APPENDIX F

Preliminary Report of Subsurface Exploration and Geotechnical Engineering Evaluations

LUDLAM TRAIL CORRIDOR
ACQUISITION ANALYSIS AND PLANNING
FROM NORTH OF NW 7TH STREET TO SW 80TH STREET
MIAMI-DADE COUNTY, FLORIDA

PRELIMINARY REPORT OF SUBSURFACE EXPLORATION AND GEOTECHNICAL ENGINEERING EVALUATIONS

PREPARED FOR: AECOM

PREPARED BY: GEOSOL, INC.

OCTOBER 15, 2018

October 15, 2018

AECOM
7650 Corporate Center Drive, Suite 400
Miami, Florida 33126

Attention: Mr. Nicholas Kuhn, RLA, CPRP
Associate Principal

Re: **Preliminary Report of Subsurface Exploration and Geotechnical Engineering Evaluations**
Ludlam Trail Corridor
Acquisition Analysis and Planning
From North of NW 7th Street to SW 80th Street
Miami-Dade County, Florida
GEOSOL Project No. 218144

Dear Ms. Kuhn:

Geosol, Inc. (GEOSOL) has completed the Preliminary Report of Subsurface Exploration and Geotechnical Engineering Evaluations for the above-referenced project. The services were performed in accordance with our proposal No. 218153-R1 dated July 11, 2018. Authorization to perform our geotechnical services was provided by means of a Purchase Order dated August 17, 2018.

The geotechnical services were performed in accordance with the requested scope of services you provided to us on June 27, 2018, and our Proposal No, 218153-R1. The results of the field exploration and laboratory testing programs, together with our preliminary geotechnical evaluations and recommendations are presented in the accompanying report.

We appreciate the opportunity to work with you on this project. If you have any question or need additional information, please do not hesitate to call our office.

Sincerely,
GEOSOL, INC.

10/15/18

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INTRODUCTION

Project Description

Miami-Dade County Parks, Recreation, and Open Spaces (MDPROS) plans to develop a multi-use trail through the heart of Miami-Dade County within the former Florida East Coast railway right-of-way. The trail will provide a safe dedicated and direct route for cyclists and pedestrians to schools, parks, work and shopping. The trail can connect more than 34,000 people within a half-mile, walkable service area to five greenways, five schools, four parks and two transit hubs. The Ludlam Trail corridor study area comprises approximately 72 acres and is a roughly six-mile long, former Florida East Coast (FEC) railway spur-line that extends from just north of NW 7th Street to SW 80th Street, generally along theoretical NW and SW 69th Avenue. It is primarily located in the central portion of unincorporated Miami-Dade County, except for a segment between the Tamiami Canal and SW 8th Street that is within the City of Miami. The corridor abuts a mix of uses including schools, parks, industrial, office, retail, as well as residential and it is situated within the County's Urban Infill Area. A Site Vicinity Map is presented in Sheet 1 of Appendix "A".

This project involves the performance of a Project Development and Environmental (PD&E) level study for the proposed Ludlam Trail Acquisition Analysis and Planning. As we understand it, the corridor is 80 to 100 feet wide, with a total length of about 5.6 miles (29,570 feet), that crosses the following features:

- Seven (7) major intersections at Flagler Street, SW 8th Street, SW 24th Street, SW 40th Street, SW 56th Street, SW 72nd Street, and SW 80th Street,
- Eight (8) minor intersections at SW 4th Street, SW 12th Street, SW 16th Street, SW 21st Street, SW 22nd Street, North Waterway Drive, SW 60th Street, and SW 64th Street/Hardees Drive, and
- Two (2) existing canal crossings as follows; one (1) at the C-3/Coral Gables Canal and one (1) at the C-4/Tamiami Canal.

This report was specifically prepared to obtain preliminary geotechnical information in the areas of the planned trail improvements that are part of this project. As requested, a preliminary field exploration and laboratory testing programs were required in order to explore the subsurface conditions and to determine the Seasonal High Water elevations along the alignment of the proposed Ludlam Trail improvements. This report contains the results of our preliminary field exploration and laboratory testing programs as well as our preliminary geotechnical engineering evaluations and recommendations for the proposed improvements described above.

SCOPE OF SERVICES

Project Approach

Our services for this project consisted of providing geotechnical services for the above-referenced proposed Ludlam Trail improvements. The services were performed in general accordance with the requested scope of services you provided to us on June 27, 2018, and our Proposal No. 218153-R1 dated July 11, 2018.

The services included performing field reconnaissance, performing SPT borings, laboratory classification testing, measuring the groundwater table depths, and providing preliminary geotechnical engineering evaluations and recommendations for the proposed Ludlam Trail improvements within the previously described project limits, as well as construction considerations.

Our geotechnical study began with a review of available subsurface test data, including the publication titled *Soil Survey of Miami-Dade County Area, Florida*, published by the United States Department of Agriculture (USDA), and the US Geological Survey. We conducted field reconnaissance and assessed conditions with respect to the drilling equipment access, general topographic site conditions and underground utilities.

PURPOSE AND SCOPE OF STUDY

The purpose of this study was to perform a preliminary subsurface investigation along the alignment of the proposed trail improvements within the described project limits in order to catalog the general near-surface stratigraphy and provide the following information:

1. Soil stratigraphy at the boring locations. Development of the anticipated soil profile along the trail and the anticipated subsurface conditions within the depth of influence.

2. Assessment of the existing soil subgrade and groundwater conditions along the alignment of the proposed trail.

3. General location and description of potential deleterious materials encountered in the borings that may interfere with construction progress or pavement performance, including existing fills, organic soils (A-8), and silty soils (A-4).

4. Site preparation requirements. Engineering criteria for placement and compaction of approved fill materials.

5. Identification of some critical design or construction considerations based on the soil and groundwater conditions developed from the borings.

6. Measurement of groundwater levels in the test locations.

The scope of services for the preliminary geotechnical testing program associated with the design and construction of the proposed trail improvements to achieve the project requirements consisted of the following:

1. Discussing with AECOM the scope of the field exploration and laboratory testing programs for this project.

2. Conducting a general visual reconnaissance of the site, locate, and coordinate for existing utilities.

3. Reviewing the USDA and USGS Soil Survey maps for the Miami-Dade County area along the project vicinity.

4. Planning and executing a Maintenance of Traffic (MOT) program in accordance with the FDOT Standard Index Drawings required for performance of the field exploration program along the proposed trail improvement limits.

5. Executing a program of preliminary subsurface exploration consisting of subsurface sampling and field testing. The subsurface program was accomplished by performing Standard Penetration Test (SPT) borings.

6. Visually classifying the samples from the test borings in the laboratory using the American Association of State Highway and Transportation Officials (AASHTO) Classification System for soil samples recovered from roadway borings and the Unified Soil Classification System (USCS) for soil samples recovered from structure borings. The laboratory testing program included grain-size analyses, percent passing the No. 200 sieve, organic content determination, moisture content determination, Atterberg limits, and FDOT Environmental Classification Testing.

7. Providing discussions of critical design or construction considerations based on the subsurface and groundwater conditions developed from the results of the geotechnical investigations.

8. Preparing a preliminary report which summarizes the course of study pursued, the field and laboratory data generated, subsurface conditions encountered, analyses, preliminary analyses, preliminary design recommendations, preliminary construction considerations and report limitations.

Report Format

This report begins with a discussion of the preliminary field and laboratory testing programs followed by general and specific subsurface conditions, preliminary geotechnical engineering evaluations and recommendations, construction considerations, and report limitations. The site vicinity map, USDA soils survey map, test location information, test location plans, Roadway Soil Profiles, Roadway Soil Survey, and Report of Core Boring sheets are presented in Appendix "A" of this report. The laboratory test results are presented in Appendix "B". The results of the preliminary foundation evaluations for the proposed rail bridge replacement at the canal crossings are presented in Appendix "C". The FHWA Checklist is presented in Appendix "D".

SITE DESCRIPTION

The Ludlam Trail corridor study area comprises approximately 72 acres former Florida East Coast (FEC) railway spur-line that extends from just north of NW 7th Street to SW 80th Street, generally along theoretical NW and SW 69th Avenue. The corridor is 80 to 100 feet wide, with a total length of about 5.6 miles (29,570 feet), with seven (7) major intersections and eight (8) minor intersections that the trail will be crossing, as well as two (2) rail bridges that are being assessed, one (1) at the C-3/Coral Gables Canal and one (1) at the Tamiami Canal. It is primarily located in the central portion of unincorporated Miami-Dade County, except for a segment between the Tamiami Canal and SW 8th Street that is within the City of Miami. The corridor abuts a mix of uses including schools, parks, industrial, office, retail, as well as residential and it is situated within the County's Urban Infill Area. We have appended Site Vicinity and USDA maps, which identify the location of the study area. These maps are presented in Sheets 1 through 3, respectively, of Appendix "A".

PRELIMINARY FIELD EXPLORATION PROGRAM

General

As requested, in order to evaluate the subsurface conditions along the alignment of the proposed Ludlam Trail improvements, Standard Penetration Test (SPT) borings were performed as follows:

- A total of twelve (12) SPT borings to depths of 10 feet below existing grades at a general spacing of 1,250 feet c-c along the alignment of the proposed Ludlam Trail,
- A total of fourteen (14) SPT borings at the previously described seven (7) major intersections, two (2) borings per intersection, to depths of 10 feet below existing grades, as follows:
- A total of eight (8) SPT borings at the previously described eight (8) minor intersections, one (1) boring per intersection, to depths of 10 feet below existing grades, and
- A total of four (4) SPT borings at the previously described two (2) canal crossings, two (2) borings per canal crossing, to depths of 50 feet below existing grades

The preliminary field exploration program was performed between September 9 and 17, 2018.

Field Test Locations

The test locations were marked in the field by representatives of GEOSOL utilizing the aerials provided by AECOM showing the proposed Ludlam Trail alignment, standard taping procedures and existing landmarks. The tests were performed as close as possible to location of the proposed improvements considering constraints such as existing utilities and equipment accessibility. The "as-drilled" boring locations were obtained by means of a hand-held Global Positioning System (GPS) device (Garmin eTrex 20x). The coordinates were converted to northing and easting coordinates using computer software (Corpscon). Also, ground surface elevations at each test boring location were obtained from the project Digital Terrain Model (DTM) provided to us. The approximate test boring locations are presented in Table 1 and in the Test Location Plans presented in Appendix "A".

Traffic Control and Signs

Barricades, cones, and sign devices were continuously used in general compliance with Roadway and Traffic Design Standards Index Drawings.

Standard Penetration Test (SPT) Borings

The borings for this study were performed utilizing a Foremost-Mobile Model B-53 truck-mounted drill rig. The SPT borings were performed with the use of an automatic hammer. The borings were performed in general accordance with the American Society of Testing and Materials (ASTM) test designation D-1586 tilted "Standard Practice for Penetration Test and Split-Barrel Sampling of Soils". All soil samples were classified in the field and placed in air-tight jars for transportation to our office for review by a Geotechnical Engineer and laboratory testing. The test boring location information is provided in Table 1 and in the Test Location Plan sheets in Appendix "A".

Water Level Measurements

Water level depths were obtained during the test boring operations. They are noted on the Soil Profiles and the Report of Core Borings sheets presented in Appendix "A". In relatively pervious soils, such as the near surface granular soils, the indicated water level depths are usually reliable groundwater levels. Seasonal variations, tidal conditions, temperature, land-use, and recent rainfall conditions may influence the depths of the groundwater.

LABORATORY TESTING

General

Representative samples collected from the test boring locations were visually reviewed in the laboratory by a Geotechnical Engineer to confirm the field classifications. The samples from the borings performed for the trail improvements were classified using the American Association of State Highway and Transportation Officials (AASHTO) Soil Classification System in general accordance with the American Society of Testing and Materials (ASTM) test designation D-3282, titled "Classification of Soils and Soils-Aggregate Mixtures for Highway Construction Purposes". Additionally, samples obtained for the canal crossings were classified using the Unified Soil Classification System (USCS) in general accordance with the American Society of Testing and Materials (ASTM) test designation D-2488, titled “Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)” and ASTM D-2487 titled “Standard Test Method for Classification of Soils for Engineering Purposes”. The soil classification was based on visual observations with the aids of laboratory testing results, which consisted of grain-size analysis, percent passing the No. 200 sieve, natural moisture content, organic content, and Atterberg limits,. The tests were performed on selected samples believed to be representative of the materials encountered. In addition, FDOT Environmental Classification testing was also performed on a select water samples obtained from a test boring performed. A summary of the laboratory test results are presented in Table Nos. 2 and 3 of Appendix “B”.

Moisture Content

Laboratory moisture content test consists of the determination of the percentage of moisture contents in selected samples in general accordance with FDOT Test Designation FM1-T265 (ASTM Test Designation D-2216, titled "Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures"). Briefly, the moisture content is determined by weighing a sample of the selected material and then drying it in a warm oven. Care is taken to use a gentle heat so as not to destroy any organics. The sample is removed from the oven and re-weighed. The difference of the two weights is the amount of moisture removed from the sample. The weight of the moisture divided by the weight of the dry soil sample is the percentage by weight of moisture in the sample. The test results are summarized in Table No. 2 of Appendix "B".

Grain-Size Analysis

The grain-size analyses were conducted in general accordance with the FDOT Test Designation FM1-T88 (ASTM Test Designation D-422, titled "Particle-Size Analysis of Soils"). The grain-size analysis test measures the grain-size distribution in the soil sample. The test also measures the percentage by weight passing the No. 200 sieve, which is the amount of silt and clay sized particles. The test results are summarized in Table 2 of Appendix “B”.

Organic Content

Organic content test consists of the determination of the percentage of organic content in selected samples in general accordance with FDOT Test Designation FM1-T267 (ASTM Test Designation D-2974, titled "Moisture, Ash, and Organic Matter of Peat and Other Organic Soils"). Briefly, the organic content is determined by weighing a sample of the selected material and then burning off the organic material in a hot oven. The sample is removed from the oven and re-weighed. The difference of the two weights is the amount of organic material removed from the sample. The weight of the organic material divided by the weight of the dry soil sample is the percentage by weight of organic material in the sample. The organic content test results are summarized in Table No. 2 of Appendix "B".

Atterberg Limits

Atterberg limit tests (plastic and liquid) measure the moisture content at which a cohesive or clayey soil sample changes from a semi-solid to plastic state and from a plastic to a liquid state, respectively. The plasticity index is the difference between the liquid and plastic limits. The plasticity index is a rough indication of the tendency of a soil to absorb water on the particle surfaces. Some clayey soils have a strong affinity for water, and tend to swell when wetted and shrink when dried. The larger the plastic index, the greater the shrink-swell tendency. The test results are summarized in Table No. 2 of Appendix "B".

Environmental Classification

Environmental classification testing was performed on two water samples obtained from the field exploration program. The testing performed included pH, resistivity, sulfate and chloride content. The results of the testing were evaluated based on the criteria established in the FDOT Structures Design Guidelines, Section 1.3. Based on the criteria in Section 1.3 and the laboratory test results, the environment is recommended as moderately aggressive for the substructure, and slightly aggressive for the superstructure and is indicated in the Soil Profiles and the Report of Core Boring sheets in Appendix “A”. The results are summarized in Table 3 in Appendix “B”.

GENERALIZED SUBSURFACE CONDITIONS

Regional Geology

The Miami area of southern Florida is underlain by an alternating sequence of cemented and uncemented Pleistocene sedimentary deposits (Pleistocene Epoch, deposited 10,000 to 2 million years before the present). A near surface Miami Limestone Formation is underlain by a wide variety of loose to dense quartz sands and coarse to fine-grained hard to very hard limestones with intermittent layers of fine to medium-quartz grained sand (Fort Thompson Formation). However, in any portion of Miami-Dade, surface sand deposits of the Pamlico Formation and man-made (artificial) fill are encountered. The Pamlico sands and man-made (artificial) fill have a thickness of approximately three (3) to seven (7) feet and overlie the Miami Limestone Formation. In the west part of the county, portions of the Everglades interfingers with the Pamlico sands. The Everglades soils consist of peat, organic silt and calcareous silt marl. The Everglades soils also have a thickness of three (3) to seven (7) feet and overlie the Miami Limestone Formation.

Although the Miami Limestone Formation can be very porous and have a sponge-like, open interconnected network of vugs and small voids, large cavities do not exist and there is no potential for sinkhole activity. The rock formations encountered in the Miami area are typically much softer than the "bedrock" formations encountered in other areas of the country.

The strength of the limestone as well as its deformation characteristics depends upon the degree of cementation of the formation and its alteration by solutioning and weathering subsequent to deposition. One of the most important characteristics of the limestone encountered in the project area is the degree of erosion. Past surface solutioning of the limestone has resulted in formation called "pinnacle rock". In some cases nearly vertical cylindrical-shaped solution cavities are filled with surficial fine sands extending below the groundwater level. The subsurface conditions encountered at the site are presented in the following section.

Miami-Dade County Soil Survey

The *Soil Survey of Miami-Dade County Area, Florida*, published by the United States Department of Agriculture (USDA), was reviewed for general near-surface soil information within the general project vicinity. This information indicates that there are four (4) primary mapping units for this project. The map soil unit encountered is as follows:

- Udorthents-Water complex (9)
- Udorthents, limestone substratum-Urban land complex (10)
- Urban land, 0 to 2 percent slopes (15)
- Water (99)

A reproduction of the USDA map for the project area is illustrated on Sheets 2 and 3 in Appendix “A”.

SITE SUBSURFACE AND GROUNDWATER CONDITIONS

Site Subsurface Conditions

The subsurface conditions disclosed by the borings are generally consistent with the previously described regional geology. The stratification is based on visual examination of the recovered soil/rock samples, laboratory testing and interpretation of the field boring logs by a Geotechnical Engineer. The boring stratification lines represent the approximate boundaries between soil types of significantly different engineering properties; however, the actual transition may be gradual. In some cases, small variations in properties not considered pertinent to our engineering evaluation may have been abbreviated for clarity. The borings present the subsurface conditions at the particular boring location and slight variations do occur among the borings. The Roadway Soil Profiles and Report of Core Borings presented in Appendix "A" provide the conditions at the particular test locations.

Presented in Appendix "A" is the site vicinity map, USDA soil survey map, boring location information, Roadway Soil Profiles, Roadway Soils Survey, and Report of Core Borings sheets along with the soil legend and other pertinent information such as measured groundwater table levels. A detailed description of the subsurface materials encountered at the project site is presented below. Specifically, we have identified nine (9) strata in the subsoils in the areas of the proposed improvements within the limits of the project. They are identified here and described on the Roadway Soil Profiles and Report of Core Borings in Appendix "A".

Stratum	Soil Description	AASHTO Group	USCS Symbol
1	Dark Brown Organic Silty Fine SAND with Grass (TOPSOIL)	A-8	SM
2	Brown Slightly Silty to Silty Fine to Coarse SAND with Some Limerock Fragments (FILL)	A-1-a/A-1-b	SP-SM/SM
3	Brown, Occasionally Dark Brown Organic Stained, Silty Fine to Medium SAND with Little to Some Limerock Fragments (FILL)	A-2-4	SM
4	Brown Slightly Silty Fine to Medium SAND with Trace to Little Limerock Fragments (FILL)	A-3	SP/SP-SM
5	Brown Sandy SILT	A-4	ML
6	Brown Sandy LIMESTONE	N/A	N/A
7	Brown Slightly Silty Fine to Medium SAND with Some Limestone Fragments	A-1-b	SP-SM

8	Brown Slightly Silty Fine to Medium SAND with Trace to Some Limestone Fragments	A-3	SP-SM
9	Brown Slightly Silty Fine to Medium SAND with Trace to Some Limestone Fragments	A-2-4	SP-SM

Specific details concerning the subsurface materials and conditions encountered at each test location may be obtained from the Roadway Soil Profiles and Report of Core Borings presented in Appendix "A".

Groundwater Conditions

The groundwater table was measured at each boring location during drilling operations for the tests performed during this study. The test borings performed by GEOSOL for this project were performed during the wet season. The depths to the "static" groundwater table encountered within the borings were measured after a short stabilization period and were found to range from about 4.5 to 13.4 feet below the existing grades. The water level elevations ranged from +0.5 to +2.0 feet (NAVD, 1988), with an average of about 1.5 feet (NAVD, 1988). It is to be noted that the groundwater table was not encountered at some of the borings, due to the relatively high ground elevation at these test boring locations. The difference in groundwater level depths may be attributed but not limited to difference in ground surface elevations that exist between the boring locations, recent rainfall, and poor drainage. This information is shown on the Roadway Soil Profiles and the Report of Core Boring sheets in Appendix “A”. In relatively pervious soils, such as the near surface granular soils, the indicated depths are usually reliable groundwater levels. Fluctuation in the observed groundwater levels should be expected due to rainfall variation, tidal conditions, construction activity and other factors.

Estimated Seasonal High Water Table

The estimated seasonal high groundwater table (SHGWT) each year is in the August-September period at the end of the wet season during a year of average (normal) rainfall. The water table elevations associated with a flood would be much higher than the seasonal high water table elevations. The normal high water levels would more approximate the seasonal high water table elevations. The seasonal high water table is affected by a number of factors. The drainage characteristic of the soils, the land surface elevation, relief points such as lakes, rivers, swamp areas, etc., and distance to relief points are some of the more important factors influencing the seasonal high water table elevation.

It is to be noted that the test borings for this project were performed during the wet season. Based on our interpretation of the site conditions using the results of our test boring data and historical water readings reported by USGS for nearby monitoring wells (i.e. Wells G-3606. G-3570, and G-3329), as well as the readings reported by SFWMD for Single Stage Monitoring Site at Ludlam Rd and C2 Canal (C2SW2), we estimate a normal seasonal high water table elevation of about +2.0 feet (NAVD, 1988). The Groundwater Watch readings for Wells G-3606, G-3570, and G-3329, and for Single Stage Monitoring Site at Ludlam Rd and C2 Canal (C2SW2) in NGVD, 1929 are presented in Appendix "C" of this report. The conversion rate of -1.555 feet suggested by NOAA, and presented in Appendix "C" of this report, was used to convert the readings from NGVD 1929 datum to NAVD 1988 datum.

The SHGWT presented is based on the limited groundwater data that was collected during the PD&E study. The recommendation for SHGWT should be refined and revisited during final design phase.

PRELIMINARY GEOTECHNICAL DESIGN PARAMETERS FOR FOUNDATION DESIGN

General

The geotechnical design parameters for this study were obtained on the basis of empirical relationships between the SPT "N"-values and the shear strength of the soil/rock strata. The subsequent sections provide derivation of geotechnical design parameters for use in preliminary foundation design for the proposed rail bridges at the canal crossing. The derivation of the geotechnical design parameters are presented in Appendix "C". It is to be noted that the SPT borings performed by GEOSOL were done with the use of an automatic hammer and The SPT "N"-values obtained from each boring were corrected for hammer efficiency – in order to use the empirical relationships that were derived based on the safety hammer N-values - in accordance with the recommended relationship presented in the FDOT *Soils and Foundations Handbook (2018)* ($N_{safety} = 1.24*N_{automatic}$). Hence, any references to SPT "N"-values in the following paragraphs only have been corrected to safety hammer N-values (N_{safety}) for use in foundation design.

The ground surface at the boring locations was covered by a topsoil layer. The following stratification was encountered either below the topsoil layer at the borings performed by GEOSOL:

- **Granular Fill (Strata 2, 3, and 4):**

  The soils from these layers generally consist of slightly silty to silty fine to coarse sand with variable percentages of limerock fragments. The materials from this stratum may classify as SP, SP-SM, or SM in accordance with the USCS. The relative density of this layer varies between loose and dense with N_{safety}-values ranging between 9 and 43 blows per foot (bpf), with a statistical average N_{safety}-value of about 19 bpf. Based on established empirical relationship between the N-value and the internal friction angle (ϕ) as well as statistical evaluation of the data, we recommend an internal friction angle (ϕ) and total unit weight (γ_t) of 33 degrees and 115 pounds per cubic foot (pcf), respectively. The active, passive, and at-rest earth pressure of coefficients (i.e. K_a, K_p, and K_o) for this layer are 0.27, 4.89 and 0.46, respectively.

❖ **Sandy Silt (Stratum 5):**

This layer was encountered in four (4) test locations (MJ-1, MJ-2, CB-7, and CB-9) at depths ranging from 1.7 to 4 feet below existing grades, with thicknesses ranging from 1.3 to 2.3 feet and an average thickness of about 2.0 feet. The composition of the material from this layer consists of sandy silt and classifies as ML according to the USCS. The consistency of this layer is stiff with N_{safety}-values ranging between 10 and 12 blows per foot (bpf), with a statistical average N_{safety}-value of about 11 bpf. Based on the review of the field data, empirical correlations, and statistical analysis, we recommend an internal friction angle (ϕ) and total unit weight (γ_t) of 26 degrees and 90 pcf, respectively. The active, passive and at-rest earth pressure of coefficients (i.e. K_a, K_p, and K_o) for this layer are 0.39, 2.56 and 0.56, respectively.

❖ **Natural Limestone Formation (Stratum 6):**

The natural limestone formation was generally encountered below the granular fill or sandy silt layers. The rock formation at the site is soft, occasionally moderately hard. This formation is very porous. Based on the SPT borings performed, the N_{safety}-values obtained from this formation ranged between 6 blows per foot (bpf) and 32, with a statistical average N_{safety}-value of about 18 bpf. Due to the relatively low N-values obtained for this formation and following the suggestions of the FDOT *Soils and Foundations Handbook (2018)*, we recommend that this layer be modeled as a gravelly material. Based on established empirical relationships between the N_{safety}-value and the internal friction angle (ϕ) as well as statistical evaluation of the data, we recommend an internal friction angle (ϕ) and total unit weight (γt) of 38 degrees and 120 pounds per cubic foot (pcf), respectively. The active, passive and at-rest earth pressure of coefficients (i.e. K_a, K_p, and K_o) for this layer are 0.22, 6.93 and 0.38, respectively.

❖ **Natural Sand (Strata 7, 8, and 9):**

The sand layer was generally encountered below the Limestone Formation. The soils from this layer generally consist of slightly silty fine to medium-grained sand with variable percentages of limestone fragments. The materials from this stratum may classify as SP-SM in accordance with the USCS. The relative density of this layer varies between loose and dense with N_{safety}-values ranging between 6 and 38 blows per foot (bpf), with a statistical average N_{safety}-value of about 14 bpf. Based on established empirical relationship between the N-value and the internal friction angle (ϕ) as well as statistical evaluation of the data, we recommend an internal friction angle (ϕ) and total unit weight (γ_t) of 32 degrees and 115 pounds per cubic foot (pcf), respectively. The active, passive, and at-rest earth pressure of coefficients (i.e. K_a, K_p, and K_o) for this layer are 0.28, 4.65 and 0.47, respectively.

Table "A" on the following page presents a summary of the preliminary geotechnical soil/rock parameters for use in preliminary foundation analyses and design.

TABLE "A"- SUMMARY OF PRELIMINARY GEOTECHNICAL DESIGN PARAMETERS

GENERAL MATERIAL DESCRIPTION	UNIT WEIGHT, γ (PCF)		FRICTION ANGLE, ϕ (Degrees)	DESIGN UNIT SKIN FRICTION, f_{su} (TSF)	EARTH PRESSURE COEFFICIENTS		
	TOTAL	EFFECTIVE			ACTIVE (Ka)	PASSIVE (Kp)	AT-REST (Ko)
Granular Fill (Strata 2, 3, and 4)	115	53	33	-	0.27	4.89	0.46
Sandy Silt (Stratum 5)	90	28	26	-	0.39	2.56	0.56
Limestone Formation (Stratum 6)	120	58	38	-	0.22	6.93	0.38
Natural Sand (Strata 7, 8 and 9)	115	53	32	-	0.28	4.65	0.47

PRELIMINARY ENGINEERING EVALUATIONS AND RECOMMENDATIONS FOR PROPOSED LUDLAM TRAIL IMPROVEMENTS

General

Results of the soil survey indicate that the project alignment is generally suitable for the proposed trail improvements when viewed from a geotechnical engineering perspective. However, planning for the proposed trail improvements should carefully consider the impact of the existing sandy silt (A-4) to the performance of the proposed trail improvements. A sandy silt (A-4) layer was encountered in four (4) test locations (MJ-1, MJ-2, CB-7, and CB-9) at depths ranging from 2 to 4 feet below existing grades, with thicknesses ranging from 1.3 to 2.0 feet and an average thickness of about 1.8 feet.

Given that the proposed use of the Ludlam Trail will be generally limited to pedestrian/bike use rather than vehicular use, as well as the isolated locations of the sandy silt (A-4) layer and the depths at which it was encountered, it is our opinion that these materials may remain in place as they have been previously loaded and no future grade changes are expected. During the final design phase once a final design-level field investigation is performed, areas that encountered sandy silt (A-4) should be further investigated to delineate the extent of these soils. Additionally, the ground improvement for these soils (A-4) shall be further re-visited with the goal of selecting the most feasible and economical method for improving these soils. The following section presents our preliminary site preparation recommendations.

Site Preparation

Site preparation for Ludlam Trail improvements will most likely include striping of pavement or vegetation, removing railroad spurs and tracks, excavation, backfilling operations, and pavement construction. The following are our preliminary discussions regarding the utilization and the site preparation requirements of the subsurface soils.

- The material from Stratum 1 is topsoil (A-8) and considered to be unsuitable (muck). It shall be removed during clearing and grubbing in accordance with Section 110 of the FDOT Standard Specifications.

- The materials from Strata Numbers 2, 4, 7, and 8 (A-1-a, A-1-b, and A-3) are considered to be select and should be utilized in accordance with FDOT Standard Plans for Road and Bridge Construction Index 120-001.

- The materials from Strata Numbers 3 and 9 (A-2-4) are considered to be select and should be utilized in accordance with FDOT Standard Plans for Road and Bridge Construction Index 120-001. Certain types of A-2-4 material are likely to retain excess moisture and may be difficult to dry and compact. They should be used in the embankment above the water level existing at time of construction. They may be used in the subgrade portion of the roadbed when approved by the District Materials Engineer.

- The material from Stratum Number 5 (A-4) is considered to be plastic. This material was encountered in four (4) test locations (MJ-1, MJ-2, CB-7, and CB-9) at depths ranging from 2 to 4 feet below existing grades, with thicknesses ranging from 1.3 to 2.0 feet and an average thickness of about 1.8 feet. Given that the proposed use of the Ludlam Trail will be generally limited to pedestrian/bike use rather than vehicular use, as well as the isolated locations of the sandy silt (A-4) layer and the depths at which it was encountered, it is our opinion that these materials may remain in place in accordance with FDOT Standard Plans for Road and Bridge Construction Index 120-002 as they have been previously loaded and no future grade changes are expected. During the final design phase once a final design-level field investigation is performed, areas that encountered sandy silt (A-4) should be further investigated to delineate the extent of these soils. Additionally, the ground improvement for these soils (A-4) shall be further re-visited with the goal of selecting the most feasible and economical method for improving these soils.

- The material from Stratum Number 6 is the natural Limestone Formation. This material may be difficult to dewater, excavate and/or penetrate and may require special equipment to do so.

Fill Material

The embankment fill should consist of select material, meeting the requirements of Standard Plans for Road and Bridge Construction Index 120-001 and shall be constructed in general accordance of Section 120.8 of the FDOT *Standard Specifications for Road and Bridge Construction*.

PRELIMINARY FOUNDATION EVALUATION FOR CANAL CROSSINGS

General

As we understand it, the Ludlam Trail corridor crosses over two (2) canals; the C-3/Coral Gables Canal and the C-4/Tamiami Canal. Currently, both canal crossings have existing wood trestle rail bridges.

For this Acquisition Analysis and Planning phase of the project, we are assuming that the existing bridges will be replaced. However, if conversion of the existing rail bridges for pedestrian use is considered, an evaluation of each bridge's structural and foundation integrity and adequacy shall be performed. However, the challenges of evaluating the existing foundations exist as there are no foundation records (pile design loads, pile lengths and tips, or driving records, etc.) to make this evaluations and as such the existing foundations are considered unknown. The evaluation of the existing rail bridges for conversion for pedestrian use was outside our scope of services for this phase of the project.

We considered supporting the proposed bridge replacement on shallow foundations and deep foundations. However, several difficulties (i.e. dewatering, site constraints, magnitude of anticipated design loads, etc.) make shallow foundations, in our opinion, not practical, not a cost-effective foundation system. However, when a final-design level geotechnical investigation is performed, a re-evaluation may be performed to determine feasibility of using a shallow foundation system for bridge support. We believe that a deep foundation system would be suitable for support of the proposed rail bridge replacement at the canal crossings. Typically, square precast prestressed concrete piles have been used and may be needed to support the magnitude of the structural loads. Drilled shaft foundations could be used as well to support the proposed rail bridge replacement at the canal crossings, but considered significantly more expensive than driven piles.

Foundation Alternatives for Bridge Structures

Foundation alternatives for the project considered the results of our field study and performance of foundation systems near the project site. Based on our experience with similar projects, we considered the following foundation alternatives:

- Shallow Foundations
- Steel Piles, Including Pipe and H-Sections
- Straight Sided Drilled Shafts
- Precast Prestressed Concrete Piles

The following sections discuss our preliminary foundation recommendations for each alternative:

Shallow Foundations

The results of the test borings performed for the rail bridge replacement at the canal crossings indicate that the near subsurface materials consist primarily of loose granular fill and sandy soils underlain by a generally weak Limestone Formation. Due to the elevated type of structure being considered, relatively large loads and foundation dimensions are anticipated. Additionally, if underground utilities are present in areas of expected footings, they will require relocation. Due to the groundwater levels measured during the field exploration program, dewatering may be required to cast spread footings in the dry, coupled with utility relocation, which can add a significant cost to the project. Therefore, at this point the use of shallow foundation systems for support of the bridges does not appear to be feasible. The use of a shallow foundation system should be re-evaluated during the final-design phase once the preferred improvement alternative is selected, details of the structural design are developed and final design-level geotechnical data has been collected.

Steel Piles

Steel pile types include pipe piles and H-sections. Previous experience has shown that steel H-piles sections and pipe piles are generally more expensive per linear foot than prestressed concrete piles. Steel piles are well suited to conditions with high variability in anticipated penetration depths where frequent splicing is expected. Typical sizes of pipe piles range from 13 to 16 inches in diameter. The steel piles do not develop as much compression and tension capacities for similar penetration depths as square driven prestressed concrete piles and rough cost data indicates that the steel pipe piles are more expensive than similar sizes of square prestressed concrete piles. Steel H-sections are inappropriate for this project because of inferior capacities compared to pipe piles at similar costs. As a result, we did not consider this alternative any further.

Drilled Shafts

Drilled shafts are a feasible foundation alternative for the support of the proposed rail bridge replacement at the canal crossings. In areas where sound rock is available, drilled shafts have the advantage of being able to develop high axial and lateral capacities in a single unit and their use reduces construction vibration concerns (using special vibration free equipment) and noise in the vicinity of existing structures and/or utilities. The minimum drilled shaft diameters allowed by the FDOT *Structures Design Guidelines* for redundant and non-redundant foundations are 42 and 48 inches, respectively.

However, in South Florida, drilled shafts are much more expensive than driven piles for bridge foundations and require significantly more testing during design phase to satisfy the requirements of the FDOT's *Standard Specifications Section 455*. Also, the quality control of drilled shaft installation requires more engineering judgment and precaution compared to driven piles to ensure that the specifications are complied with.

We have prepared preliminary curves of axial capacity versus elevation for 42, 48, 54, and 60 inches drilled shafts based on the borings performed for the proposed rail bridges. The curves were prepared using the software for axially loaded drilled shafts, "FB-Deep" v2.05, which was developed based on the procedures outlined in based upon Federal Highway Administration report "Drilled Shafts: Construction Procedure and Design Methods". As previously stated, the SPT "N"-values from the borings performed were obtained using an automatic hammer. A correction factor of $N_{safety} = 1.24*N_{automatic}$ was applied to the SPT "N"-values obtained from the borings performed with the use of an automatic hammer in accordance with the FDOT Soils and Foundation Handbook (2018). The FB-Deep runs for borings performed by GEOSOL are presented in Appendix "C".

The nominal resistances that the drilled shafts may develop were multiplied by resistance factors of 0.5 and 0.6 for non-redundant and redundant drilled shaft foundations, respectively. These resistance factors were selected because our preliminary shaft capacities based on side friction resistance only, since the full mobilization of end bearing capacity would require large tip movement and on the order of 5 to 10 percent of the pile diameter. Appendix "C" presents our preliminary drilled shaft capacity evaluations.

In South Florida, drilled shaft mainly develop their axial capacity through being socketed in sound rock. However, since only a relatively thin layer of limestone was encountered at the locations of the proposed rail bridge replacement at the canal crossings, and based our preliminary drilled shaft capacity evaluations, at this point the use of drilled shaft foundation systems for support of the bridges does not appear to be feasible and would likely yield a non-economical design. The use of a drilled shaft foundation system should be re-evaluated during the final-design phase once the preferred improvement alternative is selected, details of the structural design are developed and final design-level geotechnical data has been collected.

Precast Prestressed Concrete Driven Piles

Precast Prestressed Concrete Piles (PPCP) are also considered an appropriate foundation type. They are a widely used and proven foundation system in South Florida. Driven PPCP are readily available and generally have a lower cost per ton of capacity than other pile types. The minimum size for square prestressed concrete piles should be 18-inch square, as referenced in the FDOT Structures Design Guidelines. However, if the impact of vibrations associated with pile driving operations on existing structures and/or utilities in of concern, and due to the fact that the proposed bridges are considered off-system bridges, the use of 14-inch square prestressed concrete piles may also be investigated for the proposed rail bridge replacement at the canal crossings in order to minimize the impact of vibrations associated with pile driving operation on existing structures and or utilities. Also, 24-inch square precast concrete piles is a commonly used size. The following sections provide preliminary recommendations regarding the PPCP.

❖ *Compression Capacity*

We have prepared curves of axial capacity versus tip elevation for 14-, 18- and 24-inch square driven piles based on the borings performed for this project. These curves were prepared using software for axially loaded driven piles, "FB-Deep" v2.05, which was developed based on the procedures outlined in FDOT Research Bulletin 121. As previously stated the SPT "N"-values from the borings performed of this study were obtained using an automatic hammer. Since the program FB-Deep software uses SPT "N"-values obtained with a safety hammer, the SPT "N"-values obtained from the borings performed on land with the use of an automatic hammer were converted to safety hammer "N"-values using the FDOT *Soils and Foundation Handbook (2018)* correction of $N_{safety} = 1.24*N_{automatic}$. The FB-Deep runs for borings performed by GEOSOL are presented in Appendix "C".

From the FB-Deep computer program output, the load carrying capacity of the driven piles was generally determined to be in the area between the Davisson and ultimate capacity curves. From our experience driving piles in similar geological settings in nearby projects (i.e. SR 90/Tamiami Trail 2.6-Mile Bridging, NW 25th Street Viaduct, SR 826 Section 2, MDX Project No. 83628, and MDX's Central Boulevard expansion), the Davisson capacity curve predicted by the FB-Deep software is conservative. The nominal bearing resistance may be estimated as follows:

$$R_n = \frac{\text{Factored Design Load} + \text{Downdrag} + \text{Net Scour}}{\Phi}$$

where,

Φ =Resistance Factor = 0.75 compression design with 100% dynamic testing or
Resistance Factor = 0.65 compression design with at least 5% dynamic testing

Once design loads and pile cut-off elevation information is available during the final design phase, recommendations for test pile lengths and required nominal bearing resistance can be provided by the Geotechnical Engineer of Record.

❖ *Lateral Deflections*

At this point the design loading information is not available. During the final design phase if driven piles are selected for bridge support, lateral deflections will need to be checked and minimum tip elevations will need to be established once the design loads are available and once a final design-level geotechnical field investigation has been performed.

- *Pile Settlements*

  Settlements of driven pile supported bridge foundations are typically small and tolerable for a typical pile group. At this point the design loading information is not available. During the final design phase if driven piles are selected for bridge support, settlements will need to be checked at the Service limit state once the design loads are available and one a final design-level geotechnical field investigation has been performed.

- *Pile Installation*

  The installation on the driven piles for the proposed bridge reconstruction should be carried out in accordance with Section 455 of the FDOT *Standard Specifications for Road and Bridge Construction*.

- *Preforming*

  The need for preforming shall be evaluated during the final design phase once design loading information is available and once a final design-level geotechnical investigation has been performed. All preforming shall be carried out in accordance with Sections 455 of the FDOT *"Standard Specifications for Road and Bridge Construction".* Additionally, all preformed pile holes shall be backfilled in accordance with Section 455 of the FDOT *"Standard Specifications for Road and Bridge Construction".*

- *Protection of Existing structures and Utilities*

  All structures, substructure and utilities located in the vicinity of pile driving operations should be protected as well as monitored and surveyed for possible vibration damage and settlement in accordance with Sections 108 and 455-1.1 of the FDOT *Standard Specifications for Road and Bridge Construction*. Pre-forming may be required to reduce vibration impacts to existing structures and/or utilities and will be specified at a later time. During final design, based on the selected foundation type, specific structures to be monitored shall be identified.

PRELIMINARY CONSTRUCTION CONSIDERATIONS

Preliminary General Roadway Construction Recommendations

Site preparation shall be in accordance with sections 110 and 120 of the FDOT Standard Specifications for Road and Bridge Construction and FDOT Standard Plans for Road and Bridge Construction Indices 120-001 and 120-002.

Ground Water Control

Groundwater can normally be controlled in shallow excavations with a sump pump. During subgrade soil preparation the soils below design grade could become disturbed by construction activities. If this becomes the case, the contractor may be directed by the owner's representative to remove the disturbed or pumping soils to a depth of 12 to 18 inches below design grades and backfill the area with structural fill in accordance with FDOT Standard Plans for Road and Bridge Construction Index 120-001 and the latest FDOT *Standard Specifications for Roads and Bridge Construction*. The Contractor shall be aware that dewatering may be very difficult to accomplish due to the relatively high permeability of the natural rock formation.

Preliminary Excavation Recommendations

The proposed Ludlam Trail improvements will likely require temporary excavation of the existing subsurface materials. Temporary excavation side slopes of 1V: 2H in the granular subsurface materials (Strata 2, 3, 4, 7, 8, or 9), 1V: 3H in the sandy silt layer (Stratum 5), and 1V:1H in the natural limestone formation (Stratum 6) are stable and have a minimum factor of safety of 1.3. If steeper sides are used, the excavations will require the need of temporary ground support systems in order to maintain the stability of the excavations and for safety reasons. The Contractor is responsible for the design of the temporary ground support system. Based on the results of the soil borings, an unsupported vertical cut is not considered stable or safe during construction. An unsupported vertical cut will cause cracks on the surface of the asphalt-paved roadway because the angle of repose of the granular soils will be exceeded and a failure surface will develop behind the vertical face of the excavation. Materials removed from the excavation should not be stockpiled immediately adjacent to the cut, inasmuch as this load may cause a sudden collapse of the temporary ground support system. Open excavations shall be backfilled as soon as possible to prevent instability, which may cause collapse of the excavations and injury to people. The Contractor is responsible for backfilling the excavation in a timely fashion such that cut instability (excavation failure) will not occur. The Contractor shall be aware that special equipment may be required to excavate the natural limestone formation due to the relatively high strength of the rock layer. The temporary ground support system should be in conformance with the Occupational Safety and Health Administration (OSHA) Standards.

RECOMMENDATIONS FOR FURTHER GEOTECHNICAL STUDIES

For this PD&E phase of the project, a limited number of test borings were performed for the proposed trail improvements and proposed rail bridge replacement at the canal crossings. Once the preferred alternative for the trail improvements and the preferred foundation system for the proposed rail bridge replacement at the canal crossings is chosen, a final design-level geotechnical investigation program will be required for the proposed improvements. The final design-level geotechnical investigation program should be performed in accordance with the latest version of the FDOT *Soils and Foundations Handbook*. The final design-level field investigation should delineate the extent of areas that encountered silt (A-4). If drilled shafts are chosen as a foundation for support of the proposed bridges, rock coring and laboratory testing on rock core specimens will be required for final design of the drilled shafts in accordance with the latest version of the FDOT *Soils and Foundations Handbook*.

FHWA REPORT CHECKLIST

In conformance with FDOT and FHWA, a report "Checklist and Guidelines for Review of Geotechnical Reports and Final Plans and Specifications" is required when preparing geotechnical reports. The FHWA checklist for this report is enclosed in Appendix "D".

REPORT LIMITATIONS

Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This company is not responsible for the conclusions, opinions or recommendations made by others based on these data. No other warranties are expressed or implied.

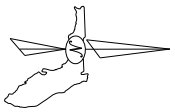
The scope of the investigation was intended to evaluate soil conditions within the influence of expected Ludlam Trail improvements. The analysis and recommendations submitted in this report are based upon the data obtained from the soil borings performed at the locations indicated. If any subsoil variations become evident during the course of this project, a re-evaluation of the recommendations contained in this report will be necessary after we have had an opportunity to observe the characteristics of the conditions encountered. The applicability of the report should also be reviewed in the event significant changes occur in the design, nature or location of the proposed roadway alignment.

The scope of our services does not include any environmental assessment or investigation for the presence or absence of hazardous or toxic materials in the soil, groundwater, or surface water within or beyond the site studied. Any statements in this report regarding odors, staining of soils, or other unusual conditions observed are strictly for the information of our client.

APPENDIX "A"

Sheet 1: Site Vicinity Map
Sheets 2 and 3: USDA Soils Survey Maps
Table 1 - Summary of Field Test Locations
Sheets 4 through 29: Test Location Plans
Sheets 30 through 33: Roadway Soil Profiles
Sheet 34: Roadway Soils Survey Sheet
Sheets 35 and 36: Report of Core Borings

APPROXIMATE SITE LOCATION



SITE VICINITY MAP

LUDLAM TRAIL CORRIDOR
ACQUISITION ANALYSIS AND PLANNING
FROM NORTH OF NW 7TH STREET
TO SW 80TH STREET
MIAMI-DADE COUNTY, FLORIDA

DRAWN: JG	SCALE: N.T.S.	PROJ. No.: 218144
CHECKED: OR	DATE: SEPT., 2018	SHEET 1

COUNTY: MIAMI-DADE, FLORIDA

REFERENCE: GOOGLE EARTH, 2018

DATE: SEPTEMBER, 2018

USDA SOILS SURVEY MAP

MAP UNIT	SOIL NAME
9	Udorthents-Water complex
10	Udorthents, limestone substratum-Urban land complex
15	Urban Land
99	Water

COUNTY: MIAMI-DADE COUNTY, FLORIDA

REFERENCE: NRCS WEB SOILS SURVEY, 2018

DATE: OCTOBER, 2018

USDA SOILS SURVEY MAP

LUDLAM TRAIL CORRIDOR
ACQUISITION ANALYSIS AND PLANNING
FROM NORTH OF NW 7TH STREET
TO SW 80TH STREET
MIAMI-DADE COUNTY, FLORIDA

DRAWN	SCALE	PROJ. No.
MK	N.T.S.	218144
CHECKED	DATE	
OR	OCT., 2018	SHEET 2

USDA SOILS SURVEY MAP

MAP UNIT	SOIL NAME
9	Udorthents-Water complex
10	Udorthents, limestone substratum-Urban land complex
15	Urban Land
99	Water

COUNTY: MIAMI-DADE COUNTY, FLORIDA

REFERENCE: NRCS WEB SOILS SURVEY, 2018

DATE: OCTOBER, 2018

USDA SOILS SURVEY MAP

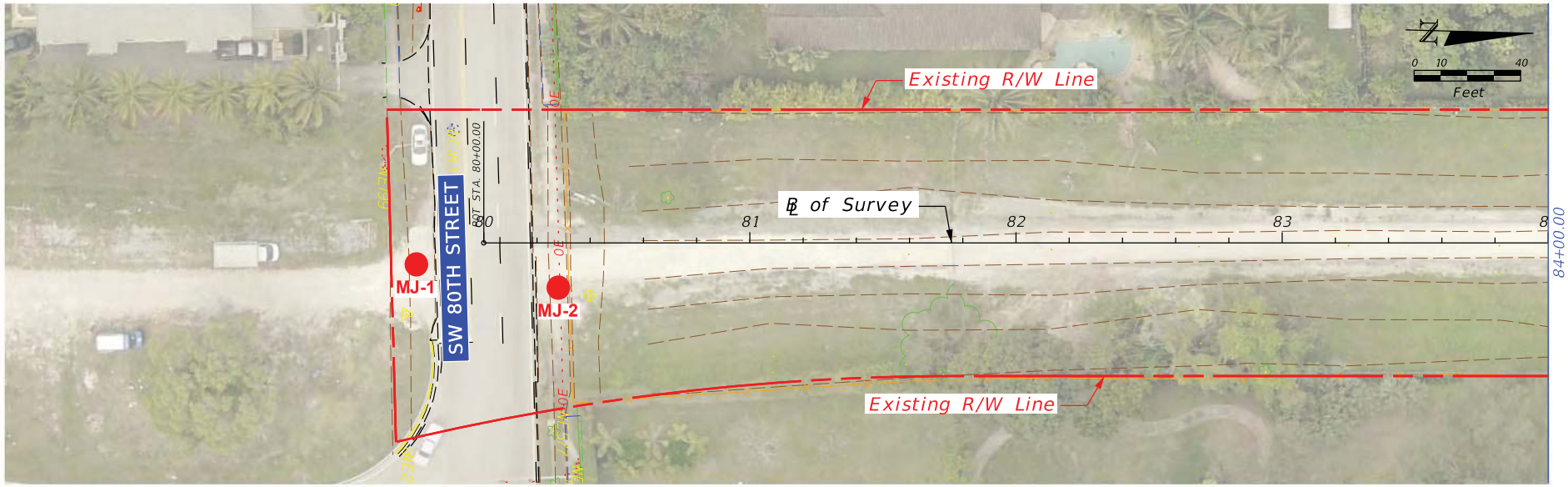
LUDLAM TRAIL CORRIDOR
ACQUISITION ANALYSIS PLANNING
FROM NORTH OF NW 7TH STREET
TO SW 80TH STREET
MIAMI-DADE COUNTY, FLORIDA

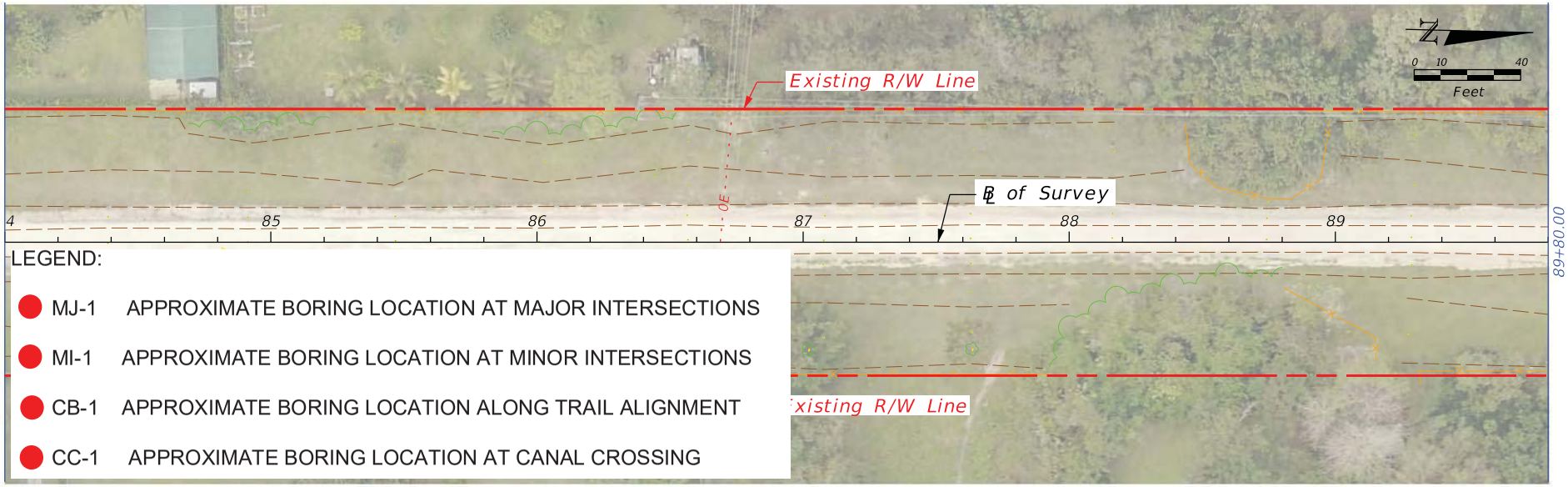
DRAWN	SCALE	PROJ. No.
MK	N.T.S.	218144
CHECKED	DATE	SHEET 3
OR	OCT., 2018	

LUDLAM TRAIL CORRIDOR - ACQUISITION ANALYSIS AND PLANNING
FROM NORTH OF NW 7TH STREET TO SW 80TH STREET
MIAMI-DADE COUNTY, FLORIDA
GEOSOL Project No. 218144

TABLE 1 - SUMMARY OF TEST BORING LOCATIONS

BORING / TEST No.	APPROXIMATE TEST LOCATION (FEET)							GROUND SURFACE ELEVATION (FEET; NAVD 1988)
	NORTHING	EASTING	LATITUDE	LONGITUDE	STATION	OFFSET	REFERENCE	
MJ-1	495843	884544	25.696115	-80.306467	79+75	8 RT	B/L OF SURVEY	11.6
MJ-2	495899	884553	25.696267	-80.306440	80+30	18 RT	B/L OF SURVEY	11.4
CB-1	497184	884481	25.699803	-80.306636	93+16	20 LT	B/L OF SURVEY	9.8
MJ-3	498489	884467	25.703395	-80.306660	106+21	1 LT	B/L OF SURVEY	11.9
MJ-4	498569	884465	25.703614	-80.306665	107+01	1 LT	B/L OF SURVEY	11.5
CB-2	499837	884420	25.707103	-80.306781	119+70	13 LT	B/L OF SURVEY	10.7
MI-1	501153	884389	25.710725	-80.306855	132+86	10 LT	B/L OF SURVEY	12.4
CB-3	501846	884396	25.712631	-80.306820	139+79	15 RT	B/L OF SURVEY	12.9
MI-2	502515	884354	25.714473	-80.306937	146+49	9 LT	B/L OF SURVEY	14.1
MJ-5	503828	884340	25.718086	-80.306960	159+62	10 RT	B/L OF SURVEY	13.4
MJ-6	503921	884317	25.718341	-80.307028	160+55	10 LT	B/L OF SURVEY	13.0
CB-4	505266	884287	25.722042	-80.307098	174+01	6 LT	B/L OF SURVEY	11.3
CB-5	506601	884275	25.725717	-80.307112	187+36	17 RT	B/L OF SURVEY	9.5
CB-6	507931	884258	25.729375	-80.307144	200+65	34 RT	B/L OF SURVEY	9.0
CB-7	508574	884234	25.731145	-80.307205	207+09	27 RT	B/L OF SURVEY	6.9
MJ-7	509295	884193	25.733129	-80.307319	214+31	4 RT	B/L OF SURVEY	8.8
MJ-8	509409	884190	25.733442	-80.307328	215+45	3 RT	B/L OF SURVEY	8.7
CB-8	510622	884156	25.736781	-80.307411	227+59	1 RT	B/L OF SURVEY	11.7
MI-3	511877	884125	25.740234	-80.307484	240+14	3 RT	B/L OF SURVEY	15.6
CB-9	513070	884092	25.743515	-80.307564	252+07	1 RT	B/L OF SURVEY	10.9
MJ-9	514657	884051	25.747883	-80.307665	267+94	0	B/L OF SURVEY	9.2
MJ-10	514770	884051	25.748195	-80.307664	269+08	3 RT	B/L OF SURVEY	9.9
MI-4	515520	884038	25.750259	-80.307690	276+58	10 RT	B/L OF SURVEY	9.1
MI-5	515911	884042	25.751332	-80.307673	280+48	23 RT	B/L OF SURVEY	8.8
CB-10	516685	884000	25.753464	-80.307787	288+23	1 RT	B/L OF SURVEY	8.6
MI-6	517525	883991	25.755774	-80.307802	296+63	14 RT	B/L OF SURVEY	7.8
MI-7	518786	883964	25.759244	-80.307862	309+24	20 RT	B/L OF SURVEY	8.2
MJ-11	520104	883901	25.762870	-80.308033	322+43	9 LT	B/L OF SURVEY	9.9
MJ-12	520185	883918	25.763093	-80.307980	323+24	10 RT	B/L OF SURVEY	9.1
MI-8	521454	883867	25.766587	-80.308114	335+94	8 LT	B/L OF SURVEY	9.5
MJ-13	522776	883833	25.770224	-80.308196	349+16	8 LT	B/L OF SURVEY	10.5
MJ-14	522859	883824	25.770451	-80.308225	349+99	16 LT	B/L OF SURVEY	10.8
CB-11	524637	883774	25.775346	-80.308348	367+79	20 LT	B/L OF SURVEY	5.6
CB-12	525761	883844	25.778437	-80.308117	379+00	79 RT	B/L OF SURVEY	6.0
CC-1	511653	884130	25.739618	-80.307473	237+90	2 RT	B/L OF SURVEY	14.8
CC-2	511757	884124	25.739905	-80.307489	238+94	2 LT	B/L OF SURVEY	15.4
CC-3	523391	883823	25.771917	-80.308218	355+32	2 LT	B/L OF SURVEY	11.6
CC-4	523504	883777	25.772227	-80.308355	356+42	45 LT	B/L OF SURVEY	5.5





LEGEND:

- MJ-1 APPROXIMATE BORING LOCATION AT MAJOR INTERSECTIONS
- MI-1 APPROXIMATE BORING LOCATION AT MINOR INTERSECTIONS
- CB-1 APPROXIMATE BORING LOCATION ALONG TRAIL ALIGNMENT
- CC-1 APPROXIMATE BORING LOCATION AT CANAL CROSSING

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

MIAMI-DADE COUNTY

LUDLAM TRAIL CORRIDOR PD&E STUDY

Miami-Dade County Parks, Recreation, and Open Spaces (MDPROS)

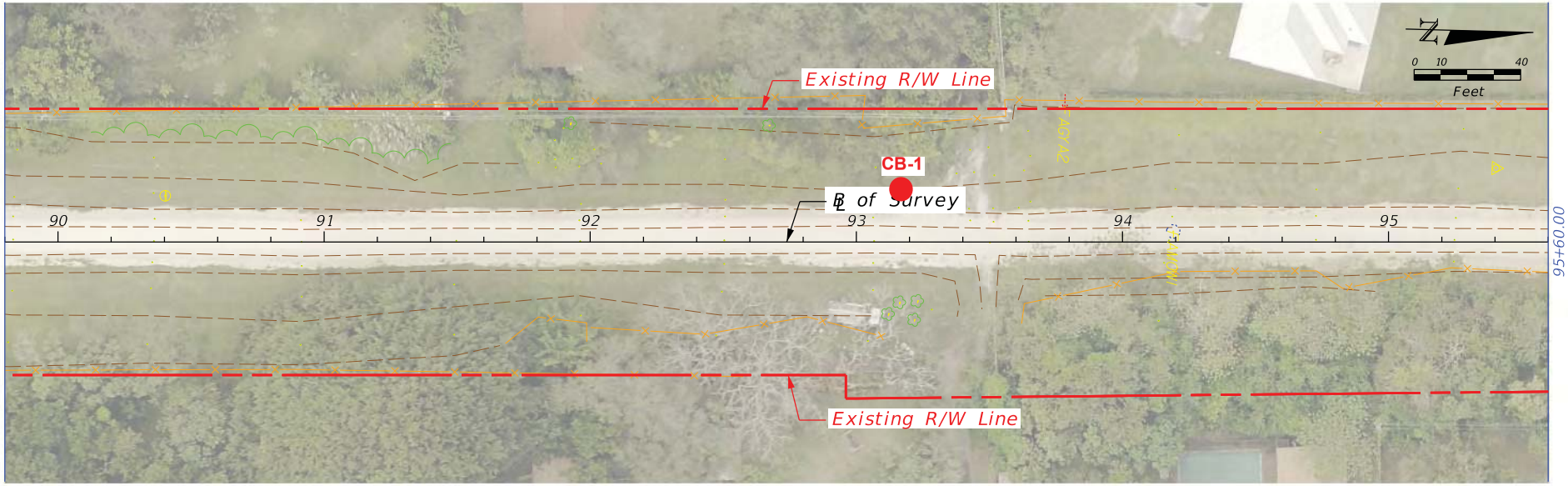
Hickman Building 275 NW 2nd Street Miami, FL 33128 305-755-7800

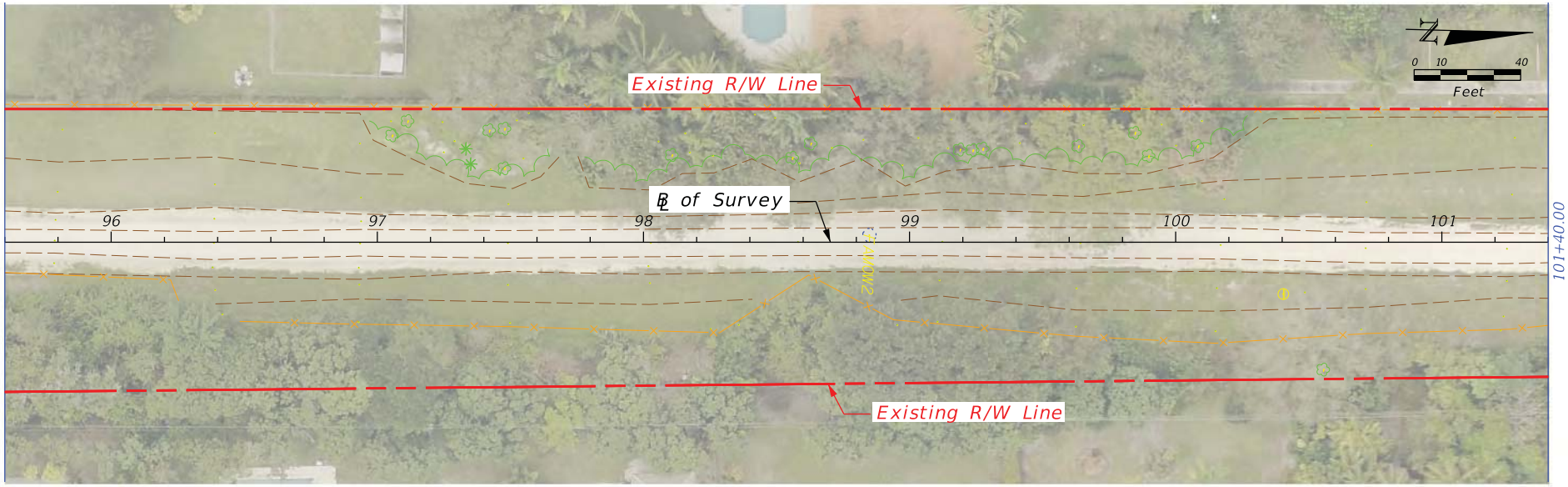
P&R CONTRACT NO. RFQ 786B

P&R PROJECT NO. 43502-15-001-14470619

TEST LOCATION PLANS

SHEET NO. 4





REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

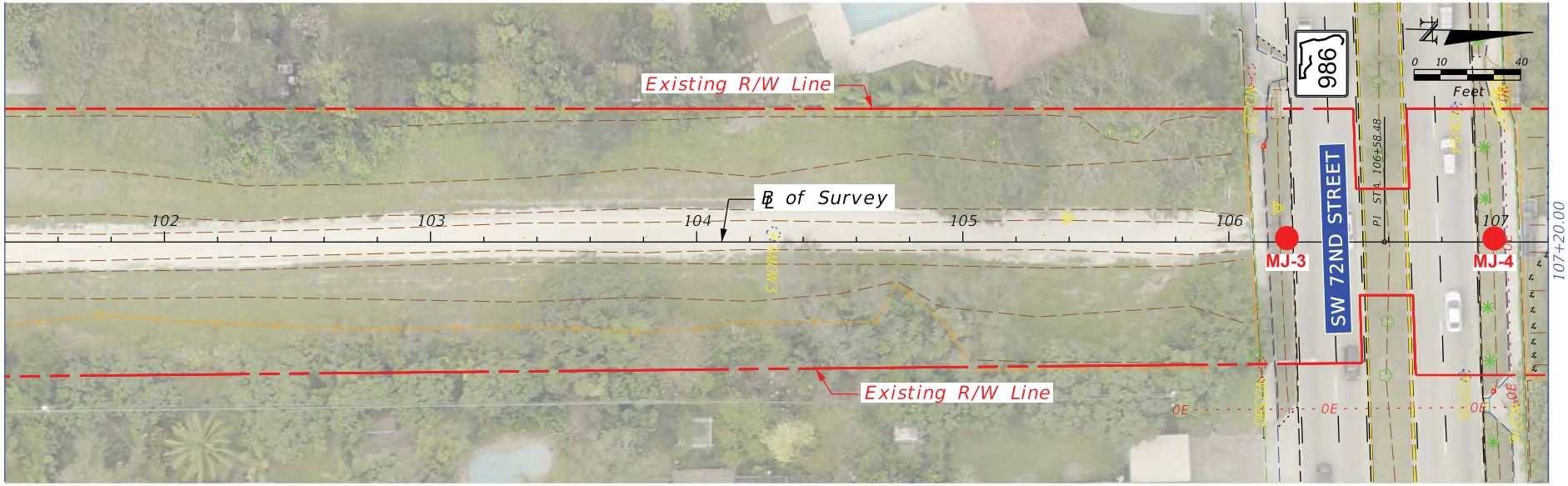
MIAMI-DADE COUNTY

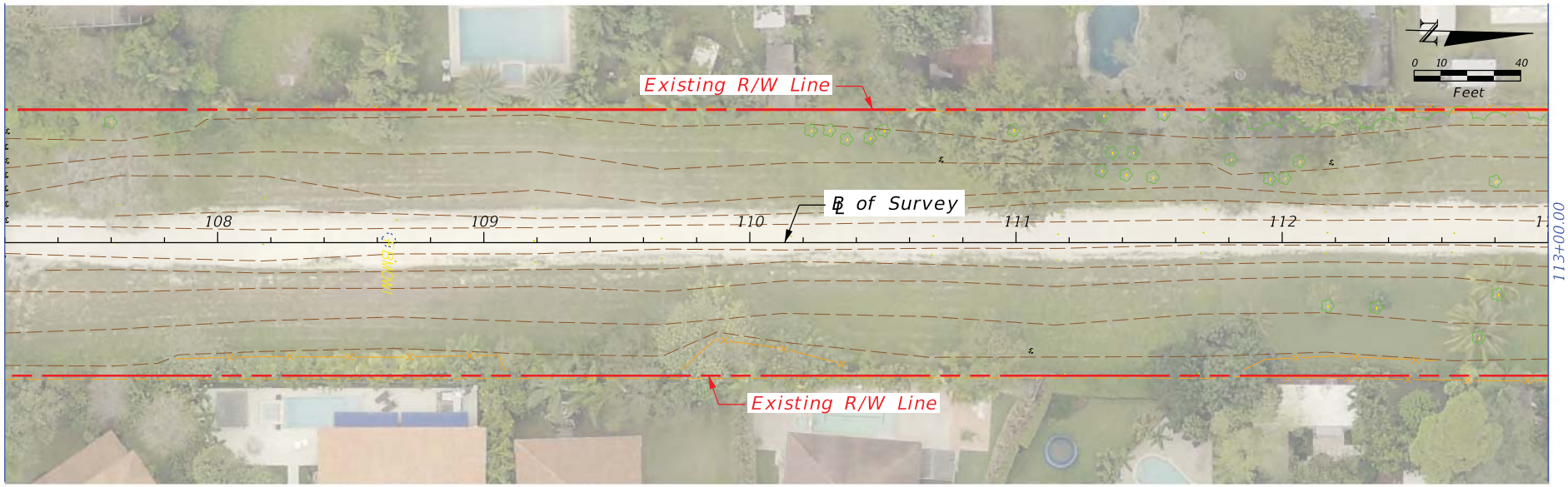
LUDLAM TRAIL CORRIDOR PD&E STUDY

Miami-Dade County Parks, Recreation, and Open Spaces (MDPROS)	Hickman Building 275 NW 2nd Street Miami, FL 33128 305-755-7800	P&R CONTRACT NO. RFQ 786B
		P&R PROJECT NO. 43502-15-001-14470619

TEST LOCATION PLANS

SHEET NO. 5





REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

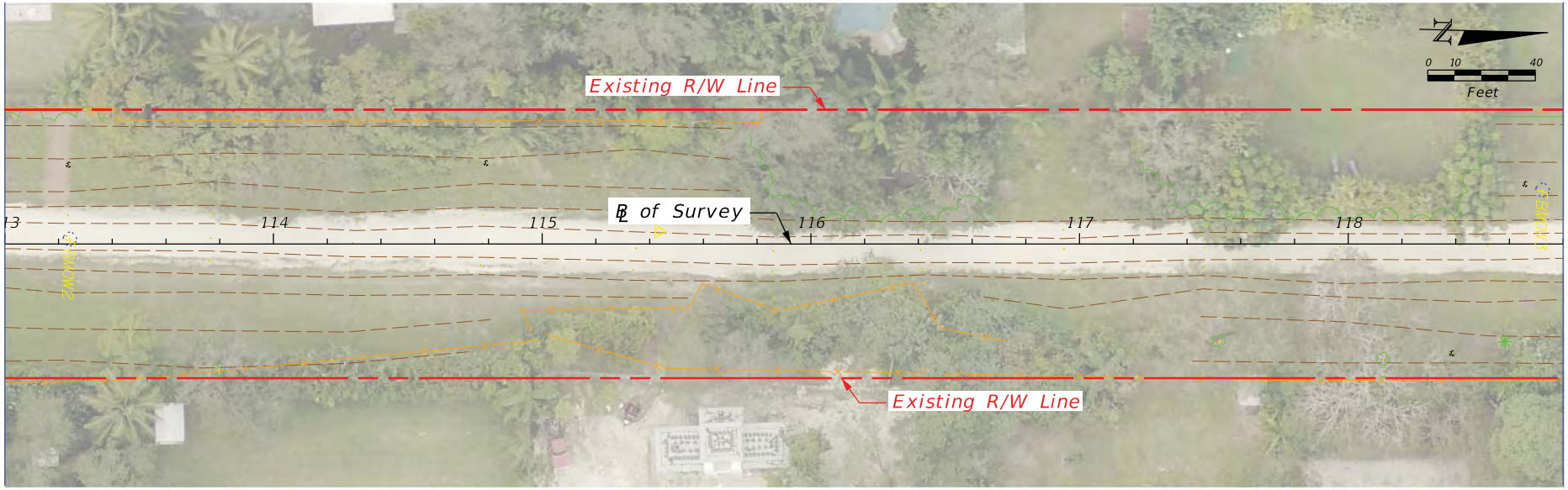
MIAMI-DADE COUNTY

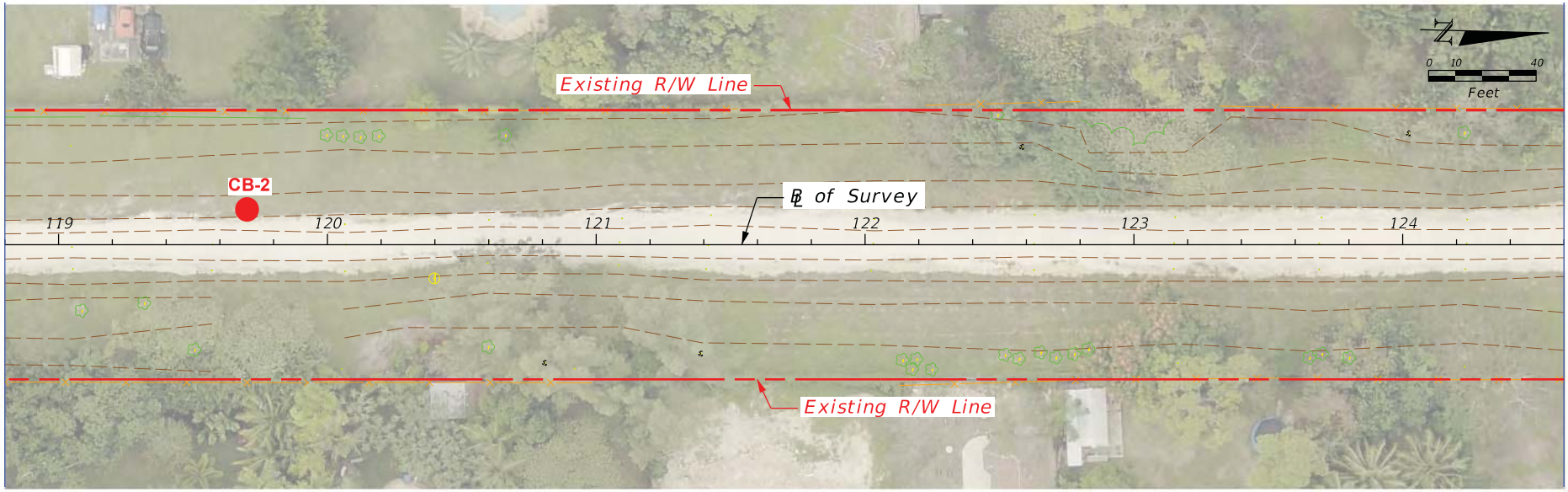
LUDLAM TRAIL CORRIDOR PD&E STUDY

Miami-Dade County Parks, Recreation, and Open Spaces (MDPROS)	Hickman Building 275 NW 2nd Street Miami, FL 33128 305-755-7800	P&R CONTRACT NO. RFQ 786B P&R PROJECT NO. 43502-15-001-14470619

TEST LOCATION PLANS

SHEET NO. 6





REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

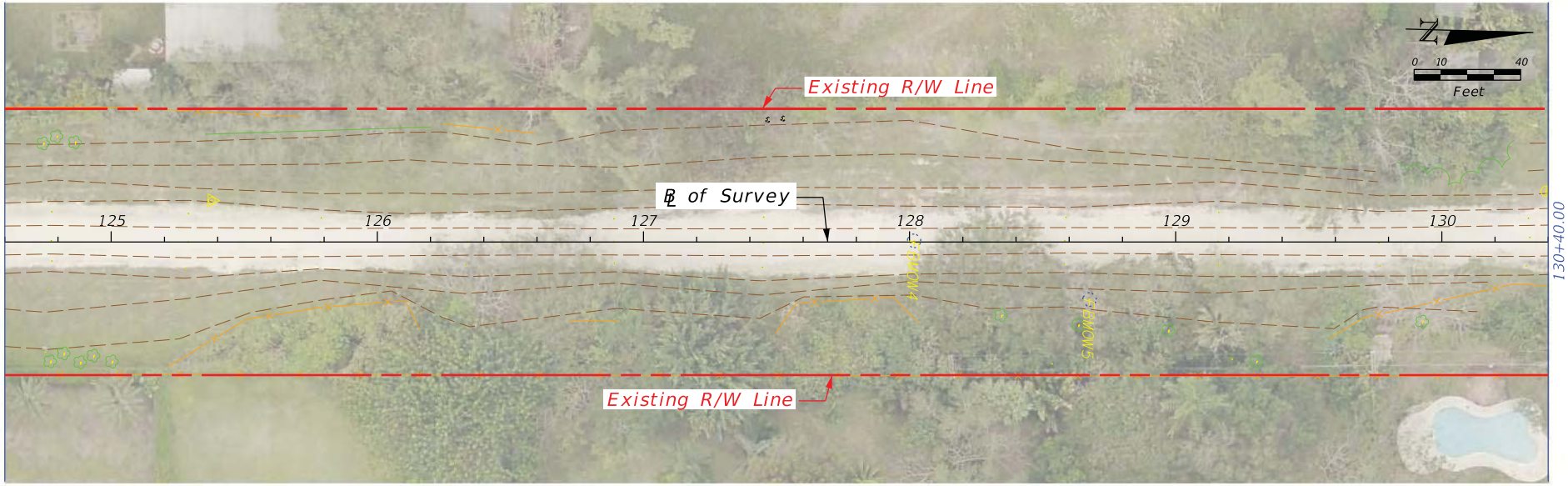
MIAMI-DADE COUNTY

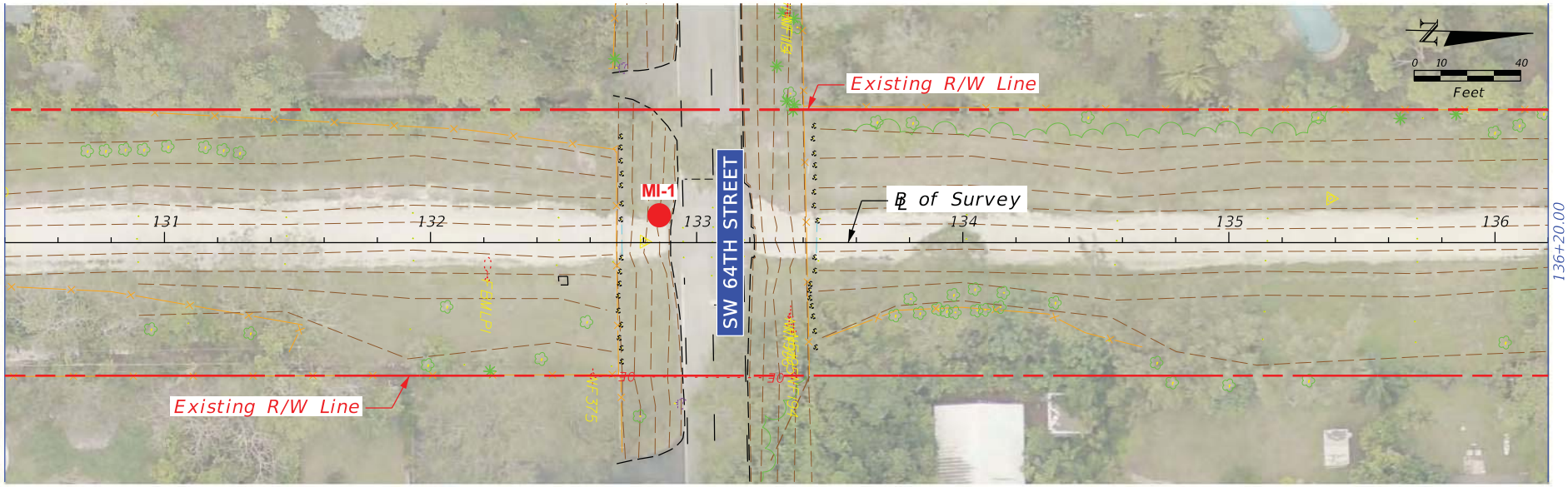
LUDLAM TRAIL CORRIDOR PD&E STUDY

Miami-Dade County Parks, Recreation, and Open Spaces (MDPROS)	Hickman Building 275 NW 2nd Street Miami, FL 33128 305-755-7800	P&R CONTRACT NO. RFQ 786B P&R PROJECT NO. 43502-15-001-14470619

TEST LOCATION PLANS

SHEET NO. 7





REVISIONS			
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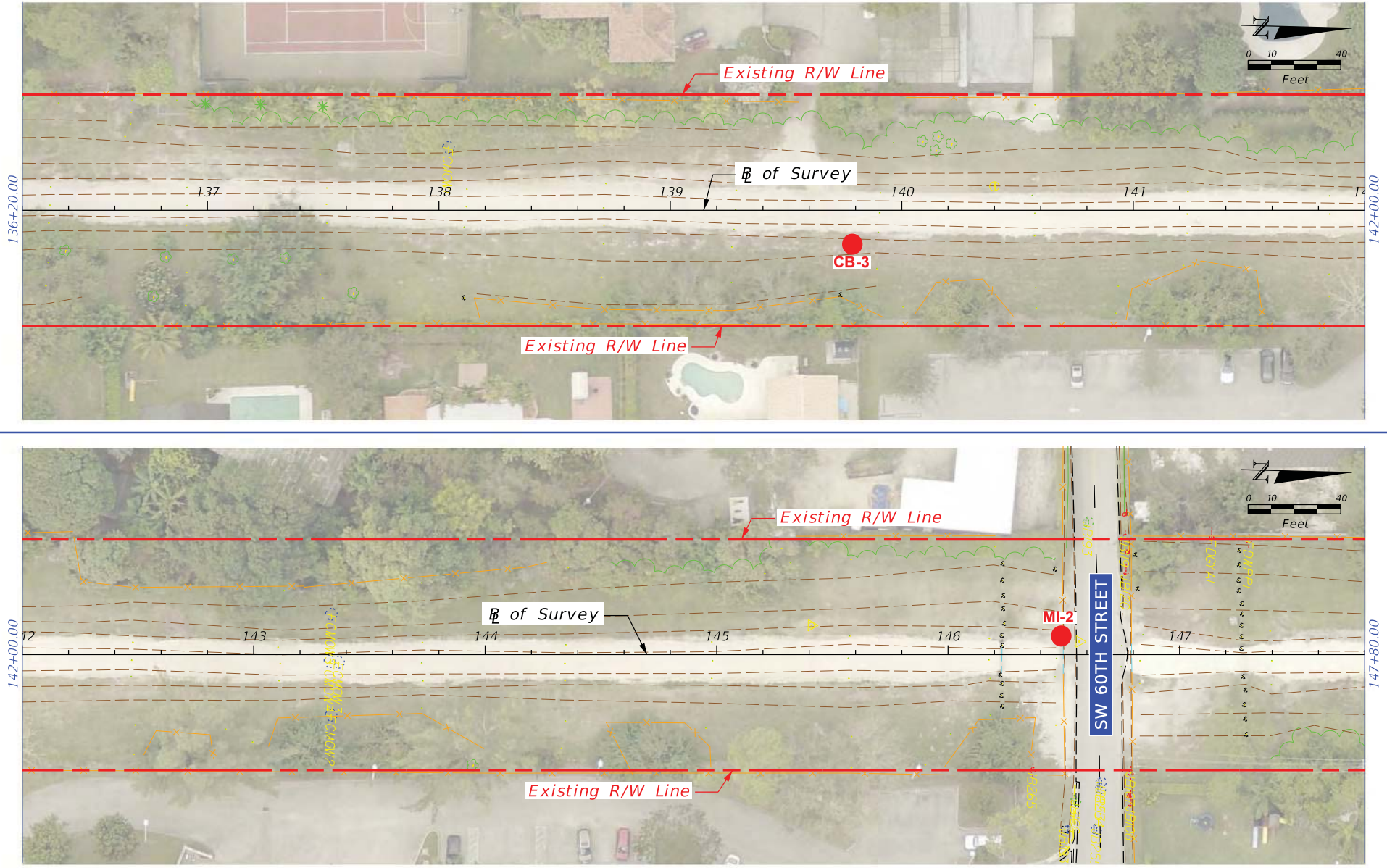
MIAMI-DADE COUNTY

LUDLAM TRAIL CORRIDOR PD&E STUDY

Miami-Dade County Parks, Recreation, and Open Spaces (MDPROS)	Hickman Building 275 NW 2nd Street Miami, FL 33128 305-755-7800	P&R CONTRACT NO. RFQ 786B
		P&R PROJECT NO. 43502-15-001-14470619

TEST LOCATION PLANS

SHEET NO. 8



REVISIONS			
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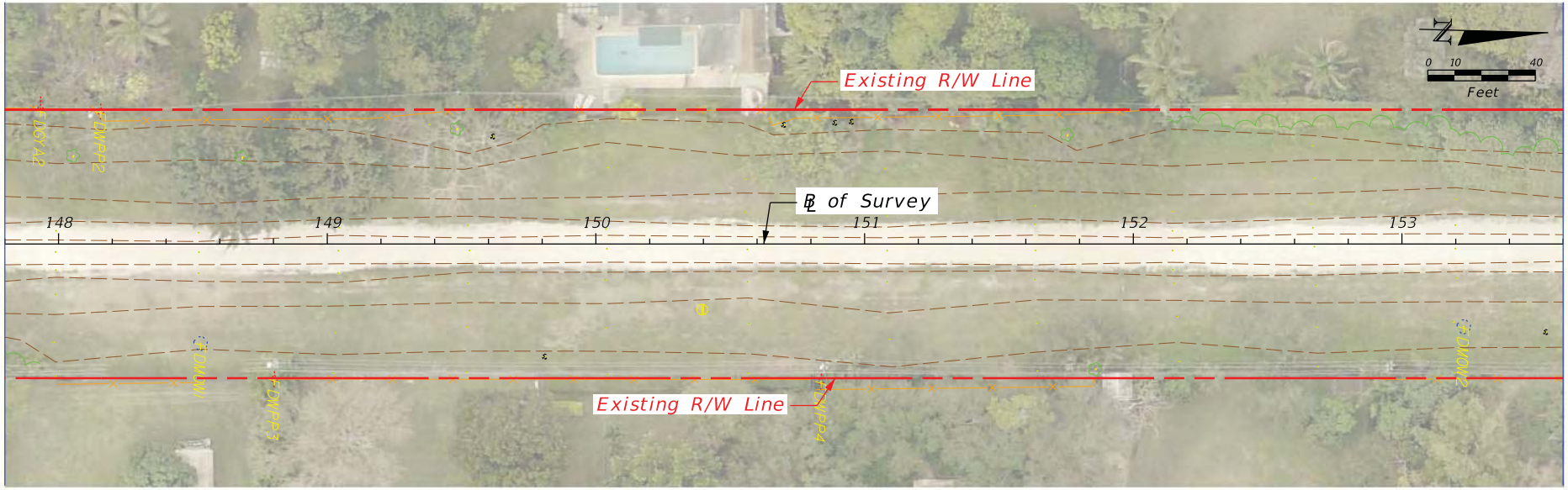
MIAMI-DADE COUNTY

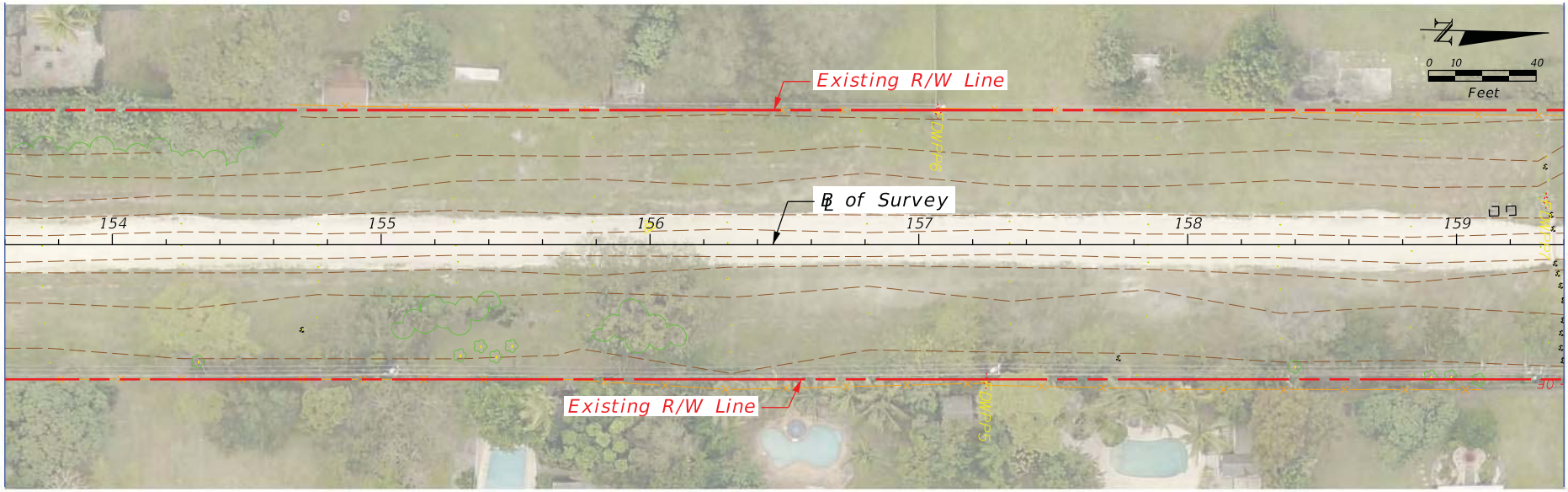
LUDLAM TRAIL CORRIDOR PD&E STUDY

Miami-Dade County Parks, Recreation, and Open Spaces (MDPROS)	Hickman Building 275 NW 2nd Street Miami, FL 33128 305-755-7800	P&R CONTRACT NO. RFQ 786B
		P&R PROJECT NO. 43502-15-001-14470619

TEST LOCATION PLANS

SHEET NO. 9





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MIAMI-DADE COUNTY

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TEST LOCATION PLANS

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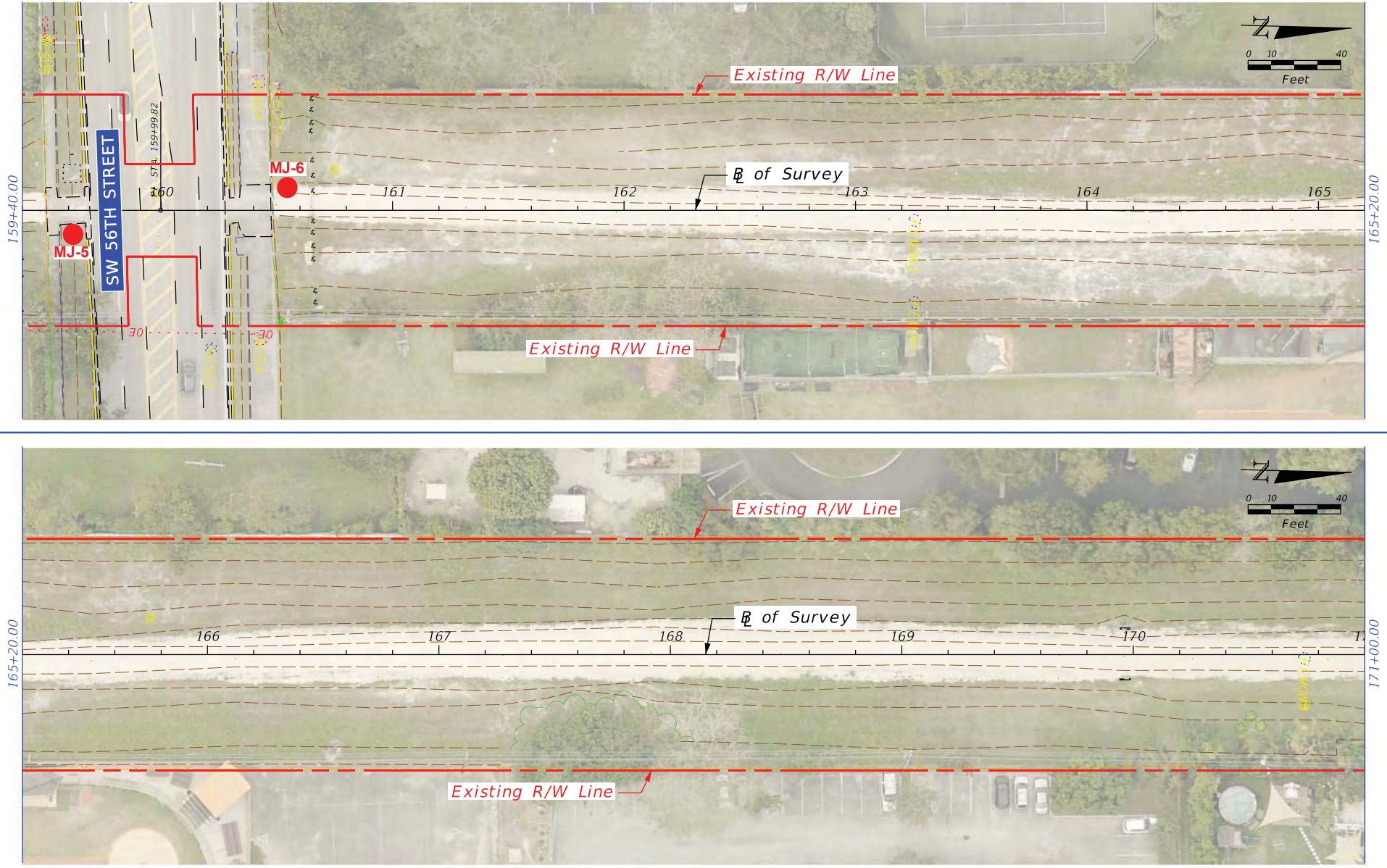

REVISIONS			
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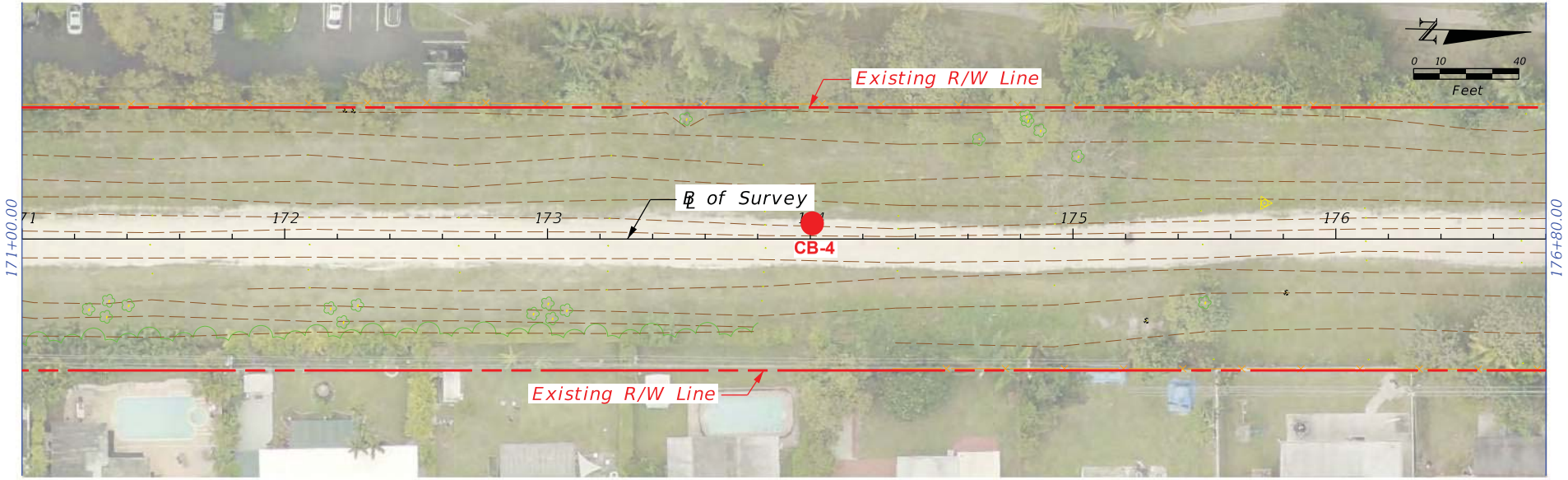
MIAMI-DADE COUNTY

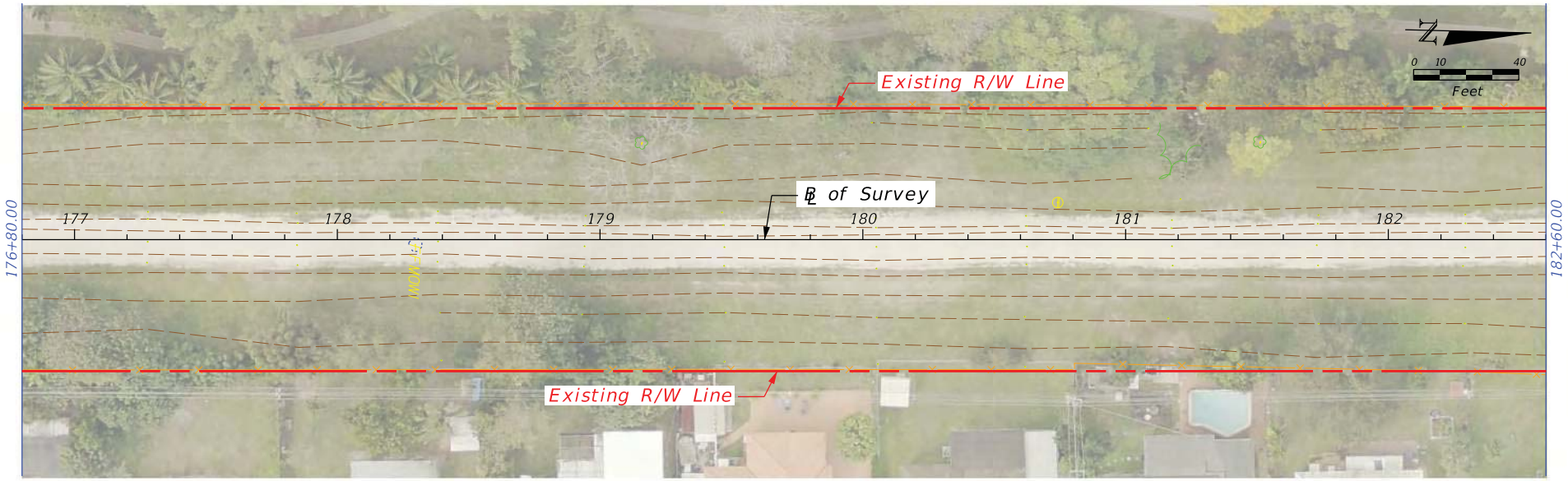
LUDLAM TRAIL CORRIDOR PD&E STUDY

Miami-Dade County Parks, Recreation, and Open Spaces (MDPROS)	Hickman Building 275 NW 2nd Street Miami, FL 33128 305-755-7800	P&R CONTRACT NO. RFQ 786B P&R PROJECT NO. 43502-15-001-14470619

TEST LOCATION PLANS

SHEET NO. 11





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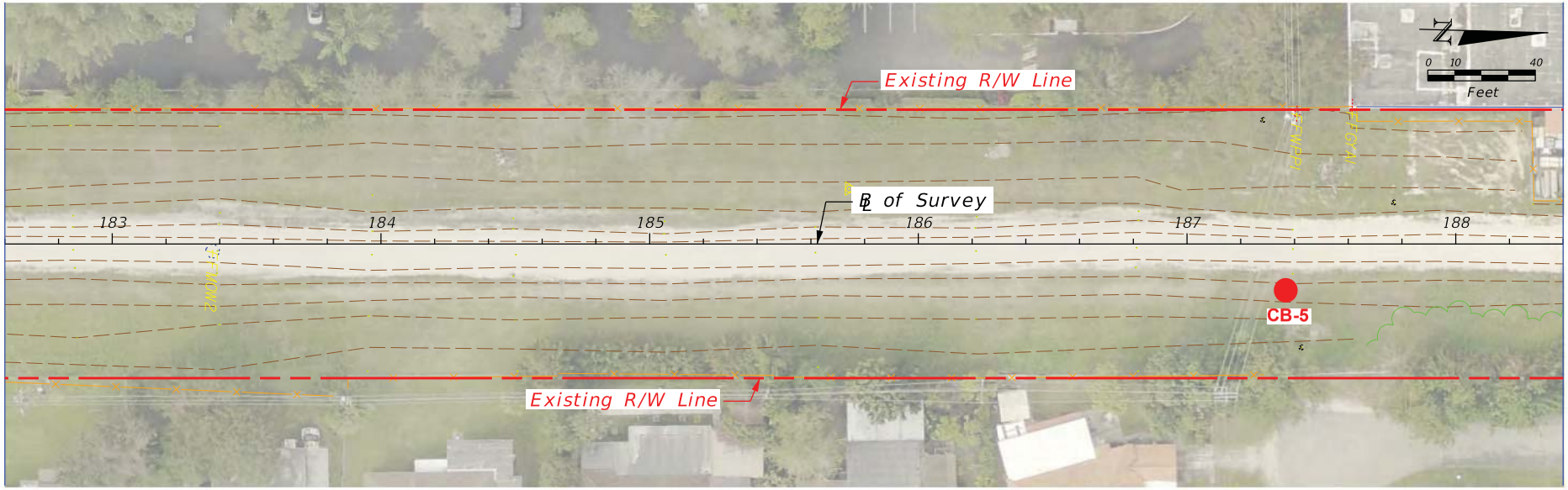
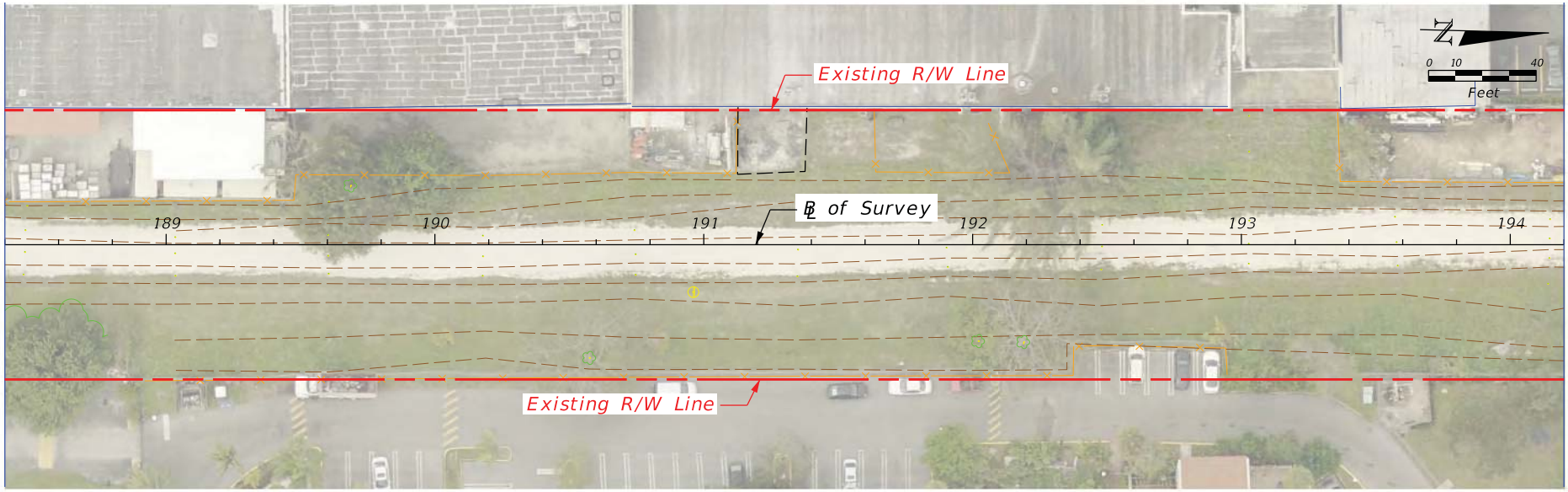
TEST LOCATION PLANS

SHEET NO. 12





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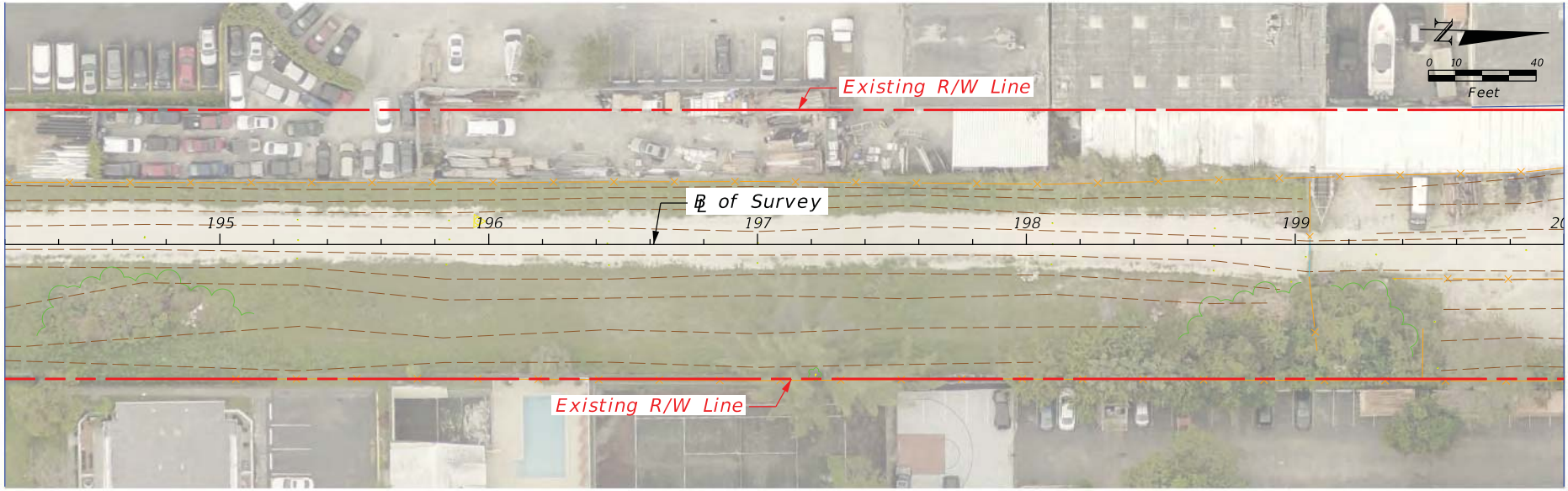
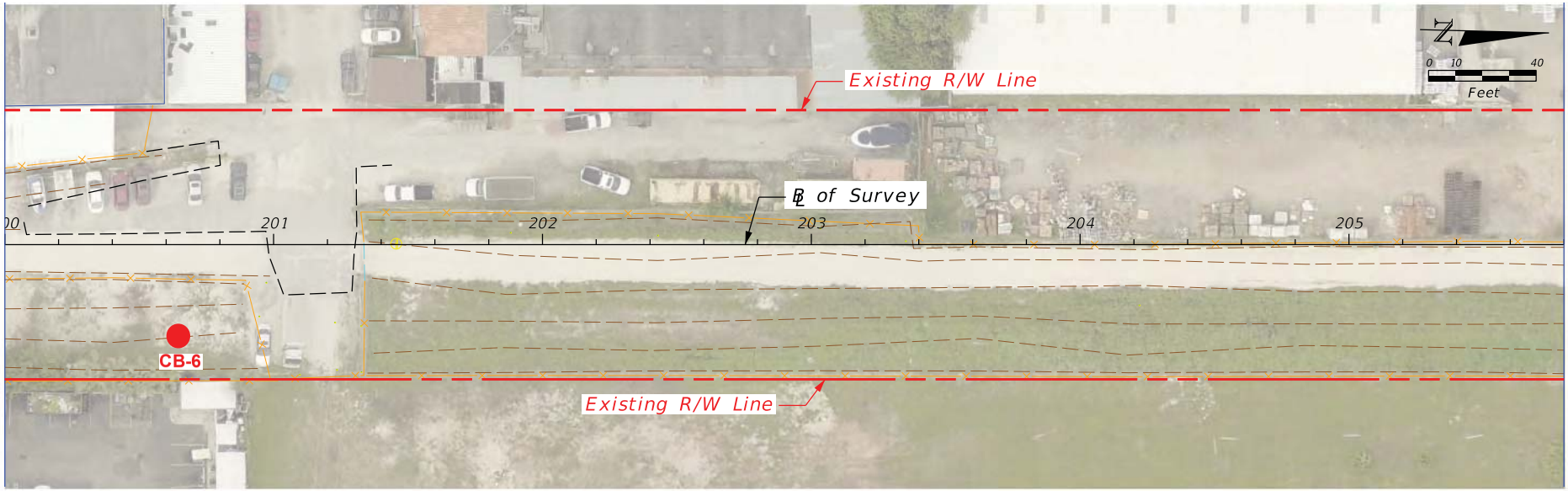
TEST LOCATION PLANS

SHEET NO. 13





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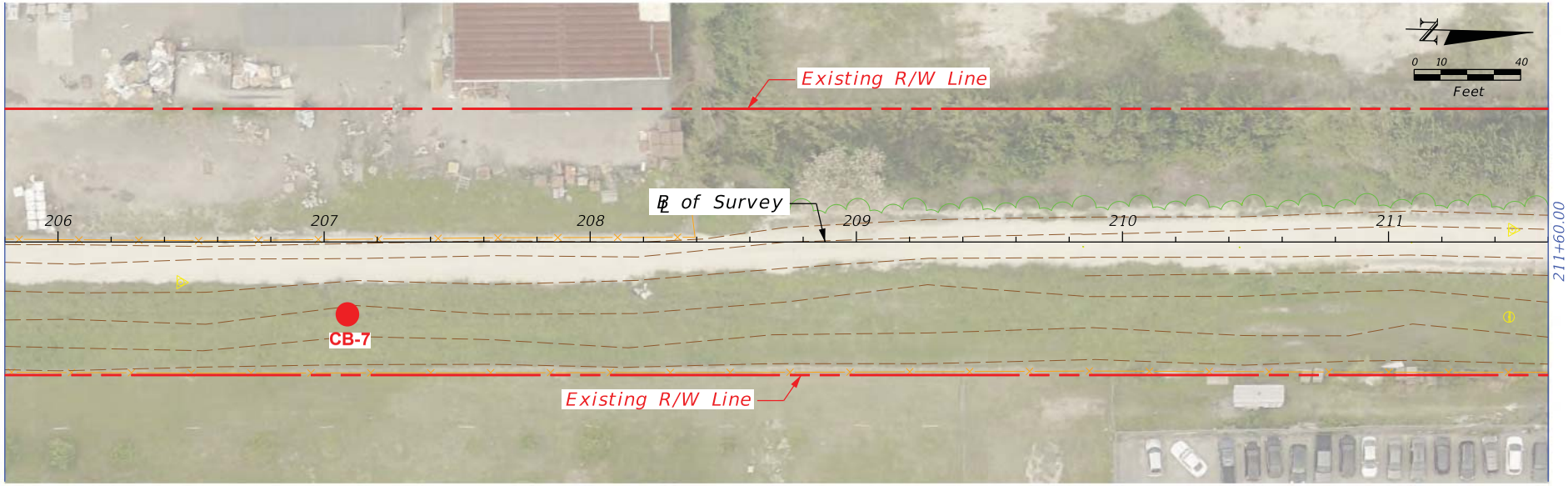
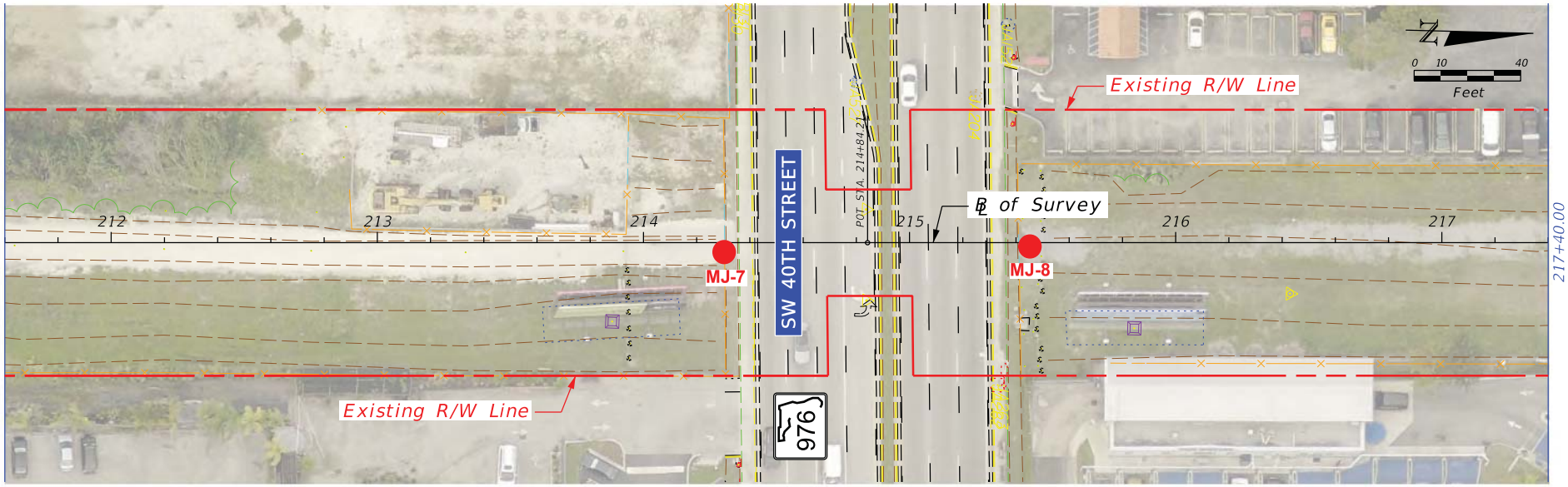
TEST LOCATION PLANS

SHEET NO. 14





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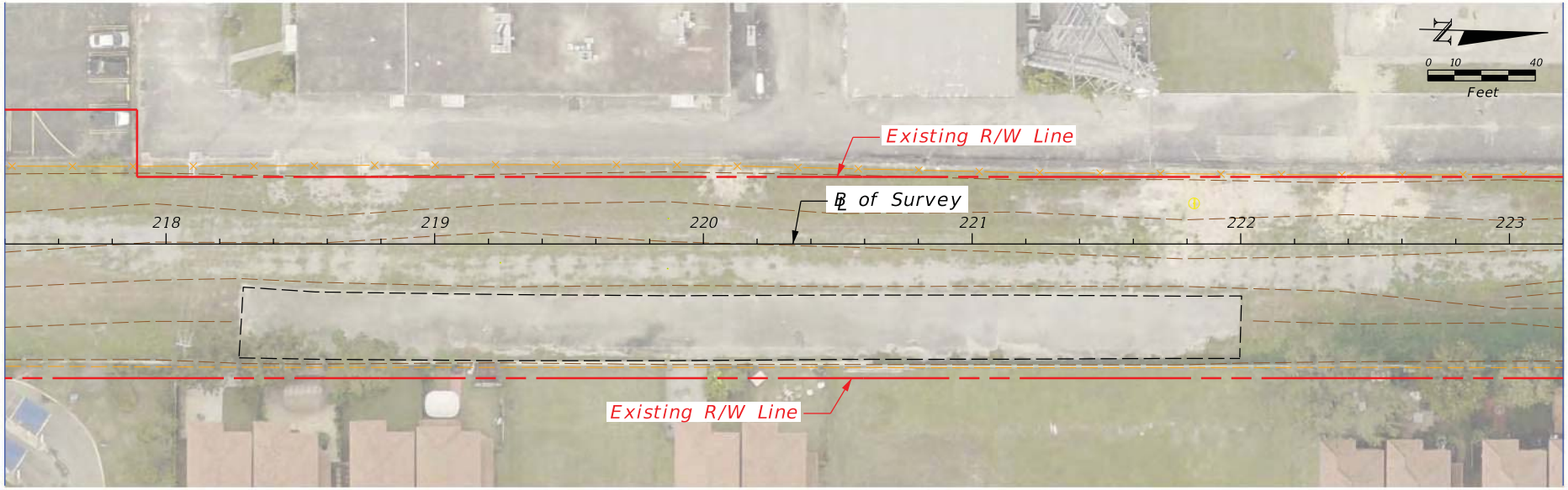
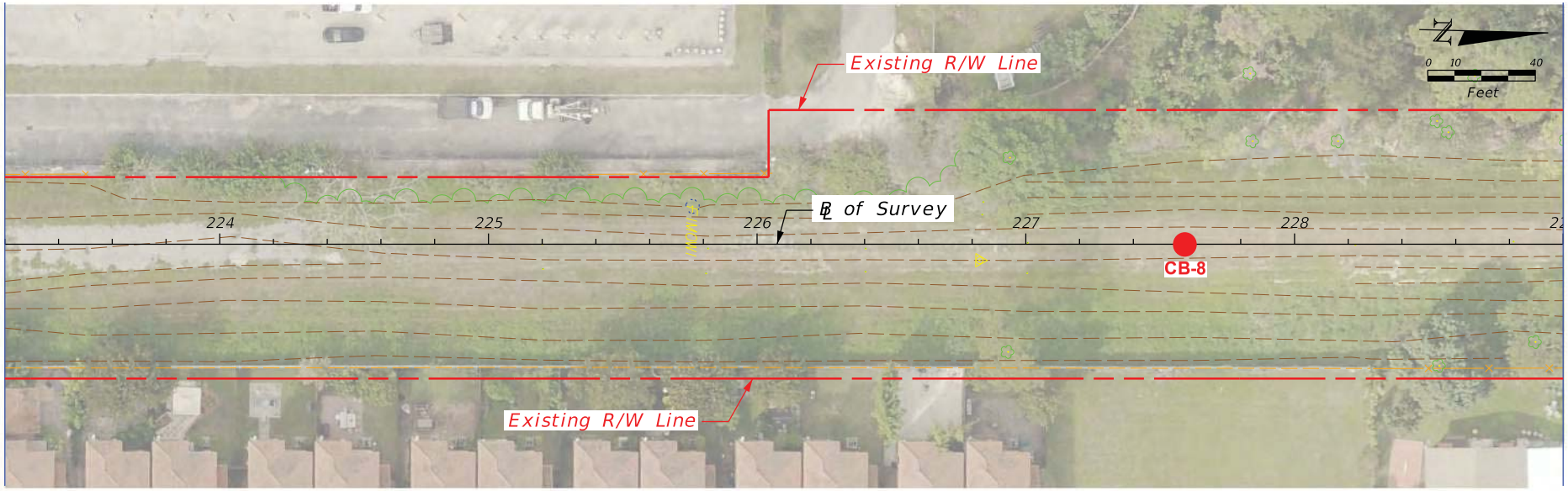
TEST LOCATION PLANS

SHEET NO. 15





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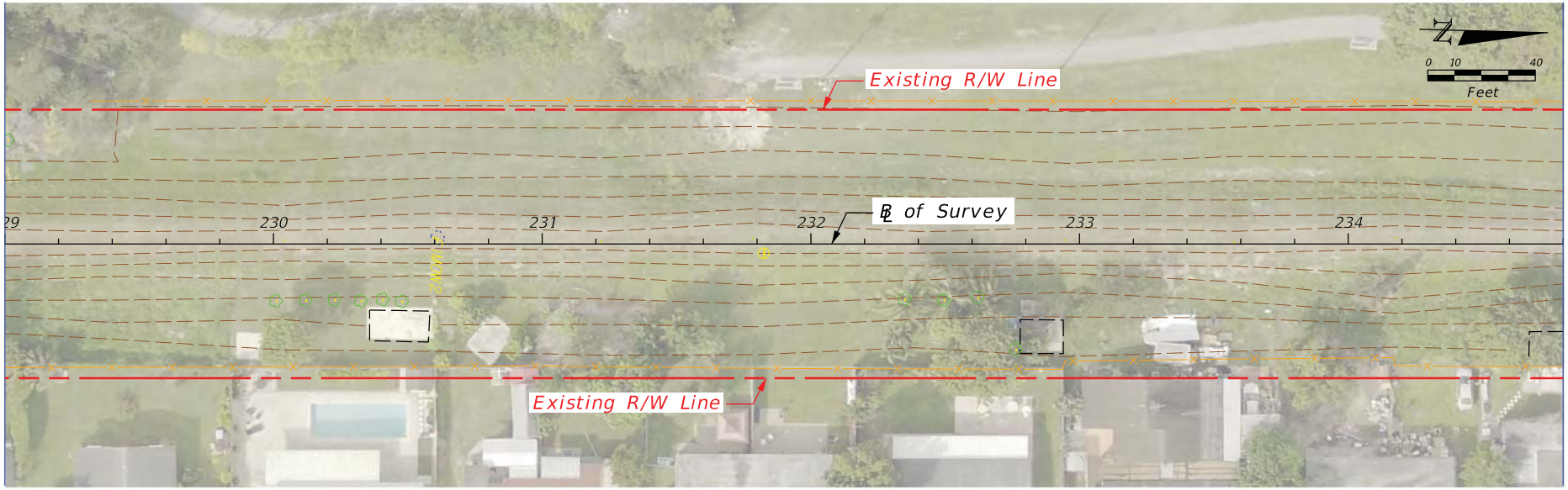
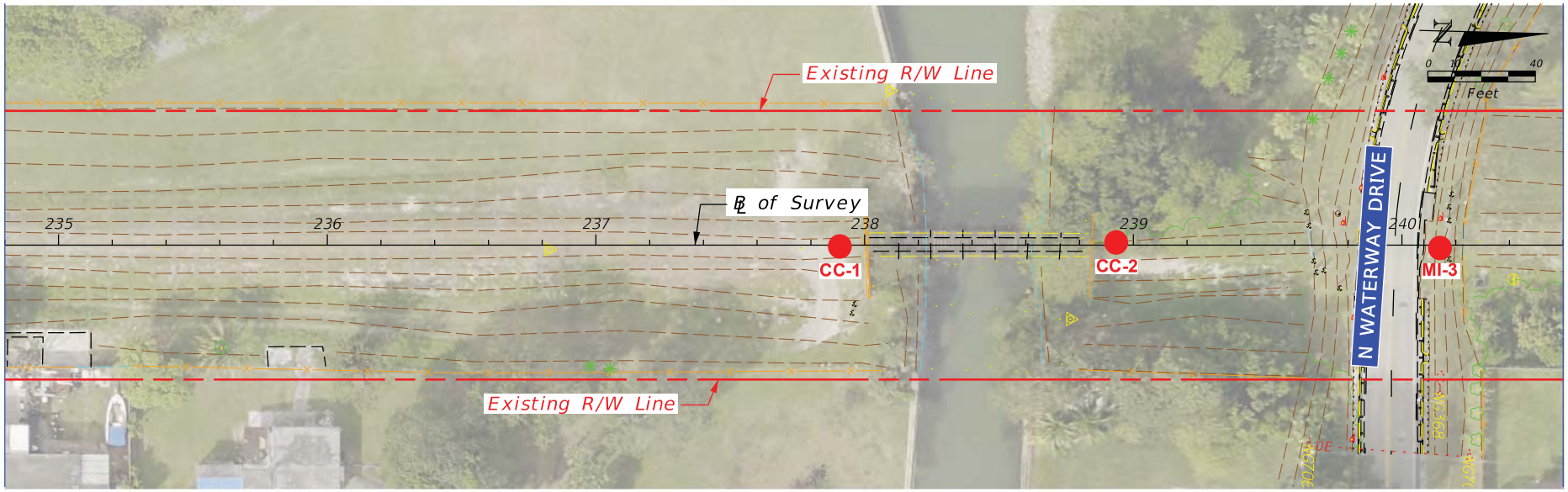
TEST LOCATION PLANS

SHEET NO. 16





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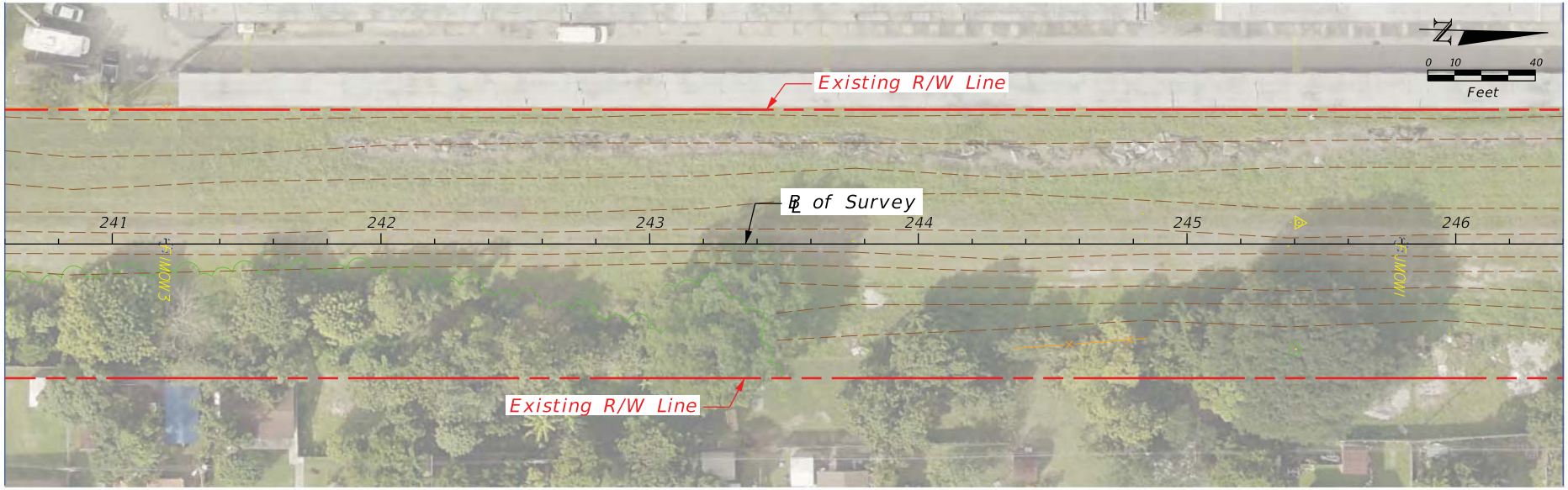
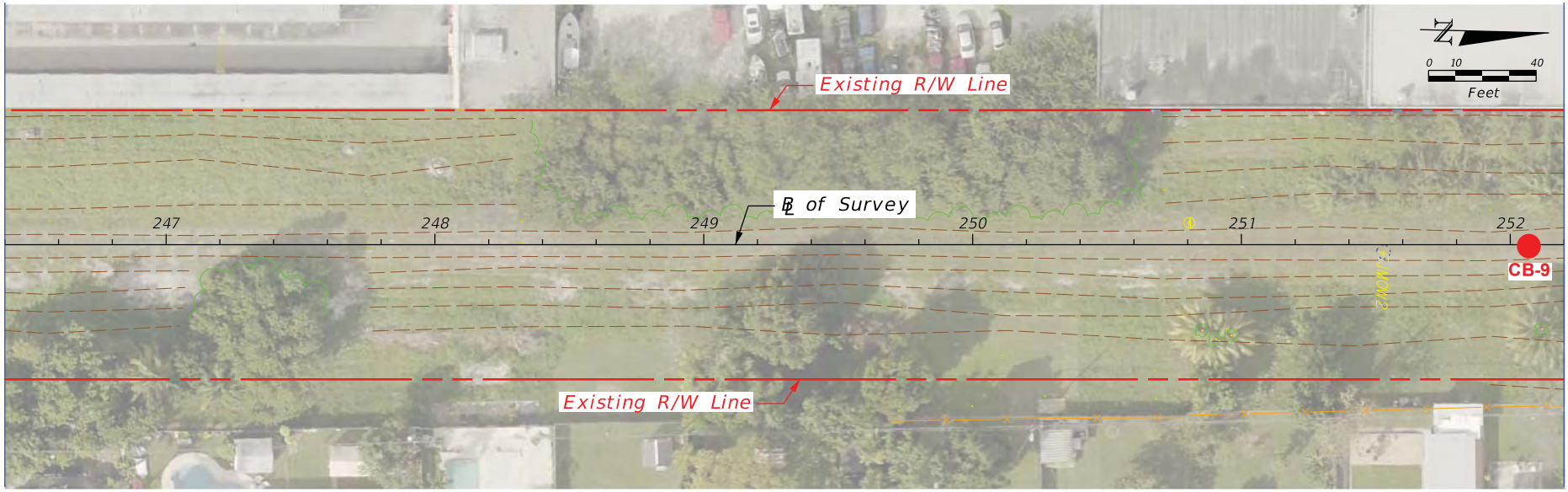
Miami-Dade County Parks, Recreation, and Open Spaces (MDPROS)	Hickman Building 275 NW 2nd Street Miami, FL 33128 305-755-7800	P&R CONTRACT NO. RFQ 786B P&R PROJECT NO. 43502-15-001-14470619

TEST LOCATION PLANS

SHEET NO. 17





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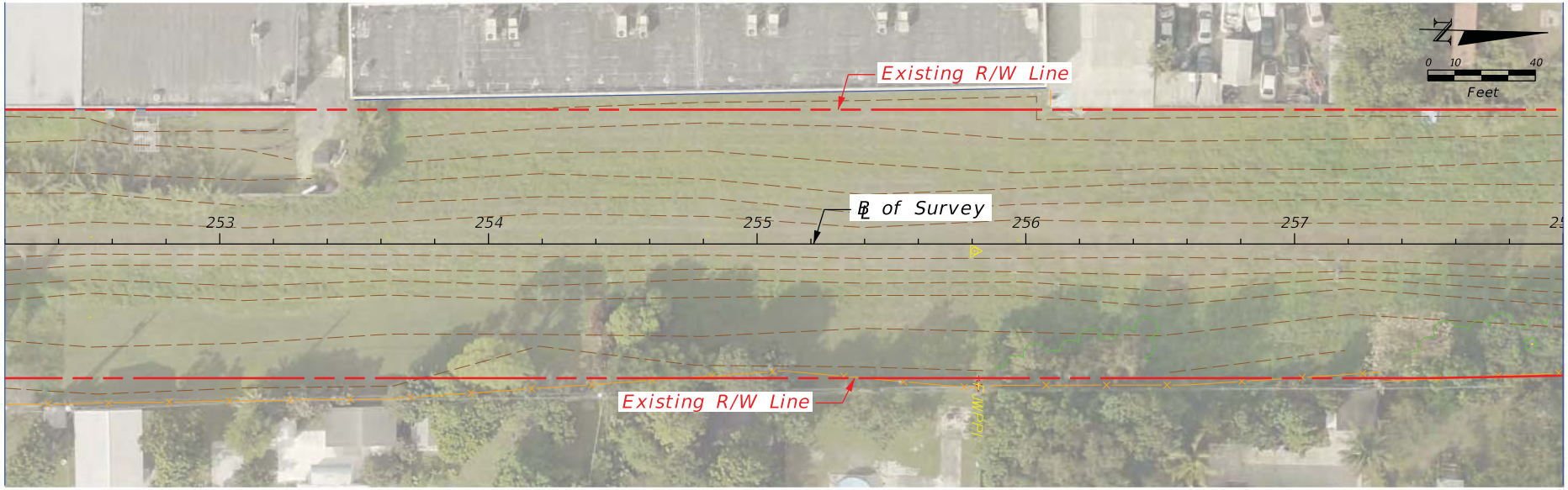
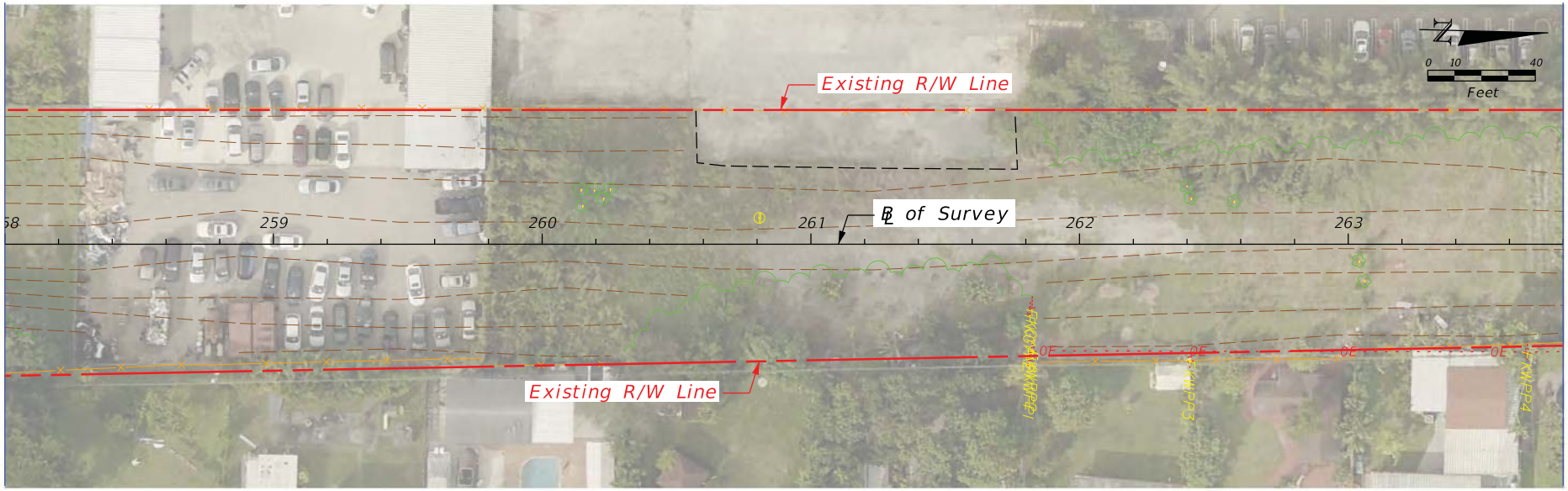
TEST LOCATION PLANS

SHEET NO. 18





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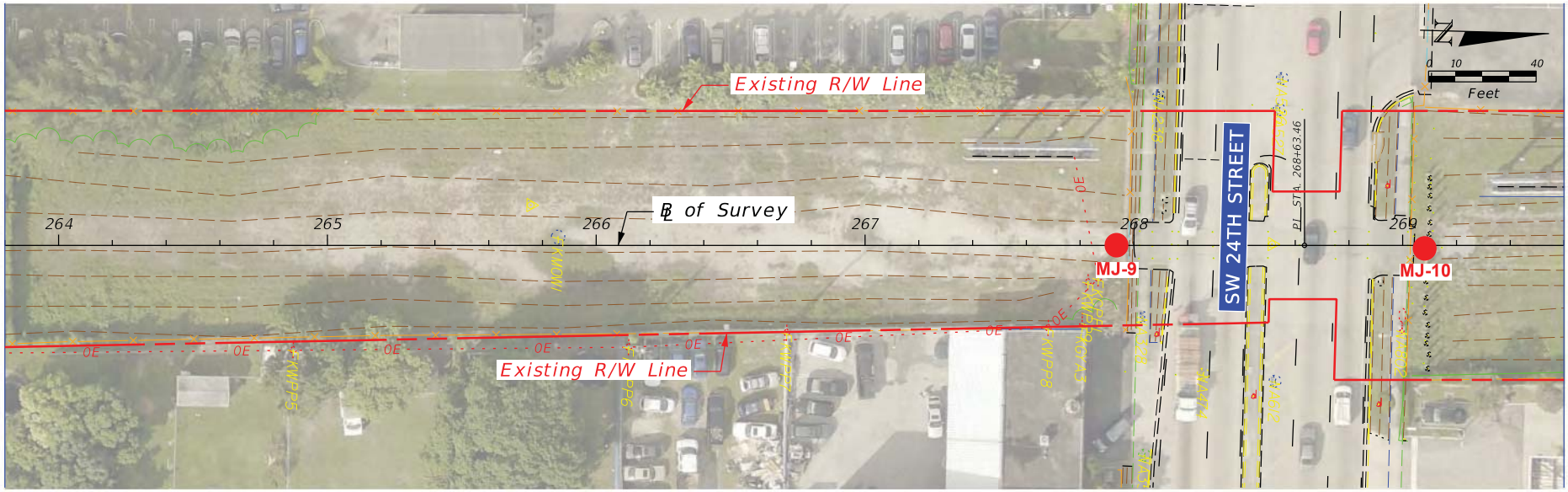
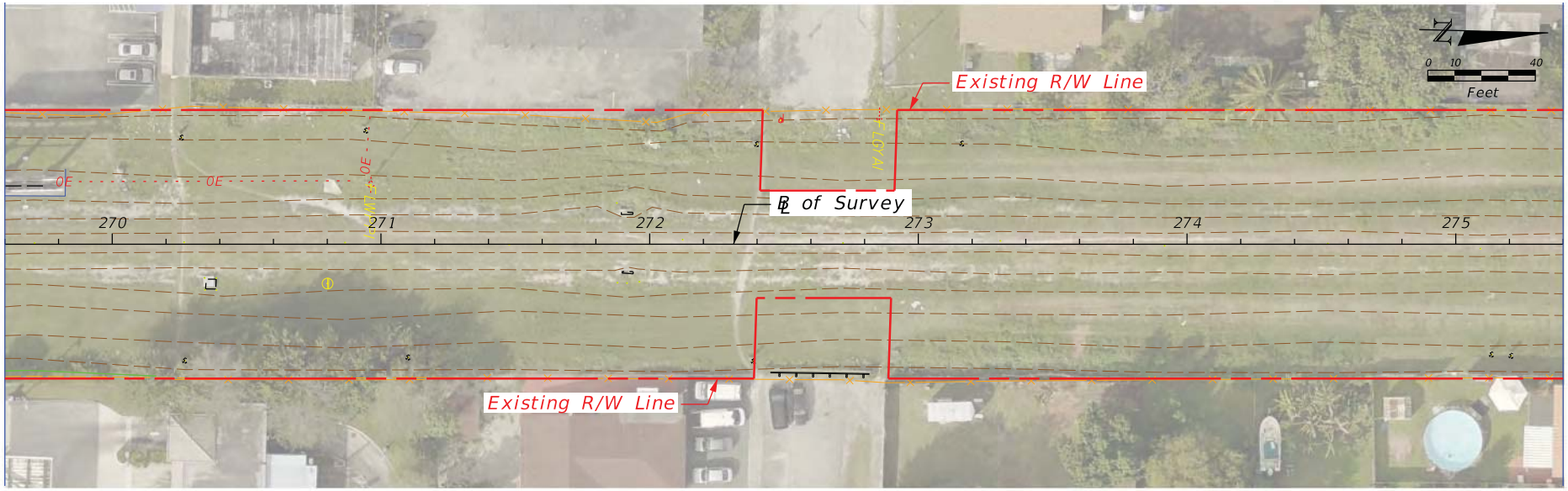
LUDLAM TRAIL CORRIDOR PD&E STUDY

Miami-Dade County Parks, Recreation, and Open Spaces (MDPROS)	Hickman Building 275 NW 2nd Street Miami, FL 33128 305-755-7800	P&R CONTRACT NO. RFQ 786B P&R PROJECT NO. 43502-15-001-14470619

TEST LOCATION PLANS

SHEET NO. 19





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MIAMI-DADE COUNTY

LUDLAM TRAIL CORRIDOR PD&E STUDY

Miami-Dade County Parks, Recreation, and Open Spaces (MDPROS)	Hickman Building 275 NW 2nd Street Miami, FL 33128 305-755-7800	P&R CONTRACT NO. RFQ 786B
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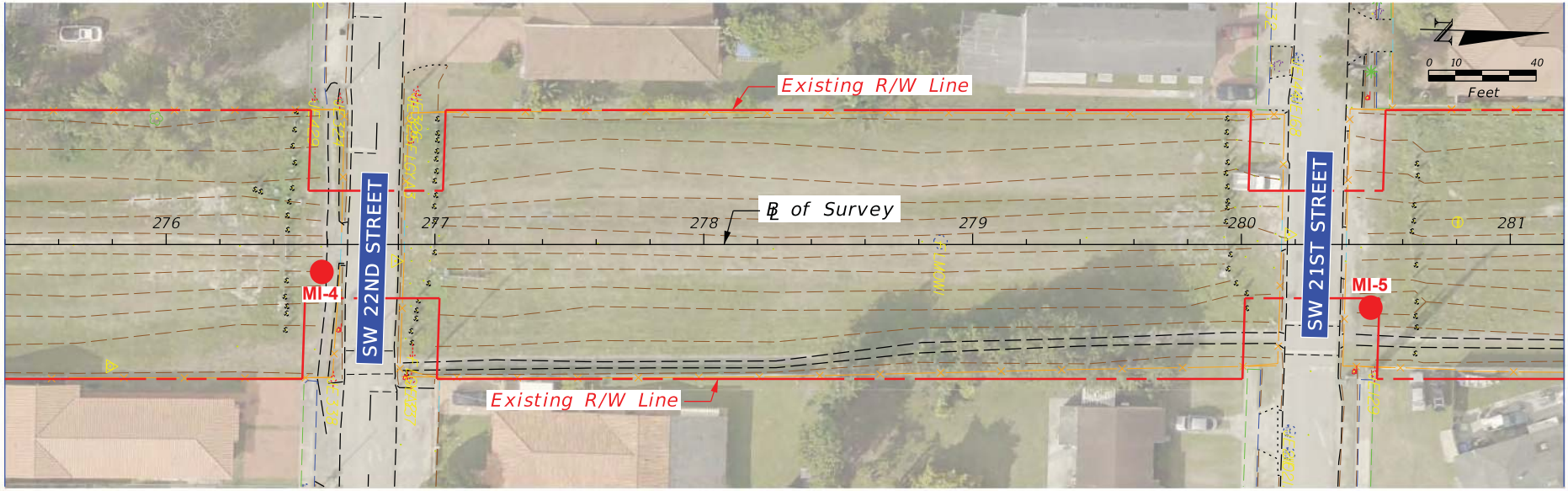
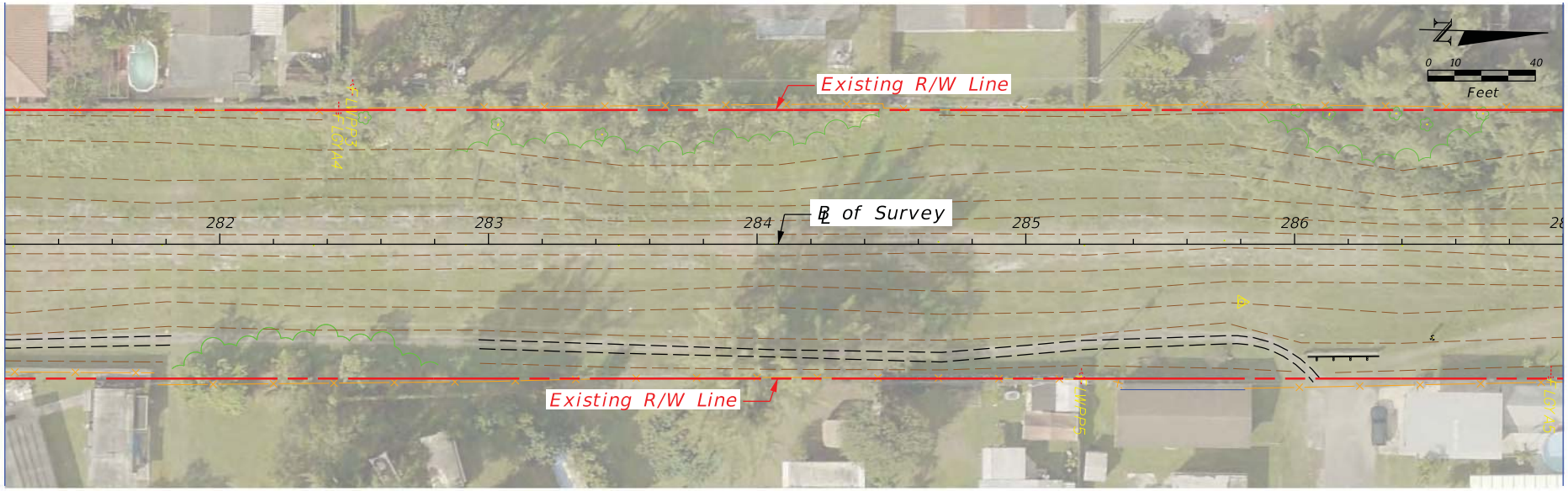
TEST LOCATION PLANS

SHEET NO. 20





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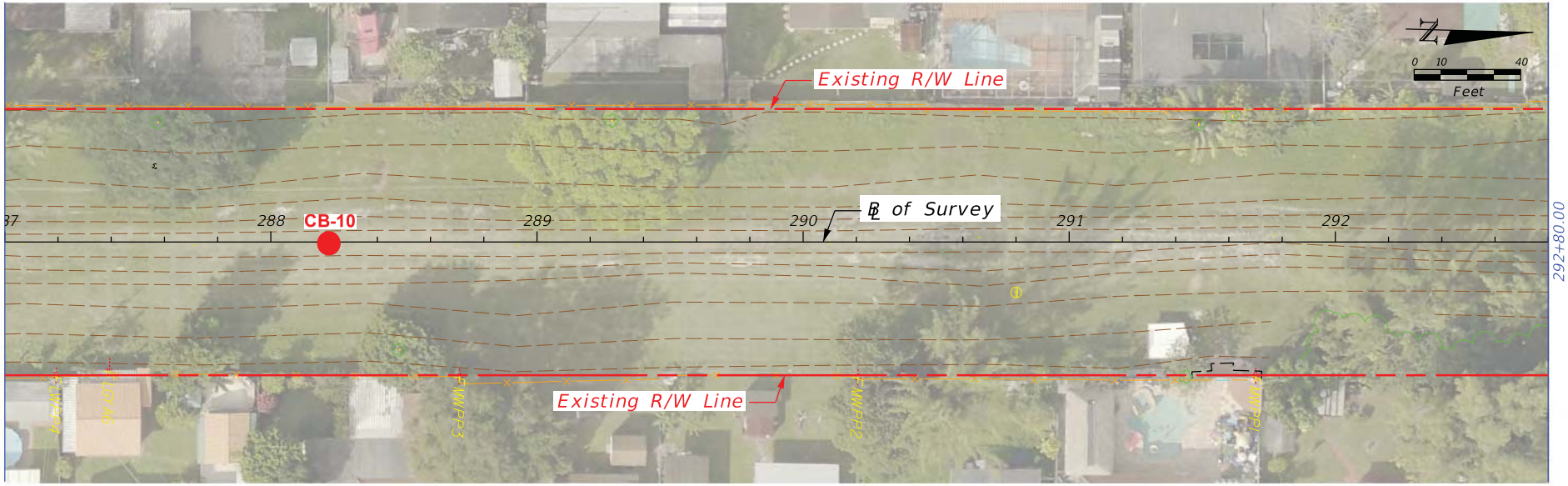
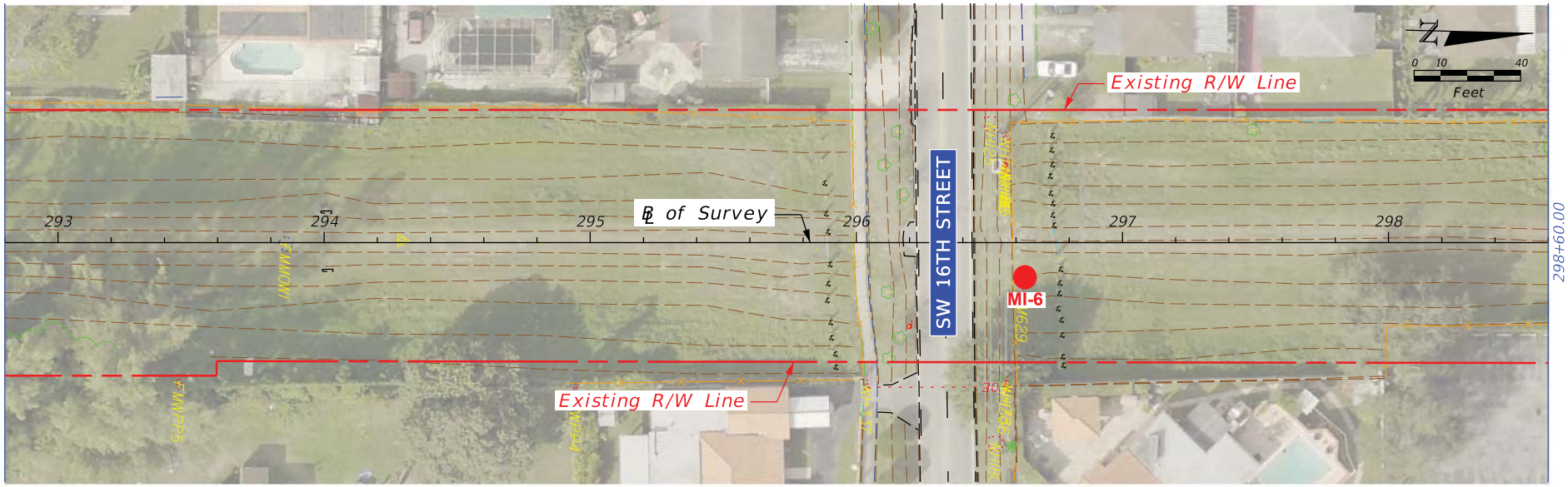
TEST LOCATION PLANS

SHEET NO. 21





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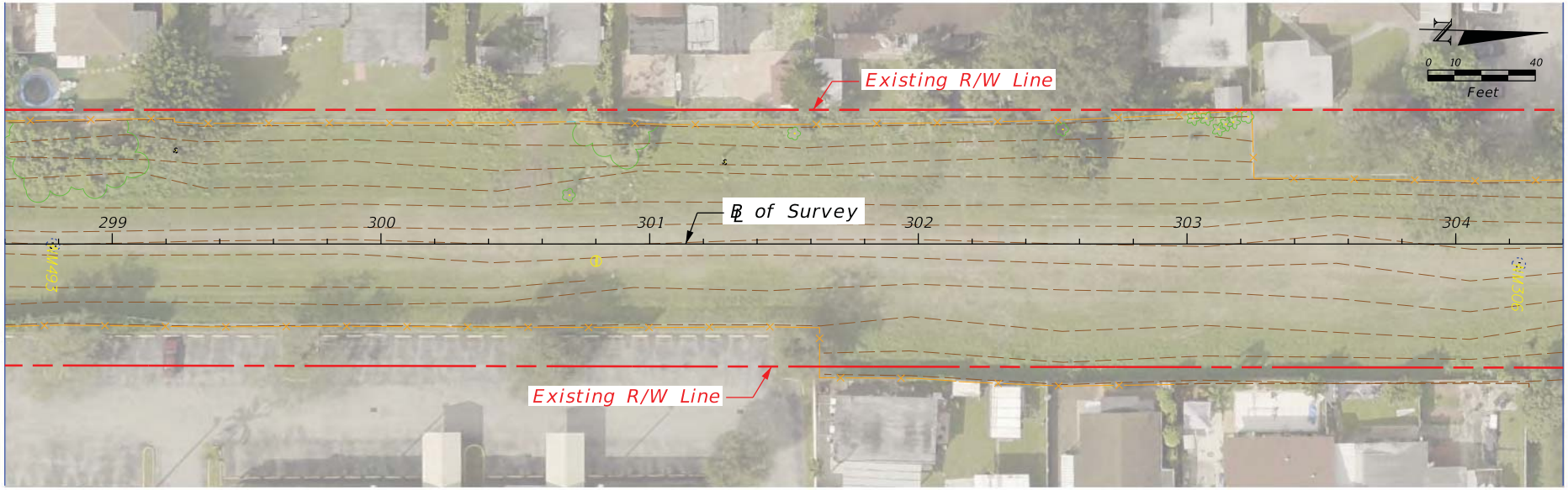
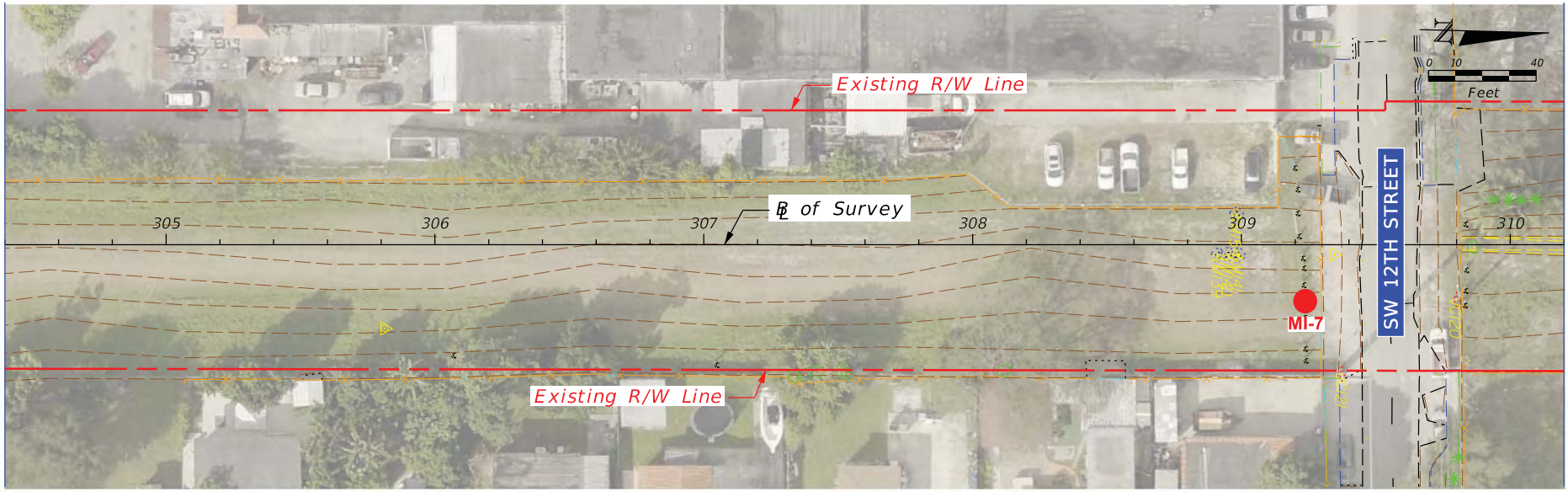
TEST LOCATION PLANS

SHEET NO. 22





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TEST LOCATION PLANS

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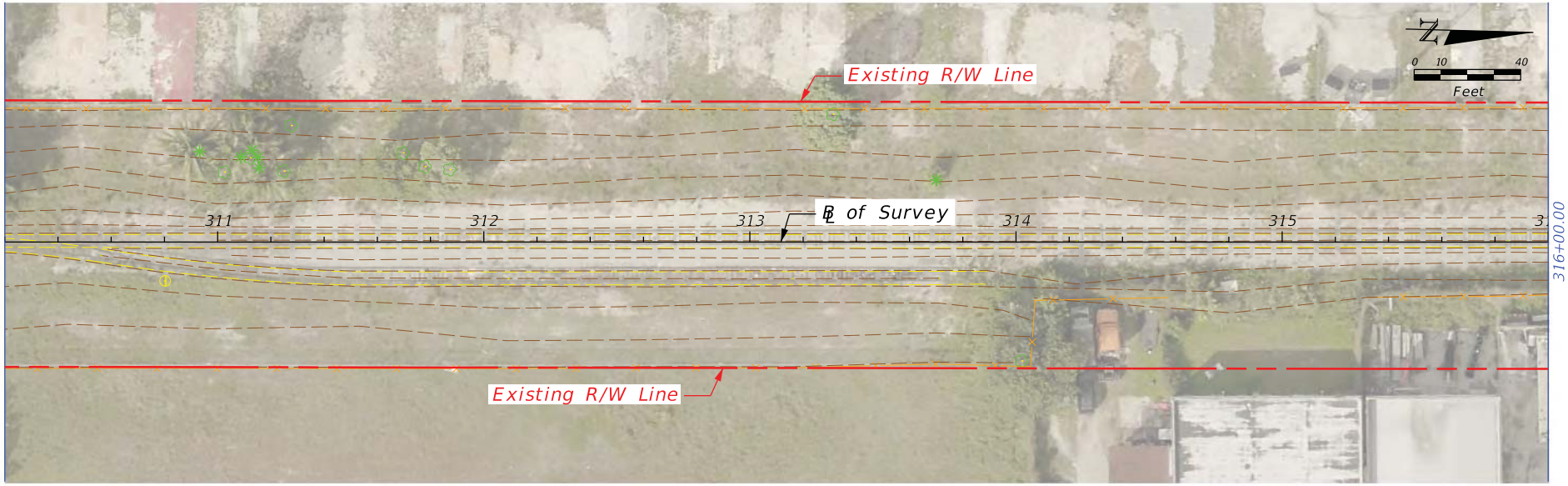

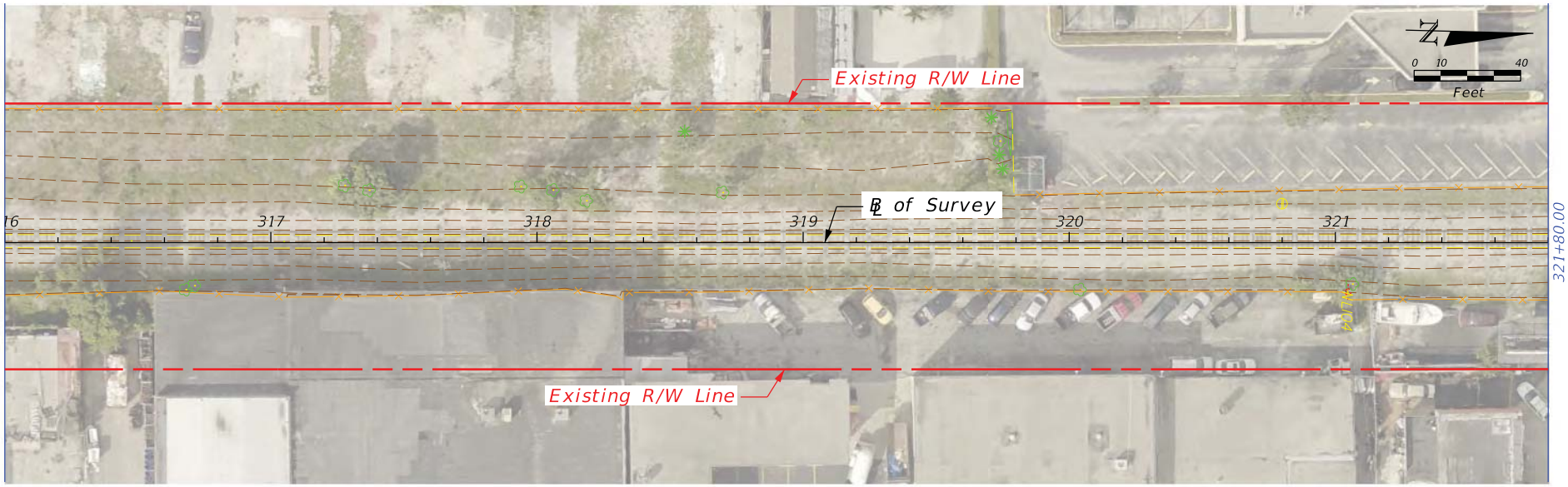

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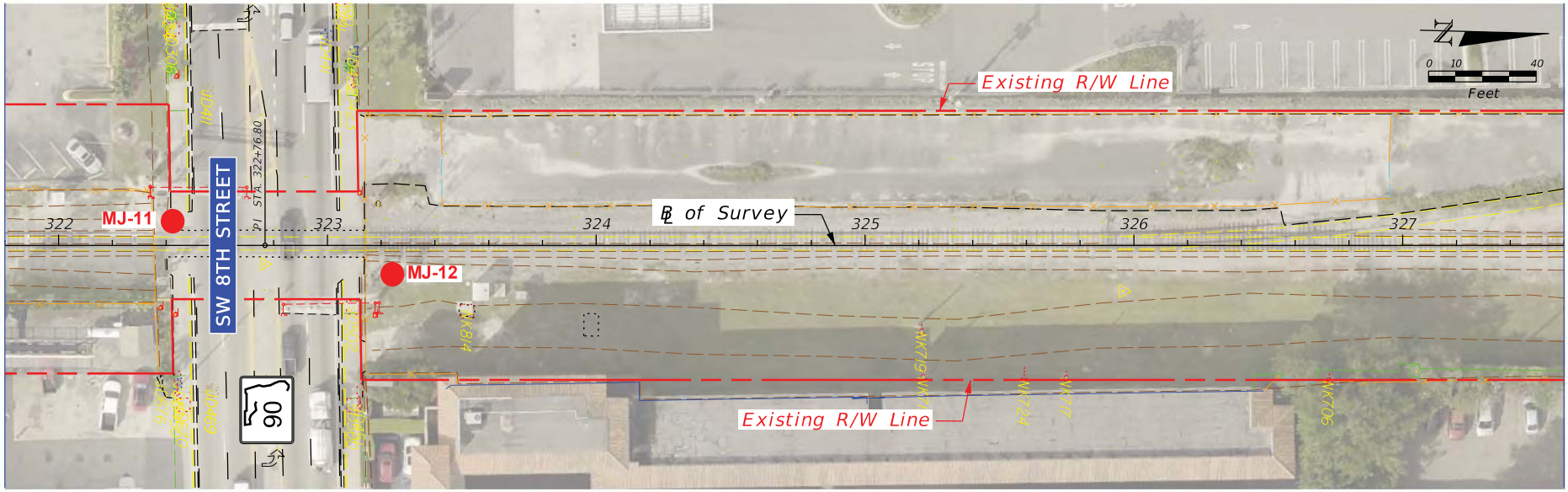
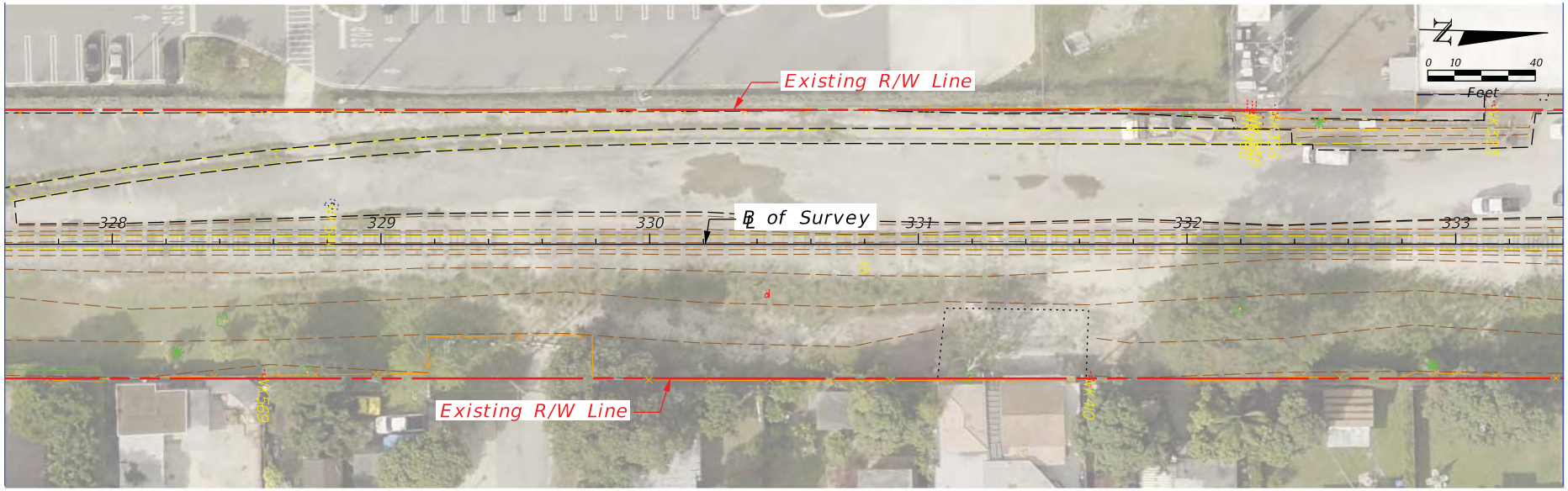
TEST LOCATION PLANS

SHEET NO. 24





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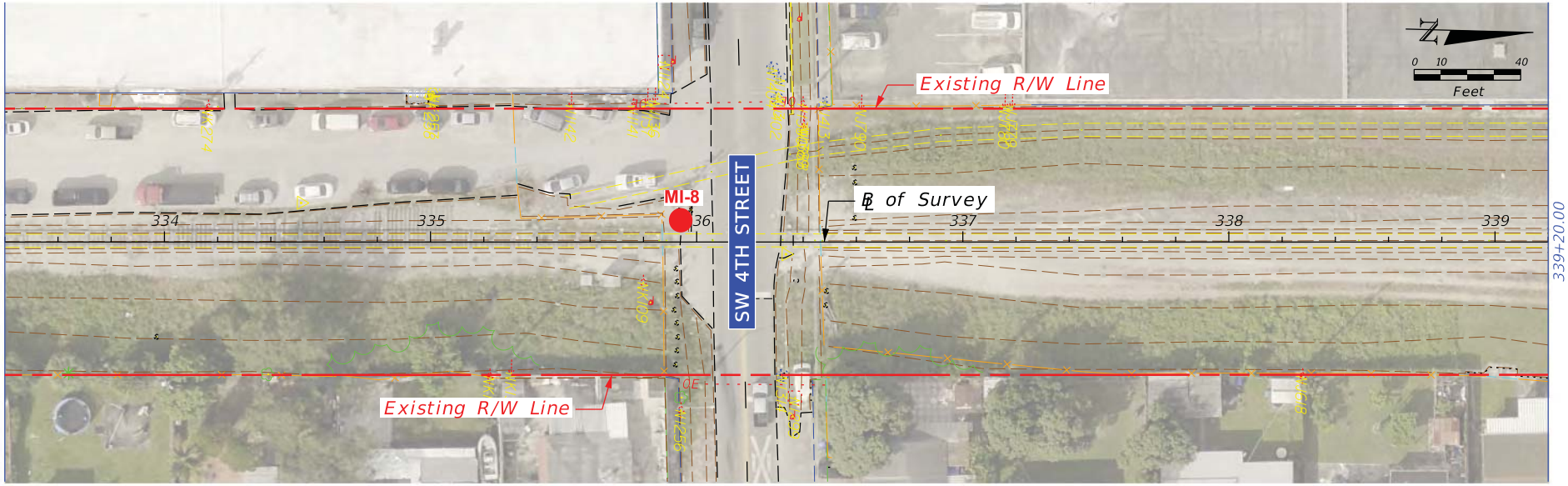
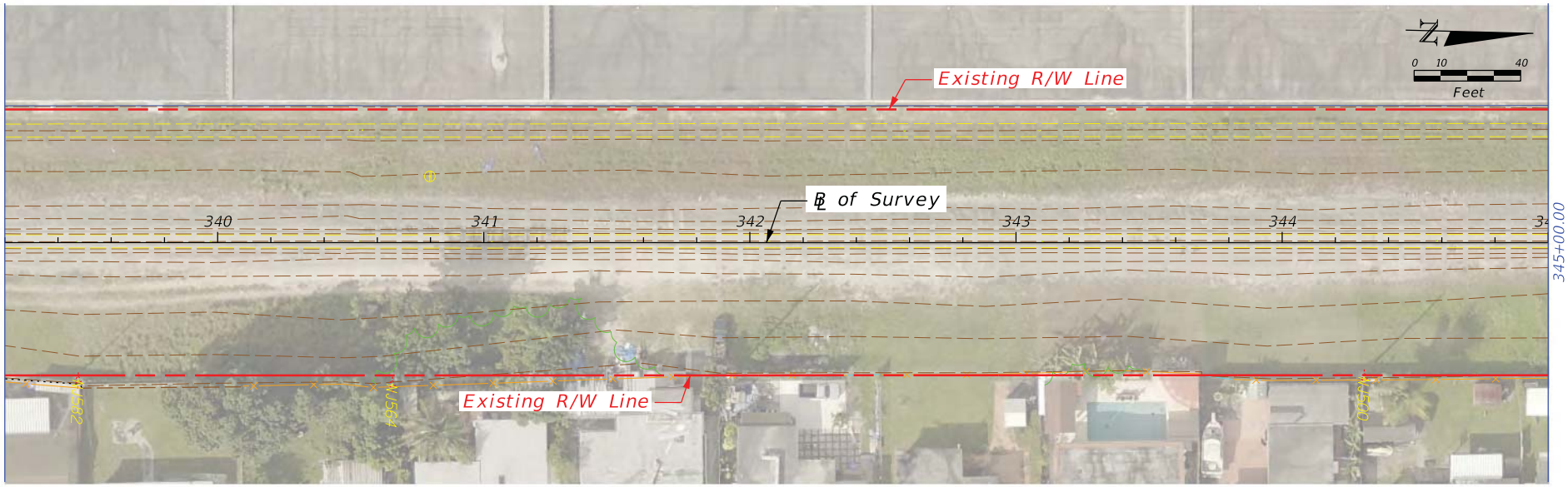
TEST LOCATION PLANS

SHEET NO. 25





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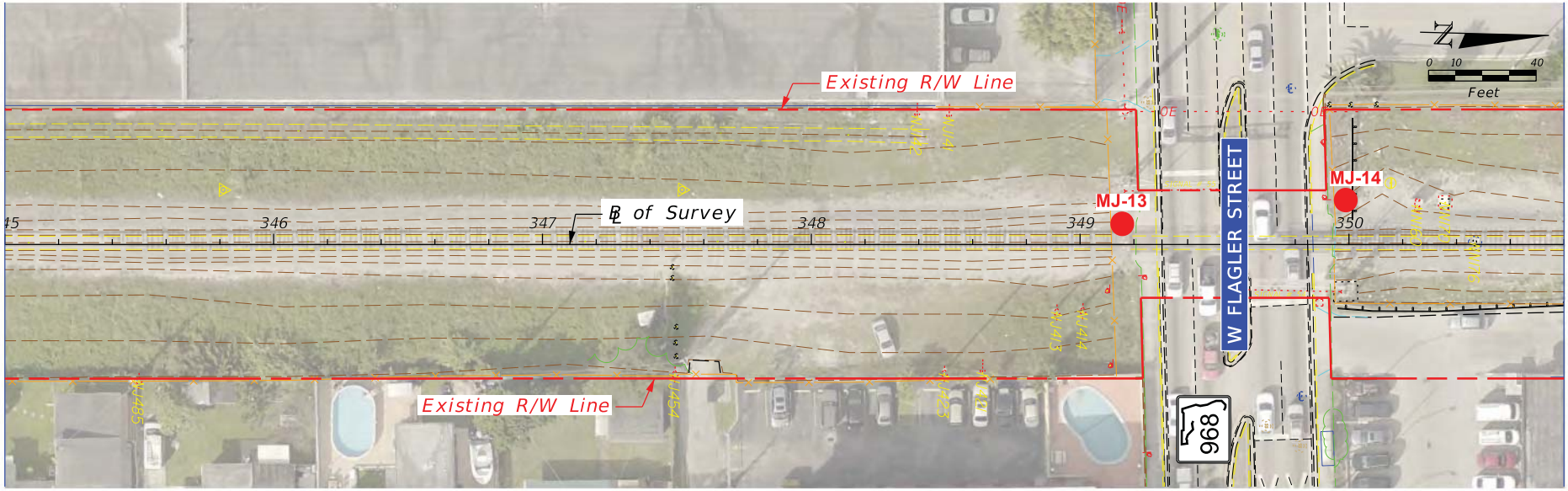
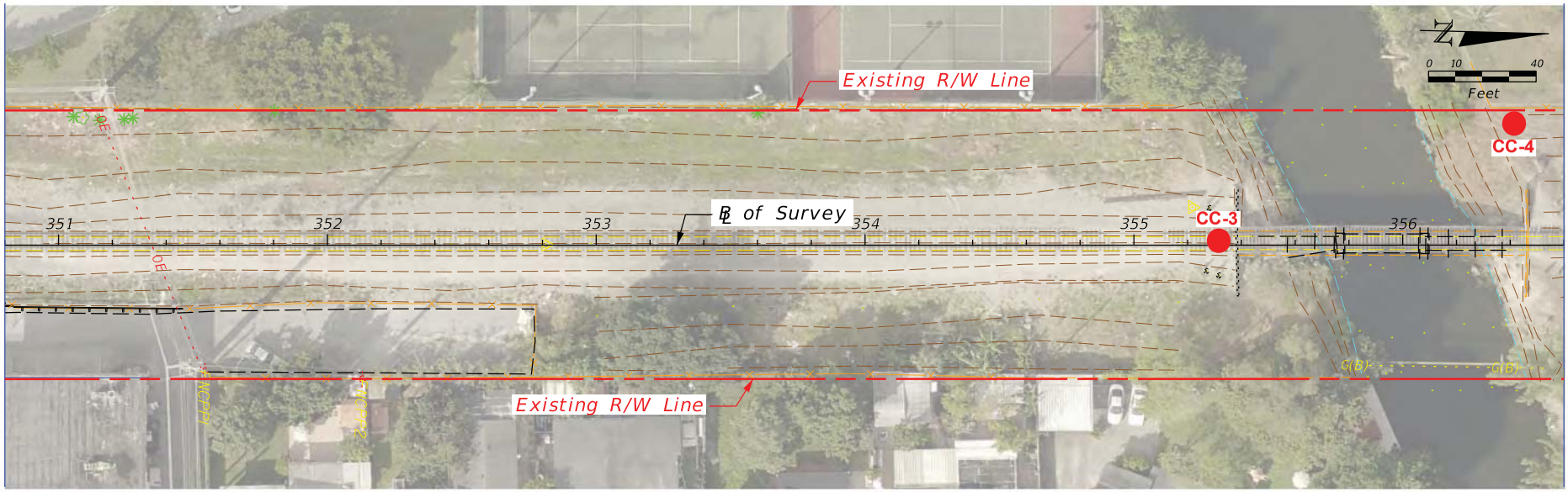
TEST LOCATION PLANS

SHEET NO. 26





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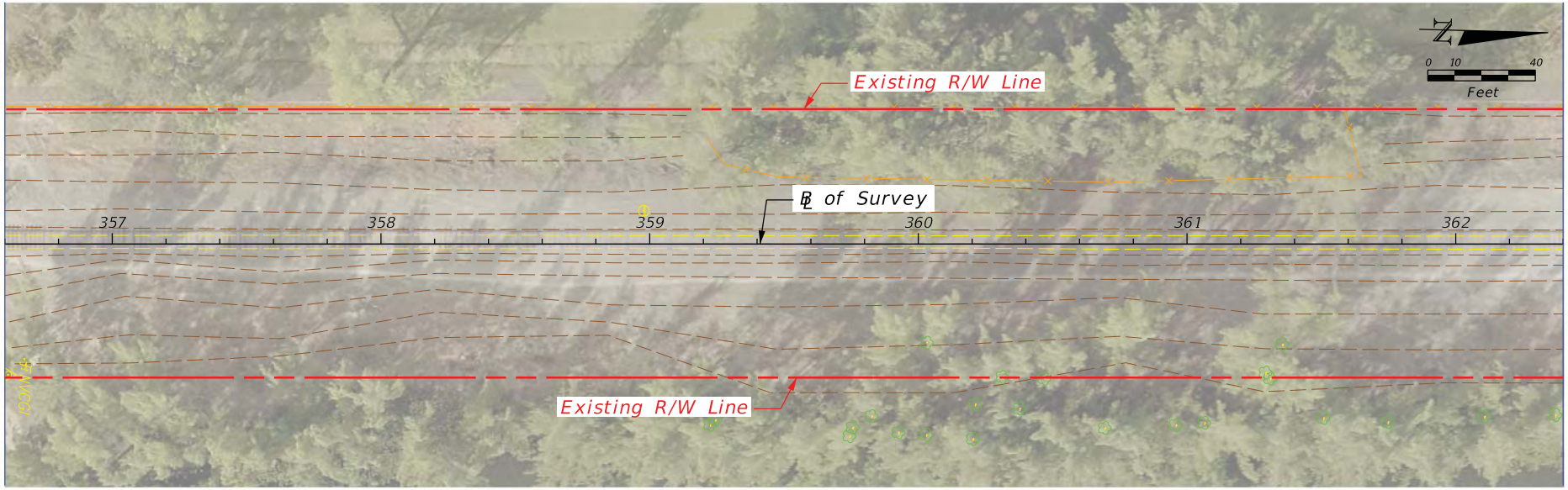
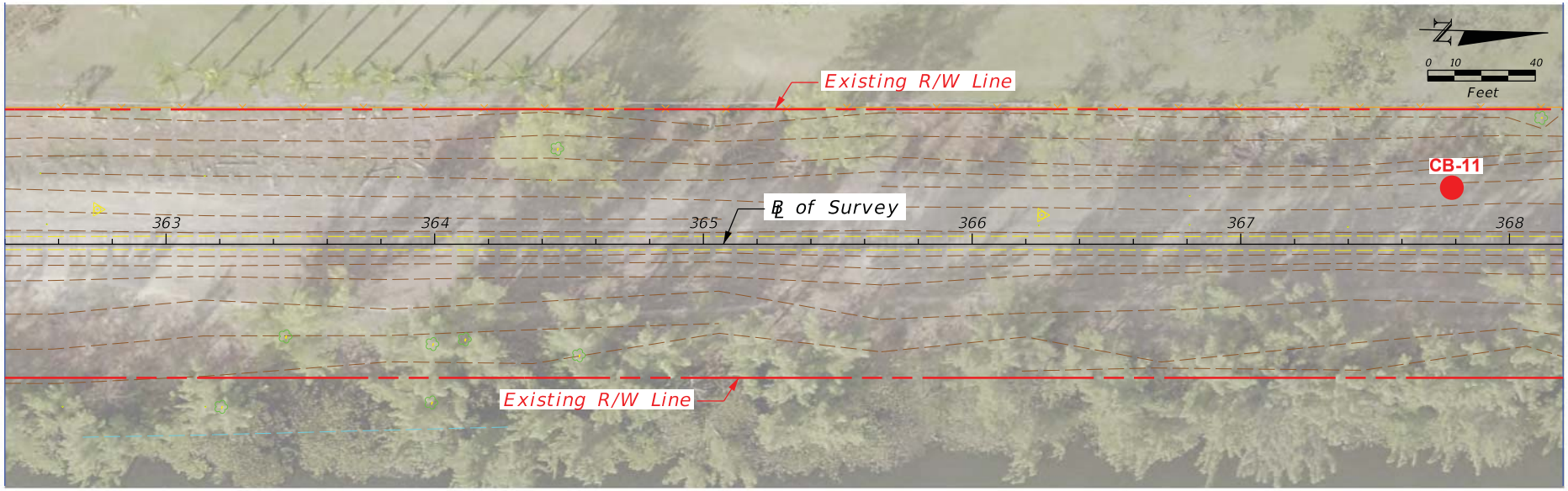
TEST LOCATION PLANS

SHEET NO. 27





REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

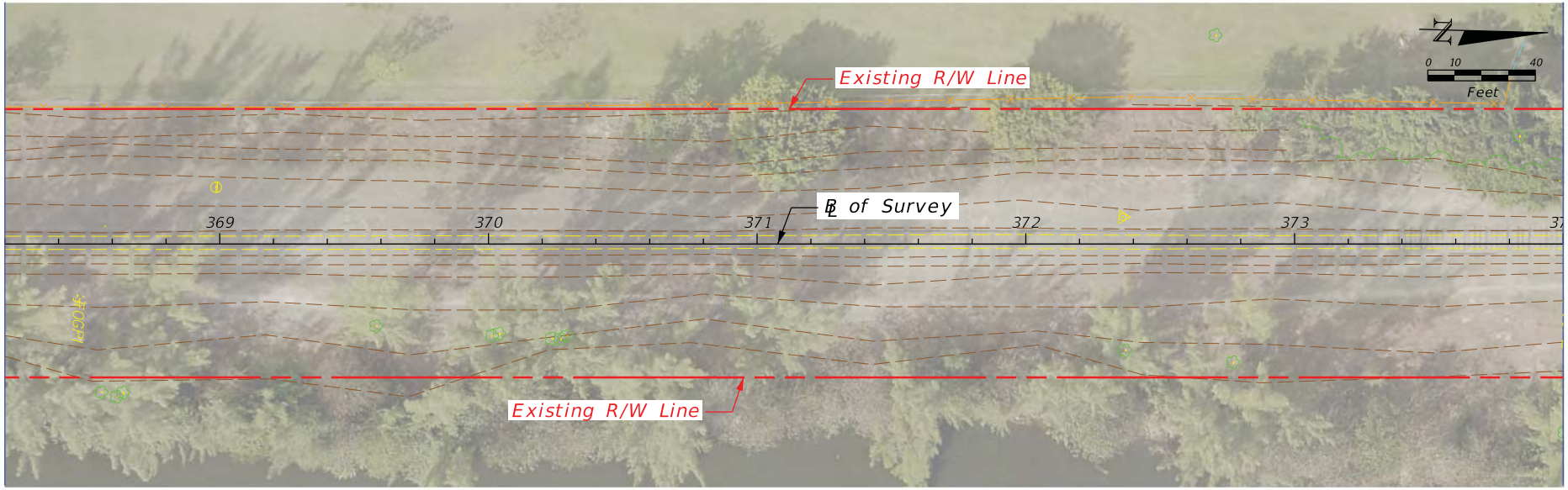
MIAMI-DADE COUNTY

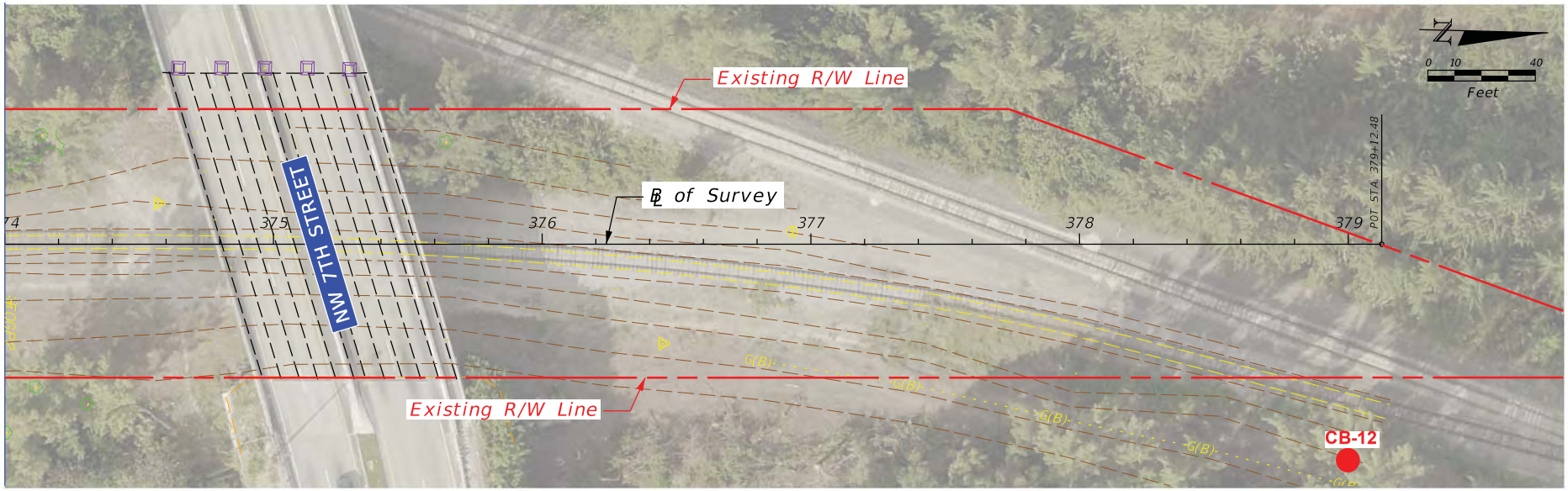
LUDLAM TRAIL CORRIDOR PD&E STUDY

Miami-Dade County Parks, Recreation, and Open Spaces (MDPROS)	Hickman Building 275 NW 2nd Street Miami, FL 33128 305-755-7800	P&R CONTRACT NO. RFQ 786B P&R PROJECT NO. 43502-15-001-14470619

TEST LOCATION PLANS

SHEET NO. 28





REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

MIAMI-DADE COUNTY

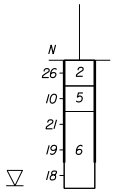
LUDLAM TRAIL CORRIDOR PD&E STUDY

Miami-Dade County Parks, Recreation, and Open Spaces (MDPROS)	Hickman Building 275 NW 2nd Street Miami, FL 33128 305-755-7800	P&R CONTRACT NO. RFQ 786B P&R PROJECT NO. 43502-15-001-14470619

TEST LOCATION PLANS

SHEET NO. 29

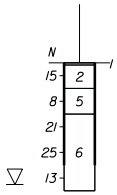
BOR #	MJ-1
STA.	79+75
OFF.	8 RT
ELEV.	11.6
DATE	9/16/2018
DRILLER	R.Morales - GEOSOL, Inc.
HAMMER	Auto
RIG	B-53
LATITUDE	25.696115
LONGITUDE	-80.306467
NORTHING	495843
EASTING	884544



Boring Terminated at Elev. 1.6ft

Casing Length 8ft

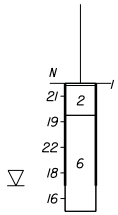
BOR #	MJ-2
STA.	80+30
OFF.	18 RT
ELEV.	11.4
DATE	9/15/2018
DRILLER	R.Morales - GEOSOL, Inc.
HAMMER	Auto
RIG	B-53
LATITUDE	25.696267
LONGITUDE	-80.30644
NORTHING	495899
EASTING	884553



Boring Terminated at Elev. 1.4ft

Casing Length 8ft

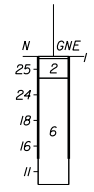
BOR #	CB-1
STA.	93+16
OFF.	20 LT
ELEV.	9.8
DATE	9/15/2018
DRILLER	R.Morales - GEOSOL, Inc.
HAMMER	Auto
RIG	B-53
LATITUDE	25.699803
LONGITUDE	-80.306636
NORTHING	497184
EASTING	884481



Boring Terminated at Elev. -0.2ft

Casing Length 8ft

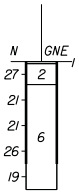
BOR #	MJ-3
STA.	106+21
OFF.	1 LT
ELEV.	11.9
DATE	9/15/2018
DRILLER	R.Morales - GEOSOL, Inc.
HAMMER	Auto
RIG	B-53
LATITUDE	25.703395
LONGITUDE	-80.30666
NORTHING	498489
EASTING	884467



Boring Terminated at Elev. 1.9ft

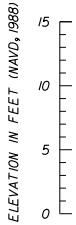
Casing Length 8ft

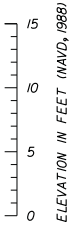
BOR #	MJ-4
STA.	107+01
OFF.	1 LT
ELEV.	11.5
DATE	9/15/2018
DRILLER	R.Morales - GEOSOL, Inc.
HAMMER	Auto
RIG	B-53
LATITUDE	25.703614
LONGITUDE	-80.306665
NORTHING	498569
EASTING	884465



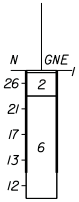
Boring Terminated at Elev. 1.5ft

Casing Length 8ft





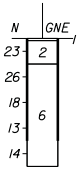
BOR #	CB-2
STA.	119+70
OFF.	13 LT
ELEV.	10.7
DATE	9/15/2018
DRILLER	R.Morales - GEOSOL, Inc.
HAMMER	Auto
RIG	B-53
LATITUDE	25.707103
LONGITUDE	-80.306781
NORTHING	499837
EASTING	884420



Boring Terminated at Elev. 0.7ft

Casing Length 8ft

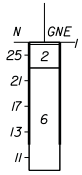
BOR #	MI-1
STA.	132+86
OFF.	10 LT
ELEV.	13.2
DATE	9/15/2018
DRILLER	R.Morales - GEOSOL, Inc.
HAMMER	Auto
RIG	B-53
LATITUDE	25.710725
LONGITUDE	-80.306855
NORTHING	501153
EASTING	884389



Boring Terminated at Elev. 3.2ft

Casing Length 8ft

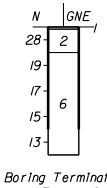
BOR #	CB-3
STA.	139+79
OFF.	15 RT
ELEV.	12.9
DATE	9/15/2018
DRILLER	R.Morales - GEOSOL, Inc.
HAMMER	Auto
RIG	B-53
LATITUDE	25.712631
LONGITUDE	-80.30682
NORTHING	501846
EASTING	884396



Boring Terminated at Elev. 2.9ft

Casing Length 8ft

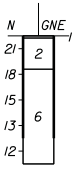
BOR #	MI-2
STA.	146+49
OFF.	9 LT
ELEV.	14.1
DATE	9/15/2018
DRILLER	R.Morales - GEOSOL, Inc.
HAMMER	Auto
RIG	B-53
LATITUDE	25.714473
LONGITUDE	-80.306937
NORTHING	502515
EASTING	884354



Boring Terminated at Elev. 4.1ft

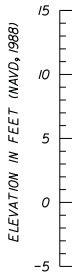
Casing Length 8ft

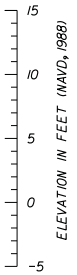
BOR #	MJ-5
STA.	159+62
OFF.	10 RT
ELEV.	13.4
DATE	9/14/2018
DRILLER	R.Morales - GEOSOL, Inc.
HAMMER	Auto
RIG	B-53
LATITUDE	25.718086
LONGITUDE	-80.30696
NORTHING	503828
EASTING	884340



Boring Terminated at Elev. 3.4ft

Casing Length 8ft





LEGEND

1) Dark Brown Organic Silty Fine SAND with Grass (TOPSOIL; A-8)

2) Brown Slightly Silty to Silty Fine to Coarse SAND with Some Limerock Fragments (FILL; A-1-b/A-1-a)

3) Brown, Occasionally Dark Brown Organic Stained, Silty Fine to Medium SAND with Little to Some Limerock Fragments (FILL; A-2-4)

4) Brown Slightly Silty Fine to Medium SAND with Trace to Little Limerock Fragments (FILL; A-3)

5) Gray Sandy SILT (A-4)

6) Brown Sandy LIMESTONE

7) Brown Slightly Silty Fine to Medium SAND with Some Limestone Fragments (A-1-b)

8) Brown Slightly Silty Fine to Medium SAND with Trace to Some Limestone Fragments (A-3)

9) Brown Slightly Silty Fine to Medium SAND with Some Limestone Fragments (A-2-4)

NOTES:

1) SPT BORINGS PERFORMED PER ASTM D-1586 WITH A HAMMER WEIGHT OF 140 LBS FALLING 30 INCHES.

2) REF: B/L OF SURVEY

N NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12" PENETRATION (UNLESS OTHER WISE NOTED).

▽ WATER TABLE AT TIME OF DRILLING

| | CASING USED

ENVIRONMENTAL CLASSIFICATION:

SUPERSTRUCTURE: SLIGHTLY AGGRESSIVE

SUBSTRUCTURE: MODERATELY AGGRESSIVE

WATER:

pH: 7.3-7.6 SULFATE: 6-18 PPM
CHLORIDE: 28-29 PPM RESISTIVITY: 1820-2060 OHM-CM

GRANULAR MATERIALS- RELATIVE DENSITY	AUTOMATIC SPT HAMMER (BLOWS PER FOOT)
VERY LOOSE	LESS THAN 3
LOOSE	3-8
MEDIUM DENSE	8-24
DENSE	24-40
VERY DENSE	GREATER THAN 40
SILTS AND CLAYS CONSISTANCY	**AUTOMATIC SPT HAMMER (BLOWS PER FOOT)**
VERY SOFT	LESS THAN 1
SOFT	1-3
FIRM	3-6
STIFF	6-12
VERY STIFF	12-24
HARD	GREATER THAN 24

0 2 10

Feet

VERTICAL SCALE
HORIZONTAL SCALE: N.T.S.

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

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD:
GEOSOL, INC.
ORACIO RICCOBONO, P.E.
P.E. LICENSE NO. 49324
5795-A NW 151ST STREET
MIAMI LAKES, FL 33014
PHONE: (305) 828-4367
CERTIFICATE OF AUTHORIZATION 8530

LUDLAM TRAIL CORRIDOR PD&E STUDY

Miami-Dade County Parks, Recreation, and Open Spaces (MDPROS)

Hickman Building
275 NW2nd Street
Miami, Florida 33128
305-755-7800

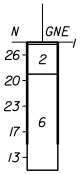
P&R CONTRACT NO.
RFQ 786B
P&R PROJECT NO.
43502-15-001-1447061/9

ROADWAY SOIL PROFILES

SHEET NO. 30

Eddie 10/15/2018 12:18:29 PM z:\2018\218144\RDGE001.dgn

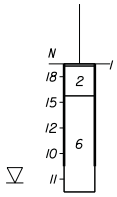
BOR # MJ-6
STA. 160+55
OFF. 10 LT
ELEV. 13
DATE 9/14/2018
DRILLER R.Morales - GEOSOL, Inc.
HAMMER Auto
RIG B-53
LATITUDE 25.718341
LONGITUDE -80.307028
NORTHING 503921
EASTING 884317



Boring Terminated at Elev. 3ft

Casing Length 8ft

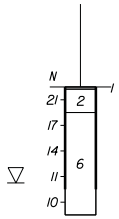
BOR # CB-4
STA. 174+01
OFF. 6 LT
ELEV. 11.3
DATE 9/14/2018
DRILLER R.Morales - GEOSOL, Inc.
HAMMER Auto
RIG B-53
LATITUDE 25.722042
LONGITUDE -80.307098
NORTHING 505266
EASTING 884287



Boring Terminated at Elev. 1.3ft

Casing Length 8ft

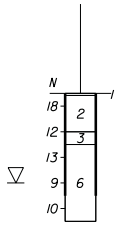
BOR # CB-5
STA. 187+36
OFF. 17 RT
ELEV. 9.5
DATE 9/14/2018
DRILLER R.Morales - GEOSOL, Inc.
HAMMER Auto
RIG B-53
LATITUDE 25.725717
LONGITUDE -80.307112
NORTHING 506601
EASTING 884275



Boring Terminated at Elev. -0.5ft

Casing Length 8ft

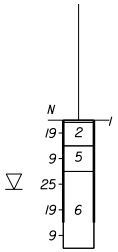
BOR # CB-6
STA. 200+65
OFF. 34 RT
ELEV. 9
DATE 9/14/2018
DRILLER R.Morales - GEOSOL, Inc.
HAMMER Auto
RIG B-53
LATITUDE 25.729375
LONGITUDE -80.307144
NORTHING 507931
EASTING 884258



Boring Terminated at Elev. -1ft

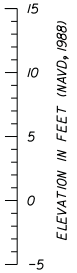
Casing Length 8ft

BOR # CB-7
STA. 207+09
OFF. 27 RT
ELEV. 6.9
DATE 9/14/2018
DRILLER R.Morales - GEOSOL, Inc.
HAMMER Auto
RIG B-53
LATITUDE 25.731145
LONGITUDE -80.307205
NORTHING 508574
EASTING 884234

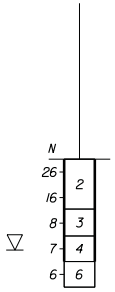


Boring Terminated at Elev. -3.1ft

Casing Length 8ft



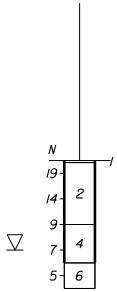
BOR # MJ-7
STA. 214+31
OFF. 4 RT
ELEV. 8.8
DATE 9/14/2018
DRILLER R.Morales - GEOSOL, Inc.
HAMMER Auto
RIG B-53
LATITUDE 25.733129
LONGITUDE -80.307319
NORTHING 509295
EASTING 884193



Boring Terminated at Elev. -1.2ft

Casing Length 8ft

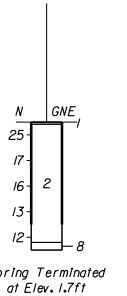
BOR # MJ-8
STA. 215+45
OFF. 3 RT
ELEV. 8.7
DATE 9/14/2018
DRILLER R.Morales - GEOSOL, Inc.
HAMMER Auto
RIG B-53
LATITUDE 25.733442
LONGITUDE -80.307328
NORTHING 509409
EASTING 884190



Boring Terminated at Elev. -1.3ft

Casing Length 8ft

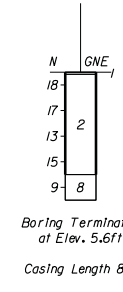
BOR # CB-8
STA. 227+59
OFF. 1 RT
ELEV. 11.7
DATE 9/9/2018
DRILLER R.Morales - GEOSOL, Inc.
HAMMER Auto
RIG B-53
LATITUDE 25.736781
LONGITUDE -80.307411
NORTHING 510622
EASTING 884156



Boring Terminated at Elev. 1.7ft

Casing Length 8ft

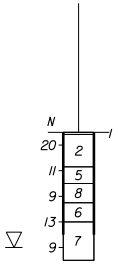
BOR # MI-3
STA. 240+14
OFF. 3 RT
ELEV. 15.6
DATE 9/9/2018
DRILLER R.Morales - GEOSOL, Inc.
HAMMER Auto
RIG B-53
LATITUDE 25.740234
LONGITUDE -80.307484
NORTHING 511877
EASTING 884125



Boring Terminated at Elev. 5.6ft

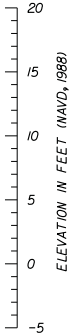
Casing Length 8ft

BOR # CB-9
STA. 252+07
OFF. 1 RT
ELEV. 10.9
DATE 9/11/2018
DRILLER R.Morales - GEOSOL, Inc.
HAMMER Auto
RIG B-53
LATITUDE 25.743515
LONGITUDE -80.307564
NORTHING 513070
EASTING 884092



Boring Terminated at Elev. 0.9ft

Casing Length 8ft



LEGEND

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2) Brown Slightly Silty to Silty Fine to Coarse SAND with Some Limerock Fragments (FILL; A-1-b/A-1-a)

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5) Gray Sandy SILT (A-4)

6) Brown Sandy LIMESTONE

7) Brown Slightly Silty Fine to Medium SAND with Some Limestone Fragments (A-1-b)

8) Brown Slightly Silty Fine to Medium SAND with Trace to Some Limestone Fragments (A-3)

9) Brown Slightly Silty Fine to Medium SAND with Some Limestone Fragments (A-2-4)

NOTES:

1) SPT BORINGS PERFORMED PER ASTM D-1586 WITH A HAMMER WEIGHT OF 140 LBS FALLING 30 INCHES.

2) REF: B/L OF SURVEY

N NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12" PENETRATION (UNLESS OTHER WISE NOTED).

▽ WATER TABLE AT TIME OF DRILLING

|| CASING USED

ENVIRONMENTAL CLASSIFICATION:

SUPERSTRUCTURE: SLIGHTLY AGGRESSIVE

SUBSTRUCTURE: MODERATELY AGGRESSIVE

WATER:

pH: 7.3-7.6 SULFATE: 6-18 PPM
CHLORIDE: 28-29 PPM RESISTIVITY: 1820-2060 OHM-CM

GRANULAR MATERIALS- RELATIVE DENSITY	AUTOMATIC SPT HAMMER (BLOWS PER FOOT)
VERY LOOSE	LESS THAN 3
LOOSE	3-8
MEDIUM DENSE	8-24
DENSE	24-40
VERY DENSE	GREATER THAN 40
SILTS AND CLAYS CONSISTANCY	AUTOMATIC SPT HAMMER (BLOWS PER FOOT)
VERY SOFT	LESS THAN 1
SOFT	1-3
FIRM	3-6
STIFF	6-12
VERY STIFF	12-24
HARD	GREATER THAN 24

0 2 10
Feet
VERTICAL SCALE
HORIZONTAL SCALE: N.T.S.

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

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD:
GEOSOL, INC.
ORACIO RICCOBONO, P.E.
P.E. LICENSE NO. 49324
5795-A NW 151ST STREET
MIAMI LAKES, FL 33014
PHONE: (305) 828-4367
CERTIFICATE OF AUTHORIZATION 8530

LUDLAM TRAIL CORRIDOR PD&E STUDY

Miami-Dade County Parks, Recreation, and Open Spaces (MDPROS)

Hickman Building
275 NW2nd Street
Miami, Florida 33128
305-755-7800

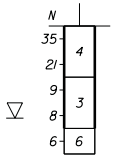
P&R CONTRACT NO.
RFQ 786B
P&R PROJECT NO.
43502-15-001-1447061/9

ROADWAY SOIL PROFILES

SHEET NO. 31

Eddie 10/15/2018 12:18:31 PM z:\2018\218144\RDGE002.dgn

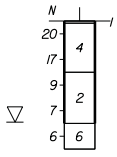
BOR #	MJ-9
STA.	267+94
OFF.	0
ELEV.	9.2
DATE	9/11/2018
DRILLER	R.Morales - GEOSOL, Inc.
HAMMER	Auto
RIG	B-53
LATITUDE	25.747883
LONGITUDE	-80.307665
NORTHING	514657
EASTING	884051



Boring Terminated at Elev. -0.8ft

Casing Length 8ft

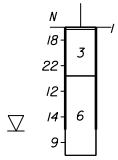
BOR #	MJ-10
STA.	269+08
OFF.	3 RT
ELEV.	9.9
DATE	9/11/2018
DRILLER	R.Morales - GEOSOL, Inc.
HAMMER	Auto
RIG	B-53
LATITUDE	25.748195
LONGITUDE	-80.307664
NORTHING	514770
EASTING	884051



Boring Terminated at Elev. -0.1ft

Casing Length 8ft

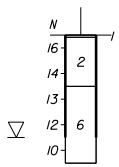
BOR #	MI-4
STA.	276+58
OFF.	10 RT
ELEV.	9.1
DATE	9/13/2018
DRILLER	R.Morales - GEOSOL, Inc.
HAMMER	Auto
RIG	B-53
LATITUDE	25.750259
LONGITUDE	-80.30769
NORTHING	515520
EASTING	884038



Boring Terminated at Elev. -0.9ft

Casing Length 8ft

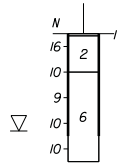
BOR #	MI-5
STA.	280+48
OFF.	23 RT
ELEV.	8.8
DATE	9/13/2018
DRILLER	R.Morales - GEOSOL, Inc.
HAMMER	Auto
RIG	B-53
LATITUDE	25.751332
LONGITUDE	-80.307673
NORTHING	515911
EASTING	884042



Boring Terminated at Elev. -1.2ft

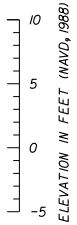
Casing Length 8ft

BOR #	CB-10
STA.	288+23
OFF.	1 RT
ELEV.	8.6
DATE	9/13/2018
DRILLER	R.Morales - GEOSOL, Inc.
HAMMER	Auto
RIG	B-53
LATITUDE	25.753464
LONGITUDE	-80.307787
NORTHING	516685
EASTING	884000

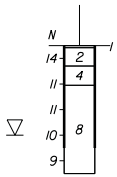


Boring Terminated at Elev. -1.4ft

Casing Length 8ft



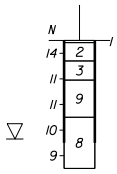
BOR #	MI-6
STA.	296+63
OFF.	14 RT
ELEV.	7.8
DATE	9/13/2018
DRILLER	R.Morales - GEOSOL, Inc.
HAMMER	Auto
RIG	B-53
LATITUDE	25.755774
LONGITUDE	-80.307802
NORTHING	517525
EASTING	883991



Boring Terminated at Elev. -2.2ft

Casing Length 8ft

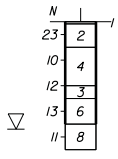
BOR #	MI-7
STA.	309+24
OFF.	20 RT
ELEV.	8.2
DATE	9/13/2018
DRILLER	R.Morales - GEOSOL, Inc.
HAMMER	Auto
RIG	B-53
LATITUDE	25.759244
LONGITUDE	-80.307862
NORTHING	518786
EASTING	883964



Boring Terminated at Elev. -1.8ft

Casing Length 8ft

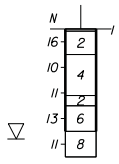
BOR #	MJ-11
STA.	322+43
OFF.	9 LT
ELEV.	9.9
DATE	9/13/2018
DRILLER	R.Morales - GEOSOL, Inc.
HAMMER	Auto
RIG	B-53
LATITUDE	25.76287
LONGITUDE	-80.308033
NORTHING	520104
EASTING	883901



Boring Terminated at Elev. -0.1ft

Casing Length 8ft

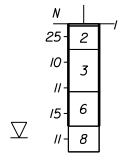
BOR #	MJ-12
STA.	323+24
OFF.	10 RT
ELEV.	9.1
DATE	9/13/2018
DRILLER	R.Morales - GEOSOL, Inc.
HAMMER	Auto
RIG	B-53
LATITUDE	25.763093
LONGITUDE	-80.30798
NORTHING	520185
EASTING	883918



Boring Terminated at Elev. -0.9ft

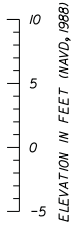
Casing Length 8ft

BOR #	MI-8
STA.	335+94
OFF.	8 LT
ELEV.	9.5
DATE	9/13/2018
DRILLER	R.Morales - GEOSOL, Inc.
HAMMER	Auto
RIG	B-53
LATITUDE	25.766587
LONGITUDE	-80.308114
NORTHING	521454
EASTING	883867



Boring Terminated at Elev. -0.5ft

Casing Length 8ft



LEGEND

1) Dark Brown Organic Silty Fine SAND with Grass (TOPSOIL; A-8)

2) Brown Slightly Silty to Silty Fine to Coarse SAND with Some Limerock Fragments (FILL; A-1-b/A-1-a)

3) Brown, Occasionally Dark Brown Organic Stained, Silty Fine to Medium SAND with Little to Some Limerock Fragments (FILL; A-2-4)

4) Brown Slightly Silty Fine to Medium SAND with Trace to Little Limerock Fragments (FILL; A-3)

5) Gray Sandy SILT (A-4)

6) Brown Sandy LIMESTONE

7) Brown Slightly Silty Fine to Medium SAND with Some Limestone Fragments (A-1-b)

8) Brown Slightly Silty Fine to Medium SAND with Trace to Some Limestone Fragments (A-3)

9) Brown Slightly Silty Fine to Medium SAND with Some Limestone Fragments (A-2-4)

NOTES:

1) SPT BORINGS PERFORMED PER ASTM D-1586 WITH A HAMMER WEIGHT OF 140 LBS FALLING 30 INCHES.

2) REF: B/L OF SURVEY

N NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12" PENETRATION (UNLESS OTHER WISE NOTED).

▽ WATER TABLE AT TIME OF DRILLING

| | CASING USED

ENVIRONMENTAL CLASSIFICATION:

SUPERSTRUCTURE: SLIGHTLY AGGRESSIVE

SUBSTRUCTURE: MODERATELY AGGRESSIVE

WATER:

pH: 7.3-7.6 SULFATE: 6-18 PPM

CHLORIDE: 28-29 PPM RESISTIVITY: 1820-2060 OHM-CM

GRANULAR MATERIALS- RELATIVE DENSITY	AUTOMATIC SPT HAMMER (BLOWS PER FOOT)
VERY LOOSE	LESS THAN 3
LOOSE	3-8
MEDIUM DENSE	8-24
DENSE	24-40
VERY DENSE	GREATER THAN 40
SILTS AND CLAYS CONSISTANCY	**AUTOMATIC SPT HAMMER (BLOWS PER FOOT)**
VERY SOFT	LESS THAN 1
SOFT	1-3
FIRM	3-6
STIFF	6-12
VERY STIFF	12-24
HARD	GREATER THAN 24

0 2 10

Feet

VERTICAL SCALE

HORIZONTAL SCALE: N.T.S.

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

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD:
GEOSOL, INC.
ORACIO RICCOBONO, P.E.
P.E. LICENSE NO. 49324
5795-A NW 151ST STREET
MIAMI LAKES, FL 33014
PHONE: (305) 828-4367
CERTIFICATE OF AUTHORIZATION 8530

LUDLAM TRAIL CORRIDOR PD&E STUDY

Miami-Dade County Parks, Recreation, and Open Spaces (MDPROS)

Hickman Building
275 NW2nd Street
Miami, Florida 33128
305-755-7800

P&R CONTRACT NO. RFQ 786B
P&R PROJECT NO. 43502-15-001-1447061/9

ROADWAY SOIL PROFILES

SHEET NO. 32

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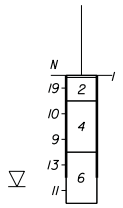
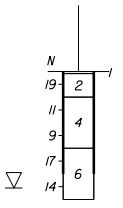
BOR #	MJ-13
STA.	349+16
OFF.	8 LT
ELEV.	10.5
DATE	9/16/2018
DRILLER	R.Morales - GEOSOL, Inc.
HAMMER	Auto
RIG	B-53
LATITUDE	25.770224
LONGITUDE	-80.308196
NORTHING	522776
EASTING	883833



Boring Terminated at Elev. 0.5ft

Casing Length 8ft

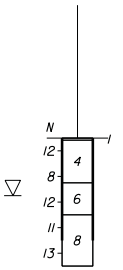
BOR #	MJ-14
STA.	349+99
OFF.	16 LT
ELEV.	10.8
DATE	9/16/2018
DRILLER	R.Morales - GEOSOL, Inc.
HAMMER	Auto
RIG	B-53
LATITUDE	25.770451
LONGITUDE	-80.308225
NORTHING	522859
EASTING	883824



Boring Terminated at Elev. 0.8ft

Casing Length 8ft

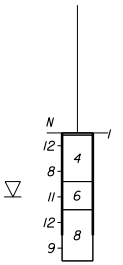
BOR #	CB-11
STA.	367+79
OFF.	20 LT
ELEV.	5.6
DATE	9/17/2018
DRILLER	R.Morales - GEOSOL, Inc.
HAMMER	Auto
RIG	B-53
LATITUDE	25.775346
LONGITUDE	-80.308348
NORTHING	524637
EASTING	883774



Boring Terminated at Elev. -4.4ft

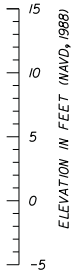
Casing Length 8ft

BOR #	CB-12
STA.	379+00
OFF.	79 RT
ELEV.	6
DATE	9/17/2018
DRILLER	R.Morales - GEOSOL, Inc.
HAMMER	Auto
RIG	B-53
LATITUDE	25.778437
LONGITUDE	-80.308117
NORTHING	525761
EASTING	883844



Boring Terminated at Elev. -4ft

Casing Length 8ft



LEGEND

1) Dark Brown Organic Silty Fine SAND with Grass (TOPSOIL; A-8)

2) Brown Slightly Silty to Silty Fine to Coarse SAND with Some Limerock Fragments (FILL; A-1-b/A-1-a)

3) Brown, Occasionally Dark Brown Organic Stained, Silty Fine to Medium SAND with Little to Some Limerock Fragments (FILL; A-2-4)

4) Brown Slightly Silty Fine to Medium SAND with Trace to Little Limerock Fragments (FILL; A-3)

5) Gray Sandy SILT (A-4)

6) Brown Sandy LIMESTONE

7) Brown Slightly Silty Fine to Medium SAND with Some Limestone Fragments (A-1-b)

8) Brown Slightly Silty Fine to Medium SAND with Trace to Some Limestone Fragments (A-3)

9) Brown Slightly Silty Fine to Medium SAND with Some Limestone Fragments (A-2-4)

NOTES:

1) SPT BORINGS PERFORMED PER ASTM D-1586 WITH A HAMMER WEIGHT OF 140 LBS FALLING 30 INCHES.

2) REF: B/L OF SURVEY

N NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12" PENETRATION (UNLESS OTHER WISE NOTED).

▽ WATER TABLE AT TIME OF DRILLING

|| CASING USED

ENVIRONMENTAL CLASSIFICATION:

SUPERSTRUCTURE: SLIGHTLY AGGRESSIVE

SUBSTRUCTURE: MODERATELY AGGRESSIVE

WATER:

pH: 7.3-7.6 SULFATE: 6-18 PPM

CHLORIDE: 28-29 PPM RESISTIVITY: 1820-2060 OHM-CM

GRANULAR MATERIALS- RELATIVE DENSITY	AUTOMATIC SPT HAMMER (BLOWS PER FOOT)
VERY LOOSE	LESS THAN 3
LOOSE	3-8
MEDIUM DENSE	8-24
DENSE	24-40
VERY DENSE	GREATER THAN 40
SILTS AND CLAYS CONSISTANCY	**AUTOMATIC SPT HAMMER (BLOWS PER FOOT)**
VERY SOFT	LESS THAN 1
SOFT	1-3
FIRM	3-6
STIFF	6-12
VERY STIFF	12-24
HARD	GREATER THAN 24

0 2 10

Feet

VERTICAL SCALE

HORIZONTAL SCALE: N.T.S.

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REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD:
GEOSOL, INC.
ORACIO RICCOBONO, P.E.
P.E. LICENSE NO. 49324
5795-A NW 151ST STREET
MIAMI LAKES, FL 33014
PHONE: (305) 828-4367
CERTIFICATE OF AUTHORIZATION 8530

LUDLAM TRAIL CORRIDOR PD&E STUDY

Miami-Dade County Parks, Recreation, and Open Spaces (MDPROS)

Hickman Building 275 NW2nd Street Miami, Florida 33128 305-755-7800

P&R CONTRACT NO. RFQ 786B

P&R PROJECT NO. 43502-15-001-1447061.9

ROADWAY SOIL PROFILES

SHEET NO. 33

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MIAMI-DADE COUNTY PARKS, RECREATION, AND OPEN SPACES (MDPROS)

DATE OF SURVEY: 9/9/2018-9/17/2018
SURVEY MADE BY: ORACIO RICCOBONO, P.E.
SUBMITTED BY: GEOSOL, Inc.

PROJECT NAME: LUDLAM TRAIL CORRIDOR - ACQUISITION ANALYSIS AND PLANNING

DISTRICT: N/A
ROAD NO.: N/A
COUNTY: MIAMI-DADE

CROSS SECTION SOIL SURVEY FOR THE DESIGN OF ROADS

SURVEY BEGINS STA.: 79+75 SURVEY ENDS STA.: 379+00 REFERENCE: B/L OF SURVEY

	ORGANIC CONTENT			SIEVE ANALYSIS RESULTS PERCENT PASS											CORROSION TEST RESULTS				
STRATUM NO.	NO. OF TESTS	% ORGANIC	MOISTURE CONTENT	NO. OF TESTS	10 MESH	40 MESH	60 MESH	100 MESH	200 MESH	NO. OF TESTS	LIQUID LIMIT	PLASTIC INDEX	AASHTO GROUP	DESCRIPTION	NO. OF TESTS	RESISTIVITY ohms cm	CHLORIDE ppm	SULFATES ppm	pH
1	1	11	29	1					15				A-8	Dark Brown Organic Silty Fine SAND with Grass (TOPSOIL)					
2	9		3-18	9	42-61	28-49	22-31	13-23	7-18				A-1-b/A-1-a	Brown Slightly Silty to Silty Fine to Coarse SAND with Some Limerock Fragments (FILL)					
3	4	3	11-27	4	64-71	55-59	32-44	17-27	14-22				A-2-4	Brown, Occasionally Dark Brown Organic Stained, Silty Fine to Medium SAND with Little to Some Limerock Fragments (FILL)					
4	3		8-14	3	82-100	55-88	30-47	8-14	1-10				A-3	Brown Slightly Silty Fine to Medium SAND with Trace to Little Limerock Fragments (FILL)					
5	4		29-53	4					63-89	1	44	N.P.	A-4	Gray Sandy SILT (FILL)					
6													N/A	Brown Sandy LIMESTONE					
7	1		11	1	59	46	30	18	10				A-1-b	Brown Slightly Silty Fine to Medium SAND with Some Limestone Fragments					
8	5		13-19	5	64-70	53-60	32-36	11-13	2-9				A-3	Brown Slightly Silty Fine to Medium SAND with Trace to Some Limestone Fragments					
9	1		15	1	63	58	54	27	11				A-2-4	Brown Slightly Silty Fine to Medium SAND with Trace to Some Limestone Fragments					
N/A													N/A	Water	2	1820-2060	28-29	6-18	7.3-7.6

EMBANKMENT AND SUBGRADE MATERIAL

STRATA BOUNDARIES ARE APPROXIMATE. MAKE FINAL CHECK AFTER GRADING.

▽ - WATER TABLE ENCOUNTERED

GNE - GROUNDWATER NOT ENCOUNTERED

Notes:

1) The material from Stratum 1 is topsoil (A-8) and considered to be unsuitable (muck). It shall be removed during clearing and grubbing in accordance with Section 110 of the FDOT Standard Specifications.

2) The materials from Strata Numbers 2, 4, 7, and 8 (A-1-a, A-1-b, and A-3) are considered to be select and should be utilized in accordance with FDOT Standard Plans for Road and Bridge Construction Index 120-001.

3) The materials from Strata Numbers 3 and 9 (A-2-4) are considered to be select and should be utilized in accordance with FDOT Standard Plans for Road and Bridge Construction Index 120-001. Certain types of A-2-4 material are likely to retain excess moisture and may be difficult to dry and compact. They should be used in the embankment above the water level existing at time of construction. They may be used in the subgrade portion of the roadbed when approved by the District Materials Engineer.

4) The material from Stratum Number 5 (A-4) is considered to be plastic. This material was encountered in four (4) test locations (MJ-1, MJ-2, CB-7, and CB-9) at depths ranging from 2 to 4 feet below existing grades, with thicknesses ranging from 1.3 to 2.0 feet and an average thickness of about 1.8 feet. Given that the proposed use of the Ludlam Trail will be generally limited to pedestrian/bike use rather than vehicular use, as well as the isolated locations of the sandy silt (A-4) layer and the depths at which it was encountered, it is our opinion that these materials may remain in place in accordance with FDOT Standard Plans for Road and Bridge Construction Index 120-002 as they have been previously loaded and no future grade changes are expected. During the final design phase once a final design-level field investigation is performed, areas that encountered sandy silt (A-4) should be further investigated to delineate the extent of these soils. Additionally, the ground improvement for these soils (A-4) shall be further re-visited with the goal of selecting the most feasible and economical method for improving these soils.

5) The material from Stratum Number 6 is the natural Limestone Formation. This material may be difficult to dewater, excavate and/or penetrate and may require special equipment to do so.

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD:
GEOSOL, INC.
ORACIO RICCOBONO, P.E.
P.E. LICENSE NO. 49324
5795-A NW 151ST STREET
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CERTIFICATE OF AUTHORIZATION 8530

LUDLAM TRAIL CORRIDOR PD&E STUDY

Miami-Dade County Parks, Recreation, and Open Spaces (MDPROS)

Hickman Building
275 NW2nd Street
Miami, Florida 33128
305-755-7800

P&R CONTRACT NO.
RFQ 786B
P&R PROJECT NO.
43502-15-001-1447061/9

SHEET TITLE: ROADWAY SOILS SURVEY

SHEET NO. 34

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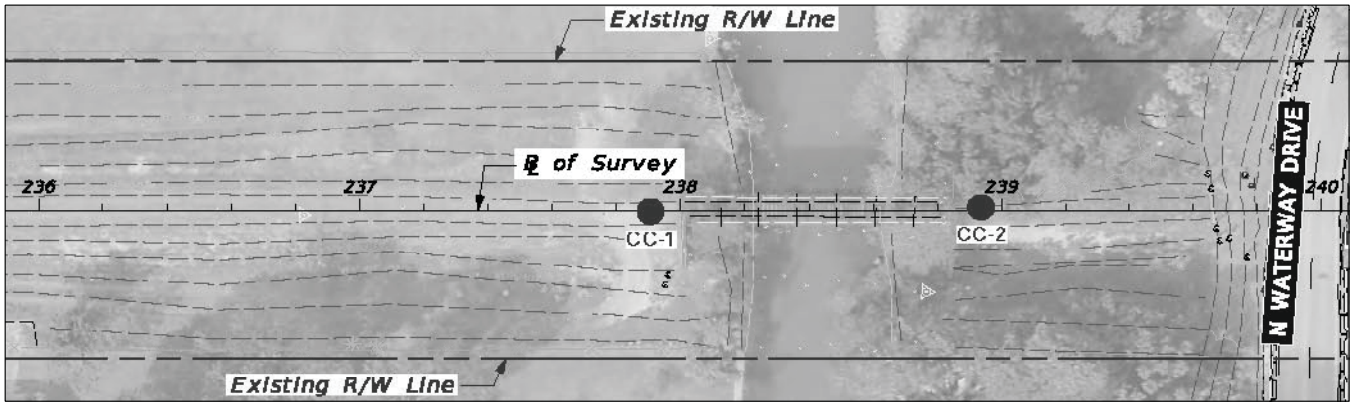
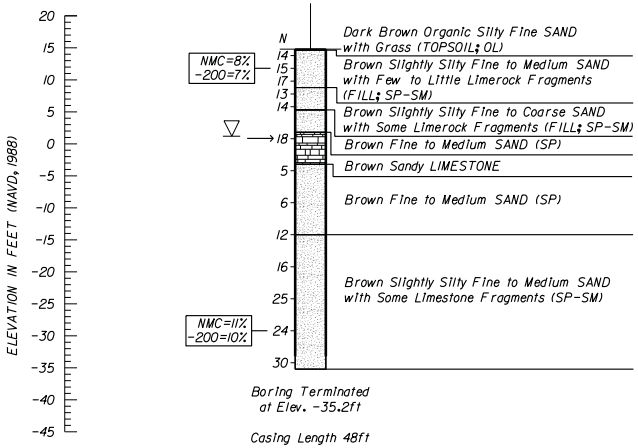


BORING LOCATION PLAN

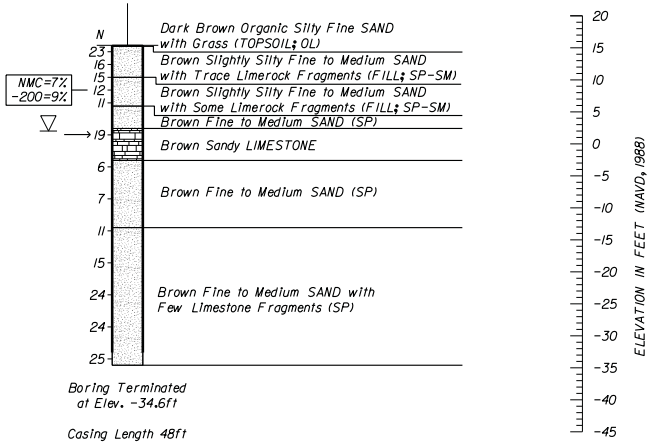
BOR #	CC-1
STA.	237+90
OFF.	2 RT
ELEV.	14.8
DATE	9/10/2018
DRILLER	R.Morales - GEOSOL, Inc.
HAMMER	Auto
RIG	B-53
LATITUDE	25.739618
LONGITUDE	-80.307473
NORTHING	511653
EASTING	884130



Boring Terminated at Elev. -35.2ft

Casing Length 48ft

BOR #	CC-2
STA.	238+94
OFF.	2 LT
ELEV.	15.4
DATE	9/9/2018
DRILLER	R.Morales - GEOSOL, Inc.
HAMMER	Auto
RIG	B-53
LATITUDE	25.739905
LONGITUDE	-80.307489
NORTHING	511757
EASTING	884124



Boring Terminated at Elev. -34.6ft

Casing Length 48ft

0 4 20

Feet

VERTICAL SCALE

HORIZONTAL SCALE: N.T.S.

LEGEND

- TOPSOIL (OL)
- SAND (FILL; SP, SP-SM)
- SAND (SP, SP-SM)
- SILTY SAND (FILL; SM)
- LIMESTONE
- WATER TABLE AT TIME OF DRILLING
- SPT BORING LOCATION
- CASING USED
- N — NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12" PENETRATION (UNLESS OTHERWISE NOTED).
- NMC — NATURAL MOISTURE CONTENT (%)
- -200 — FINES PASSING THE #200 SIEVE (%)
- OC — ORGANIC CONTENT (%)
- → — PERIODIC TOTAL LOSS OF DRILLING FLUID CIRCULATION (100%)

NOTES:

1) SPT BORINGS PERFORMED PER ASTM D-1586 WITH A HAMMER WEIGHT OF 140 LBS FALLING 30 INCHES.
2) REF: B/L OF SURVEY

ENVIRONMENTAL CLASSIFICATION:
SUPERSTRUCTURE: SLIGHTLY AGGRESSIVE
SUBSTRUCTURE: MODERATELY AGGRESSIVE

WATER:
pH: 7.3-7.6 SULFATE: 6-18 PPM
CHLORIDE: 28-29 PPM RESISTIVITY: 1820-2060 OHM-CM

SITE CONDITION NOTES:

1) THE STRATA ENCOUNTERED WITHIN THE PROJECT SITE CORRESPOND TO ROCK FORMATIONS THAT OFFER HIGH RESISTANCE TO DRIVING AND EXCAVATION. SPECIAL EQUIPMENT AND BREAKING TOOLS ARE TYPICALLY REQUIRED TO EXCAVATE OR PENETRATE THESE LAYERS. THESE LAYERS ARE ALSO DIFFICULT TO DEWATER DUE TO THEIR HIGH POROSITY AND PERMEABILITY. FOR DRILLED SHAFTS, SHEET PILE AND OTHER RETAINING WALL SYSTEM RELATED WORK, THESE LAYERS TYPICALLY REQUIRE PREFORMING HOLES TO MINIMUM TIP ELEVATION TO PREVENT REFUSAL CONDITIONS, STRUCTURAL DAMAGE, OR TO MINIMIZE VIBRATION-INDUCED DAMAGE TO NEARBY STRUCTURES.
2) THE CONTRACTOR IS ADVISED THAT CAVING SATURATED SANDY SOILS MAY BE ENCOUNTERED DURING THE EXCAVATION FOR INSTALLATION OF THE FOUNDATION STRUCTURES.
3) THE CONTRACTOR IS ADVISED THAT PERIODIC TOTAL LOSS OF CIRCULATION WAS EXPERIENCED DURING THE PERFORMANCE OF THE BORINGS WHICH MAY MAKE IT DIFFICULT TO MAINTAIN THE FLUID LEVEL IN THE EXCAVATION.

GRANULAR MATERIALS- RELATIVE DENSITY	AUTOMATIC SPT HAMMER (BLOWS PER FOOT)
VERY LOOSE	LESS THAN 3
LOOSE	3-8
MEDIUM DENSE	8-24
DENSE	24-40
VERY DENSE	GREATER THAN 40
SILTS AND CLAYS CONSISTANCY	**AUTOMATIC SPT HAMMER (BLOWS PER FOOT)**
VERY SOFT	LESS THAN 1
SOFT	1-3
FIRM	3-6
STIFF	6-12
VERY STIFF	12-24
HARD	GREATER THAN 24

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REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD:
GEOSOL, INC.
ORACIO RICCOBONO, P.E.
P.E. LICENSE NO. 49324
5795-A NW 151ST STREET
MIAMI LAKES, FL 33014
PHONE: (305) 828-4367
CERTIFICATE OF AUTHORIZATION 8530

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REPORT OF CORE BORINGS

SHEET NO. 35

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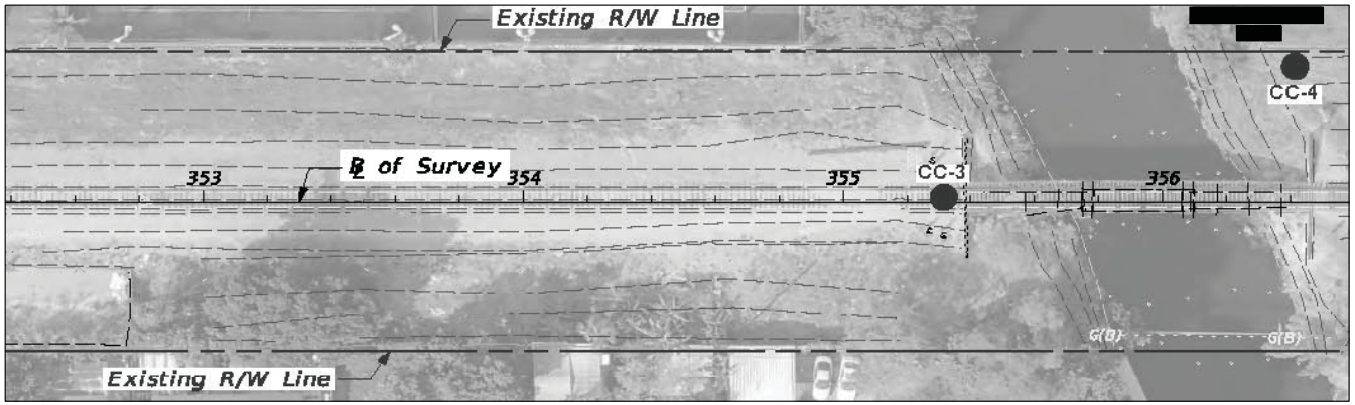
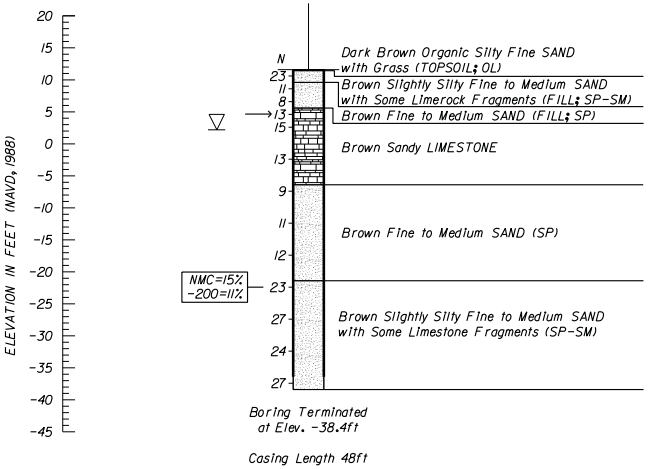


BORING LOCATION PLAN

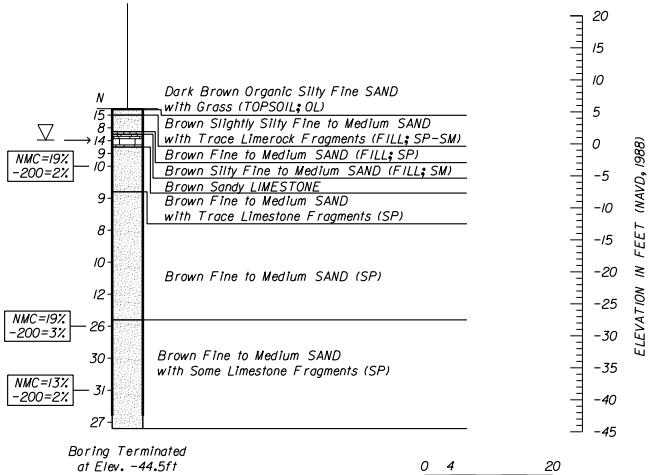
BOR # CC-3
STA. 355+32
OFF. 2 LT
ELEV. 11.6
DATE 9/16/2018
DRILLER R.Morales - GEOSOL, Inc.
HAMMER Auto
RIG B-53
LATITUDE 25.771917
LONGITUDE -80.308218
NORTHING 523391
EASTING 883823



Boring Terminated at Elev. -38.4ft

Casing Length 48ft

BOR # CC-4
STA. 356+42
OFF. 45 LT
ELEV. 5.5
DATE 9/17/2018
DRILLER R.Morales - GEOSOL, Inc.
HAMMER Auto
RIG B-53
LATITUDE 25.772227
LONGITUDE -80.308355
NORTHING 523504
EASTING 883777



Boring Terminated at Elev. -44.5ft

Casing Length 48ft

0 4 20
Feet
VERTICAL SCALE
HORIZONTAL SCALE: N.T.S.

LEGEND

- TOPSOIL (OL)
- SAND (FILL; SP, SP-SM)
- SAND (SP, SP-SM)
- SILTY SAND (FILL; SM)
- LIMESTONE
- WATER TABLE AT TIME OF DRILLING
- SPT BORING LOCATION
- CASING USED
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REPORT OF CORE BORINGS

SHEET NO. 36

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