Andreyev Engineering, Inc.

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Groundwater ▼ Environmental ▼ Geotechnical ▼ Construction Materials Testing

June 16, 2020
Project No.: CPGT-20-066

To: CBD Real Estate Investment, LLC
1420 Celebration Boulevard, Suite 200
Celebration, Florida 34747

Attention: Mr. David Waronker

Subject: Geotechnical Study
Proposed Wire Ranch Development
Zephyrhills, Pasco County, Florida

Dear Mr. Waronker:

Per your request and authorization, Andreyev Engineering, Inc. (AEI) has completed a geotechnical investigation for the above referenced project. The purpose of this study was to obtain geotechnical data to assist in the design and construction of the proposed development. We understand that the project will consist of developing an approximate 33-acre property into a multifamily site with a large retention dry pond. We also understand that significant mass grading is proposed to get the property to the final grades. This report presents the results of our geotechnical investigation along with an evaluation of the soil and groundwater conditions encountered. In addition, it provides geotechnical engineering recommendations for pavement base design, evaluation of the proposed retention ponds, and site preparation.

SITE LOCATION AND PROJECT DESCRIPTION

The subject site is located along the east side of Gall Boulevard (US 301) in Zephyrhills, Pasco County, Florida Section 26, Township 25 South, Range 21 East. A quadrangle map U.S.G.S. Topographic map is presented on **Figure 1**, a Soil Survey map on **Figure 2,** and a Boring Location Plan is presented on **Figure 3**. We understand that the proposed project will consist of a residential subdivision with one (1) stormwater retention area located along the eastern perimeter of the property.

PURPOSE AND SCOPE OF FIELD EXPLORATION

The scope of our field investigation consisted of the following:

- Mobilized crew and drilling equipment to the site.
- Performed nine (9) auger borings to a depth of 30 feet below existing grade within the proposed cut areas to determine fill suitability of the soil.

- Performed four (4) auger borings to a depth of 20 feet within the proposed retention pond configuration/layout areas.

- Performed two (2) field permeability tests within the proposed retention pond area.

- Performed sixteen (16) moisture content and percent of fines passing the #200 sieve from the retrieved soils samples.

- Prepared a geotechnical report including results of the soil investigations, evaluation of encountered conditions, estimation of seasonal high groundwater levels, retention pond design parameters and fill suitability of the encountered soils.

SOIL AND GROUNDWATER CONDITIONS

The approximate locations of the borings are shown on the attached **Figure 3**. Please note that survey control was not provided for our field investigation. Therefore, the locations of the borings indicated on the attached **Figure 3** should be considered approximate.

Representative portions of each soil strata identified in the borings were packaged and sealed for transportation to our laboratory for further examination and visual classification

Soil Conditions

The soil types encountered at the boring locations are presented in the form of soil profiles on the attached **Figures 4 and 5**. The stratification presented on **Figures 4 and 5** is based on visual examination of the recovered soil samples and the interpretation of the field logs by a geotechnical engineer.

In general, the borings encountered the following soil types:

Stratum No.	Soil Description	USCS GROUP
1	Dark brown to brown to light brown fine sand	(SP)
2	Light brown to brown clayey fine sand	(SC)
3	Light brown to brown sandy clay	(CL)
4	Dark brown to brown to light brown silty to clayey fine sand	(SM)(SC)

Please refer to the soil profiles on the attached **Figures 4 and 5** for specific boring data. The information presented on the soil profiles represent the subsurface conditions encountered at the noted boring locations. Accordingly, the materials between and away

from the boring locations may vary from those encountered at the specific boring locations. The strata boundaries presented on the soil profiles have been approximated. The actual boundaries may be gradual or otherwise not clearly defined.

The results of the moisture content and percent of fines passing the #200 sieve are presented in the following table and on the soil profiles on the attached **Figure 4**.

Boring	Stratum	Sample Depth (feet)	Moisture Content (%)	-#200 (%)
A-1	2	6 to 11	12.3	24.7
A-1	2	11 to 15	11.4	26.9
A-2	2	7 to 10	10.6	26.0
A-3	1	3 to 7	3.5	3.9
A-3	2	9.5 to 14	12.3	27.3
A-3	2	14 to 15	12.5	26.4
A-4	1	10 to 15	4.0	3.4
A-4	2	15 to 17	9.7	14.9
A-5	1	2 to 4.5	3.5	4.5
A-6	2	11 to 16	10.2	29.2
A-7	2	9 to 14	12.4	20.7
A-7	3	21 to 24	15.0	39.7
A-8	2	9 to 10	9.5	17.2
A-8	2	10 to 13	13.5	29.4
A-9	2	5 to 8	9.5	24.7
A-9	3	8 to 11	18.1	51.8

N.R.C.S. Soil Survey

The N.R.C.S. soil survey map of Pasco County was reviewed for the project site and the following table summarizes the soil types mapped by the NRCS and the approximated high groundwater level associated with these soil types:

Soil Unit #	Name	High Water Table Depth (inches)
6	Tavares sand, 0 to 5 percent slopes	42 to 72
7	Sparr fine sand, 0 to 5 percent slopes	18 to 42
43	Arredondo fine sand, 0 to 5 percent slopes	>80

The USDA/NRCS soil survey of the project site is provided on the attached **Figure 3**.

Groundwater Table

The subsurface investigation was performed on May 28, 2020. At the time of the soil borings investigation, groundwater table was not encountered to the investigated depths of up to 30 feet below the existing ground surface.

Fluctuation of the groundwater table should be anticipated throughout the year due to variations in seasonal rainfall. Due to the presence of the clayey fine sand and sandy clay layers of Strata 2 and 3 and the poorly permeable characteristics of these soil, we anticipate temporary perching of groundwater above these soils during periods of heavy or extended rainfall to occur on top of these soils. We anticipate that a temporary perched groundwater table would occur at about 0.5 to 1-foot above the top of Strata 2 and 3 depending on the depth and the slope of the underlying clay layers. At boring locations where clayey fine sand was not encountered, we anticipate that the seasonal high groundwater table to occur at more than 20 feet below ground surface.

CONCLUSIONS AND RECOMMENDATIONS

Mass Grading

Based on the results of our subsurface exploration program, it is our opinion that the site is generally suitable for the planned development. The main constraints for development of the site are possible areas of shallow clayey soils after the mass grading operations. The following are general recommendations for consideration during preliminary planning and design:

- Any clayey soils located within 2 feet of the bottom of slabs/footings and pavement base materials should be over-excavated and replaced with well-draining fine sand.

- Any shallow deposits of organic soils present (if encountered during mass grading) within the development area should be fully over-excavated, removed and replaced with compacted engineered fill.

- Conventional site preparation is anticipated for the construction of roadways, parking areas, and building sites. This should consist of removal of unwanted vegetation, topsoil, roots, organic soils, near surface clayey soils, and soils containing debris. The exposed soils and any fill soils should be compacted in accordance with the project specifications.

- All fill should be placed in level lifts not to exceed 12 inches loose and should be compacted to a minimum of 95% of the soil's modified Proctor maximum dry density as determined by ASTM Specification D-1557. In-place density tests should be performed on each lift by an experienced engineering technician working under the direction of a registered geotechnical engineer to verify that the recommended degree of compaction has been achieved. We suggest a minimum

testing frequency of one (1) test per lift per 10,000 square feet of area during mass grading.

Fill Suitability

The clean fine sand soils (Stratum 1) is considered a good source for engineered fill. The stratum 1 soils fines content (-200) ranged between 3.4% and 4.5%.

The three classifications of encountered soil types with limitations for use as general fill includes the encountered clayey sand to sandy clay soils. The Strata 2, 3 and 4 clayey soils should not be used for direct foundation support or placed in near-surface areas due to their moisture retention properties, difficulties with compaction, and drainage issues associated with higher surface runoff volumes from the poorly permeable soils when compacted. These soils can expose overlying supported structures to increased levels of differential settlement if they are within 3 feet of the bottom of the foundations.

However, the strata 2, 3 and 4 soils could be used as deeper fill for mass grading and stabilized subgrade underlying the limerock base of an asphalt roadway and in non-structural areas that are not dependent on good drainage. It should be understood that using these soils as fill may more difficult to compact during mass grading than using clean fine sand, due to their tendency to hold on to moisture when wet.

Figure 6 presents the contour map of the depth of the sand (stratum 1) and **Figure 7** presents the elevation of the bottom of the stratum 1 layer encountered in the borings. Please note that the contour lines are based on the data derived from our borings and is presented for information purposes only. The materials between and away from the boring locations may vary from those encountered at the specific boring locations.

Excavations

All excavations should be constructed in accordance with applicable local, state and federal regulations including those outlined by the Occupational Safety and Health Administration (OSHA). It is the contractor's responsibility for designing and constructing safe and stable excavations. Excavation should be sloped, benched or braced as required to maintain stability of the excavation sides and bottoms. Excavations should consider loads resulting from equipment, fill stockpile and existing construction. Any shoring needed to maintain a safe excavation should be designed by a professional engineer registered in the State of Florida in accordance with local, state and federal guidelines.

Stormwater Retention Pond

Based on the information provided to us, there is one (1) proposed retention pond area. In order to evaluate the soil and groundwater conditions within the proposed pond area, we performed a total of four (4) auger borings, A-1 through A-4, to a depth of 20 feet

below existing grade. The results of the borings are shown in the form of soil profiles on the **Figure 5**.

In addition, we performed two (2) laboratory permeability tests. The measured laboratory permeability tests are presented below:

Boring	Test Depth (feet)	Horizontal Permeability (feet/day)
P-2	3	24.5
P-4	3	28.7

The field permeability test result is presented adjacent to the borings A-1 and A-4 on the soil profiles on the attached **Figure 4**. The permeability value should not be misconstrued to represent the design exfiltration rate. The exfiltration rate should be lower due to pond bottom siltation, pond geometry, volume and groundwater mounding effects. Below is a summary of recommended aquifer parameters to be used in the design and stormwater recovery analysis for the proposed retention ponds.

PARAMETERS	**BORINGS A-1, A-2, A-3 and A-4**
Bottom of Aquifer Depth (NAVD88)	76.6 ft
Estimated Normal Seasonal High Ground Water Table Depth (NAVD88)	77.6 ft
Average Horizontal Hydraulic Conductivity (feet/day)	39.9
Average Unsaturated Vertical Hydraulic Conductivity (feet/day)	17.7
Storage Coefficient	0.3

**Aquifer depth is the average to the top of clayey soils (restrictive layer) at each boring.*
*** Seasonal high water table is estimated to be 1 foot above the estimated restrictive layer.*
**** Permeability average between the two laboratory permeability values*

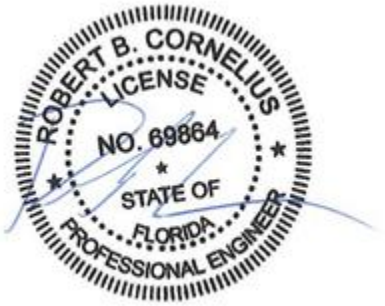
LIMITATIONS OF REPORT

The analyses and recommendations submitted in this report are based on the anticipated location and type of construction discussed herein and the data obtained from the soil borings performed at the locations indicated and does not reflect any variations which may occur beyond these borings.

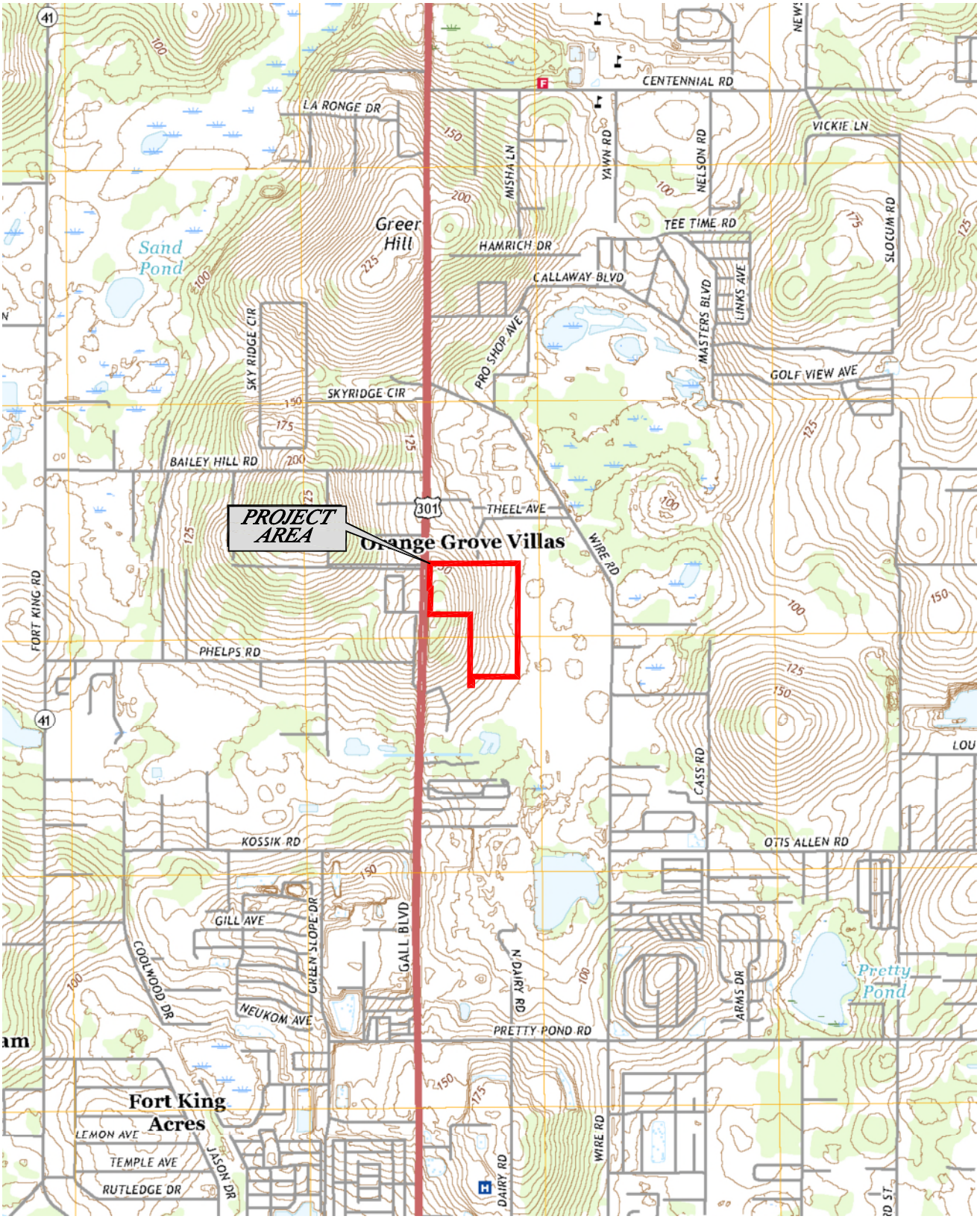
CLOSURE

AEI appreciates the opportunity to participate in this project and we trust that the information provided herein is sufficient for your immediate needs. If you have any questions or comments concerning the contents of this report, please do not hesitate to contact the undersigned.

Sincerely,
Andreyev Engineering, Inc.



Robert B. Cornelius, P.E.
Vice President
Florida Registration No. 69864



REFERENCE:
U.S.G.S. DADE CITY, FLA.
QUADRANGLE MAP
DATED 2018
SECTION 26
TOWNSHIP 25 SOUTH
RANGE 21 EAST

Andreyev Engineering, Inc.

APPROXIMATE SCALE:	DATE: 06/01/20	ENGINEER: RC
1"=2000'	PN: CPGT-20-066	DRAWN BY: DLS

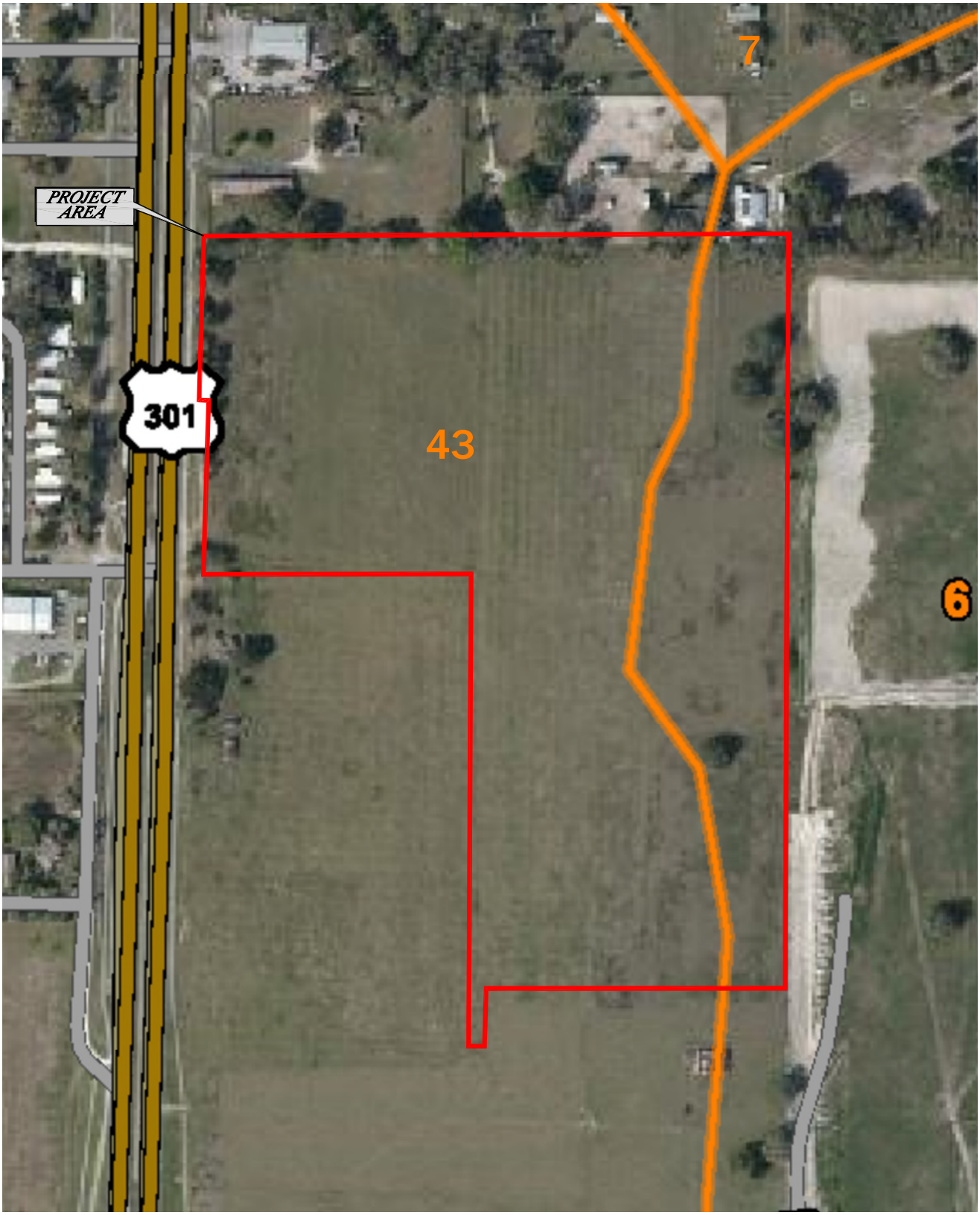
GEOTECHNICAL STUDY

PROPOSED WIRE RANCH DEVELOPMENT

ZEPHYRHILLS, PASCO COUNTY, FL

U.S.G.S. TOPOGRAPHIC MAP

FIGURE 1



LEGEND:

6	TAVARES SAND
7	SPARR FINE SAND
43	ARREDONDO FINE SAND

REFERENCE:
U.S.D.A. N.R.C.S. WEB SOIL SURVEY

Andreyev Engineering, Inc.

APPROXIMATE SCALE: 1"=300'	DATE: 06/01/20	ENGINEER: RC
	PN: CPGT-20-066	DRAWN BY: DLS

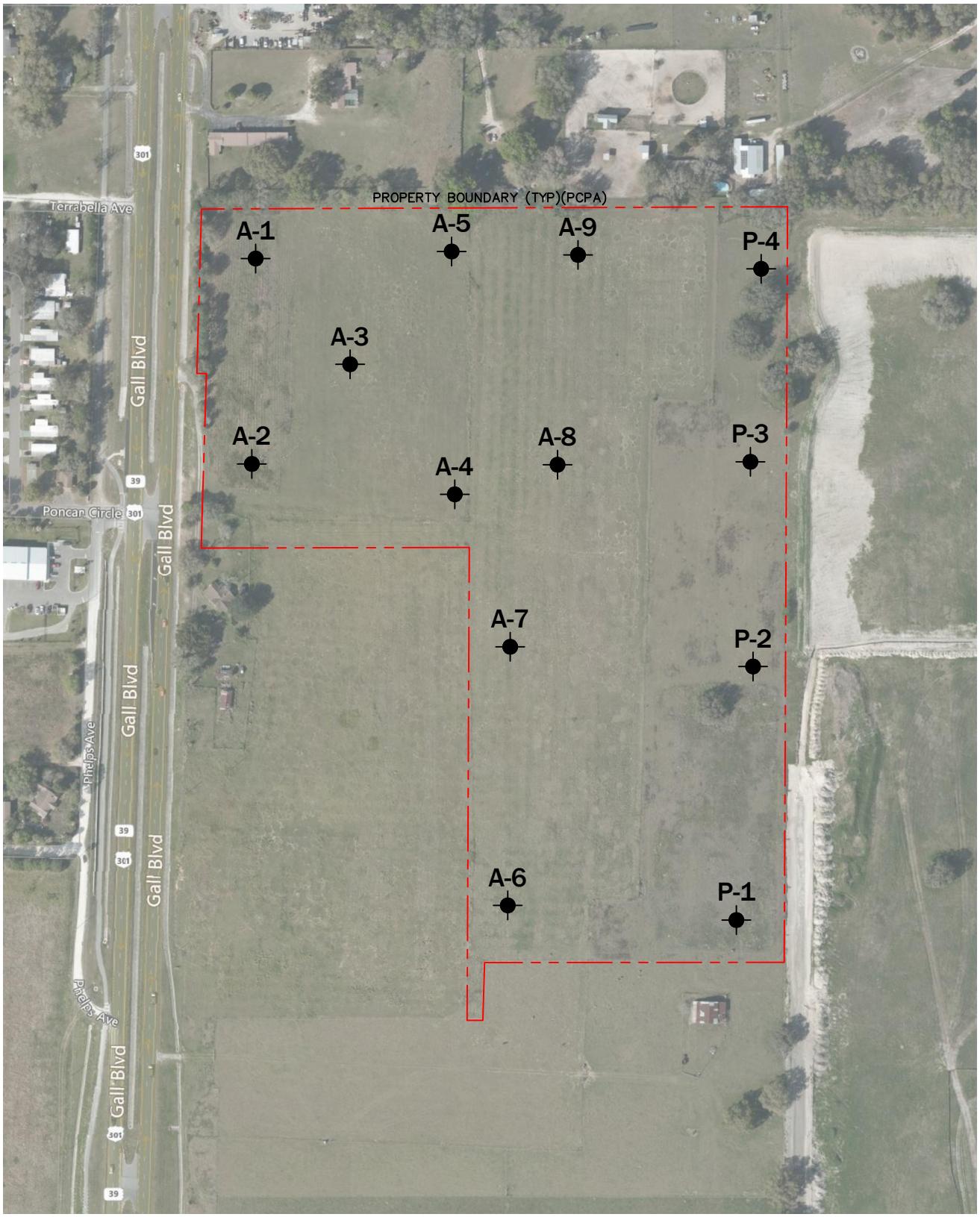
GEOTECHNICAL STUDY

PROPOSED WIRE RANCH DEVELOPMENT

ZEPHYRHILLS, PASCO COUNTY, FL

N.R.C.S. SOIL SURVEY MAP

FIGURE 2



LEGEND:

APPROXIMATE LOCATION OF MACHINE AUGER BORING

0 150 300 600

GRAPHIC SCALE: 1"=300'

Andreyev Engineering, Inc.

APPROXIMATE SCALE:	DATE: 06/11/20	ENGINEER: RC
1"=300'	PN: CPGT-20-066	DRAWN BY: DLS

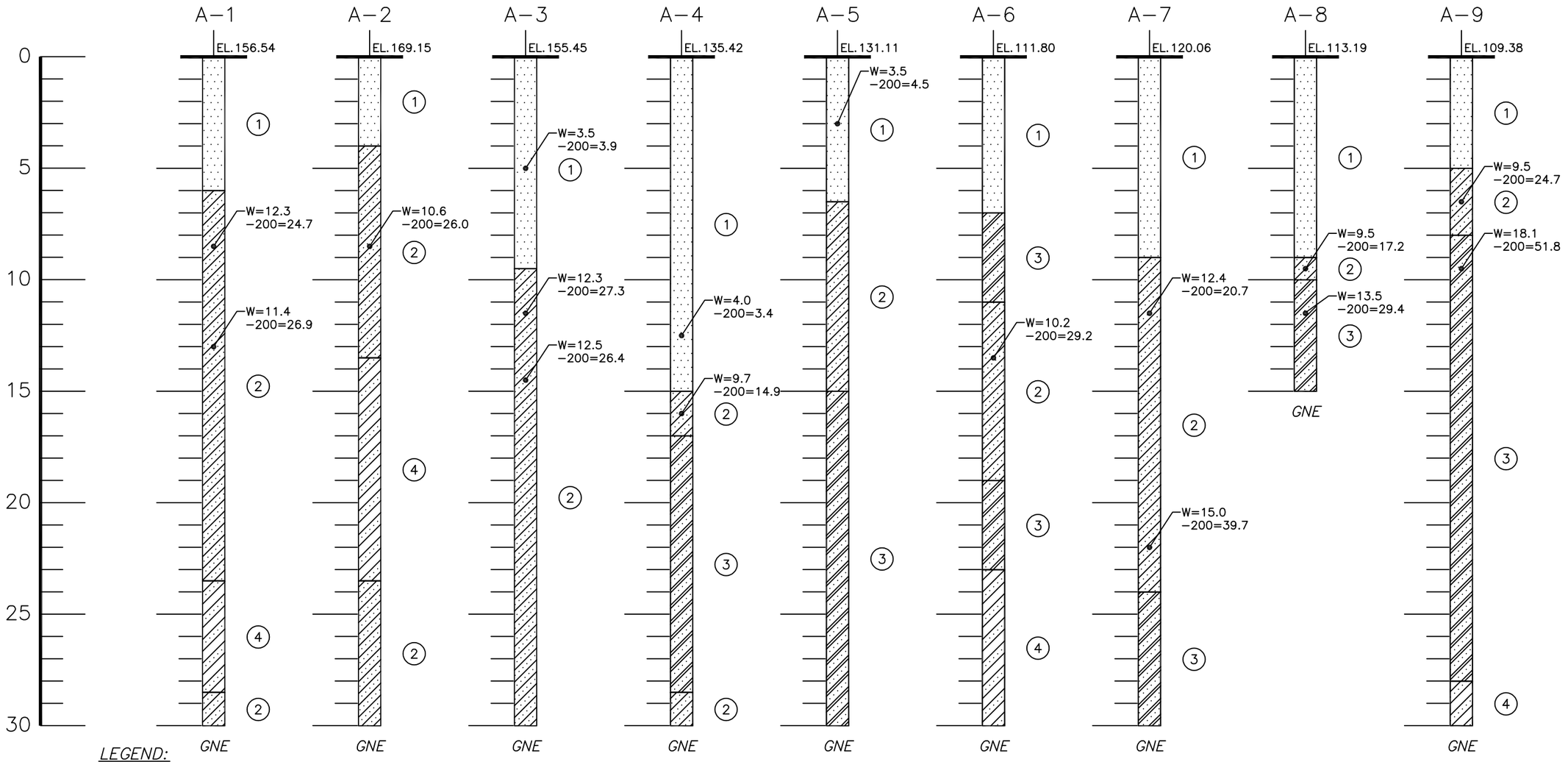
GEOTECHNICAL STUDY

PROPOSED WIRE RANCH DEVELOPMENT

ZEPHYRHILLS, PASCO COUNTY, FL

BORING LOCATION PLAN

FIGURE 3



LEGEND:

1. DARK BROWN TO BROWN TO LIGHT BROWN FINE SAND (SP)
2. LIGHT BROWN TO BROWN CLAYEY FINE SAND (SC)
3. LIGHT BROWN TO BROWN SANDY CLAY (CL)
4. DARK BROWN TO BROWN TO LIGHT BROWN SILTY TO CLAYEY FINE SAND (SM)(SC)

(SP) UNIFIED SOIL CLASSIFICATION SYSTEM GROUP SYMBOL

GNE GROUNDWATER NOT ENCOUNTERED

W MOISTURE CONTENT, IN PERCENT

-200 PERCENT OF FINES PASSING THE U.S. No. 200 SIEVE

Kv VERTICAL COEFFICIENT OF PERMEABILITY, IN FEET PER DAY

EL. GROUND ELEVATION AT BORING LOCATION (FT-NAVD88)

Andreyev Engineering, Inc.

GEOTECHNICAL STUDY

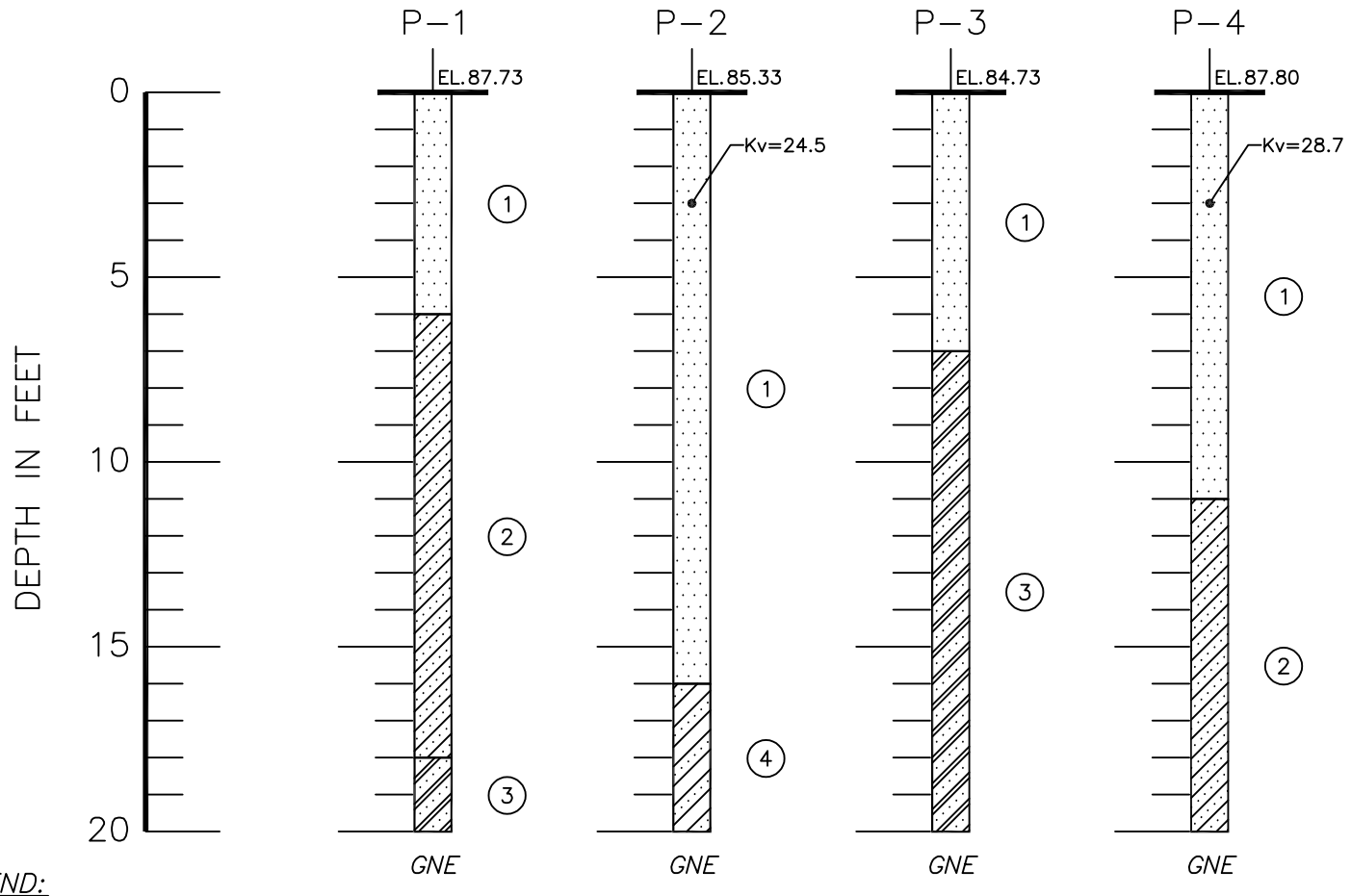
PROPOSED WIRE RANCH DEVELOPMENT

ZEPHYRHILLS, PASCO COUNTY, FL

SOIL PROFILES

APPROXIMATE SCALE:	DATE: 06/11/20	ENGINEER: RC
1"=5'	PN: CPGT-20-066	DRAWN BY: DLS

FIGURE 4



LEGEND:

1. DARK BROWN TO BROWN TO LIGHT BROWN FINE SAND (SP)
2. LIGHT BROWN TO BROWN CLAYEY FINE SAND (SC)
3. LIGHT BROWN TO BROWN SANDY CLAY (CL)
4. DARK BROWN TO BROWN TO LIGHT BROWN SILTY TO CLAYEY FINE SAND (SM)(SC)

(SP) UNIFIED SOIL CLASSIFICATION SYSTEM GROUP SYMBOL

GNE GROUNDWATER NOT ENCOUNTERED

W MOISTURE CONTENT, IN PERCENT

–200 PERCENT OF FINES PASSING THE U.S. No. 200 SIEVE

Kv VERTICAL COEFFICIENT OF PERMEABILITY, IN FEET PER DAY

EL. GROUND ELEVATION AT BORING LOCATION (FT–NAVD88)

Andreyev Engineering, Inc.

APPROXIMATE SCALE:	DATE: 06/11/20	ENGINEER: RC
1"=5'	PN: CPGT–20–066	DRAWN BY: DLS

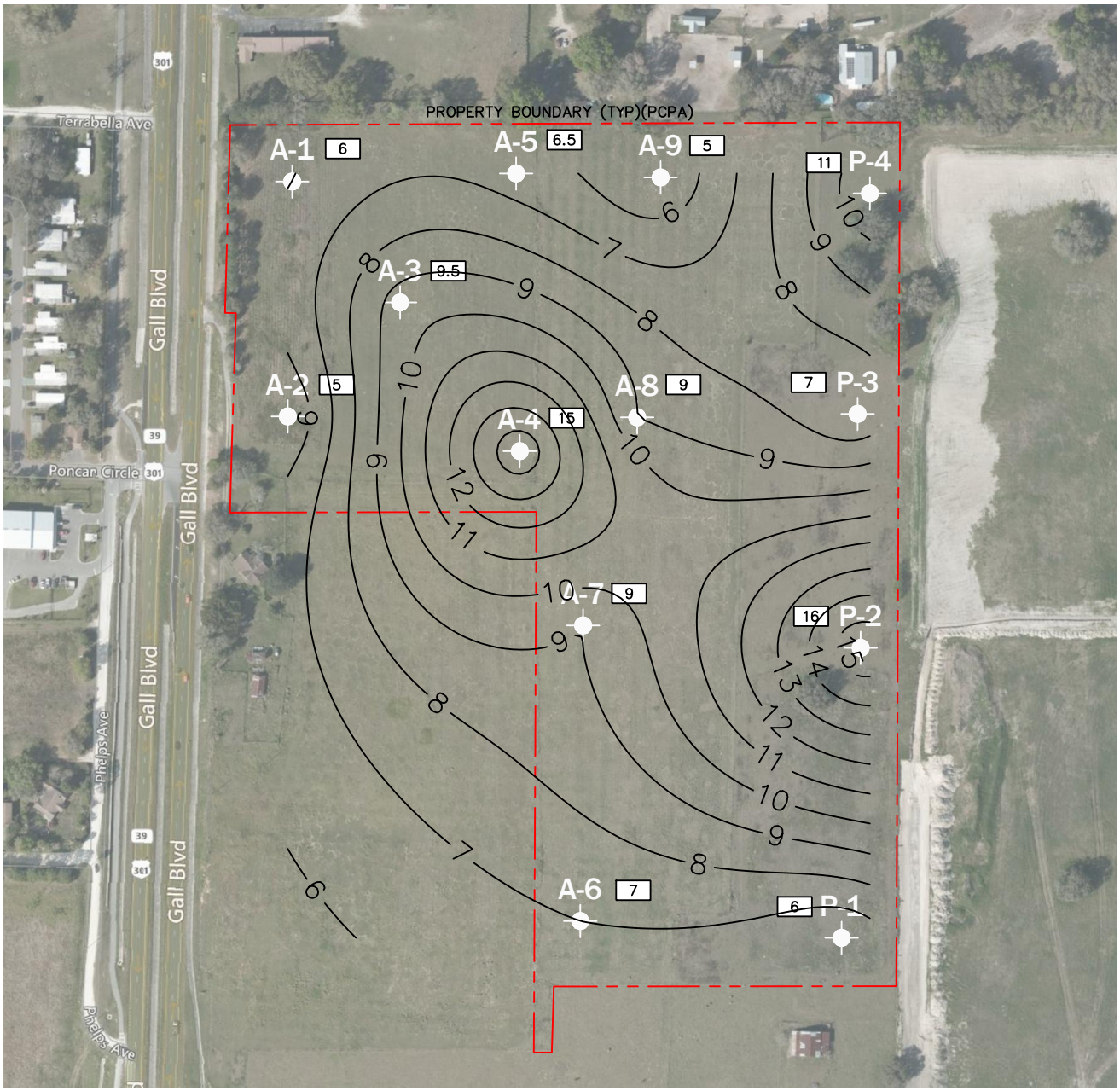
GEOTECHNICAL STUDY

PROPOSED WIRE RANCH DEVELOPMENT

ZEPHYRHILLS, PASCO COUNTY, FL

SOIL PROFILES

FIGURE 5



LEGEND:

APPROXIMATE LOCATION OF MACHINE AUGER BORING

8 DEPTH TO SAND (FEET)

DEPTH TO SAND CONTOUR (FEET)

0 150 300 600

GRAPHIC SCALE: 1"=300'

Andreyev Engineering, Inc.			GEOTECHNICAL STUDY PROPOSED WIRE RANCH DEVELOPMENT ZEPHYRHILLS, PASCO COUNTY, FL
APPROXIMATE SCALE: 1"=300'	DATE: 06/11/20	ENGINEER: RC	DEPTH OF SAND CONTOUR MAP
	PN: CPGT-20-066	DRAWN BY: DLS	FIGURE 6

LEGEND:

APPROXIMATE LOCATION OF MACHINE AUGER BORING

150.48 BOTTOM OF SAND ELEVATION (FT–NAVD88)

BOTTOM OF SAND ELEVATION CONTOUR (FT–NAVD88)

0 150 300 600

GRAPHIC SCALE: 1"=300'

Andreyev Engineering, Inc.

GEOTECHNICAL STUDY

PROPOSED WIRE RANCH DEVELOPMENT

ZEPHYRHILLS, PASCO COUNTY, FL

BOTTOM OF SAND ELEVATION CONTOUR MAP

APPROXIMATE SCALE:	DATE: 06/11/20	ENGINEER: RC
1"=300'	PN: CPGT–20–066	DRAWN BY: DLS

FIGURE 7