEVEL (DATE OF READING)
- GNE TO 10' GROUNDWATER NOT ENCOUNTERED TO THE DEPTH OF 10.0 FEET
- W=0 -200=0 OC=0 NATURAL MOISTURE CONTENT (%) FINES PASSING No. 200 SIEVE (%) ORGANIC CONTENT (%)
- N STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT UNLESS OTHERWISE NOTED
- 50/6" NUMBER OF BLOWS REQUIRED (50) TO DRIVE SAMPLING SPOON (6) INCHES
- DRILLING FLUID CIRCULATION LOSS

MANUAL HAMMER

STANDARD PENETRATION TEST DATA

| | |
|---|---|
| SPOON INSIDE DIA. | 1 3/8 in. |
| SPOON OUTSIDE DIA. | 2 in. |
| ASTM STANDARD DROP SAFETY HAMMER (ROPE-CATHEAD) | |
| AVG. HAMMER DROP | 30 in. |
| HAMMER WEIGHT | 140 lbs. |

GRANULAR MATERIALS

| RELATIVE DENSITY | SPT (BLOWS/FOOT) |
|---|---|
| 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 (BLOWS/FOOT) |
|---|---|
| VERY SOFT | LESS THAN 2 |
| SOFT | 2-4 |
| FIRM | 4-8 |
| STIFF | 8-15 |
| VERY STIFF | 15-30 |
| HARD | GREATER THAN 30 |

NOTES:

1) LAYER BOUNDARIES ARE APPROXIMATE AND REPRESENT SOIL LAYERS AT EACH TEST HOLE LOCATION ONLY. SUBSURFACE VARIATIONS BETWEEN BORINGS SHOULD BE ANTICIPATED.

ENVIRONMENTAL CLASSIFICATION:

SUPERSTRUCTURE: SLIGHTLY AGGRESSIVE
SUBSTRUCTURE:
STEEL: N/A
CONCRETE: N/A

REVISIONS

| DATE | BY | DESCRIPTION | DATE | BY | DESCRIPTION |
|---|---|---|---|---|---|
| | | | | | |


JAMES JACKSON, P.E.
P.E. LICENSE NUMBER 77733
TERRACON
8260 VICO COURT
SARASOTA, FLORIDA 34240


DRAWN BY: MG 12-16-20
CHECKED BY: JJ 12-16-20
DESIGNED BY:
CHECKED BY:

STATE OF FLORIDA
DEPARTMENT OF TRANSPORATATION

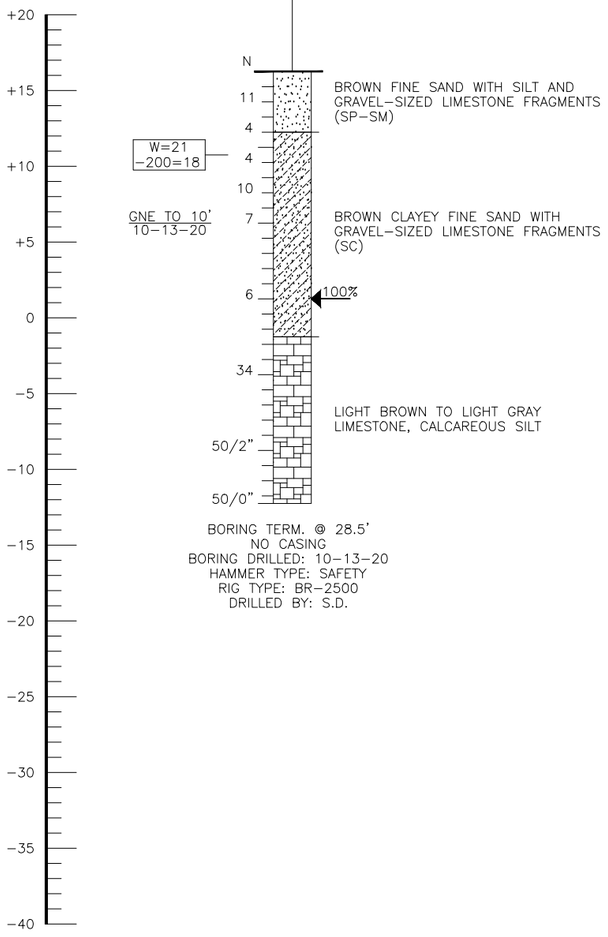
| ROAD NO. | COUNTY | FINANCIAL PROJECT ID |
|---|---|---|
| CANAL | MANATEE | - |

SHEET TITLE: REPORT OF CORE BORINGS FOR CULVERTS
REF. DWG. NO.:
PROJECT NAME: CANAL ROAD - PHASE 1
FROM US 301 TO 22ND LANE EAST
SHEET NO.: -

TERRACON No. HC185036 EXHIBIT: A-14

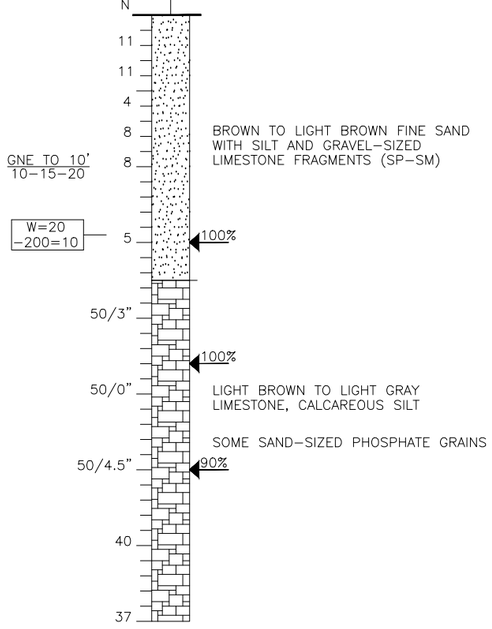
Dec28, 2020-12:06pm N:\Projects-Other Offices\Sarasota\2018\HC185036\Cad\HC185036 Culvert Borings 6.dwg

BORING No.: BC-19
STATION: 136+64
OFFSET: 22' RT.
LATITUDE: 27.531065
LONGITUDE: -82.548045
ELEVATION: +16.2'



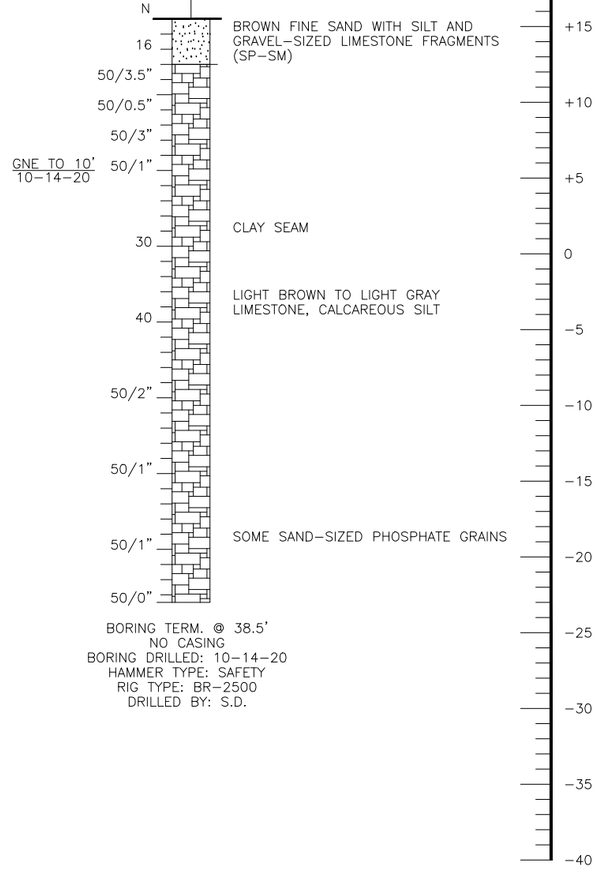

BORING TERM. @ 28.5'
NO CASING
BORING DRILLED: 10-13-20
HAMMER TYPE: SAFETY
RIG TYPE: BR-2500
DRILLED BY: S.D.

BORING No.: BC-20
STATION: 139+20
OFFSET: 21' RT.
LATITUDE: 27.531698
LONGITUDE: -82.548062
ELEVATION: +15.7'




BORING TERM. @ 40.0'
NO CASING
BORING DRILLED: 10-15-20
HAMMER TYPE: SAFETY
RIG TYPE: BR-2500
DRILLED BY: S.D.

BORING No.: BC-21
STATION: 141+11
OFFSET: 19' RT.
LATITUDE: 27.532255
LONGITUDE: -82.548049
ELEVATION: +15.5'




BORING TERM. @ 38.5'
NO CASING
BORING DRILLED: 10-14-20
HAMMER TYPE: SAFETY
RIG TYPE: BR-2500
DRILLED BY: S.D.

## LEGEND

- SAND
- CLAYEY SAND
- LIMESTONE
- (SP) — UNIFIED SOIL CLASSIFICATION GROUP SYMBOL
- 10-12-20 — ENCOUNTERED GROUNDWATER LEVEL (DATE OF READING)
- GNE TO 10' — GROUNDWATER NOT ENCOUNTERED TO THE DEPTH OF 10.0 FEET
- W=0 / -200=0 / OC=0 — NATURAL MOISTURE CONTENT (%) / FINES PASSING No. 200 SIEVE (%) / ORGANIC CONTENT (%)
- N — STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT UNLESS OTHERWISE NOTED
- 50/6" — NUMBER OF BLOWS REQUIRED (50) TO DRIVE SAMPLING SPOON (6) INCHES
- ← DRILLING FLUID CIRCULATION LOSS

MANUAL HAMMER

STANDARD PENETRATION TEST DATA

| | |
|---|---|
| SPOON INSIDE DIA. | 1 3/8 in. |
| SPOON OUTSIDE DIA. | 2 in. |
| ASTM STANDARD DROP SAFETY HAMMER (ROPE-CATHEAD) | |
| AVG. HAMMER DROP | 30 in. |
| HAMMER WEIGHT | 140 lbs. |

GRANULAR MATERIALS

| RELATIVE DENSITY | SPT (BLOWS/FOOT) |
|---|---|
| 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 (BLOWS/FOOT) |
|---|---|
| VERY SOFT | LESS THAN 2 |
| SOFT | 2-4 |
| FIRM | 4-8 |
| STIFF | 8-15 |
| VERY STIFF | 15-30 |
| HARD | GREATER THAN 30 |

NOTES:

1) LAYER BOUNDARIES ARE APPROXIMATE AND REPRESENT SOIL LAYERS AT EACH TEST HOLE LOCATION ONLY. SUBSURFACE VARIATIONS BETWEEN BORINGS SHOULD BE ANTICIPATED.

ENVIRONMENTAL CLASSIFICATION:

SUPERSTRUCTURE: SLIGHTLY AGGRESSIVE
SUBSTRUCTURE:
STEEL: N/A
CONCRETE: N/A

REVISIONS

| DATE | BY | DESCRIPTION | DATE | BY | DESCRIPTION |
|---|---|---|---|---|---|
| | | | | | |


JAMES JACKSON, P.E.
P.E. LICENSE NUMBER 77733
TERRACON
8260 VICO COURT
SARASOTA, FLORIDA 34240


DRAWN BY: MG 12-16-20
CHECKED BY: JJ 12-16-20
DESIGNED BY:
CHECKED BY:

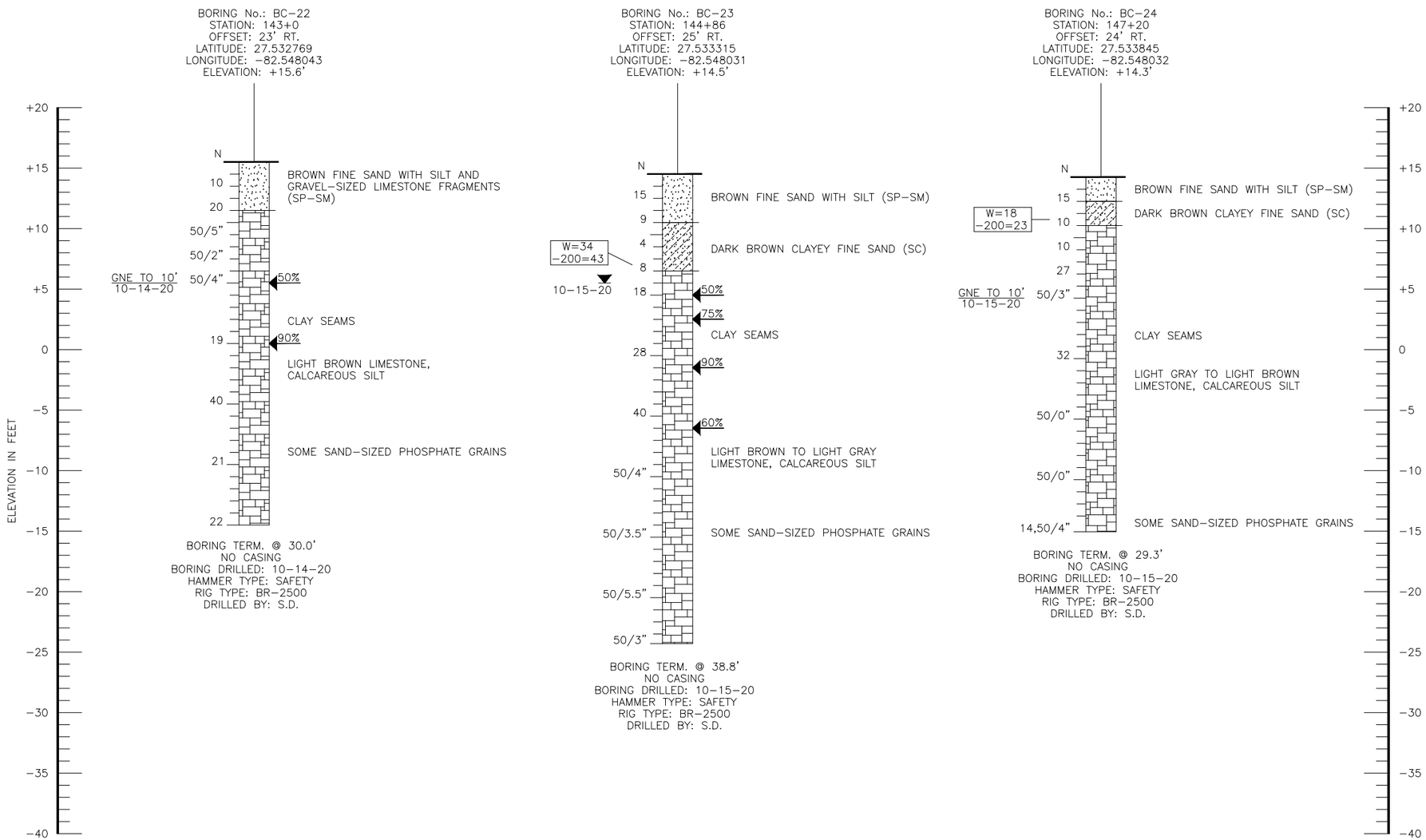
STATE OF FLORIDA
DEPARTMENT OF TRANSPORATATION

| ROAD NO. | COUNTY | FINANCIAL PROJECT ID |
|---|---|---|
| CANAL | MANATEE | - |

SHEET TITLE: REPORT OF CORE BORINGS FOR CULVERTS
REF. DWG. NO.:
PROJECT NAME: CANAL ROAD - PHASE 1 FROM US 301 TO 22ND LANE EAST
SHEET NO.: -

TERRACON No. HC185036 EXHIBIT: A-15

Dec28, 2020 - 12:07pm N:\Projects - Other Offices\Sarasota\2018\HC185036\Cad\HC185036 Culvert Borings 7.dwg




LEGEND

| | |
|---|---|
| | SAND |
| | CLAYEY SAND |
| | LIMESTONE |
| (SP) | UNIFIED SOIL CLASSIFICATION GROUP SYMBOL |
| 10-12-20 | ENCOUNTERED GROUNDWATER LEVEL (DATE OF READING) |
| GNE TO 10' | GROUNDWATER NOT ENCOUNTERED TO THE DEPTH OF 10.0 FEET |
| W=0<br>-200=0<br>OC=0 | NATURAL MOISTURE CONTENT (%)<br>FINES PASSING No. 200 SIEVE (%)<br>ORGANIC CONTENT (%) |
| N | STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT UNLESS OTHERWISE NOTED |
| 50/6" | NUMBER OF BLOWS REQUIRED (50) TO DRIVE SAMPLING SPOON (6) INCHES |
| ← | DRILLING FLUID CIRCULATION LOSS |

MANUAL HAMMER

STANDARD PENETRATION TEST DATA

| | |
|---|---|
| SPOON INSIDE DIA. | 1 3/8 in. |
| SPOON OUTSIDE DIA. | 2 in. |
| ASTM STANDARD DROP SAFETY HAMMER (ROPE-CATHEAD) | |
| AVG. HAMMER DROP | 30 in. |
| HAMMER WEIGHT | 140 lbs. |

GRANULAR MATERIALS

| RELATIVE DENSITY | SPT (BLOWS/FOOT) |
|---|---|
| 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 (BLOWS/FOOT) |
|---|---|
| VERY SOFT | LESS THAN 2 |
| SOFT | 2-4 |
| FIRM | 4-8 |
| STIFF | 8-15 |
| VERY STIFF | 15-30 |
| HARD | GREATER THAN 30 |

NOTES:

1) LAYER BOUNDARIES ARE APPROXIMATE AND REPRESENT SOIL LAYERS AT EACH TEST HOLE LOCATION ONLY. SUBSURFACE VARIATIONS BETWEEN BORINGS SHOULD BE ANTICIPATED.

ENVIRONMENTAL CLASSIFICATION:

SUPERSTRUCTURE: SLIGHTLY AGGRESSIVE

SUBSTRUCTURE:

STEEL: N/A

CONCRETE: N/A

Dec28, 2020-12:08pm N:\Projects-Other Offices\Sarasota\2018\HC185036\Cad\HC185036 Culvert Borings 8.dwg

REVISIONS

| DATE | BY | DESCRIPTION | DATE | BY | DESCRIPTION |
|---|---|---|---|---|---|
| | | | | | |


JAMES JACKSON, P.E.
P.E. LICENSE NUMBER 77733
TERRACON
8260 VICO COURT
SARASOTA, FLORIDA 34240


DRAWN BY: MG 12-16-20
CHECKED BY: JJ 12-16-20
DESIGNED BY:
CHECKED BY:

STATE OF FLORIDA
DEPARTMENT OF TRANSPORATATION

| ROAD NO. | COUNTY | FINANCIAL PROJECT ID |
|---|---|---|
| CANAL | MANATEE | - |

SHEET TITLE: REPORT OF CORE BORINGS FOR CULVERTS

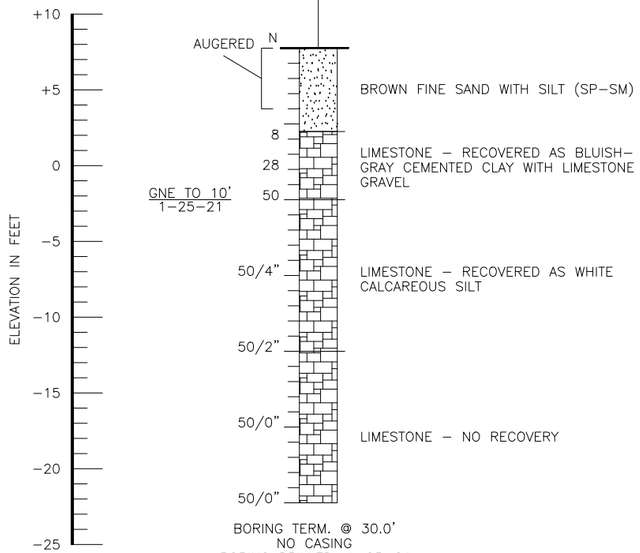
PROJECT NAME: CANAL ROAD - PHASE 1
FROM US 301 TO 22ND LANE EAST

REF. DWG. NO.

SHEET NO. -

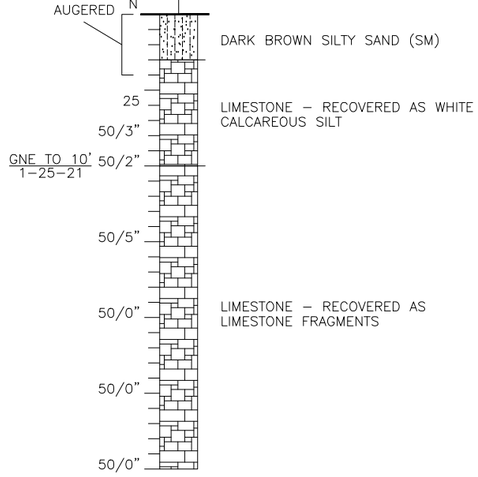
TERRACON No. HC185036 EXHIBIT: A-16

BORING No.: B-301-1
STATION: 100+05
OFFSET: 90' RT.
LATITUDE: 27.521273
LONGITUDE: -82.54841
ELEVATION: +7.8'



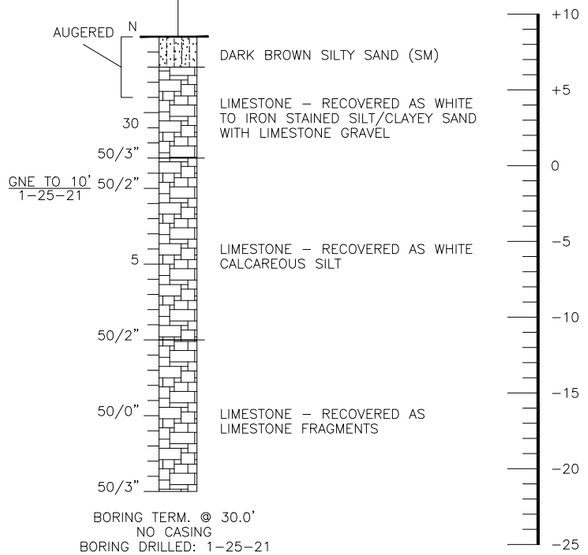

BORING TERM. @ 30.0'
NO CASING
BORING DRILLED: 1-25-21
HAMMER TYPE: MANUAL (SAFETY)
RIG TYPE: BR-2500
DRILLED BY: S. KEREKES

BORING No.: B-301-2
STATION: 100+15
OFFSET: 53' LT.
LATITUDE: 27.521388
LONGITUDE: -82.548046
ELEVATION: +8.0'




BORING TERM. @ 30.0'
NO CASING
BORING DRILLED: 1-25-21
HAMMER TYPE: MANUAL (SAFETY)
RIG TYPE: BR-2500
DRILLED BY: S. KEREKES

BORING No.: B-301-3
STATION: 101+50
OFFSET: 65' RT.
LATITUDE: 27.520975
LONGITUDE: -82.547961
ELEVATION: +8.5'




BORING TERM. @ 30.0'
NO CASING
BORING DRILLED: 1-25-21
HAMMER TYPE: MANUAL (SAFETY)
RIG TYPE: BR-2500
DRILLED BY: S. KEREKES

LEGEND

| | |
|---|---|
| SAND | LIMESTONE |
| SILTY SAND | |
| (SP) | UNIFIED SOIL CLASSIFICATION GROUP SYMBOL |
| GNE TO 10' | GROUNDWATER NOT ENCOUNTERED TO THE DEPTH OF 10 FEET |
| N | STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT UNLESS OTHERWISE NOTED |
| 50/6" | NUMBER OF BLOWS REQUIRED (50) TO DRIVE SAMPLING SPOON (6) INCHES |

MANUAL HAMMER
STANDARD PENETRATION TEST DATA

| | |
|---|---|
| SPOON INSIDE DIA. | 1 3/8 in. |
| SPOON OUTSIDE DIA. | 2 in. |
| ASTM STANDARD DROP SAFETY HAMMER (ROPE-CATHEAD) | |
| AVG. HAMMER DROP | 30 in. |
| HAMMER WEIGHT | 140 lbs. |

GRANULAR MATERIALS

| RELATIVE DENSITY | SPT (BLOWS/FOOT) |
|---|---|
| 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 (BLOWS/FOOT) |
|---|---|
| VERY SOFT | LESS THAN 2 |
| SOFT | 2-4 |
| FIRM | 4-8 |
| STIFF | 8-15 |
| VERY STIFF | 15-30 |
| HARD | GREATER THAN 30 |

SOIL DESIGN PARAMETERS FOR B-301-1

| DEPTH (FEET) | SOIL TYPE | SOIL UNIT WEIGHT (pcf) | | SOIL FRICTION ANGLE (ϕ) (DEGREES) | COHESION (psf) | ULTIMATE SHEAR STRENGTH (psf) | EARTH PRESSURE COEFFICIENT | | SOIL MODULUS, k (pci) |
|---|---|---|---|---|---|---|---|---|---|
| | | TOTAL (γ) (ABOVE GWT) | EFFECTIVE (γ) | | | | ACTIVE | PASSIVE | |
| 0-5 | SAND | 105 | 43 | 29 | – | – | 0.347 | 2.88 | 10 |
| 5-8 | LIMESTONE | 135 | 73 | – | – | 8,000 | 1 | 1 | – |
| 8-30 | LIMESTONE | 135 | 73 | – | – | 15,000 | 1 | 1 | – |

SOIL DESIGN PARAMETERS FOR B-301-2

| DEPTH (FEET) | SOIL TYPE | SOIL UNIT WEIGHT (pcf) | | SOIL FRICTION ANGLE (ϕ) (DEGREES) | COHESION (psf) | ULTIMATE SHEAR STRENGTH (psf) | EARTH PRESSURE COEFFICIENT | | SOIL MODULUS, k (pci) |
|---|---|---|---|---|---|---|---|---|---|
| | | TOTAL (γ) (ABOVE GWT) | EFFECTIVE (γ) | | | | ACTIVE | PASSIVE | |
| 0-3 | SAND | 105 | 43 | 29 | – | – | 0.347 | 2.88 | 10 |
| 3-6 | LIMESTONE | 135 | 73 | – | – | 8,000 | 1 | 1 | – |
| 6-30 | LIMESTONE | 135 | 73 | – | – | 15,000 | 1 | 1 | – |

SOIL DESIGN PARAMETERS FOR B-301-3

| DEPTH (FEET) | SOIL TYPE | SOIL UNIT WEIGHT (pcf) | | SOIL FRICTION ANGLE (ϕ) (DEGREES) | COHESION (psf) | ULTIMATE SHEAR STRENGTH (psf) | EARTH PRESSURE COEFFICIENT | | SOIL MODULUS, k (pci) |
|---|---|---|---|---|---|---|---|---|---|
| | | TOTAL (γ) (ABOVE GWT) | EFFECTIVE (γ) | | | | ACTIVE | PASSIVE | |
| 0-2 | SAND | 105 | 43 | 29 | – | – | 0.347 | 2.88 | 10 |
| 2-6 | LIMESTONE | 135 | 73 | – | – | 8,000 | 1 | 1 | – |
| 6-13 | LIMESTONE | 135 | 73 | – | – | 15,000 | 1 | 1 | – |
| 13-18 | LIMESTONE | 120 | 58 | – | – | – | 1 | 1 | – |
| 18-30 | LIMESTONE | 135 | 73 | – | – | 15,000 | 1 | 1 | – |

NOTES:

1) LAYER BOUNDARIES ARE APPROXIMATE AND REPRESENT SOIL LAYERS AT EACH TEST HOLE LOCATION ONLY. SUBSURFACE VARIATIONS BETWEEN BORINGS SHOULD BE ANTICIPATED.

2) LATITUDE AND LONGITUDE AT BORING LOCATIONS IS BASED ON HANDHELD GPS DEVICE.

REVISIONS

| DATE | BY | DESCRIPTION | DATE | BY | DESCRIPTION |
|---|---|---|---|---|---|
| | | | | | |


JAMES JACKSON, P.E.
P.E. LICENSE NUMBER 77733
TERRACON
8260 VICO COURT
SARASOTA, FLORIDA 34240


DRAWN BY: MG 2-4-21
CHECKED BY: JJ 2-4-21
DESIGNED BY:
CHECKED BY:

STATE OF FLORIDA
DEPARTMENT OF TRANSPORATATION

| ROAD NO. | COUNTY | FINANCIAL PROJECT ID |
|---|---|---|
| CANAL | MANATEE | - |

SHEET TITLE: REPORT OF CORE BORINGS FOR SIGNALS
PROJECT NAME: CANAL ROAD - PHASE 1
FROM US 301 TO 22ND LANE EAST

REF. DWG. NO.:
SHEET NO.: -

TERRACON No. HC185036 EXHIBIT: A-17

**EXHIBIT A-18**
**FIELD PERMEABILITY TEST RESULTS - CANAL ROAD**
**USBR METHOD**

| LOCATION | DEPTH OF | SCREEN | BOREHOLE | FLOW RATE | | | | HEAD CONDITIONS | | | AVERAGE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| (PZ No.) | SCREEN | LENGTH | DIAMETER | TIME | VOL | Q | Q | STICK UP | DEPTH | HEAD | PERMEABILITY |
| | (feet) | (feet) | (inches) | (minutes) | (gallons) | (gpm) | (cfs) | (feet) | (feet) | (feet) | (feet/day) |
| | | | | | | | | | | | |
| 1B2-1 | 11 to 16 | 5.0 | 4 | 23.8 | 2.32 | 0.10 | 0.0002 | 0 | 5 | 5 | 0.4 |
| 1B2-2 | 11 to 16 | 5.0 | 4 | 14.6 | 2.32 | 0.16 | 0.0004 | 0.0 | 5.1 | 5.1 | 0.6 |
| 1C1-1 | 11 to 16 | 5.0 | 4 | 1.9 | 1.75 | 0.92 | 0.0021 | 0.0 | 1.8 | 1.8 | 10.7 |
| 1C1-2 | 11 to 16 | 5.0 | 4 | 15.5 | 2.32 | 0.15 | 0.0003 | 0.0 | 6.1 | 6.1 | 0.5 |

# APPENDIX B – LABORATORY TESTING

**Contents:**

## Exhibit B-1: Laboratory Testing Procedures

The project engineer reviewed the field data and assigned laboratory tests to understand the engineering properties of the various soil strata, as necessary, for this project. Procedural standards noted below are for reference to methodology in general. In some cases, variations to methods were applied because of local practice or professional judgment. Standards noted below include reference to other, related standards. Such references are not necessarily applicable to describe the specific test performed.

- ASTM D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- ASTM D1140 Standard Test Method for Amount of Material in Soils Finer than No. 200 (75-µm) Sieve) in Soil by Washing
- ASTM D6913 Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis
- FM 1-T267 Determination of Organic Content in Soil by Loss on Ignition
- FM 5-515 Limerock Bearing Ratio
- FM 5-550 pH of Soil and Water
- FM 5-551 Minimum Resistivity of Soil and Water
- FM 5-552 Chloride in Soil and Water
- FM 5-553 Sulfate in Soil and Water

Our laboratory testing program also included review of soil samples by an engineer. Based on observation and test data, the engineer classified the soil samples in accordance with the Unified Soil Classification System (ASTM D2487) and the American Association of State Highway and Transportation Officials (AASHTO) classification system.

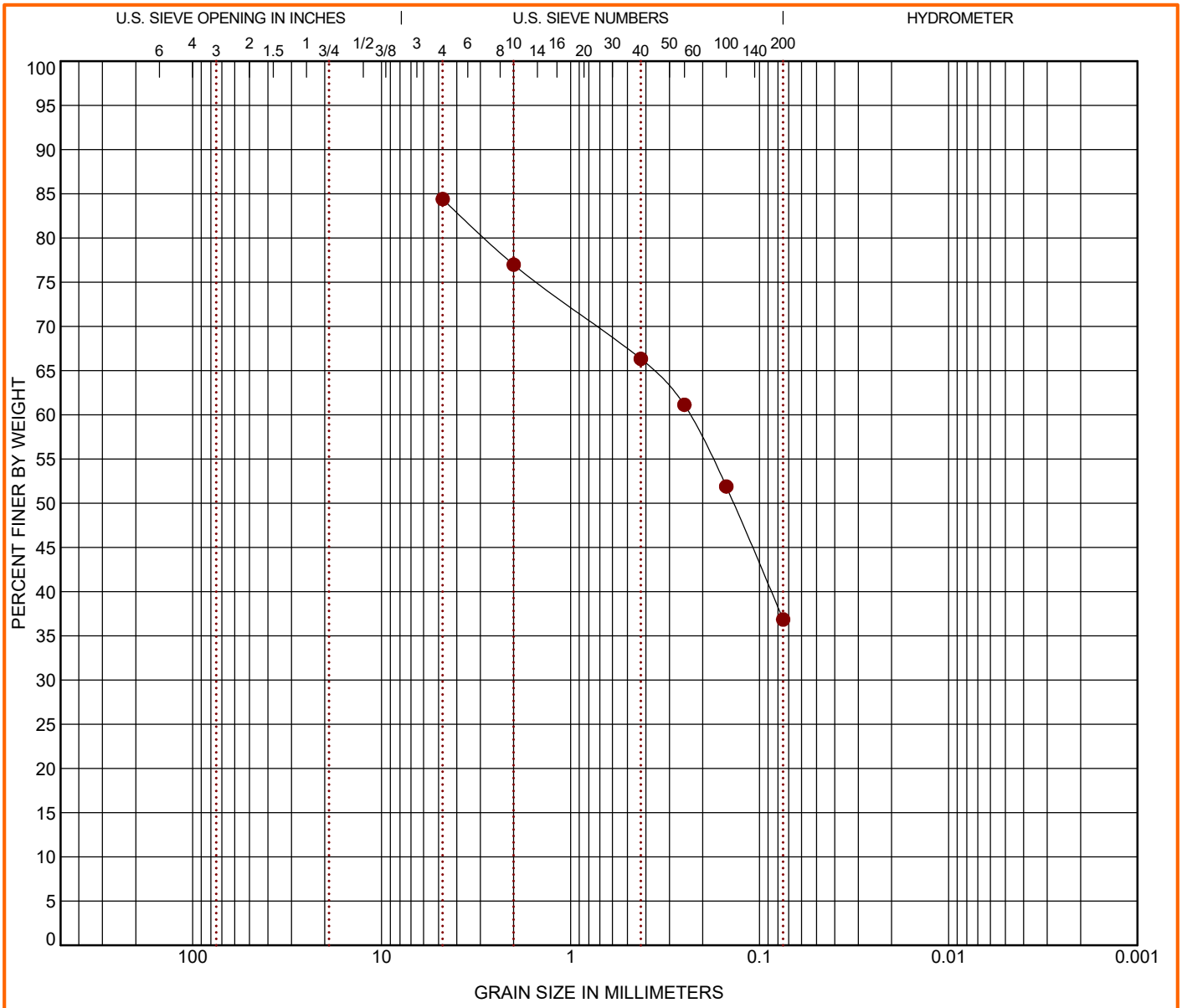
## Exhibit B-2: Summary of Laboratory Testing

| Location | Sample Depth (feet) | Moisture Content (%) | Organic Content (%) | Fines Content (%) | Atterberg Limits (%) | | AASHTO Classification | Stratum Number |
|---|---|---|---|---|---|---|---|---|
| | | | | | LL | PI | | |
| AB-109R | 2 to 3 | 25 | 8.5 | 18 | - | - | A-8 | 1 |
| AB-116L | 3 to 5 | 22 | - | 44 | 43 | 24 | A-7-6 | 4 |
| AB-135L | 4 to 5 | 20 | - | 27 | - | - | A-2-6 | 3 |
| AB-146R | 2.5 to 5 | 19 | - | 29 | - | - | A-2-6 | 3 |
| BC-1 | 2 to 4 | 17 | 4.4 | 14 | - | - | A-2-6 | 3 |
| BC-2 | 2 to 4 | 19 | - | 37 | - | - | A-7-6 | 4 |
| BC-2 | 8 to 10 | 31 | - | 24 | - | - | A-2-6 | 3 |
| BC-3 | 0 to 2 | 23 | - | 40 | - | - | A-7-6 | 4 |
| BC-7 | 0 to 2 | 20 | - | 31 | - | - | A-2-6 | 3 |
| BC-9 | 2 to 4 | 25 | - | 16 | - | - | A-2-6 | 3 |
| BC-10 | 0 to 2 | 15 | - | 11 | - | - | A-2-4 | 2 |
| BC-12 | 2 to 4 | 19 | - | 38 | 44 | 24 | A-7-6 | 4 |
| BC-17 | 2 to 4 | 26 | - | 26 | - | - | A-2-6 | 3 |
| BC-19 | 4 to 6 | 21 | - | 18 | - | - | A-2-6 | 3 |
| BC-23 | 6 to 8 | 34 | - | 43 | - | - | A-7-6 | 4 |
| BC-24 | 2 to 4 | 18 | - | 23 | - | - | A-2-6 | 3 |
| BC-CR1C-1 | 0 to 2 | 24 | - | 40 | - | - | A-2-6 | 3 |
| BC-CR1C-1 | 2 to 4 | 28 | 8.4 | 26 | - | - | A-8 | 1 |

# GRAIN SIZE DISTRIBUTION

**ASTM D422 / ASTM C136**

Exhibit B-3




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| Boring ID | Depth | USCS Classification | AASHTO Classification | WC (%) | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|---|---|
| BC-2 | 2 - 4 | Sandy CLAY (SC) | Sandy CLAY (A-7-6) | 22.7 | | | | | |

| Boring ID | Depth | $D_{100}$ | $D_{60}$ | $D_{30}$ | $D_{10}$ | %Gravel | %Sand | %Silt | %Fines | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| BC-2 | 2 - 4 | 4.75 | 0.235 | | | | 47.6 | | 36.9 | |

PROJECT: Canal Road

PROJECT NUMBER: HC185036

SITE: Canal Road
Ellenton, FL

Terracon
8260 Vico Ct, Unit B
Sarasota, FL

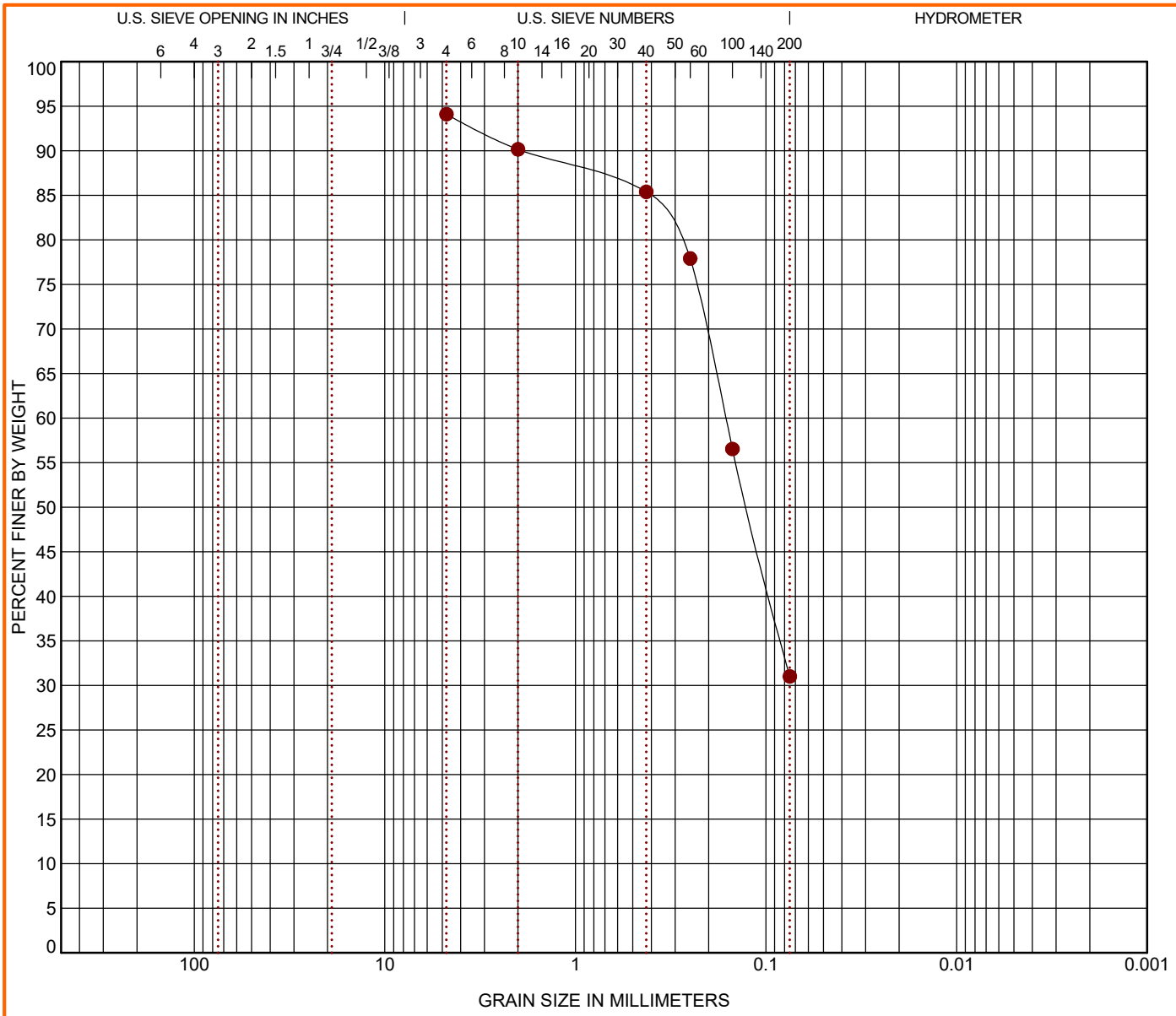
CLIENT: HDR Engineering, Inc.
Sarasota, FL

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS & AASHTO DESC COMBINED HC185036 CANAL ROAD PONDS.GPJ TERRACON_DATATEMPLATE.GDT 12/17/20

# GRAIN SIZE DISTRIBUTION

**ASTM D422 / ASTM C136**

Exhibit B-4




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| Boring ID | Depth | USCS Classification | AASHTO Classification | WC (%) | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|---|---|
| BC-7 | 0 - 2 | Clayey SAND (SC) | Clayey SAND (A-2-6) | 25.5 | | | | | |

| Boring ID | Depth | $D_{100}$ | $D_{60}$ | $D_{30}$ | $D_{10}$ | %Gravel | %Sand | %Silt | %Fines | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| BC-7 | 0 - 2 | 4.75 | 0.163 | | | | 63.1 | | 31.0 | |

PROJECT: Canal Road

SITE: Canal Road
Ellenton, FL

Terracon
8260 Vico Ct, Unit B
Sarasota, FL

PROJECT NUMBER: HC185036

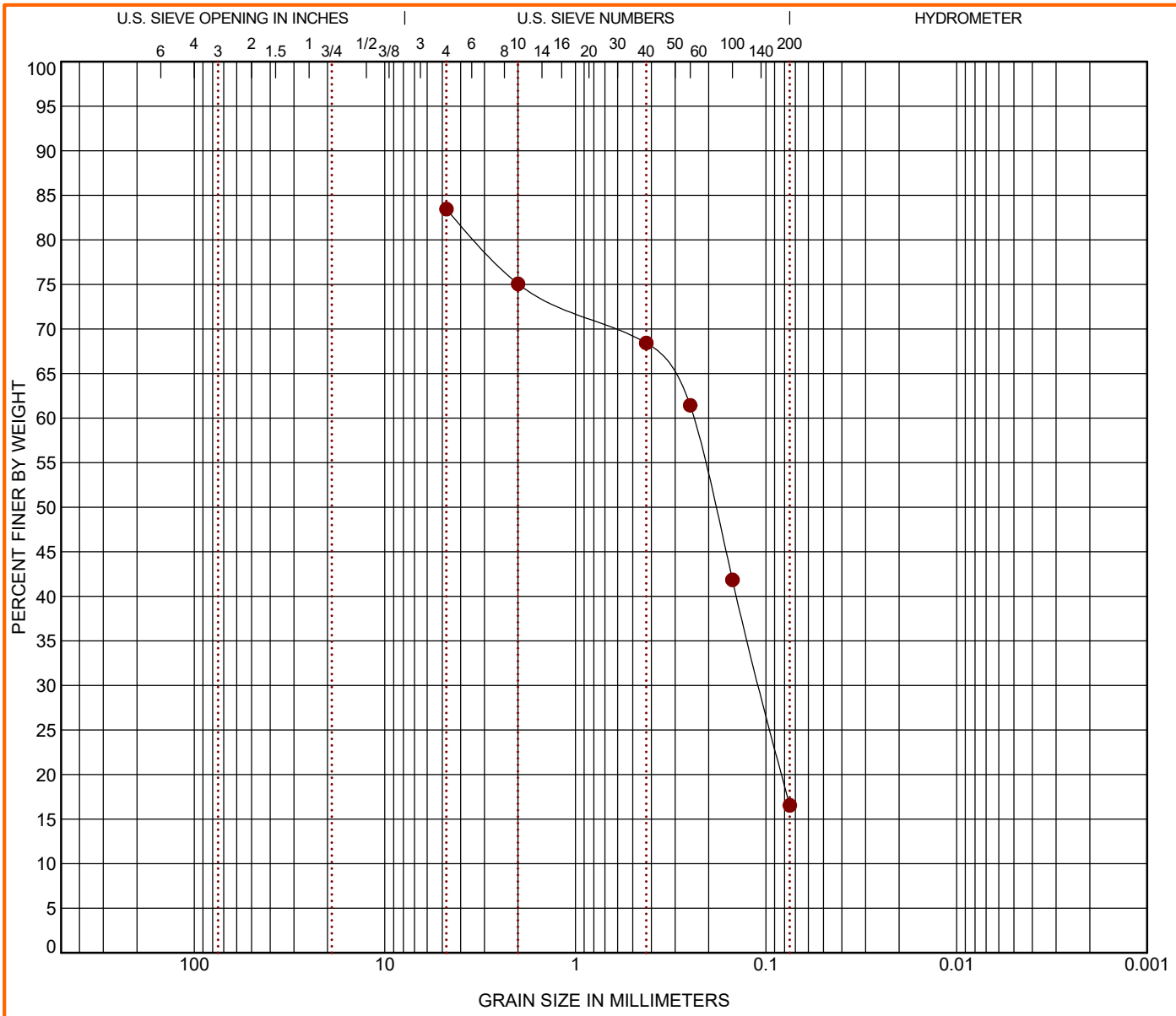
CLIENT: HDR Engineering, Inc.
Sarasota, FL

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS & AASHTO DESC COMBINED HC185036 CANAL ROAD PONDS.GPJ TERRACON_DATATEMPLATE.GDT 12/17/20

# GRAIN SIZE DISTRIBUTION

**ASTM D422 / ASTM C136**

Exhibit B-5




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| Boring ID | Depth | USCS Classification | AASHTO Classification | WC (%) | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|---|---|
| BC-9 | 2 - 4 | Clayey SAND (SC) | Clayey SAND (A-2-6) | 24.7 | | | | | |

| Boring ID | Depth | $D_{100}$ | $D_{60}$ | $D_{30}$ | $D_{10}$ | %Gravel | %Sand | %Silt | %Fines | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| BC-9 | 2 - 4 | 4.75 | 0.241 | 0.108 | | | 66.9 | | 16.5 | |

PROJECT: Canal Road

PROJECT NUMBER: HC185036

SITE: Canal Road
Ellenton, FL

Terracon
8260 Vico Ct, Unit B
Sarasota, FL

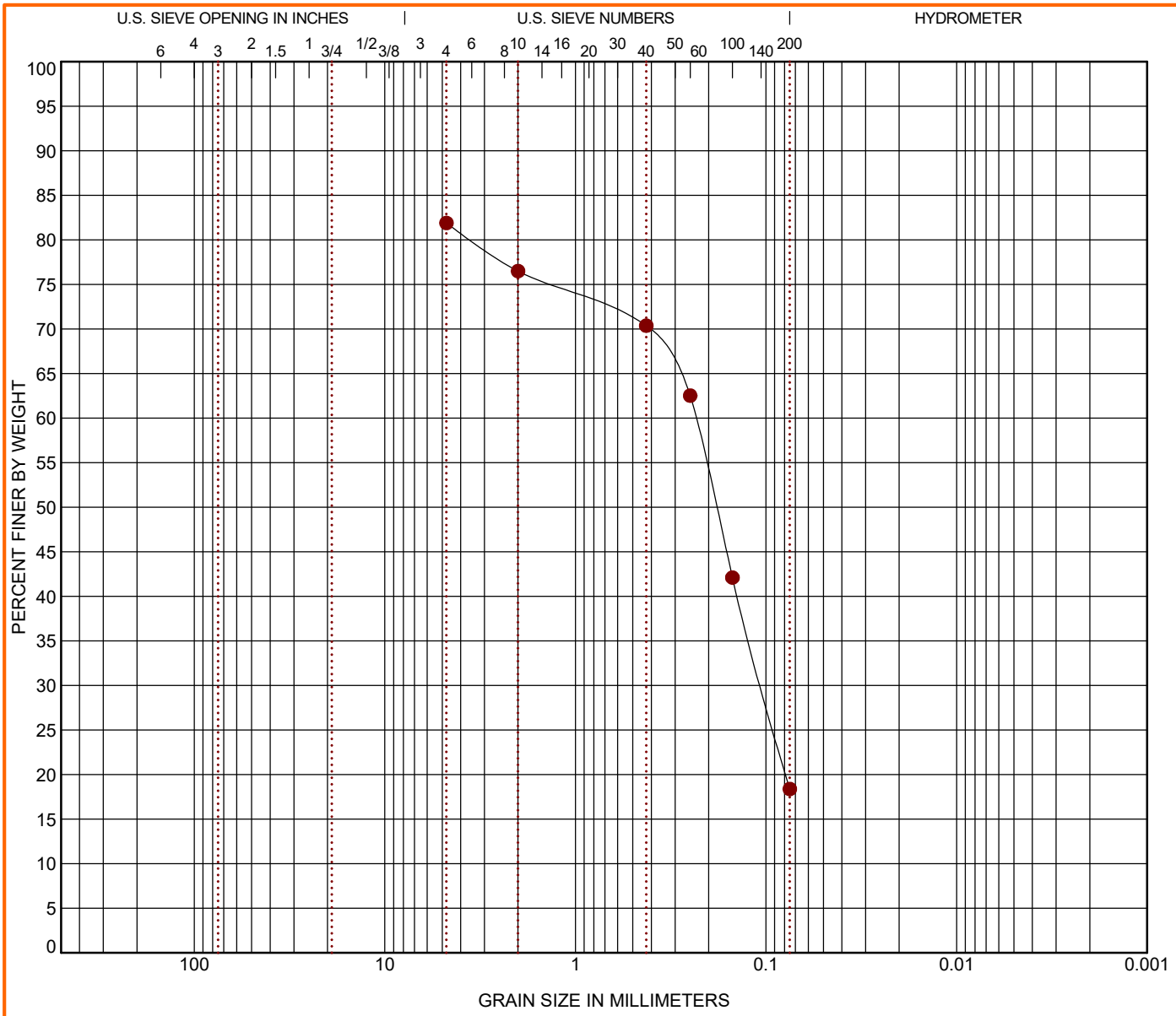
CLIENT: HDR Engineering, Inc.
Sarasota, FL

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS & AASHTO DESC COMBINED HC185036 CANAL ROAD PONDS.GPJ TERRACON_DATATEMPLATE.GDT 12/17/20

# GRAIN SIZE DISTRIBUTION

**ASTM D422 / ASTM C136**

Exhibit B-6




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| Boring ID | Depth | USCS Classification | AASHTO Classification | WC (%) | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|---|---|
| BC-19 | 4 - 6 | Clayey SAND (SC) | Clayey SAND (A-2-6) | 20.5 | | | | | |

| Boring ID | Depth | $D_{100}$ | $D_{60}$ | $D_{30}$ | $D_{10}$ | %Gravel | %Sand | %Silt | %Fines | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| BC-19 | 4 - 6 | 4.75 | 0.235 | 0.105 | | | 63.5 | | 18.4 | |

PROJECT: Canal Road

PROJECT NUMBER: HC185036

SITE: Canal Road
Ellenton, FL

Terracon
8260 Vico Ct, Unit B
Sarasota, FL

CLIENT: HDR Engineering, Inc.
Sarasota, FL

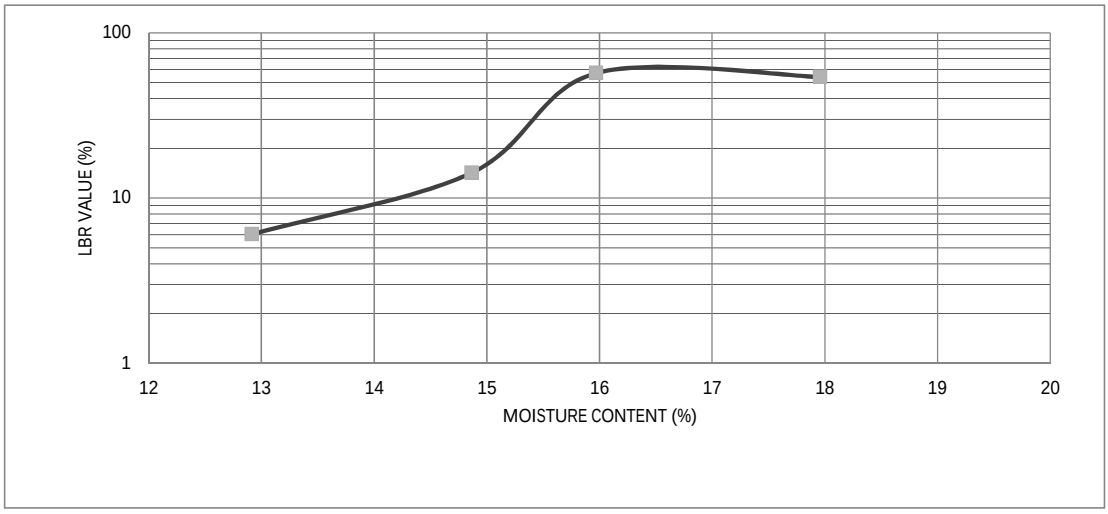
LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS & AASHTO DESC COMBINED HC185036 CANAL ROAD PONDS.GPJ TERRACON_DATATEMPLATE.GDT 12/17/20

## LIMEROCK BEARING RATIO TEST RESULTS
## (FM5-515)

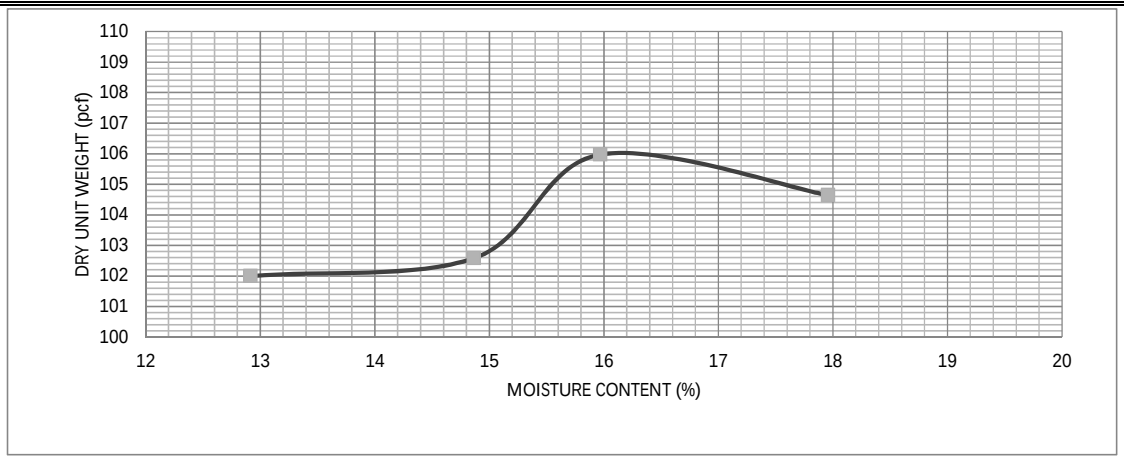
**TESTED FOR:** Manatee County
**SAMPLE NO.:** HC185036.0002
**TESTED BY:** D. Richards
**DATE TESTED:** November 12, 2020

**PROJECT:** Canal Road
**PROJECT NO:** HC185036
**%<#4:** 77.0%
**WASH 200:** 24.4%

**SAMPLE LOCATION:** AB-102R
**SOIL DESCRIPTION:** Dark gray to gray sillty sand with limestone




PROJECT LBR REQUIREMENT: **N/A** LBR VALUE: **57**



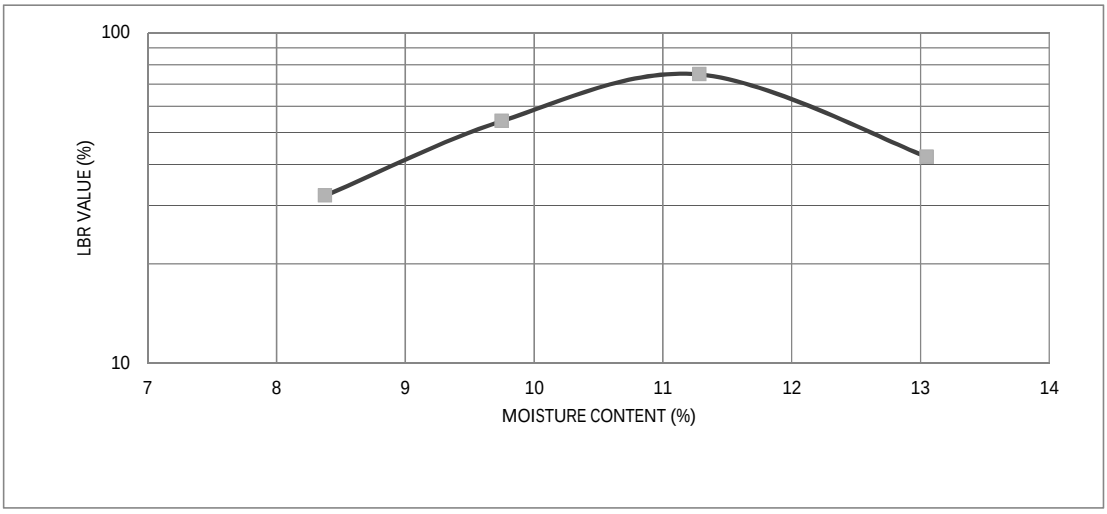

OPT MOISTURE: **16.9** MAX DENSITY: **107.2**

## LIMEROCK BEARING RATIO TEST RESULTS
## (FM5-515)

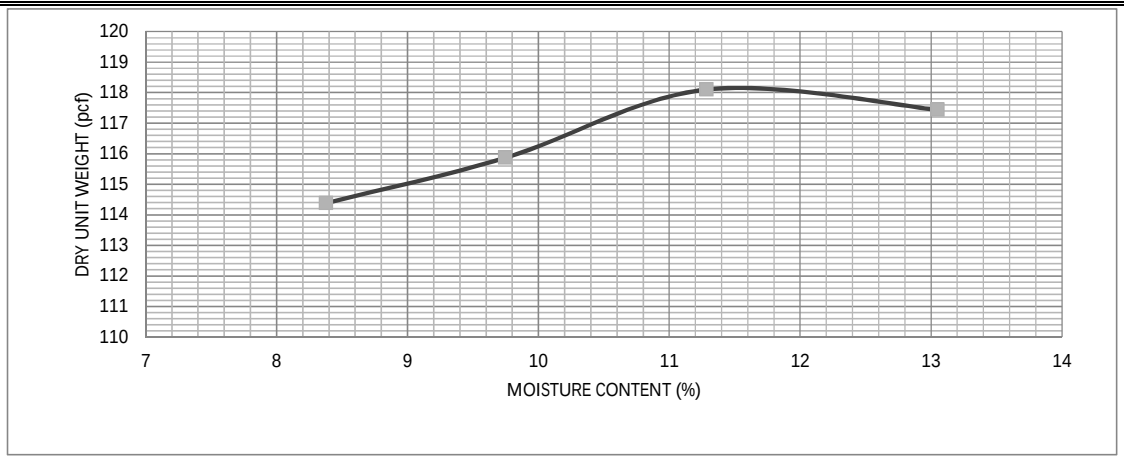
**TESTED FOR:** Manatee County
**SAMPLE NO.:** HC185036.0003
**TESTED BY:** D. Richards
**DATE TESTED:** November 13, 2020

**PROJECT:** Canal Road
**PROJECT NO:** HC185036
**%<#4:** 96.0%
**WASH 200:** 12.4%

**SAMPLE LOCATION:** AB-112L
**SOIL DESCRIPTION:** Gray fine sand with silt, trace roots, and rock fragments




PROJECT LBR REQUIREMENT: **N/A** LBR VALUE: **75**



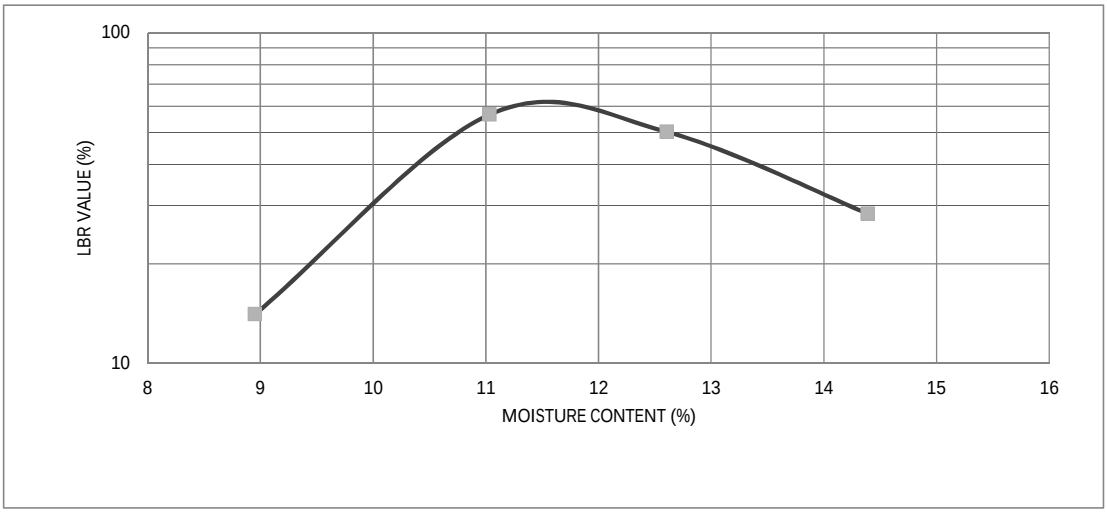

OPT MOISTURE: **12.0** MAX DENSITY: **118.4**

## LIMEROCK BEARING RATIO TEST RESULTS
## (FM5-515)

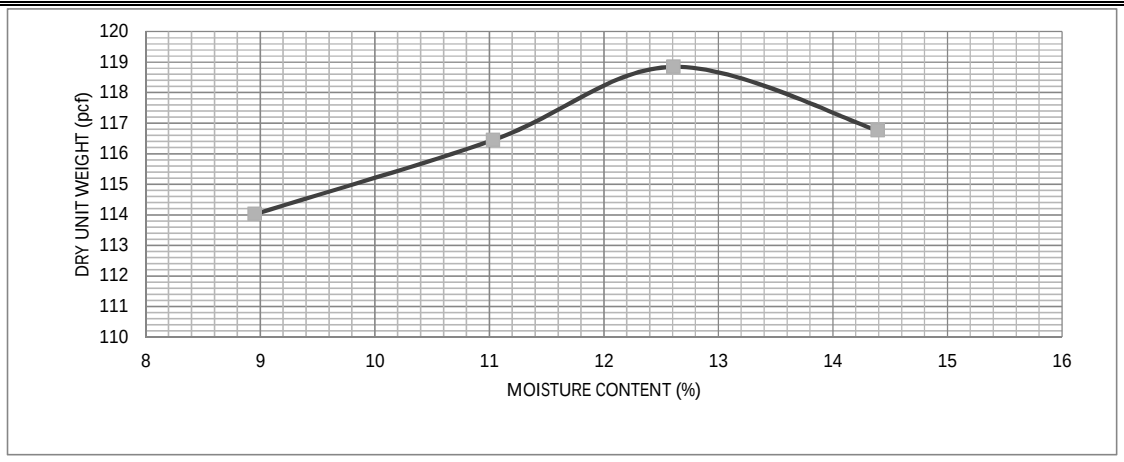
**TESTED FOR:** Manatee County
**SAMPLE NO.:** HC185036.0004
**TESTED BY:** D. Richards
**DATE TESTED:** November 17, 2020

**PROJECT:** Canal Road
**PROJECT NO:** HC185036
**%<#4:** 90.0%
**WASH 200:** 16.4%

**SAMPLE LOCATION:** AB-121R
**SOIL DESCRIPTION:** Dark gray to gray silty fine sand with rock fragments




PROJECT LBR REQUIREMENT: **N/A** LBR VALUE: **57**



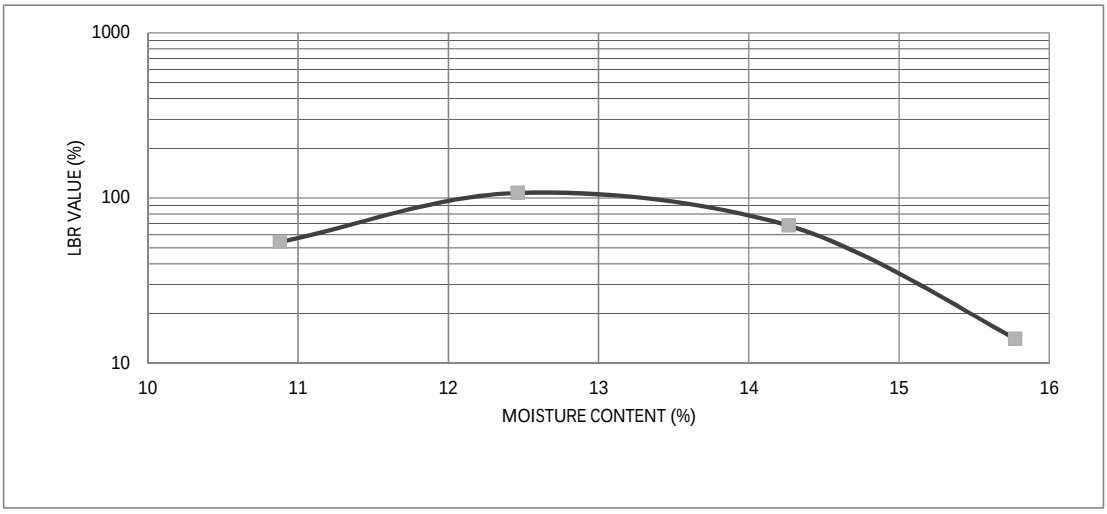

OPT MOISTURE: **13.0** MAX DENSITY: **119.0**

## LIMEROCK BEARING RATIO TEST RESULTS
## (FM5-515)

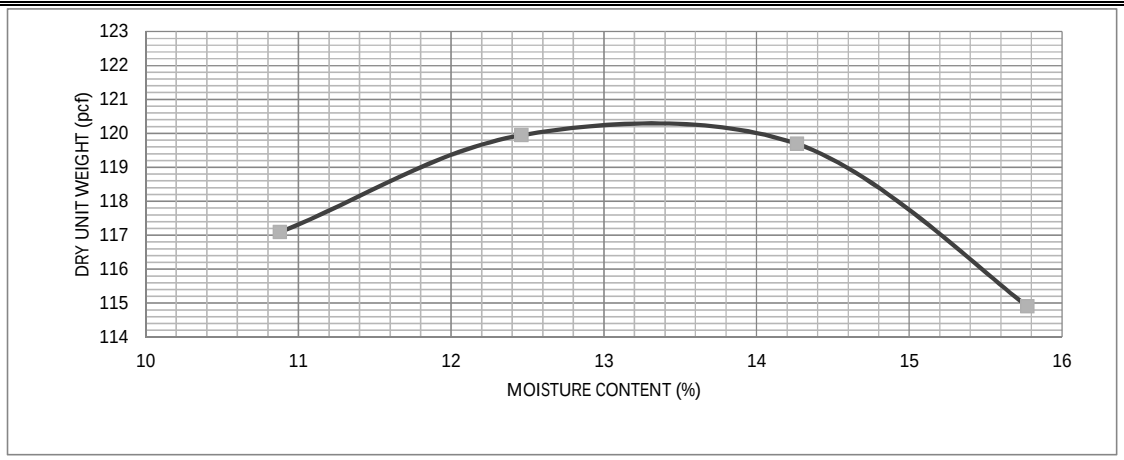
**TESTED FOR:** Manatee County
**SAMPLE NO.:** HC185036.0005
**TESTED BY:** D. Richards
**DATE TESTED:** November 17, 2020

**PROJECT:** Canal Road
**PROJECT NO:** HC185036
**%<#4:** 83.0%
**WASH 200:** 20.5%

**SAMPLE LOCATION:** AB-131L
**SOIL DESCRIPTION:** Gray to brown silty fine sand with shell and rock fragments




PROJECT LBR REQUIREMENT: **N/A** LBR VALUE: **107**



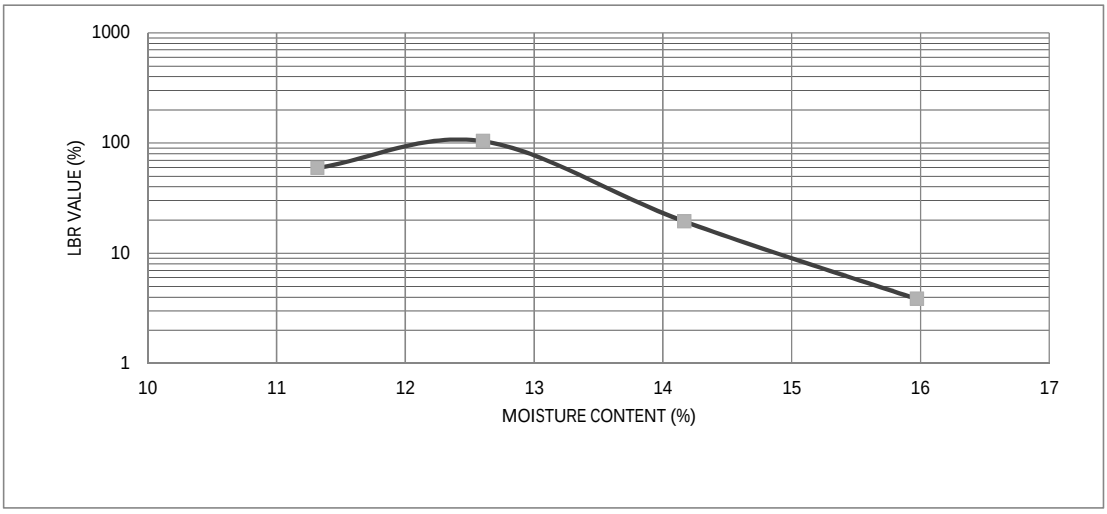

OPT MOISTURE: **13.3** MAX DENSITY: **120.3**

## LIMEROCK BEARING RATIO TEST RESULTS
## (FM5-515)

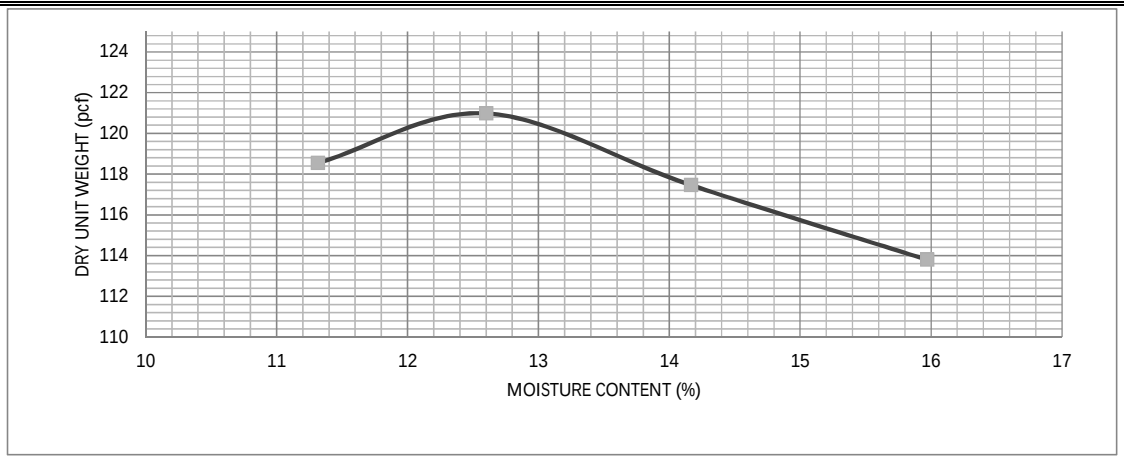
**TESTED FOR:** HDR Engineering
**SAMPLE NO.:** HC185036.0006
**TESTED BY:** D. Richards
**DATE TESTED:** November 13, 2020

**PROJECT:** Canal Road
**PROJECT NO:** HC185036
**%<#4:** 83.0%
**WASH 200:** 13.1%

**SAMPLE LOCATION:** AB-144R
**SOIL DESCRIPTION:** Gray to light brown silty fine sand with limestone




PROJECT LBR REQUIREMENT: **N/A** LBR VALUE: **104**




OPT MOISTURE: **12.4** MAX DENSITY: **121.1**

# APPENDIX C – SUPPORTING INFORMATION

**Contents:**

GeoSearch

On time. On target. In touch.™

# *Historical Aerial Photographs*

***NEW:*** *GeoLens by Geosearch*

*Target Property:*

***Canal Road Widening***
***Canal Road***
***Palmetto, Manatee, Florida 34221***

*Prepared For:*

***Terracon Consultants-Sarasota***

***Order #: 157141***
***Job #: 383351***
***Project #: HC185036***
***Date: 11/17/2020***

# *Target Property Summary*

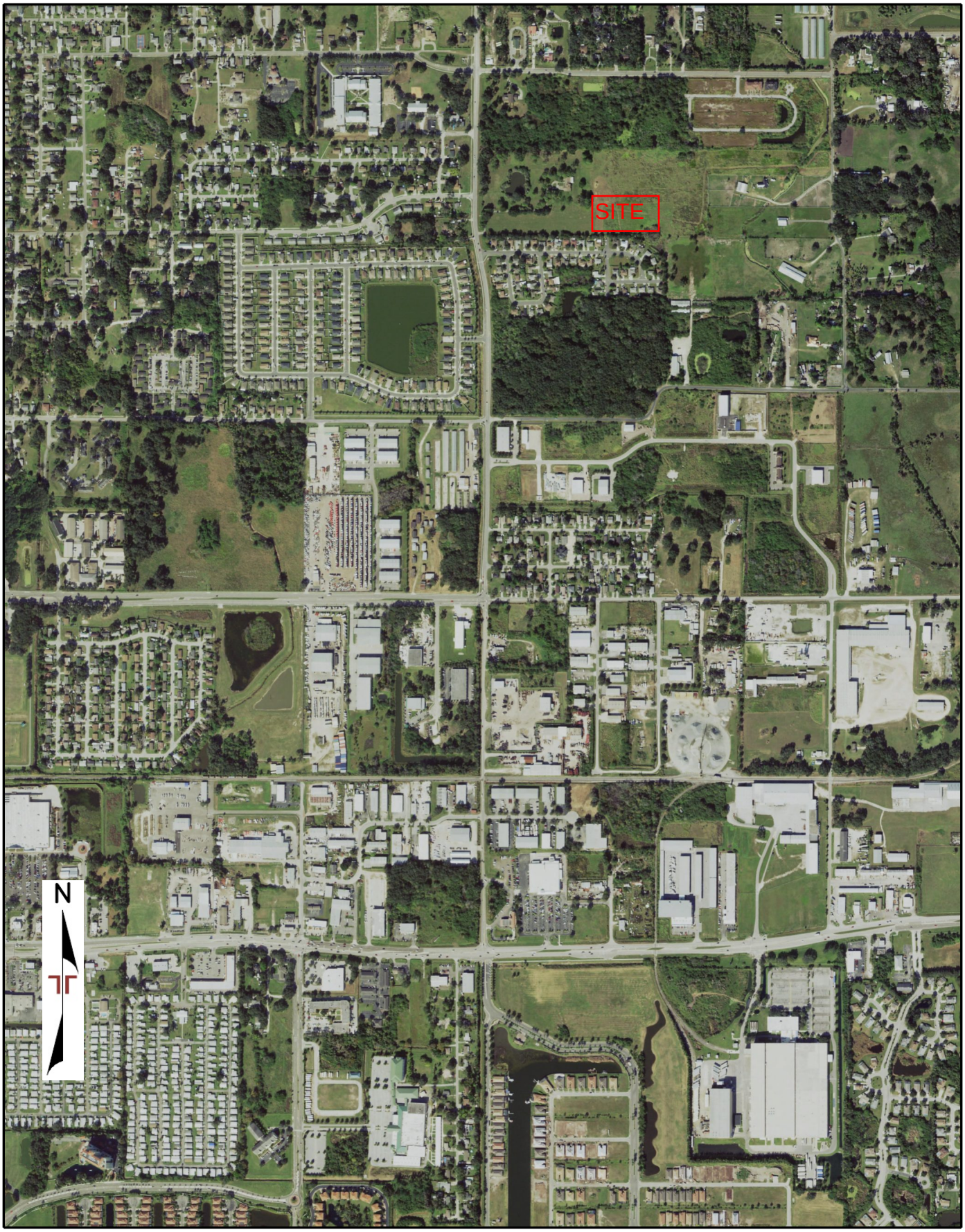
***Canal Road Widening***
***Canal Road***
***Palmetto, Manatee, Florida 34221***

*USGS Quadrangle:* ***Palmetto***
*Target Property Geometry:* ***Area***

*Target Property Longitude(s)/Latitude(s):*
***(-82.550130514, 27.535593528), (-82.546353963, 27.535593528), (-82.546353963, 27.520523088), (-82.550130514, 27.520523088)***

# Aerial Research Summary

| Date | Source | Scale | Frame |
|---|---|---|---|
| 2019 | USDA | 1" = 1000' | N/A |
| 2017 | USDA | 1" = 1000' | N/A |
| 2015 | USDA | 1" = 1000' | N/A |
| 2013 | USDA | 1" = 1000' | N/A |
| 2010 | USDA | 1" = 1000' | N/A |
| 2007 | USDA | 1" = 1000' | N/A |
| 2006 | USDA | 1" = 1000' | N/A |
| 2005 | USDA | 1" = 1000' | N/A |
| 12/31/1998 | USGS | 1" = 1000' | N/A |
| 01/27/1995 | USGS | 1" = 1000' | N/A |
| 11/12/1991 | FDOT | 1" = 1000' | 3952-08-09 |
| 02/07/1984 | USGS | 1" = 1000' | 35-75 |
| 12/07/1977 | FDOT | 1" = 1000' | 2179-07-08 |
| 06/30/1969 | USGS | 1" = 1000' | 1-38 |
| 03/28/1962 | USGS | 1" = 1000' | 1-25 |
| 12/13/1957 | ASCS | 1" = 1000' | 2-13 |
| 05/21/1951 | ASCS | 1" = 1000' | 3-42 |
| 04/22/1940 | ASCS | 1" = 1000' | 2-46 |

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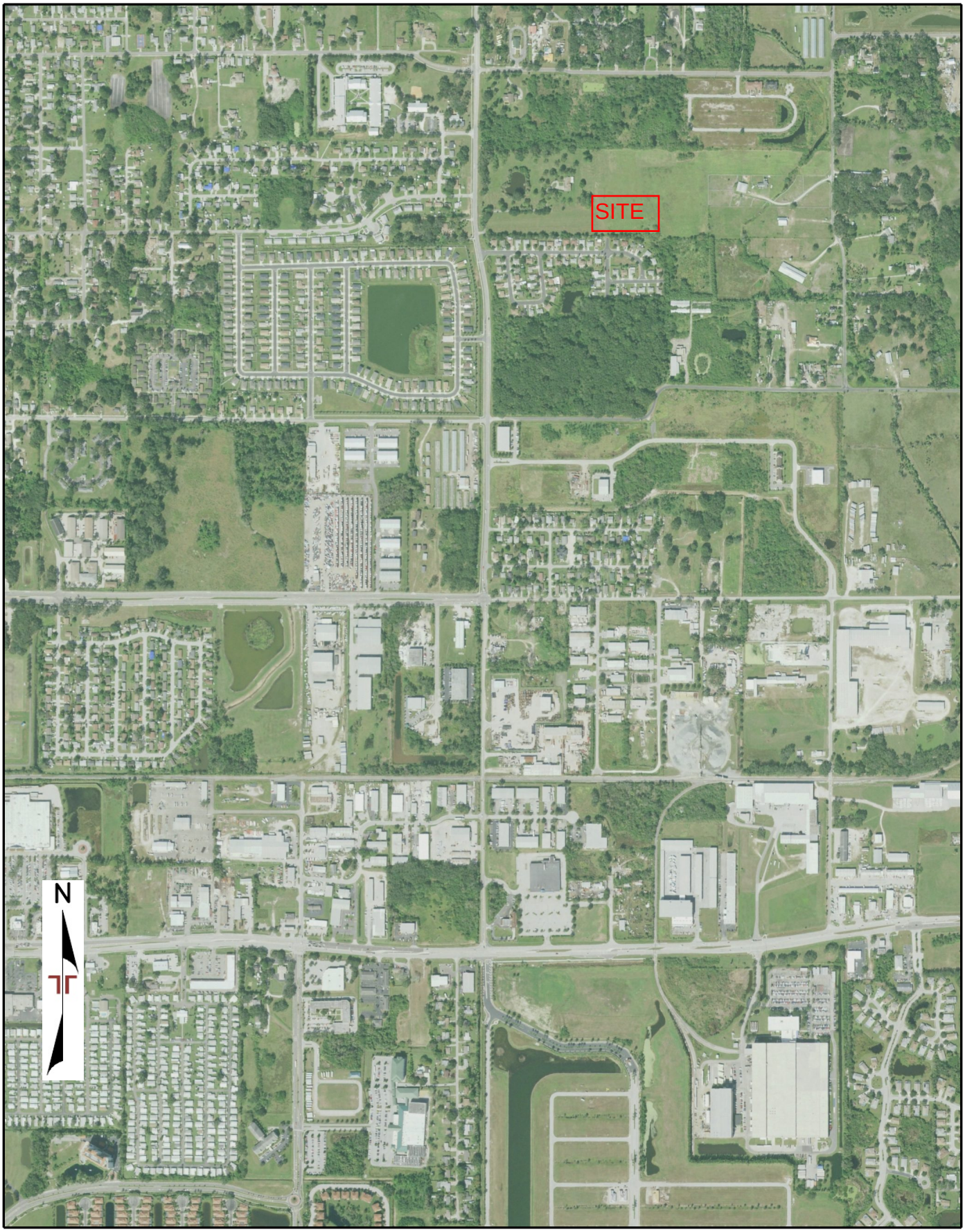
|---|---|---|---|---|
| **Project Manager:** | **Project No:** HC185036 | Terracon<br>8260 Vico Court, Unit B<br>Sarasota, Florida 34240 | AERIAL PHOTOGRAPH<br>Canal Road Widening<br>Canal Road<br>Palmetto, Florida 34221 | Appendix<br>C |
| **Drawn by:** | **Scale:** 1" = 1000' | | | |
| **Checked by:** | **File Name:** USDA | | | |
| **Approved by:** | **Date:** 2019 | | | |

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|---|---|---|---|---|
| **Project Manager:** | **Project No:** HC185036 | Terracon<br>8260 Vico Court, Unit B<br>Sarasota, Florida 34240 | AERIAL PHOTOGRAPH<br>Canal Road Widening<br>Canal Road<br>Palmetto, Florida 34221 | Appendix<br>C |
| **Drawn by:** | **Scale:** 1" = 1000' | | | |
| **Checked by:** | **File Name:** USDA | | | |
| **Approved by:** | **Date:** 2017 | | | |


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|---|---|---|---|---|
| **Project Manager:** | **Project No:** HC185036 | Terracon<br>8260 Vico Court, Unit B<br>Sarasota, Florida 34240 | AERIAL PHOTOGRAPH<br>Canal Road Widening<br>Canal Road<br>Palmetto, Florida 34221 | Appendix<br>C |
| **Drawn by:** | **Scale:** 1" = 1000' | | | |
| **Checked by:** | **File Name:** USDA | | | |
| **Approved by:** | **Date:** 2015 | | | |


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|---|---|---|---|---|
| **Project Manager:** | **Project No:** HC185036 | Terracon<br>8260 Vico Court, Unit B<br>Sarasota, Florida 34240 | AERIAL PHOTOGRAPH<br>Canal Road Widening<br>Canal Road<br>Palmetto, Florida 34221 | Appendix<br>C |
| **Drawn by:** | **Scale:** 1" = 1000' | | | |
| **Checked by:** | **File Name:** USDA | | | |
| **Approved by:** | **Date:** 2013 | | | |


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|---|---|---|---|---|
| **Project Manager:** | **Project No:** HC185036 | Terracon<br>8260 Vico Court, Unit B<br>Sarasota, Florida 34240 | AERIAL PHOTOGRAPH<br>Canal Road Widening<br>Canal Road<br>Palmetto, Florida 34221 | Appendix<br>C |
| **Drawn by:** | **Scale:** 1" = 1000' | | | |
| **Checked by:** | **File Name:** USDA | | | |
| **Approved by:** | **Date:** 2010 | | | |


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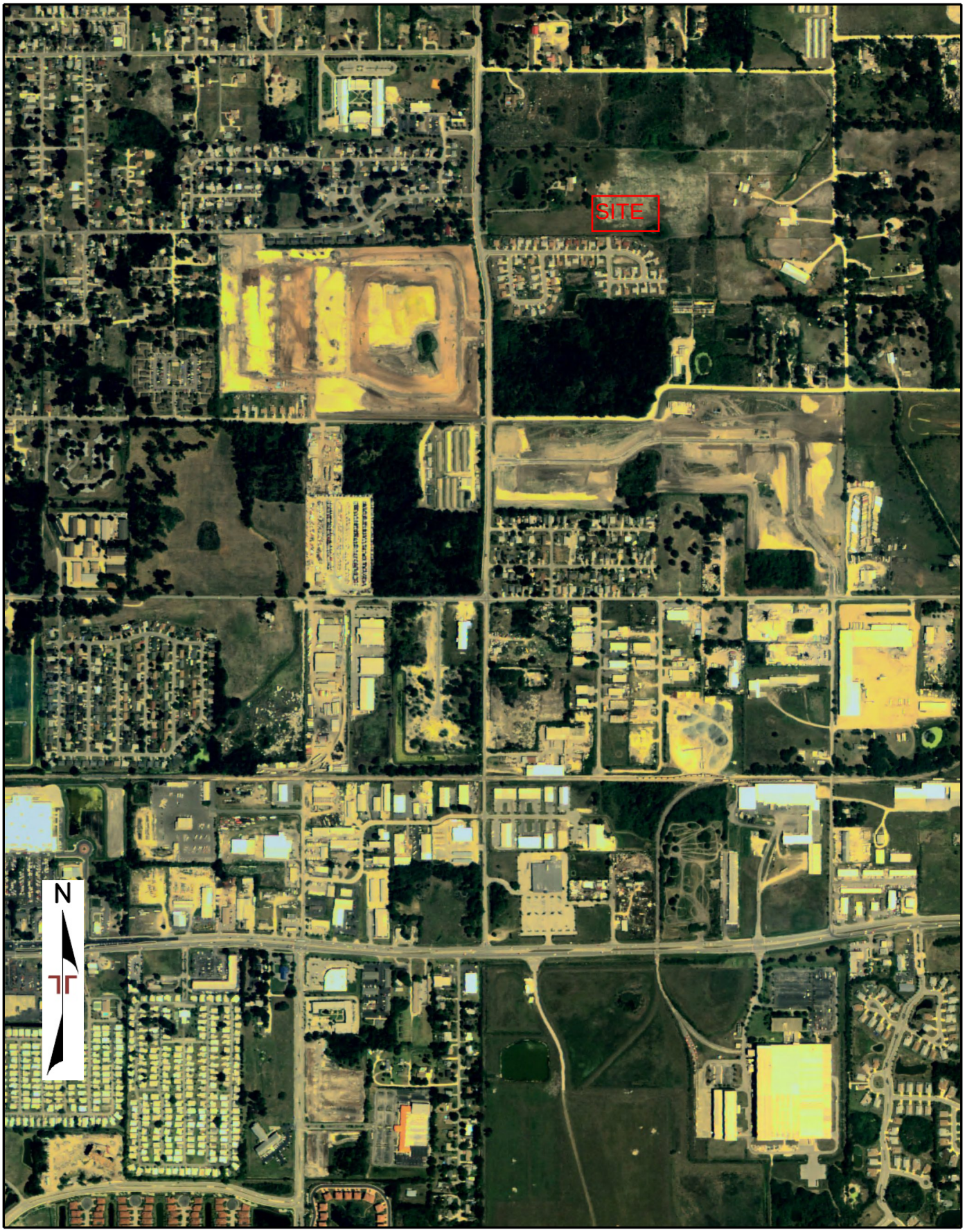
|---|---|---|---|---|
| **Project Manager:** | **Project No:** HC185036 | Terracon<br>8260 Vico Court, Unit B<br>Sarasota, Florida 34240 | AERIAL PHOTOGRAPH<br>Canal Road Widening<br>Canal Road<br>Palmetto, Florida 34221 | Appendix<br>C |
| **Drawn by:** | **Scale:** 1" = 1000' | | | |
| **Checked by:** | **File Name:** USDA | | | |
| **Approved by:** | **Date:** 2007 | | | |

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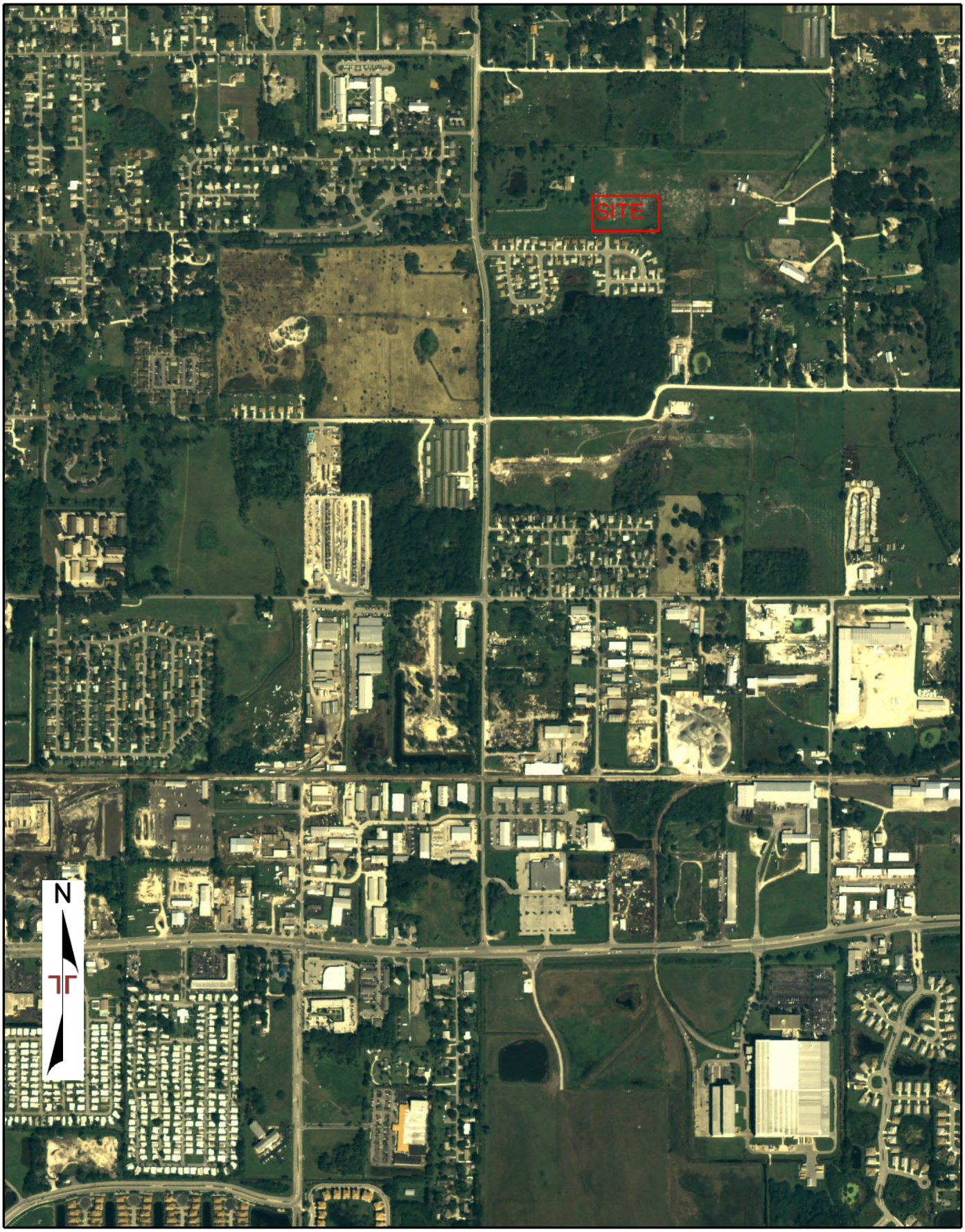
|---|---|---|---|---|
| **Project Manager:** | **Project No:** HC185036 | Terracon<br>8260 Vico Court, Unit B<br>Sarasota, Florida 34240 | AERIAL PHOTOGRAPH<br>Canal Road Widening<br>Canal Road<br>Palmetto, Florida 34221 | Appendix<br>C |
| **Drawn by:** | **Scale:** 1" = 1000' | | | |
| **Checked by:** | **File Name:** USDA | | | |
| **Approved by:** | **Date:** 2006 | | | |

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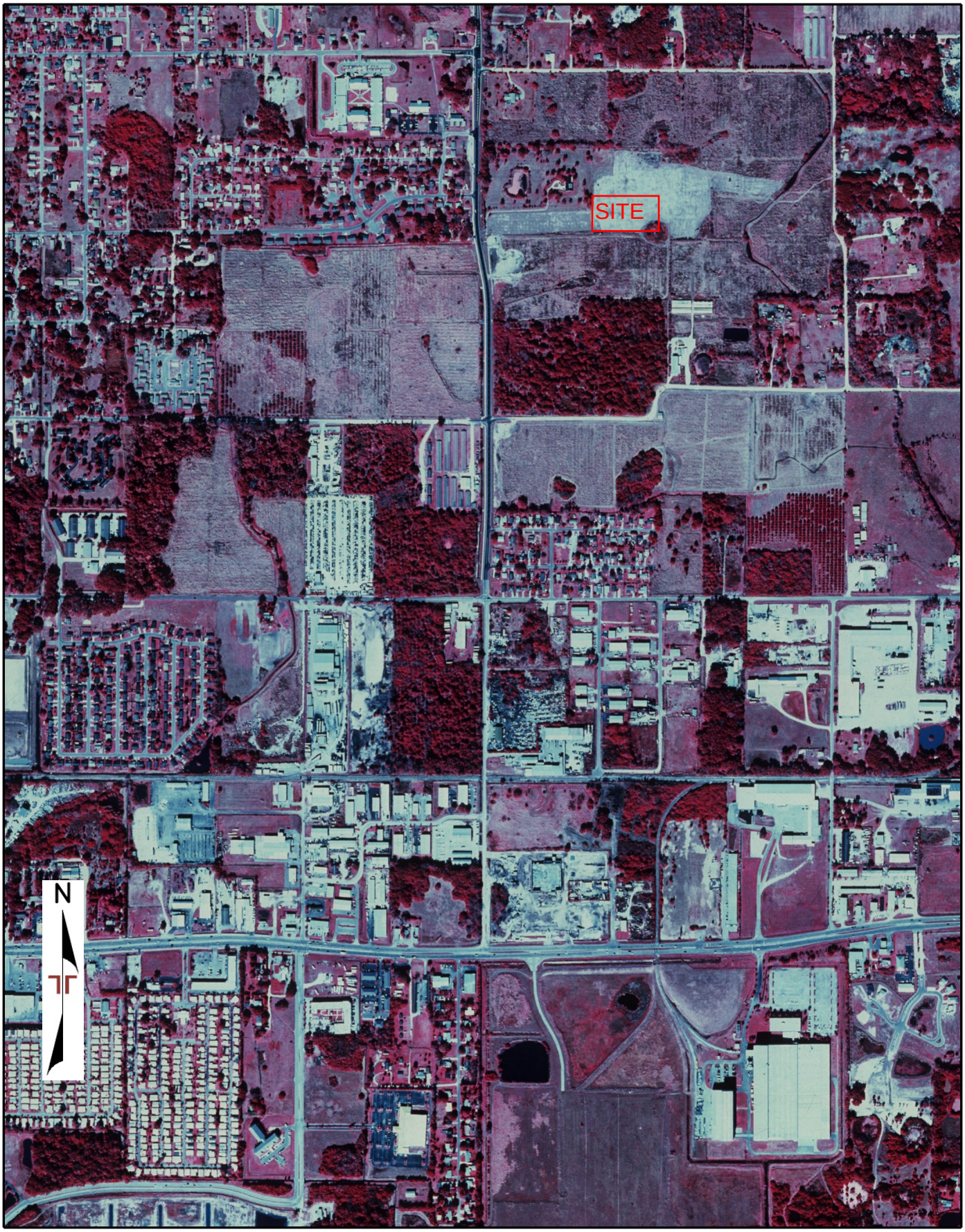
|---|---|---|---|---|
| **Project Manager:** | **Project No:** HC185036 | Terracon<br>8260 Vico Court, Unit B<br>Sarasota, Florida 34240 | AERIAL PHOTOGRAPH<br>Canal Road Widening<br>Canal Road<br>Palmetto, Florida 34221 | Appendix<br>C |
| **Drawn by:** | **Scale:** 1" = 1000' | | | |
| **Checked by:** | **File Name:** USDA | | | |
| **Approved by:** | **Date:** 2005 | | | |

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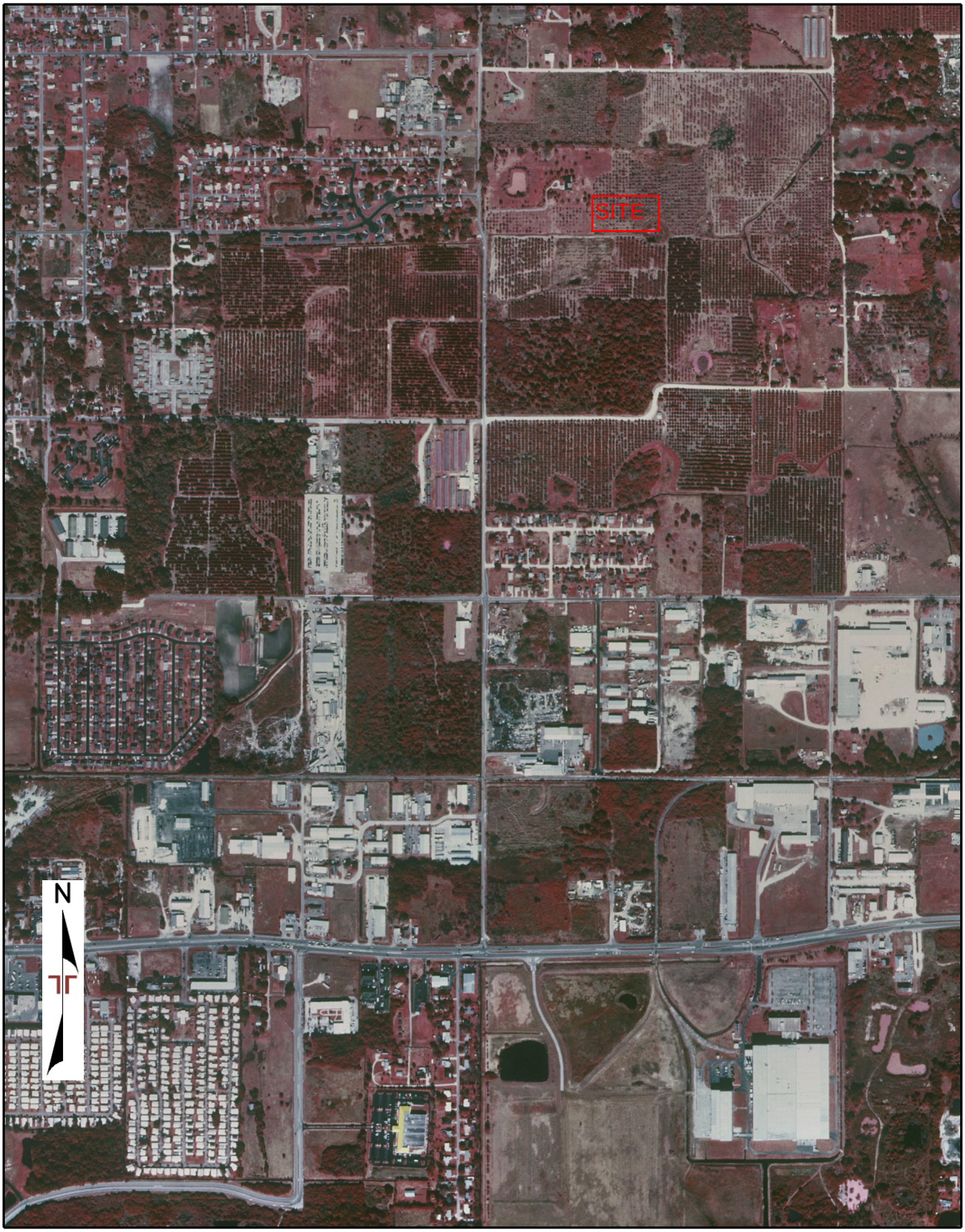
|---|---|---|---|---|
| **Project Manager:** | **Project No:** HC185036 | Terracon<br>8260 Vico Court, Unit B<br>Sarasota, Florida 34240 | AERIAL PHOTOGRAPH<br>Canal Road Widening<br>Canal Road<br>Palmetto, Florida 34221 | Appendix<br>C |
| **Drawn by:** | **Scale:** 1" = 1000' | | | |
| **Checked by:** | **File Name:** USGS | | | |
| **Approved by:** | **Date:** 12/31/1998 | | | |

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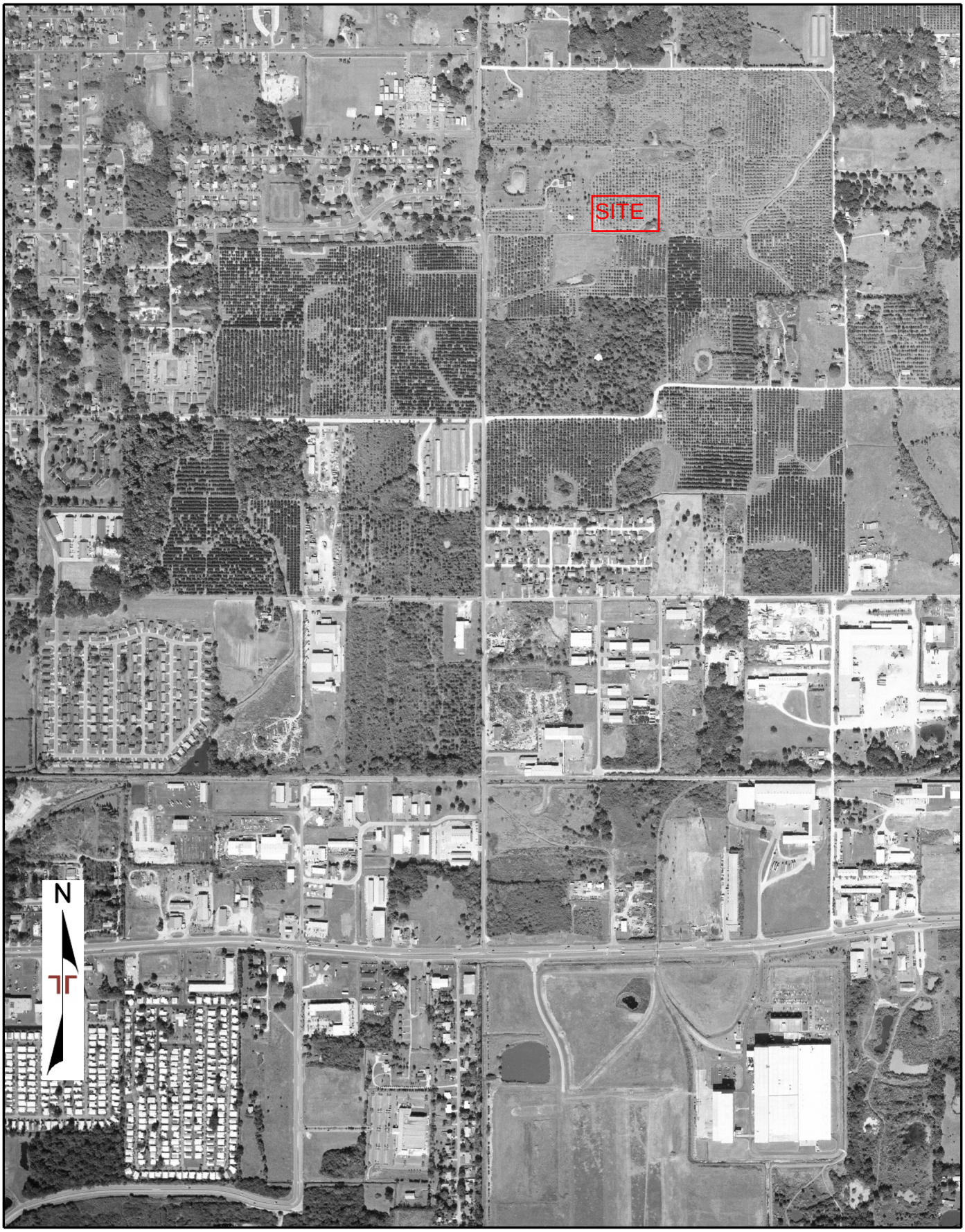
|---|---|---|---|---|
| **Project Manager:** | **Project No:** HC185036 | Terracon<br>8260 Vico Court, Unit B<br>Sarasota, Florida 34240 | AERIAL PHOTOGRAPH<br>Canal Road Widening<br>Canal Road<br>Palmetto, Florida 34221 | Appendix<br>C |
| **Drawn by:** | **Scale:** 1" = 1000' | | | |
| **Checked by:** | **File Name:** USGS | | | |
| **Approved by:** | **Date:** 01/27/1995 | | | |

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|---|---|---|---|---|
| **Project Manager:** | **Project No:** HC185036 | Terracon<br>8260 Vico Court, Unit B<br>Sarasota, Florida 34240 | AERIAL PHOTOGRAPH<br>Canal Road Widening<br>Canal Road<br>Palmetto, Florida 34221 | Appendix<br>C |
| **Drawn by:** | **Scale:** 1" = 1000' | | | |
| **Checked by:** | **File Name:** FDOT | | | |
| **Approved by:** | **Date:** 11/12/1991 | | | |


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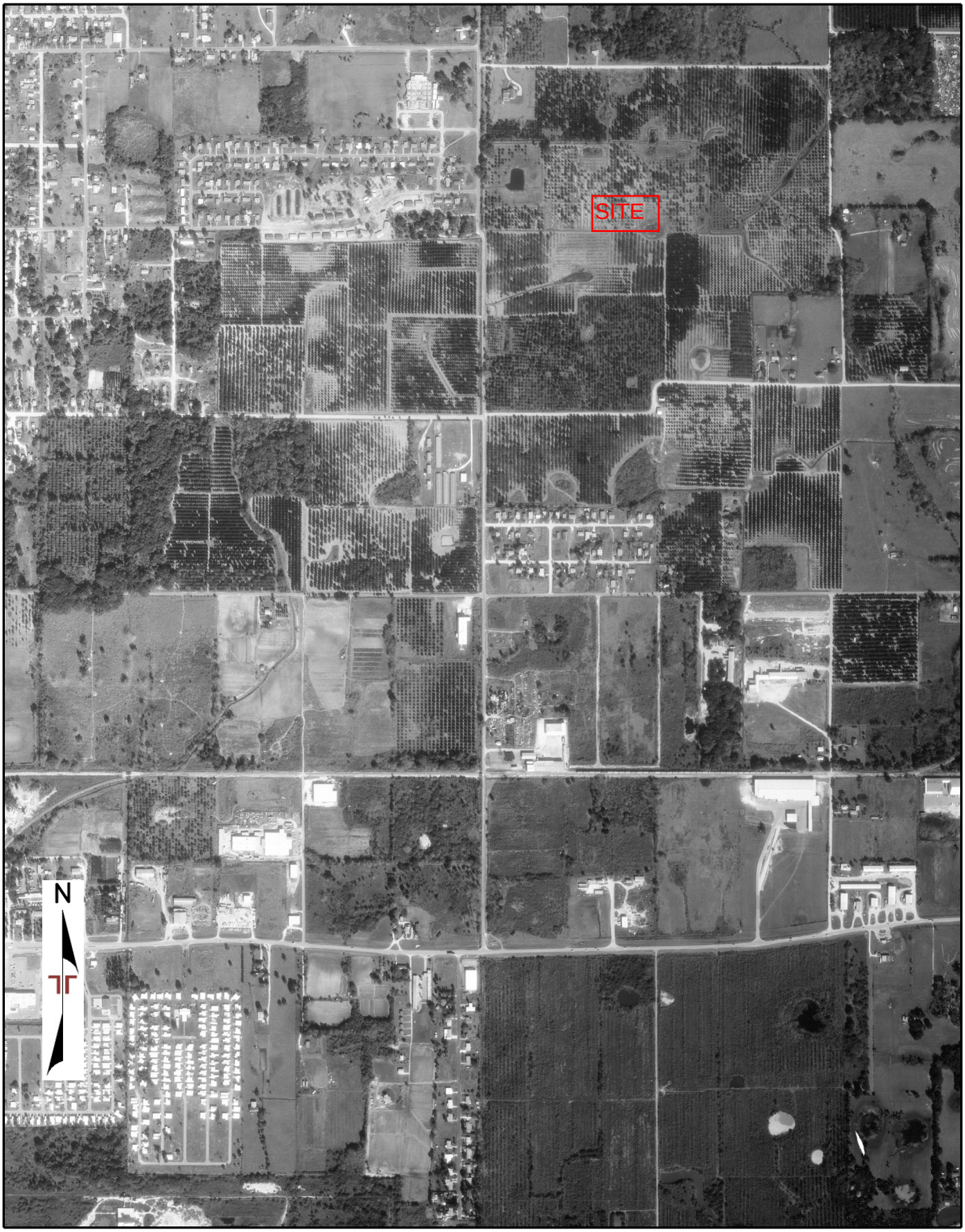
|---|---|---|---|---|
| **Project Manager:** | **Project No:** HC185036 | Terracon<br>8260 Vico Court, Unit B<br>Sarasota, Florida 34240 | AERIAL PHOTOGRAPH<br>Canal Road Widening<br>Canal Road<br>Palmetto, Florida 34221 | Appendix<br>C |
| **Drawn by:** | **Scale:** 1" = 1000' | | | |
| **Checked by:** | **File Name:** USGS | | | |
| **Approved by:** | **Date:** 02/07/1984 | | | |

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|---|---|---|---|---|
| **Project Manager:** | **Project No:** HC185036 | Terracon<br>8260 Vico Court, Unit B<br>Sarasota, Florida 34240 | AERIAL PHOTOGRAPH<br>Canal Road Widening<br>Canal Road<br>Palmetto, Florida 34221 | Appendix<br>C |
| **Drawn by:** | **Scale:** 1" = 1000' | | | |
| **Checked by:** | **File Name:** FDOT | | | |
| **Approved by:** | **Date:** 12/07/1977 | | | |


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|---|---|---|---|---|
| **Project Manager:** | **Project No:** HC185036 | Terracon<br>8260 Vico Court, Unit B<br>Sarasota, Florida 34240 | AERIAL PHOTOGRAPH<br>Canal Road Widening<br>Canal Road<br>Palmetto, Florida 34221 | Appendix<br>C |
| **Drawn by:** | **Scale:** 1" = 1000' | | | |
| **Checked by:** | **File Name:** USGS | | | |
| **Approved by:** | **Date:** 06/30/1969 | | | |


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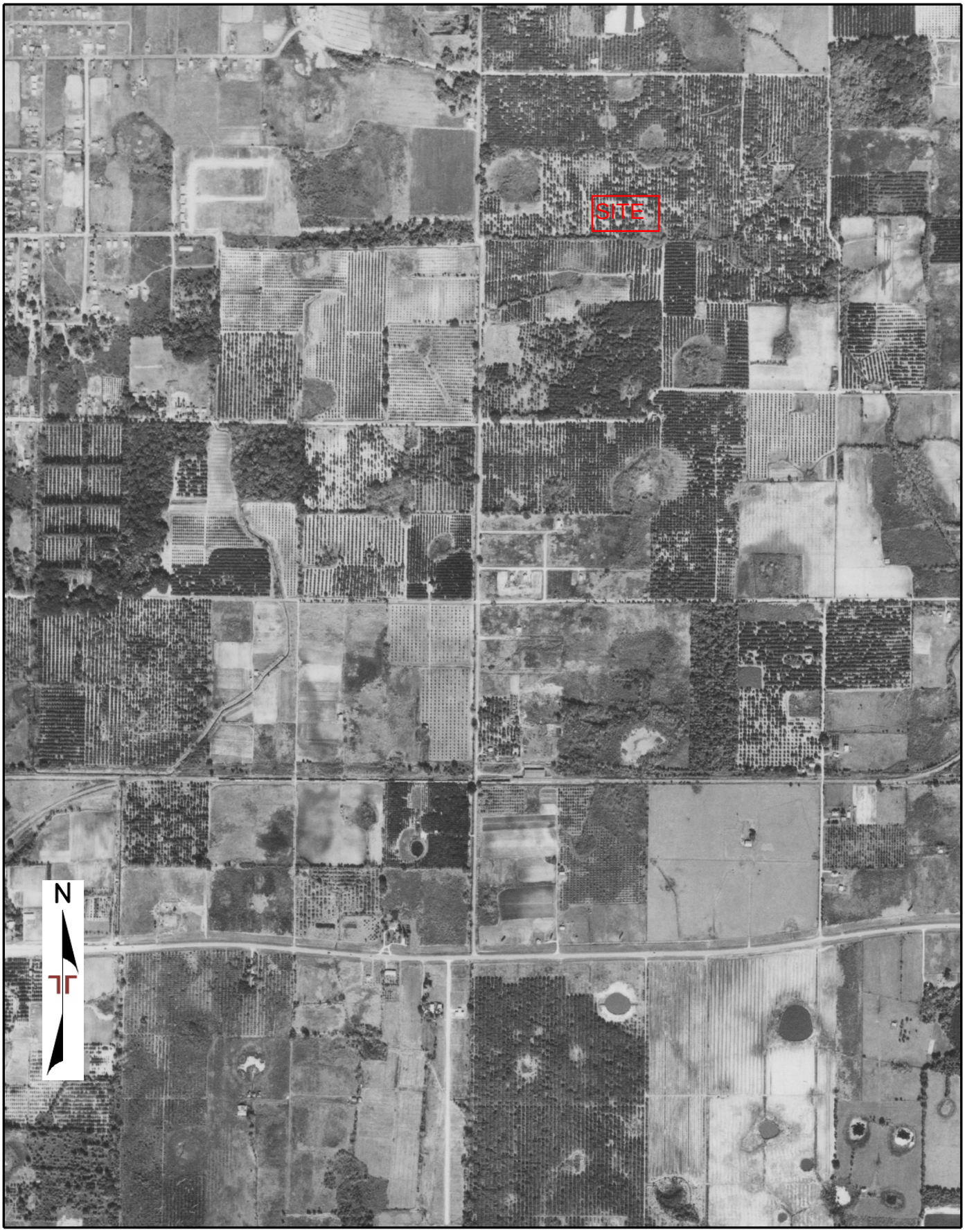
|---|---|---|---|---|
| **Project Manager:** | **Project No:** HC185036 | Terracon<br>8260 Vico Court, Unit B<br>Sarasota, Florida 34240 | AERIAL PHOTOGRAPH<br>Canal Road Widening<br>Canal Road<br>Palmetto, Florida 34221 | Appendix<br>C |
| **Drawn by:** | **Scale:** 1" = 1000' | | | |
| **Checked by:** | **File Name:** USGS | | | |
| **Approved by:** | **Date:** 03/28/1962 | | | |

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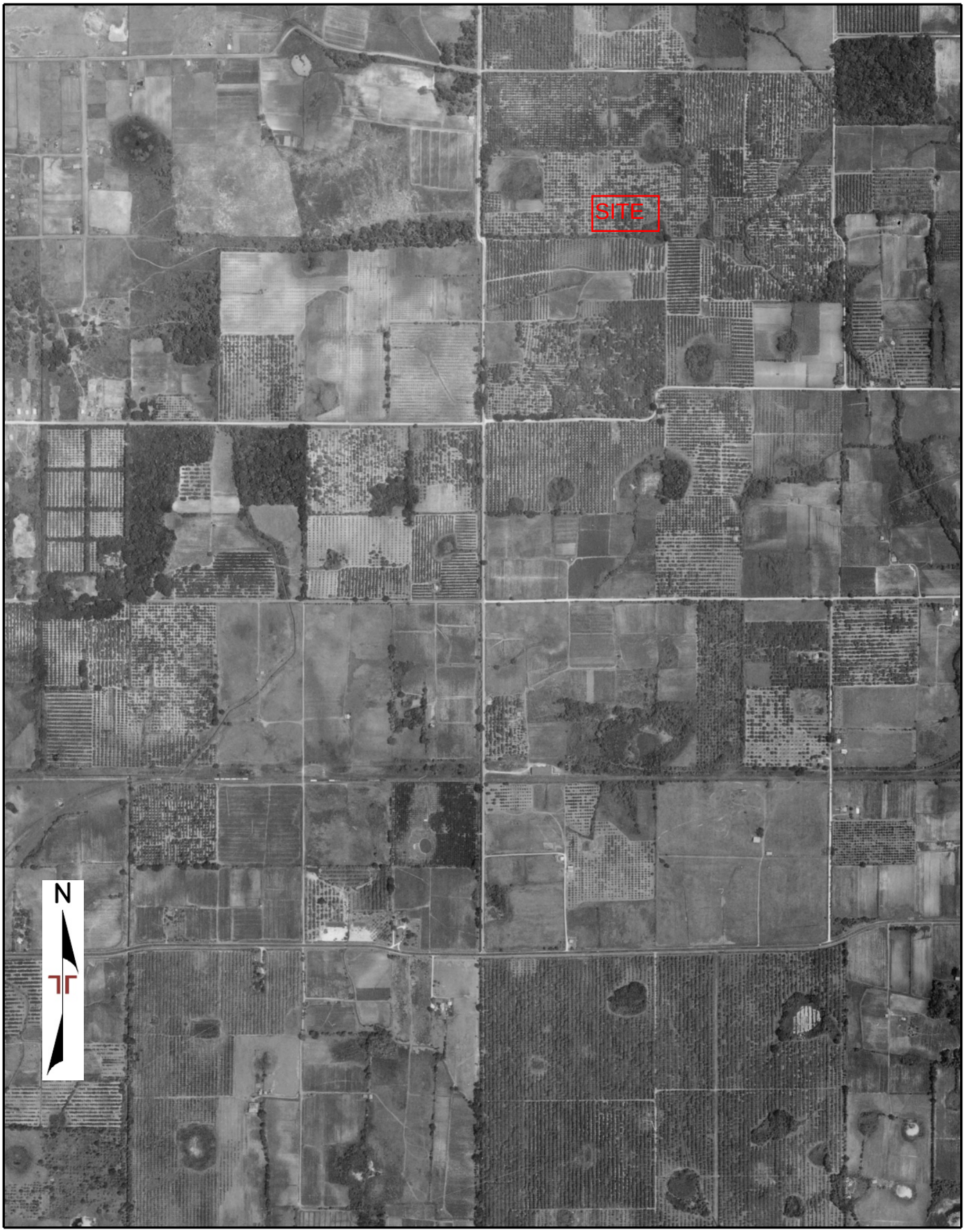
| **Project Manager:** | **Project No:** HC185036 | Terracon<br>8260 Vico Court, Unit B<br>Sarasota, Florida 34240 | AERIAL PHOTOGRAPH<br>Canal Road Widening<br>Canal Road<br>Palmetto, Florida 34221 | Appendix<br>C |
| **Drawn by:** | **Scale:** 1" = 1000' | | | |
| **Checked by:** | **File Name:** ASCS | | | |
| **Approved by:** | **Date:** 12/13/1957 | | | |

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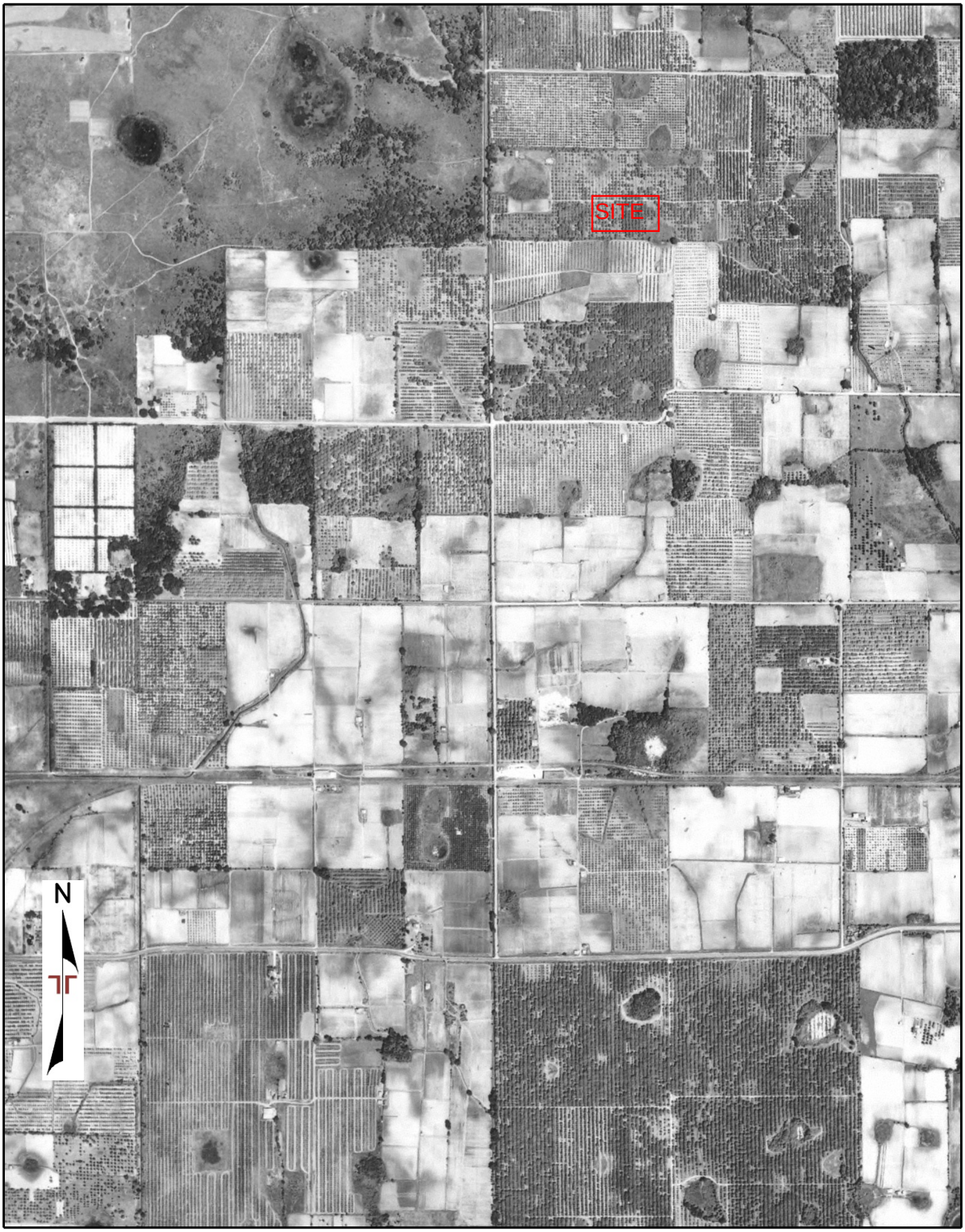
|---|---|---|---|---|
| **Project Manager:** | **Project No:** HC185036 | Terracon<br>8260 Vico Court, Unit B<br>Sarasota, Florida 34240 | AERIAL PHOTOGRAPH<br>Canal Road Widening<br>Canal Road<br>Palmetto, Florida 34221 | Appendix<br>C |
| **Drawn by:** | **Scale:** 1" = 1000' | | | |
| **Checked by:** | **File Name:** ASCS | | | |
| **Approved by:** | **Date:** 05/21/1951 | | | |

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|---|---|---|---|---|
| **Project Manager:** | **Project No:** HC185036 | Terracon<br>8260 Vico Court, Unit B<br>Sarasota, Florida 34240 | AERIAL PHOTOGRAPH<br>Canal Road Widening<br>Canal Road<br>Palmetto, Florida 34221 | Appendix<br>C |
| **Drawn by:** | **Scale:** 1" = 1000' | | | |
| **Checked by:** | **File Name:** ASCS | | | |
| **Approved by:** | **Date:** 04/22/1940 | | | |