ANTICUS ENGINEERING

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November 15, 2023

Bellerive at Fox Hollow
c/o Management & Associates
720 Brooker Creek Boulevard, Suite 206
Oldsmar, Florida 34677

Attn: Nancy Lucas, LCAM
nlucas@mgmt-assoc.com

Reference: Report of Geotechnical Engineering Services
Bellerive at Fox Hollow
9126, 9138, and 9150 Callaway Drive
Trinity, Pasco County, Florida
Anticus Project No: 01.6141.23

Dear Ms. Lucas:

As authorized, we completed a Privacy Wall Evaluation which included a ground penetrating radar (GPR) survey, two (2) hand auger borings in conjunction with static cone penetrometer (SCP) testing, damage assessment, and foundation test pit. The field testing was completed along the area of settlement / cracking of the CMU block privacy wall located along the rear (north) perimeter of 9126, 9138, and 9150 Callaway Drive, Trinity, Pasco County, Florida. The following report briefly describes the field test procedures used and presents the findings and conclusions.

## GENERAL

Based on electronic mail correspondence with Joseph Trocano of Karins Engineering on August 28, 2023, it is our understanding that there are concerns associated with settlement / cracking of the CMU block privacy wall that runs through 9126, 9138, and 9150 Callaway Drive, Trinity, Pasco County, Florida.

## HISTORIC TOPOGRAPHIC AND AERIAL REVIEW

As part of this evaluation, a review of readily available historic aerials and topographic maps of the subject property were reviewed. Based on review of a selection of historic Google Earth aerials and topographic maps, depressional features were not observed on the subject property prior to development of the neighborhood sometime before 1998. However, in the 1974 topographic map the property consisted of a low lying marsh area. In addition, a marsh area is visible in the 1970 historic aerial of the subject property. Below in **Figure 1**, are images of the historic topographic map and aerial of the subject property.


**Figure 1:** View of 1970 historic aerial and 1974 historic topographic map of the subject property. The red line indicates the approximate current location of the privacy wall.

## EXPLORATION PROGRAM

The evaluation included a Ground Penetrating Radar Surveys (GPR) in the area of the existing privacy wall; two (2) hand auger borings with SCP testing; foundation test pit, and a visual structural damage survey of accessible areas of the privacy wall structure.

The privacy wall GPR survey was performed using a GSSI StructureScan Mini XT, which incorporates a 2.7 Giga-Hertz (GHz) antenna. The GPR Surveys were used to record profiles that represent virtual cross-sections of the CMU block underlying the survey transect lines.

Two (2) hand auger borings in conjunction with the static cone penetrometer tests were performed by manually twisting a post-hole auger into the soil at the locations shown on the attached Privacy Wall Cell Fill and Field Test Location Plan, Sheet 1. The auger consists of two curved blades and a bucket which retains the soil as the auger is advanced. At approximately 6 inch intervals the auger is removed and the soil retained in the bucket is classified in the field by a licensed professional geologist. The soils encountered in the borings were classified utilizing the USCS.

The static cone penetrometer (SCP) is an accepted field test method utilizing a shaft tipped with a conical point having a projected area of 1.5 square centimeters. The test consists of advancing the cone at 6 inch intervals under a relatively uniform rate of advancement into the soil and measuring the soil resistance. The dial indicator reading value has been empirically correlated to typical soil strength properties. The penetrometer reading is correlated to the Standard Penetration Resistance (N) Value as defined by ASTM D 1586. The penetrometer test results provide an index for estimating soil strength and relative density.

One (1) test pit was excavated below along the foundation system to expose the existing foundation and document embedment depth and dimensions.

A visual structural survey of the observable portions of the privacy wall was performed. The areas of distress were photographed, and the photographs are maintained within our files for these sites for future reference. It is possible that damage not observed could exist in areas of the privacy wall.

The observed procedures used for field sampling and testing were performed in general accordance with ASTM procedures and established engineering practice.

## OBSERVATIONS

The condition of the privacy wall and surrounding ground surface was observed on October 11, 2023. The condition of the privacy wall was primarily observed from the backyards of 9126 and 9138 Callaway Drive. The privacy wall consisted of painted split faced CMU blocks with a cementitious top cap.

In the area of concern, separations and stair-step cracks up to approximately an inch wide were observed in the privacy wall. A portion of the cracks exhibited horizontal offset. In the section of the privacy wall behind 9126 Callaway Drive, a portion of the cracks on the privacy wall were observed to have been previously repaired and since then have re-opened. In addition, the section of privacy wall behind 9126 Callaway Drive was observed to be out of plumb or leaning towards the north. Below in **Figure 2**, is an image of a 1/2 wide crack / separation between the top cap and CMU block in the privacy wall.

**Figure 2**: View of crack / separation in the privacy wall.

Along the privacy wall, evidence of animal activity was observed. In the backyard of 9150 Callaway Drive, animal burrows consistent with the presence of Gopher Tortoises were observed. A likely Gopher Tortoise burrow was adjacent to the privacy wall. In addition, other areas on the north side of the privacy wall evidenced potential animal digging.

## GROUND PENETRATING RADAR (GPR) SURVEY

The GPR survey was performed along an approximately ninety-four (94) foot section of the privacy wall along the rear (south) perimeter of the properties located at 9126, 9138, and 9150 Callaway Drive. The results of the GPR survey indicate that a minimal amount of the CMU block cells were filled with grout or similar material. The location filled CMU cells can be viewed in the attached Privacy Wall Cell Fill and Field Test Location Plan, Sheet 1.

## HAND AUGER BORINGS AND SCP TESTING

Two (2) hand auger borings were performed at the locations shown on the attached Field Test Location Plan. The hand auger borings encountered loose to medium dense SAND to SAND With Silt (SP/SP-SM) to approximate depths of 1.5 to 2.5 feet. The surficial sands were underlain with very loose and medium dense PEAT to Silty SAND (SM) or organic-laden soils, underlain by medium dense SAND with Clay (SP-SC).

## FOUNDATION TEST PIT

The test pit excavation of the foundation indicated an approximately 12 inch thick cast-in-place concrete footing with an approximate 3 inch offset from the CMU block stemwall (indicating an approximate foundation width of 14 inches), that was embedded approximately 12 inches in depth. The location of the test pit is presented in the Privacy Wall Cell Fill and Field Test Location Plan, Sheet 1.

## LABORATORY TESTING

Our field representative sealed and returned the soil samples to our office where a Geotechnical Engineer visually classified the soils according to the USCS (ASTM D2488). Laboratory testing was performed as follows:

- Two (2) moisture content tests in accordance with ASTM D2216, entitled “Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass”;
- Two (2) percent organic content tests in accordance with ASTM D2974 entitled “Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils”.

ASTM D2216: The moisture content of soil is an indicator of various physical properties, including strength and compressibility. The sample was weighed and placed in an oven set to 110 degrees Celsius, plus or minus 5 degrees. The sample remained in the oven until the free moisture had evaporated. The dried sample was removed from the oven, allowed to cool, and weighed. The moisture content was computed by

dividing the weight of evaporated water by the weight of the dry sample. The result is expressed as a percent, with the tests indicating a range of moisture content from 97.8% to 118.8% within the samples tested.

ASTM D2974: The organic content of soils is an indicator of various physical properties, including strength and compressibility. A selected sample was taken from a sealed container obtained during the augering phase of the project. The sample was weighed, and then placed in an oven set to 110 degrees Celsius, plus or minus 5 degrees. The sample remained in the oven until the free moisture had evaporated. The dried sample was removed from the oven, allowed to cool, then placed in a muffle furnace and ignited at a temperature of 440 degrees Celsius. The substance remaining after ignition is the ash. The organic matter is determined by subtracting the ash content from one hundred. The result is expressed as a percent, with the tests indicating a range of organic content from 66.1% to 84.5% within the samples tested. Generally an organic content of greater than 7.5% for an individual sample or an average of greater 5.0% for multiple samples is considered detrimental to structures.

The results of the testing are summarized on the attached Table of Laboratory Testing Results, Table 1.

## CONCLUSIONS

Based on review of historic aerials and topographic maps, the privacy wall is located within a former marsh area. Organic-laden soils are prevalent in marshes. Organic-laden soils are considered deleterious due to the propensity of organics to decay, which results in a reduction in the volume of the material and subsequent settlement of overburden soils and the structure(s) which they support. Peat and/or organic-laden soils were recovered within the hand auger borings, HA-1 and HA-2, performed along the privacy wall. Organic soils above the groundwater level decay at a faster rate than organic soils below the water table due to continued exposure to oxygenated storm water filtering through the soils from above. The organic soils recovered within the hand auger borings were encountered above the groundwater level. The distress is consistent with the effects of differential foundation settlement caused by a reduction of soil support due to the decay of organic material.

Although the organic soils are the primary cause of distress, the lack of filled cells and presence of animal burrows likely exacerbated the observed conditions. Within the GPR survey, minimal cells were imaged to have been filled during construction of the wall. The purpose of cell fill is to strengthen the wall structure which aides in the wall ability to resist loads or differential movement. The cells were not filled to current industry standards. The presence of animal burrows may have also contributed to the distress. Gopher Tortoises are known to excavate relatively deep burrows. The burrow creates void space in the subsurface and over time the holes collapse, causing settlement of overburden soils and the structure(s) which they support.

## RECOMMENDATIONS

In order to stabilize the shallow organic laden soils supported the existing privacy wall, we would recommend a limited chemical grouting program. Chemical grouting would densify the existing shallow soils and encapsulate the existing organ laden soils to reduce the future risk of settlement / consolidation of the privacy wall. Another benefit to the chemical grouting program would be to fill in any void spaces caused by the observed abandoned animal burrows. Injection is completed through temporary grout pipe (generally less than 1/2 inch in diameter) drilled into the ground with a sacrificial tip at the pipe end. The chemical grouting will utilize a two part chemical injected at a given depth, the two chemicals react fairly instantaneously, expanding and mixing with the soil, filling voids, and consolidating very loose and very soft areas and encapsulate the organic laden soils – generally chemical grout will improve the densities of the subsurface soils to medium dense. We recommend 20 chemical grout injection locations (at approximate 5 foot center to center spacing), with injections at 3 feet and 5 feet as illustrated on the attached plan. We recommend that each grout point be injected with approximately 25 pounds of chemical grout (we recommend 486 STAR or engineer approved equivalent). The estimated cost for the chemical grout program, including engineering observation is approximately $9,900.00.

The Chemical Grout Location Plan, Sheet 3, and Chemical Grout Specifications are attached.

## LIMITATIONS

Generally accepted geotechnical engineering practices were utilized in the preparation of this report; and no other warranty, either expressed or implied, is made as to the professional advice provided. The report is based upon the information provided as discussed in this report. Consequently, we can assume no responsibility for misinterpretation or misapplication of this report unless given an opportunity to review any changes, which may affect their validity. This report has been prepared solely for the use of our client and may not contain sufficient information for other uses or for the purposes of other parties. Therefore, conclusions or recommendations based upon these data but made by others are not our responsibility. The following are other limitations that are applicable to this report.

Sampling and testing of the soil, rock, groundwater, surface water and air for the presence of environmental contamination was beyond the scope of this exploration. We will be glad to provide these services at your request.

Anticus appreciates the opportunity to be of service on this very important project. Should you have questions or need additional information on this investigation, or if we may be of further assistance, please do not hesitate to call.

Respectfully submitted,
**Anticus Engineering, LLC**
P.O. Box 921 Riverview, Florida 33568

Jonathan Clarkson, P.G.
FL License No. 2928

James LaCava, P.E., State of Florida, Professional Engineer, License No.73080. This item has been digitally signed and sealed by James LaCava on November 15, 2023. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

James M LaCava 2023.11.15 16:33:49 -05'00'

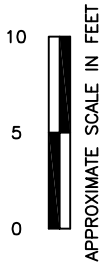
James M. LaCava, P.E.
FL License No. 73080

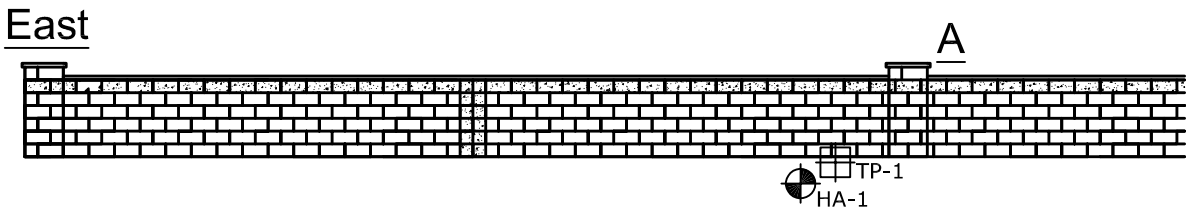
Copies Submitted: One (1) Electronic (PDF)

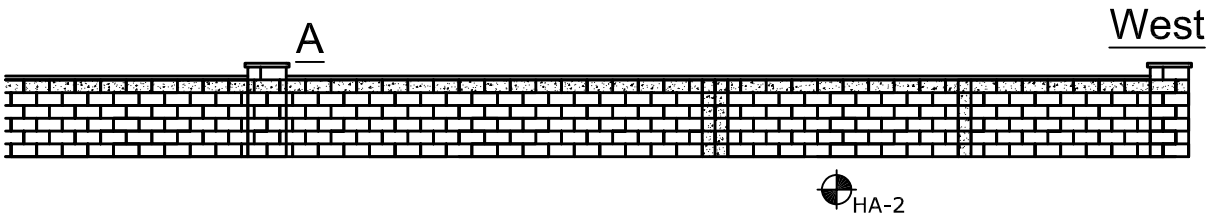
Enclosures: Table 1: Table of Laboratory Testing
Privacy Wall Cell Fill Field Test Location Plan, Sheet 1
Soil Profile, Sheet 2

**TABLE OF LABORATORY TESTING RESULTS, TABLE 1.**

| Boring No. | Boring Interval (depth below grade – ft) | Moisture Content (%) | Organic Content (%) |
|---|---|---|---|
| HA-1 | 1.5-3.5 | 118.8 | 66.1 |
| HA-2 | 2.5-5.0 | 97.8 | 84.5 |




## PRIVACY WALL CELL FILL & FIELD TEST LOCATION PLAN

LEGEND

APPROXIMATE LOCATION FILLED CELLS

HA-1 APPROXIMATE SPT BORING LOCATION

TP-1 APPROXIMATE TEST PIT LOCATION

ANTICUS ENGINEERING
Post Office Box 921
Riverview, FL 33568
Phone/Fax (813) 642-3965

Engineer of Record

James M. LaCava, PE
License No. 73080

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Bellerive at Fox Hollow
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Trinity, FL

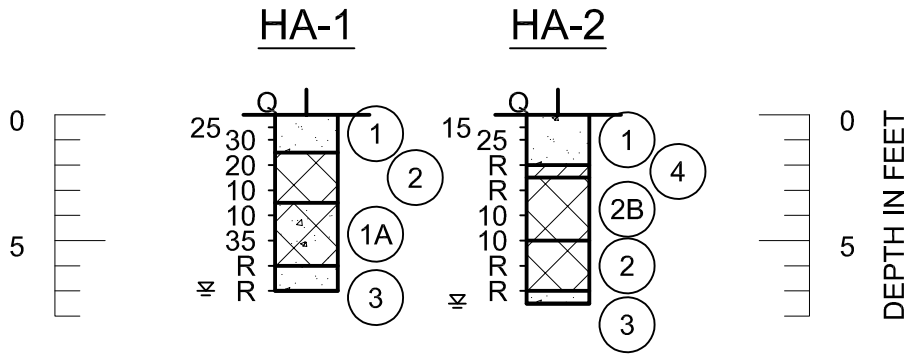
Project 01.6141.23

Date November 15, 2023

Scale As Shown

Sheet 1

# SOIL PROFILE




## LEGEND

| | | |
|---|---|---|
| ① | | Grayish Brown to Light Gray SAND to SAND With Silt (SP/SP-SM) |
| ② | | PEAT (Pt) to Silty SAND (SM) With Organics |
| ③ | | Very Light Gray SAND With Clay (SP-SC) |
| ④ | | Light Gray Clayey SAND (SC) |
| | | A - with organics |
| SP | | Unified Soil Classification System (ASTM D 2488) Group Symbol As Determined By Visual Review |
| | | Groundwater Level |
| Q | | Cone Bearing Capacity (TSF) |
| R | | Penetrometer Encountered Refusal |

Soil Profile Notes:

1. The profiles depicted are of a generalized nature to highlight the major subsurface stratification features and material characteristics. The soil profiles include soil description, stratifications and penetration resistances. The stratifications shown on the boring profiles represent the conditions only at the actual boring location. Variations may occur and should be expected between boring locations. The stratifications represent the approximate boundary between subsurface materials and the actual transition may be gradual.
2. Groundwater levels generally fluctuate during periods of prolonged drought and extended rainfall and may be affected by man-made influences. In addition, a seasonal effect will also occur in which higher groundwater levels or temporary perched conditions are normally recorded in rainy seasons.

| Q-Cone Bearing Capacity (tsf) | Cohesive Soil Consistency | Cohesionless Soil Relative Density |
|---|---|---|
| < 15 | medium stiff | very loose |
| 15 - 40 | stiff | loose |
| 40 - 120 | very stiff to hard | medium dense |

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Post Office Box 921
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Scale Not To Scale

Sheet 2


## CHEMICAL GROUT LOCATION PLAN

LEGEND

G-1 APPROXIMATE CHEMICAL GROUT PIN LOCATION

ESTIMATED QUANTITIES:

20 @ 3' and 5' (25# each)

Total Estimated Grout:
1,000#

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Scale As Shown

Sheet 3