Note that this Addendum DOES change the bid due date and time as stated in the above referenced RFB. Sealed bids must now be received by 10:00 AM on April 10th, 2020, in the Office of the City Clerk, 155 Corey Avenue, St. Pete Beach Florida at which time they will be publicly opened and read. All bidders are invited to attend this bid opening, which will be held immediately following the closing time specified. Bids received after the deadline will not be accepted.

1) As stated in the above note, the Bid Deadline for this project is extended to April 10, 2020 at 10:00 AM.

2) The City has revised the Bid Form for this project. Please see attached Updated Bid Form.

3) Sheets 3 and 4 of the Bid Plans for this project are deleted and replaced with the attached Sheets 3 and 4. A set of plans with a smaller file size has been uploaded to the City’s web page. This smaller plan set includes the updated Sheets 3 and 4.

4) Please see attached inspection report dated October 16, 2019 for the 7th Avenue and 11th Avenue bid Alternates.

5) Please see attached as-builts for the 7th Avenue and 11th Avenue piers.

6) The structural pile jacket underneath the building at Merry Pier is removed from the scope of work for this project.
7) Are there any soil studies or information where these piles are being driven? None seem to be provided.
   a. Please see attached Geotechnical Engineering Services Report by Tierra, Inc.

8) Plans are vague on where 8" tip piles and star piles are to be driven and replaced. Can you provide clarifications on locations of these piles and drive depths?
   a. Star Piles are to be installed for interior piles. 8” Tip piles are to be installed along the exterior of the pier and finger piers. See the existing pile plan on page 16 of the plans? The existing footprint of the pier is not to be modified.

9) How much of lower landing in Phase 1B is to be replaced?
   a. The entire lower landing is to be replaced in Phase 1B.

10) What are the specs on the structural piles? How are these to be built what manufacturers jacket? Concrete and Rebar Specs?
    a. See item No. 7 above.

11) We are just replumbing existing pump-outs correct. If new pump outs will need model #'s etc.
    a. The replacement of the existing pump-out is not included in the scope for this project.

12) Can they populate the bid sheet with #'s of piles and Square footages? ETC. Also there is a lot of replacement items that don't really have an itemized area on bid sheet. Where should we add these items?
    a. Please see Updated Bid Form. Unit prices are no longer required.

13) Any better pictures or drawings on the building foundation and pilings so we know what we are replacing underneath? (Clips Brackets, bolts etc.)
    a. See item No. 7 above.

14) Overall Clarification on Scope of work to be completed.
    a. See Updated Bid Form. The City is requesting a lump sum base bid price to repair and replace Merry Pier as specified in the plans. Additionally, the City is requesting three alternate bids, as described on the Updated Bid Form, for a full tear down replacement of Merry Pier, a full tear down replacement of the Pier at 11th Avenue, and repairs to the Pier at 7th Avenue.

15) Confirm that a Bid Bond is not required for the above-mentioned Bid Submission due on 3/13/2020.
    a. A bid bond is not required for this project.

Acknowledge receipt of this addendum by initialing and including this page with the submittal.
Initial ______________
Base Bid – Phased Partial Replacement and Repairs

Provide a lump sum cost to provide all labor, materials, and equipment to provide complete construction as described in the Request for Bids and as described in the Plans.

Base Bid Price – Phase 1 (A & B) $___________________
Base Bid Price – Phase 2 $___________________
Total Base Bid Price – Lump Sum $___________________

Alternate Bid #1 – Full Merry Pier Replacement

Provide a lump sum cost to provide all labor, materials, and equipment to remove and replace all pilings, stringers, caps, bracing, deck, all utilities and associated facilities on the main deck and finger piers of Merry Pier. This Alternate does not include the replacement of any pilings supporting the building. See project plans for existing pile locations.

Total Alternate Bid #1 Price – Lump Sum $___________________

Alternate Bid #2 – 11th Avenue Pier Replacement

Provide a lump sum cost to provide all labor, materials, and equipment to remove and replace all pilings, stringers, caps, bracing, deck, all utilities and associated facilities required to completely remove and replace the pier located at 1100 Pass-a-Grille Way, St. Pete Beach, FL 33706. See inspection report dated October 16, 2019 by Cardno. See provided as-builts for the 11th Avenue Pier.

Total Alternate Bid #2 Price – Lump Sum $___________________

Alternate Bid #3 – 7th Avenue Pier Repairs

Provide a lump sum cost to provide all labor, materials, and equipment to perform repairs to the pier located at 700 Pass-a-Grille Way, St. Pete Beach, FL 33706, as described in the recommendations section of the inspection report dated October 16, 2019 by Cardno. See provided as-builts for the 7th Avenue Pier.

Total Alternate Bid #3 Price – Lump Sum $___________________

Contractor Name __________________________________________
Bidder Name/Title _________________________________________
Bidder Signature __________________________________________
Date ______________________________________________________

Comments/Substitutions regarding bids:
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
Executive Summary

The City of St. Pete Beach contracted Cardno to inspect two of its wooden fishing piers alongside Pass-a-Grille Way and to make recommendations as necessary to address deficiencies and deterioration. Cardno inspected the piers and their components above water and subconsulted with Bolt Underwater Services to inspect the piers below water.

The north fishing pier is approximately 25+ years old and is in critical condition overall. The substructure is in critical condition and has a number of issues. The pier's deck is in very good condition. The superstructure is in poor condition with extensive stringer cracking and splitting. Cross-bracing members are missing. Several piles have between 75% and 90% section loss, with one pile that has lost 100% of its section. This is the driving reason for the recommendation of replacement and immediate shoring. If shoring cannot be installed in the immediate future, our recommendation is to close the pier.

The south fishing pier is approximately 15 years old and is in fair or better condition. The deck and superstructure are in very good condition. The substructure is in fair condition. The elements which require remediation are the piles and the cross-bracing. Many of the piles have minor to moderate section loss due to marine borer activity. This deterioration may be delayed by wrapping the piles as mentioned in Section 4. It is also recommended to replace the deteriorated or missing cross-bracing.
# Table of Contents

**Executive Summary**  
1  Introduction  
   1.1  Purpose  
   1.2  Scope of Work  
   1.3  Project Location and Description  
      1.3.1  North Fishing Pier  
      1.3.2  South Fishing Pier  

2  Methodology  
   2.1  Initial Structural Evaluation  

3  Inspection Findings  
   3.1  North Fishing Pier  
      3.1.2  Deck  
      3.1.3  Superstructure  
      3.1.4  Substructure  
   3.2  South Fishing Pier  
      3.2.2  Deck  
      3.2.3  Superstructure  
      3.2.4  Substructure  

4  Recommendations  
   4.1  North Fishing Pier  
   4.2  South Fishing Pier  

**Figures**  
Figure 1-1  North Fishing Pier  
Figure 1-2  South Fishing Pier  
Figure 1-3  Location Plan, St. Pete Beach  
Figure 1-4  North Fishing Pier Deck Plan  
Figure 1-5  North Fishing Pier Pile Layout  
Figure 1-6  South Fishing Pier Deck Plan  
Figure 1-7  South Fishing Pier Pile Layout  
Figure 3-1  Aerial View, North Fishing Pier  
Figure 3-2  Typical Deck Condition  
Figure 3-3  Superstructure Cross-Section  
Figure 3-4  Typical Steel Corrosion and Split Timber Members  
Figure 3-5  Pile at Bent 5 with 100% Section Loss  
Figure 3-6  Pile Section Loss  
Figure 3-7  Pier Elevation  
Figure 3-8  Cross-Bracing Section Loss Examples
Figure 3-9  Aerial View, South Fishing Pier  
Figure 3-10  Typical Deck Condition  
Figure 3-11  Superstructure Elevation  
Figure 3-12  Typical Washer and Washer Corrosion with Rust Staining  
Figure 3-13  Failed Cross-Bracing  
Figure 3-14  Pile Section Loss

Tables

Table 2-1  Timber Deck Condition Rating  
Table 2-2  Timber Superstructure Rating  
Table 2-3  Substructure Rating  
Table 3-1  Overall Pier Condition

Appendices

Appendix A  Above-Water Inspection Findings  
Appendix B  Underwater Inspection Report
1 Introduction

1.1 Purpose

The purpose of this work is to inspect and evaluate the structural condition of the two city-owned fishing piers on the east side of Pass-a-Grille Way, within the Pass-a-Grille channel, and to make recommendations as necessary to address deficiencies and deterioration.

Figure 1-1 North Fishing Pier

Figure 1-2 South Fishing Pier
1.2 Scope of Work
The scope of work for this project includes inspection and evaluation of the two city-owned fishing piers east of Pass-a-Grille Way, within the Pass-a-Grille channel. The evaluation includes an underwater inspection by divers in addition to a hands-on and visual inspection of piles, pile caps, beams, and deck.

1.3 Project Location and Description
The Pass-a-Grille Fishing Piers are located in the City of St. Pete Beach, FL. The piers are situated on the east side of Pass-a-Grille Way, within the Pass-a-Grille channel. The north fishing pier is located at 11th Ave & Pass-a-Grille Way. The south fishing pier is located at 7th Ave & Pass-a-Grille Way.

Figure 1-3 Location Plan, St. Pete Beach

1.3.1 North Fishing Pier
The north fishing pier has an unknown construction date, but records indicate that it was constructed prior to 1994. The pier is T-shaped. The approach portion of the pier measures 39 feet 8 inches with a width of 8 feet and the pier portion (top of the “T”) is 48 feet long and 8 feet wide. The bent spacing ranges from 6 feet 2 inches to 8 feet 1 inch.
Figure 1-4  North Fishing Pier Deck Plan

Figure 1-5  North Fishing Pier Pile Layout
The structure consists of 13 bents, 6 bents in the approach and 7 in the pier portion, having 2 piles per bent. The timber piles are 8± inch butt diameter circular piles with 8x10 (nominal) timber cross-beams. The 5 timber stringers that run from bent to bent are 10x4 (nominal) and spaced at 2 feet c-c ±. The plastic lumber deck planks are 2x6 (actual). There is a plastic lumber curb, 4x4 (nominal), which runs along the entire edge of the pier deck.

The threaded rods used in this pier are galvanized steel. The stringers are connected to the beams by a rod driven through the stringer into the beam. The beams are connected to the piles by a threaded rod through the beams and piles tightened with nuts on both ends.

1.3.2 South Fishing Pier

The south fishing pier was constructed circa 2004. The pier is T-shaped. The approach portion of the pier measures 49 feet 6 inches ± with a width of 10 feet 9 inches. The pier portion (top of the “T”) is 113 feet ± long and the width ranges from 14 feet to 28 feet 2 inches wide. The bent spacing ranges from 6 feet to 10 feet 2-1/2 inches.

The structure consists of 18 bents, 6 bents in the approach and 12 in the pier portion. The approach has 2 piles per bent. The number of piles in the pier portion ranges from 3 to 5 per bent. The timber piles are 11± inch butt diameter circular piles with 2-4½x12 (nominal) timber cross-beams per bent. The timber stringers that run from bent to bent are 3x10 (nominal) wide and are spaced at 18 inches± center-to-center. The plastic lumber deck planks are 2x6 (nominal). There is a plastic lumber curb, 4x4 (nominal), which runs along the entire edge of the pier deck.

The threaded rods and nuts used in this pier are Grade 316 stainless steel. However, the hurricane clips connecting the stringers to the beams and the washers are galvanized steel. The beam-pile and stringer-pile connection consists of all-thread rods through the beams and pile tightened with hex nuts.
Figure 1-6  South Fishing Pier Deck Plan
Figure 1-7  South Fishing Pier Pile Layout
2 Methodology

2.1 Initial Structural Evaluation

The inspection methodology included a hands-on and visual inspection. Probes and hammers were used to evaluate the integrity of timber members and connections while measurements and photos were taken of deteriorated members.

A description of the condition ratings used in this report are provided in the following tables and are based on the FDOT Bridge Management System (BMS) Coding Guide.

Table 2-1 Timber Deck Condition Rating

<table>
<thead>
<tr>
<th>CODE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>EXCELLENT – No noticeable or noteworthy deficiencies which affect the condition of the deck.</td>
</tr>
<tr>
<td>8</td>
<td>VERY GOOD – No crushing, rotting or splitting. Tightly secured to floor system.</td>
</tr>
<tr>
<td>7</td>
<td>GOOD – Minor cracking or splitting with a few loose planks.</td>
</tr>
<tr>
<td>6</td>
<td>SATISFACTORY – Less than 20 percent of the planks rotted or crushed and in need of replacement. Many planks cracked or split. Many loose planks.</td>
</tr>
<tr>
<td>5</td>
<td>FAIR – Approximately 50 percent of the planks cracked, split, rotted or crushed and in need of replacement. Majority of planks are loose.</td>
</tr>
<tr>
<td>4</td>
<td>POOR – Greater than 60 percent of the planks are rotted, crushed and/or split necessitating the replacement of the entire deck.</td>
</tr>
<tr>
<td>3</td>
<td>SERIOUS – This rating will apply if severe or critical signs of structural distress are visible.</td>
</tr>
<tr>
<td>2</td>
<td>CRITICAL – Advanced deterioration with partial deck failure.</td>
</tr>
<tr>
<td>1</td>
<td>IMMINENT FAILURE – The deck is considered unsafe for pedestrian use and the pier is closed; however, corrective action may enable the structure to be placed into light service.</td>
</tr>
<tr>
<td>0</td>
<td>FAILED – The deck is Out-of-Service and replacement is necessary.</td>
</tr>
</tbody>
</table>

1 Based on FDOT BMS Coding Guide, Table 58-3 Timber Decks
### Table 2-2  Timber Superstructure Rating

<table>
<thead>
<tr>
<th>CODE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>EXCELLENT – No noticeable or noteworthy deficiencies which affect the condition of the superstructure.</td>
</tr>
<tr>
<td>8</td>
<td>VERY GOOD – Minor cracking or splitting of beams or stringers at insignificant locations.</td>
</tr>
<tr>
<td>7</td>
<td>GOOD – Incidence of insignificant decay, cracking, splitting or crushing of beams or stringers.</td>
</tr>
<tr>
<td>6</td>
<td>SATISFACTORY – Limited decay, cracking, splitting or crushing of beams or stringers.</td>
</tr>
<tr>
<td>5</td>
<td>FAIR – Substantial decay, cracking, splitting or crushing of beams or stringers.</td>
</tr>
<tr>
<td>4</td>
<td>POOR – Extensive decay, cracking, splitting or crushing of beams or stringers.</td>
</tr>
<tr>
<td>3</td>
<td>SERIOUS – Severe decay, cracking, splitting or crushing of beams or stringers.</td>
</tr>
<tr>
<td>2</td>
<td>CRITICAL – Beam ends crushed or split with some settlement of deck. Pier closure or close monitoring is required.</td>
</tr>
<tr>
<td>1</td>
<td>IMMINENT FAILURE – The pier is closed to pedestrian traffic. Corrective action may put the structure back into light service.</td>
</tr>
<tr>
<td>0</td>
<td>FAILED – The pier superstructure is Out-of-Service.</td>
</tr>
</tbody>
</table>

---

### Table 2-3  Substructure Rating

<table>
<thead>
<tr>
<th>CODE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>EXCELLENT – No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.</td>
</tr>
<tr>
<td>8</td>
<td>VERY GOOD – Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.</td>
</tr>
<tr>
<td>7</td>
<td>GOOD – Insignificant decay, cracking, splitting or crushing of timber.</td>
</tr>
<tr>
<td>6</td>
<td>SATISFACTORY – Moderate decay, cracking, splitting or crushing of timber.</td>
</tr>
<tr>
<td>5</td>
<td>FAIR – Some timber piles require replacement. Repaired elements in good condition. Substantial decay, cracking, splitting or crushing of timber members. Minor exposure of piling as a result of erosion or scour. Additional cross bracing is required.</td>
</tr>
<tr>
<td>4</td>
<td>POOR – Some timber bents require replacement due to decay, cracking, splitting or crushing. Moderate scouring or undermining of footings starting to affect the stability of the unit. Minor settlement of the substructure may have occurred.</td>
</tr>
<tr>
<td>3</td>
<td>SERIOUS – Bearing area may be seriously deteriorated considerable loss of bearing area. Blocking and shoring considered necessary (not just precautionary) to maintain the safety and alignment of the structure. Local failures are possible. Any further deterioration of other conditions noted in Code 4.</td>
</tr>
<tr>
<td>2</td>
<td>CRITICAL – Top of pier cap is split. Scour is sufficient that substructure is near state of collapse. Pier has settled.</td>
</tr>
<tr>
<td>1</td>
<td>IMMINENT FAILURE – The pier is closed to pedestrian traffic. Corrective action may put the structure back into light service.</td>
</tr>
<tr>
<td>0</td>
<td>FAILED – The pier is Out-of-Service. Replacement of the substructure is required.</td>
</tr>
</tbody>
</table>

---

2 Based on FDOT BMS Coding Guide, Table 59-4 Timber Superstructures
3 Based on FDOT BMS Coding Guide, Table 60-1 Substructure
3 Inspection Findings

Table 3-1 Overall Pier Condition

<table>
<thead>
<tr>
<th>Item</th>
<th>Rating</th>
<th>Comments</th>
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</thead>
<tbody>
<tr>
<td><strong>North Fishing Pier</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deck: 8 Very Good</td>
<td></td>
<td>Weathered and aged but no loose planks</td>
</tr>
<tr>
<td>Superstructure: 4 Poor</td>
<td></td>
<td>Stringer cracking and splitting</td>
</tr>
<tr>
<td>Substructure: 2 Critical</td>
<td></td>
<td>One pile with 100% section loss, 7 other piles with 75% to 90% section loss. Most cross-bracing members are missing, have up to 80% section loss, and/or are no longer functional.</td>
</tr>
<tr>
<td><strong>South Fishing Pier</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deck: 8 Very Good</td>
<td></td>
<td>Weathered and aged but no loose planks</td>
</tr>
<tr>
<td>Superstructure: 8 Very Good</td>
<td></td>
<td>Rust staining from corroded steel washers and hurricane clips.</td>
</tr>
<tr>
<td>Substructure: 5 Fair</td>
<td></td>
<td>Twenty-one piles have marine borer activity with 5% to 25% section loss. Timber cross-bracing have up to 80% section loss.</td>
</tr>
</tbody>
</table>

3.1 North Fishing Pier

![Aerial View, North Fishing Pier](image)

Figure 3-1 Aerial View, North Fishing Pier
3.1.2 Deck

Figure 3-2  Typical Deck Condition

The composite plastic lumber deck planks and curb are in weathered but securely fastened to the stringers.

3.1.3 Superstructure

The superstructure is in poor condition. Many of the timber stringers of the superstructure have split over their point of bearing where the steel tie down rods have corroded and expanded. Connections in the superstructure show advanced corrosion.

Figure 3-3  Superstructure Cross-Section
3.1.4 **Substructure**

The substructure is in critical condition. The piles have moderate to heavy section loss. One pile has 100% section loss and there are seven other piles with 75% to 90% section loss. The piles with the 75-100% section loss are all grouped at the approach section of the fishing pier. All the remaining piles have marine borer activity up to 1 inch deep with 20-40% section loss.

There are a few locations (between P7 & P8 and P9 & P10) where the timber cross-bracing is completely missing. The majority of all other timber cross-bracing has some section loss, up to 80% in some areas, and many of the connections no longer function.
Due to the loss of the pile at Bent 5, the stringers that run from Bent 4 to Bent 6 were checked to verify that the pier would be safe without the support of the missing pile. The calculation check verified that the existing 3.5 inch by 9.5 inch stringers are sufficiently strong to span the 14 feet 1 inch span between Bents 4 & 6. However, because the piles in the adjacent bents on both sides have deteriorated significantly, with section loss between 75% and 90%, their supportive capacity is dramatically reduced and temporary supports are necessary to keep the pier open as discussed in section 4.
3.2 South Fishing Pier

3.2.2 Deck

Figure 3-10 Typical Deck Condition

The composite plastic lumber deck planks and curb are weathered but securely fastened to the stringers.
3.2.3 **Superstructure**

The superstructure is in very good condition. While the threaded rods are stainless steel, the washers and hurricane clips that connect stringers to the beam are galvanized steel and have corroded. This has left rust staining on the timber from corroded steel washers and hurricane clips.

![Figure 3-11 Superstructure Elevation](image)

![Figure 3-12 Typical Washer and Washer Corrosion with Rust Staining](image)
3.2.4 Substructure

The substructure is in fair condition. The piles have moderate to heavy weathering from marine growth and the outer ¼ inch of the piles are soft. Twenty-one (35%) piles have marine borer activity with 5% to 25% section loss. The majority of all timber cross-bracing has some section loss, up to 80% in some areas, and many of the connections no longer function.

Figure 3-13 Failed Cross-Bracing

Figure 3-14 Pile Section Loss
4 Recommendations

4.1 North Fishing Pier
Due to the serious condition of the substructure & piles, Cardno recommends immediate temporary support of the north fishing pier at bent 5, pile 5-1, or closure of the structure.

The following repairs are necessary to maintain safe operation of the fishing pier:

- Replace deteriorated or missing cross-bracing.
- Place jacketing around all the piles, with injected cement-based grout until the jacket is completely filled.
- Drive a new pile next to the missing pile at Bent 5 and reconfigure the pier cap so that it is supported by the replacement pile.
- Add new stringers between the existing ones.

However, due to the extent of major repairs and the age of the structure being at the end of its design life, Cardno recommends a full replacement, as it would be more cost effective and last for 25 to 30 years.

4.2 South Fishing Pier
To extend the life of the south fishing pier and address the existing deficiencies, the following repairs are recommended:

- Replace the corroded washers (only those that have cracked) with new stainless steel ones.
- Replace all cross-bracing.
- Wrap all timber piling which have less than 10% section loss, with prime high density polyethylene. Wrapping shall be started at the mudline and extend a minimum of 2 feet above the water line.
- Timber piling with more than 10% section loss should be jacketed and filled with a cement-based grout.
- Install new stainless steel hurricane straps to secure the stringers to the pier bents.

All new structural bolts, washers, nuts, hurricane clips, miscellaneous hardware, and fasteners shall be stainless steel type 316.
APPENDIX A   ABOVE WATER INSPECTION FINDINGS
Notes:

1. Unless otherwise noted, all piles have 20% to 40% section loss.
South Pier Deficiencies Plan
APPENDIX B UNDERWATER INSPECTION REPORT
## Underwater Inspection Report

**BOLT UNDERWATER SERVICES, INC.**

**for**

**CARDNO**

---

**Structure ID. (8): Fishing Pier 1**

<table>
<thead>
<tr>
<th>Field Personnel:</th>
<th>Title</th>
<th>C.B.I. No.:</th>
<th>Duty:</th>
<th>Signature:</th>
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<tbody>
<tr>
<td>Hoogland, Keith S.</td>
<td>SUCBI</td>
<td>00341/Lead</td>
<td>Dive</td>
<td></td>
</tr>
<tr>
<td>Payne, Timothy N.</td>
<td>UCBI</td>
<td>00589</td>
<td>Tend</td>
<td></td>
</tr>
<tr>
<td>Myers, Jared L.</td>
<td>SI</td>
<td></td>
<td>Dive</td>
<td></td>
</tr>
</tbody>
</table>

---

### CHANNEL

Elevation photos

There is concrete debris and rubble throughout, below the pier.
TIMBER PILES

NOTE: This element represents the timber piles below the pier. See sketch.

The cross-bracing lower connecting hardware has moderate to severe corrosion.

The timber cross-bracing at the lower connections has up to 80% section loss and many of the connections are no longer functional.

Piles 2-1, 2-2, 3-1, 3-2, 4-1, 4-2 and 6-1, 3ft. below cap have 75% to 90% section loss.
TIMBER PILES

Pile 5-1, 3ft. below cap, 18in. section of no pile with 100% section loss.

The remaining piles, not listed above, have marine borer activity up to 1in. deep with 20% to 40% section loss.

The piles have moderate to heavy weathering from the marine growth up and the outside ¼in. is soft.

Cleaning Log: 7-7, 8-2 and 8-6.

INSPECTION NOTES: Divers inspected Channel and Timber Piles.
STRUCTURE NOTES: Inventoried west to east.
Sketch

Rows are numbered from shore out
Piles are numbered left to right per row

_rows = cross bracing
_pile = pile

Not to scale
Underwater Inspection Report
BOLT UNDERWATER SERVICES, INC.
for
CARDNO

Structure ID. (8): Fishing Pier 2
Underwater Date (93): 09/09/19

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<th>Underwater Inspection Details:</th>
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<tr>
<td>District (2): 07</td>
<td>Special Crew Hours: 5.0</td>
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<tr>
<td>County (3): Pinellas</td>
<td>Max. Depth: 12ft. at Row11</td>
</tr>
<tr>
<td>Feature Intersected (6): South of Merry Pier</td>
<td>Type of Dive Insp.: Level II (SCUBA)</td>
</tr>
<tr>
<td>Facility Carried (7): N/A</td>
<td>Type of Boat Used: N/A</td>
</tr>
<tr>
<td></td>
<td>Water Type/Marine Growth: Salt/Tidal – Barnacles/Oysters</td>
</tr>
</tbody>
</table>

Inspection Personnel:

<table>
<thead>
<tr>
<th>Field Personnel:</th>
<th>Title</th>
<th>C.B.I. No.:</th>
<th>Duty</th>
<th>Signature:</th>
</tr>
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<td>00341/Lead</td>
<td>Dive</td>
<td></td>
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<tr>
<td>Payne, Timothy N.</td>
<td>UCBI</td>
<td>00589</td>
<td>Tend</td>
<td></td>
</tr>
<tr>
<td>Myers, Jared L.</td>
<td>SI</td>
<td></td>
<td>Dive</td>
<td></td>
</tr>
</tbody>
</table>

CHANNEL

Elevation photos:

Rock rubble extends from Row 1 to Row 3.

Row 4 to Row 7 has pile cut-offs laying west-to-east under the structure.

Rows 9 to 11 there is a concrete pile cut-off laying south-to-north under the T-head section.

This report contains information relating to the physical security of a structure and depictions of the structure. This information is confidential and exempt from public inspection pursuant to sections 119.071(3)(a) and 119.071(3)(b), Florida Statutes.
TIMBER PILES

NOTE: This element represents the timber piles below the pier. See sketch.

The cross-bracing lower connecting hardware (stainless nut and bolt, steel washer) has light to moderate corrosion on the washers.

![Image of timber piles with corrosion]

The timber cross-bracing at the lower connection has up to 80% section loss.

![Image of timber cross-bracing]

Piles 4-3, 7-1, 7-2, 7-3, 8-1, 8-2, 8-4, 8-5, 9-2, 9-10, 9-11, 10-1, 10-2, 11-1, 11-2, 11-3, 11-7, 11-9, 11-10, 11-11 and 11-12 have marine borer activity with 5% to 25% section loss.

![Images of specific piles with marine borer activity]
TIMBER PILES (CONTINUED)

The cross-bracing between Piles 9-5 and 9-6 is hanging with one bolt.

Pile 10-5: NE quadrant, 4ft. below cap, shake/splinter area, 3ft. 6in. H x 6in. W x ¾in. D.

The piles have moderate to heavy weathering from the marine growth up and the outside ¼in. is soft.

Cleaning Log: Piles 2-1, 7-2, 7-3, 8-7, 9-8 and 10-5.

INSPECTION NOTES: Divers inspected Channel and Timber Piles.
STRUCTURE NOTES: Inventoried west to east.
Sketch

Rows are numbered from shore out
Piles are numbered left to right per row

Not to scale
October 24, 2019

Cardno, Inc.
380 Park Place Blvd., Suite 300
Clearwater, Florida 33759

Attn: Ms. Ananda Kelley, P.E.

RE: Geotechnical Engineering Services Report
Pass-a-Grille Seawall – Preliminary Feasibility Study
City of St. Petersburg
Pinellas County, Florida
Tierra Project No.: 6511-19-198

Ms. Kelley:

Tierra, Inc. has completed the geotechnical engineering study for the above referenced project. The results of the study are provided herein.

Should there be any questions regarding this report, please do not hesitate to contact our office at (813) 989-1354. Tierra would be pleased to continue providing geotechnical services throughout the implementation of the project. We look forward to working with you and your organization on this and future projects.

Respectfully Submitted,

TIERRA, INC.

Dylan A. Nelson, E.I.
Geotechnical Engineer Intern

Joseph R. Antinori, P.E.
Geotechnical Engineer
Florida License No. 73176
## TABLE OF CONTENTS

1.0 PROJECT DESCRIPTION .......................................................................................... 1

2.0 PURPOSE AND SCOPE OF SERVICES ..................................................................... 1

3.0 REVIEW OF AVAILABLE DATA ............................................................................... 2

3.1 USGS Quadrangle Map and Survey Information ..................................................... 2

3.2 USDA Soil Survey ................................................................................................ 2

3.3 Review of Potentiometric Surface Information ...................................................... 3

4.0 SUBSURFACE CONDITIONS ............................................................................... 3

4.1 Boring Location Plan and Utility Clearance .......................................................... 3

4.2 Soil Borings ......................................................................................................... 3

5.0 LABORATORY TESTING ....................................................................................... 4

5.1 General ............................................................................................................... 4

5.2 Test Designation .................................................................................................. 4

6.0 RESULTS OF SUBSURFACE EXPLORATION ......................................................... 4

6.1 General Soil Condition .......................................................................................... 4

6.2 Groundwater Information ...................................................................................... 5

7.0 EVALUATION AND RECOMMENDATIONS .......................................................... 5

7.1 General ............................................................................................................... 5

7.2 Environmental Classification .................................................................................. 5

7.3 Recommended Soil Parameters ............................................................................ 5

8.0 REPORT LIMITATIONS ......................................................................................... 6

**APPENDIX**

Report of Core Borings (Sheets 1 through 3)
Grain Size Distribution Report
Recommended Soil Parameters for Sheet Pile Walls
1.0 PROJECT DESCRIPTION

The project consists of evaluating a section of seawall approximately ½ mile in length along the intracoastal waterway of Pass-a-Grille Beach in Pinellas County, Florida. Tierra’s involvement will be to provide geotechnical information for use in the evaluation and analyses associated with the remediation or replacement of the seawall.

2.0 PURPOSE AND SCOPE OF SERVICES

The objective of our study was to obtain information concerning subsurface conditions at the project site in order to base engineering estimates and recommendations for the seawall remediation or replacement. The following services were provided:

1. Reviewed soil information from the “Soil Survey of Pinellas County, Florida” published by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). Reviewed topographic information obtained from the “Pass-a-Grille Beach” Quadrangle Map published by the United States Geological Survey (USGS). Reviewed potentiometric information obtained from the “Potentiometric Surface of Upper Floridian Aquifer in Florida” Maps also published by the USGS.

2. Conducted a visual reconnaissance of the project site and coordinated utility clearance via Sunshine State One Call.

3. Obtained a permit for drilling within the waterway through Florida Department of Environmental Protection.

4. Executed a program of subsurface exploration consisting of subsurface sampling and field testing.
   - Performed two (2) Standard Penetration Test (SPT) borings on land advanced to a depth on the order of 50 and 55 feet below the ground surface along Pass-a-Grille Way adjacent to the seawall/sidewalk.
   - Performed two (2) SPT borings in the water advanced to a depths on the order of 44 and 47 feet below the waterline in the intracoastal water way adjacent to the seawall.

5. Identified groundwater table and water levels at the boring locations.

6. Visually classified the samples in the laboratory using the Unified Soil Classification System (USCS). Identified soil conditions at each boring location.

7. Completed laboratory testing on select soil samples to confirm the visual classification and estimate engineering properties. Samples were collected and tested to determine a D_{50} – Value for use by the Hydraulics Engineer in scour analysis.

8. Generated soil parameters soil parameters for use by the Structural Engineer in evaluation and analysis of the seawall feasibility study.
9. Identified geomaterials or conditions encountered within the borings that may impact the design or construction considerations.

10. Prepared this engineering report in accordance with the scope of services herein that summarizes the course of study pursued, the field and lab data generated, subsurface conditions encountered and our engineering recommendations in each of the pertinent topic areas.

### 3.0 REVIEW OF AVAILABLE DATA

#### 3.1 USGS Quadrangle Map and Survey Information

Based on a review of the “Pass-a-Grille Beach, Florida” USGS Quadrangle Map, the natural ground elevation at the project site is on the order of approximately -5 (in the waterway) to +5 feet National Geodetic Vertical Datum of 1929 (NGVD 29).

#### 3.2 USDA Soil Survey

Soil data published by the USDA Soil Survey of Pinellas County, Florida was reviewed as part of the subsurface investigation. This information indicates that there is one primary mapping unit within the vicinity of the project site. The following paragraph and table provide a brief description of the soil units as presented in the Soil Survey.

**Palm Beach Fine Sand (Map Unit 19):** Slopes are 0 to 8 percent. This component is on ridges on marine terraces on coastal plains. The parent material consists of shells and sandy marine deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is excessively drained. Water movement in the most restrictive layer is very high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent.

<table>
<thead>
<tr>
<th>USDA Map Unit and Soil Name</th>
<th>Depth (in)</th>
<th>Soil Classification</th>
<th>Permeability (in/hr)</th>
<th>pH</th>
<th>Seasonal High Water Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>(19) Palm Beach</td>
<td>0-4</td>
<td>SP, SW A-1-b, A-2-4, A-3</td>
<td>20.0 - 50.0</td>
<td>7.4-9.0</td>
<td>---(1)</td>
</tr>
<tr>
<td></td>
<td>4-80</td>
<td>SP A-1, A-2-4, A-3</td>
<td>20.0 - 50.0</td>
<td>7.4-9.0</td>
<td>Jan-Dec</td>
</tr>
</tbody>
</table>

*(1) USDA/NRCS Soil Survey table does not provide a SHGWT Depth for Unit 19 Palm Beach.*

It should be noted that information contained in the USDA/NRCS Soil Survey may not be reflective of current subsurface conditions, particularly if recent development in the project vicinity has modified existing soils or surface/subsurface drainage.
3.3 Review of Potentiometric Surface Information

Based on a review of the “Potentiometric Surface of the Upper Floridan Aquifer in Florida” map published by the USGS, the potentiometric surface elevation of the upper Floridan Aquifer in the project vicinity ranges from approximately +10 to +20 feet, NGVD 29. As indicated in Section 3.1, the proposed project site elevations range from approximately -5 to +5 feet, NGVD 29. Although artesian conditions were not apparent at the locations of the borings performed, the Contractor's dewatering equipment and methods should be adequate to handle artesian flow conditions, if encountered during construction at no additional cost to the owner.

4.0 SUBSURFACE CONDITIONS

4.1 Boring Location Plan and Utility Clearance

Prior to commencing our subsurface exploration, a permit for drilling within a waterway was obtained from the Florida Department of Environmental Protection and utility clearances were coordinated by Tierra through Sunshine State One Call and updated as required to reduce the potential for damage to any underground utilities during the boring process.

The SPT borings were located in the field by a representative of Tierra using a handheld Global Positioning System (GPS) device with a reported accuracy of ±10 feet. If a more accurate determination of the boring locations and elevations is required, then Tierra recommends the boring locations be survey located by the project surveyor. The approximate boring locations are shown on the attached Report of Core Borings sheets in the Appendix.

4.2 Soil Borings

SPT borings B-1 and B-3 were completed on land adjacent to the seawall/sidewalk. SPT borings B-2 and B-4 were completed within the intracoastal waterway adjacent to the seawall. The SPT borings were performed using a drill rig with bentonite mud drilling procedures utilizing an automatic hammer for SPT borings B-1 and B-3 and a safety hammer for SPT borings B-2 and B-4. The soil sampling was performed in general accordance with American Society for Testing and Materials (ASTM) Test Designation D-1586. The initial 4 feet of SPT borings B-1 and B-3 were advanced by manual auger to verify utility clearances. SPT resistance N-values were then taken at intervals of 2 feet to a depth of approximately 10 feet and at intervals of 5 feet thereafter. SPT resistance N-values for SPT borings B-2 and B-4 were taken at intervals of 2 feet to a depth of approximately 10 feet and at intervals of 5 feet thereafter. As each soil type was revealed, representative samples were placed in air-tight containers and returned to the laboratory for testing and confirmation of the field classification by a geotechnical engineer.
5.0 LABORATORY TESTING

5.1 General

Representative soil samples collected from the SPT borings were classified and stratified in general accordance with the USCS soil classification system. Our classification was based on visual observations using the results from the laboratory testing as confirmation. These tests included fines content (percentage passing the No. 200 mesh sieve) and grain-size analyses. The test results of the Fines Content are presented on the attached Report of Core Borings sheets. The Grain-Size Analyses are presented on the Grain Size Distribution Report in the Appendix.

5.2 Test Designation

The following list summarizes the laboratory tests performed and respective test methods.

- **Fines Content Test** - The fines content tests were conducted in general accordance with the AASHTO test designation T-088 (ASTM test designation D-1140).
- **Grain-Size Analyses** - The grain-size analyses were conducted in general accordance with the AASHTO test designation T-088 (ASTM test designation D-422).

6.0 RESULTS OF SUBSURFACE EXPLORATION

6.1 General Soil Condition

The soil types encountered during the soil exploration have been assigned a stratum number. The stratum numbers and soil types associated with this part of the project are listed in the following table.

<table>
<thead>
<tr>
<th>Stratum Number</th>
<th>Soil Description</th>
<th>USCS Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Gray Sand to Sand with Silt Occasionally with Few (5% to 10%) to Some (30% to 45%) Shell</td>
<td>SP/SP-SM</td>
</tr>
<tr>
<td>2</td>
<td>Gray Shelly Sand to Shelly Sand with Silt</td>
<td>SP/SP-SM</td>
</tr>
<tr>
<td>3</td>
<td>Gray to Brown Silty Sand with Few to Some Shell</td>
<td>SM</td>
</tr>
</tbody>
</table>

The subsurface soil stratification is of a generalized nature to highlight the major subsurface stratification features and material characteristics. The soil profiles included on the Report of Core Borings sheets should be reviewed for specific information at individual boring locations. These profiles include soil descriptions, stratifications and penetration resistances when applicable. The stratifications shown on the boring profiles represent the conditions only at the actual boring location. Variations did occur and should be expected between boring locations. The stratifications represent the approximate boundary between subsurface materials and the actual transition may be gradual.
6.2 Groundwater Information

The groundwater table at the time the SPT borings located on land were performed was encountered at 3½ feet below existing grades. The depth of the water at boring locations B-2 and B-4 fluctuate with tidal conditions. The groundwater levels and depths are depicted adjacent to the soil profiles on the Report of Core Borings sheets.

Groundwater conditions will vary with environmental variations, tidal fluctuations, and seasonal conditions, such as the frequency and magnitude of rainfall patterns, as well as man-made influences (i.e. existing swales, drainage ponds, underdrains and areas of covered soils, such as paved parking lots). It should be noted that groundwater levels tend to 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 are normally recorded in rainy seasons.

7.0 EVALUATION AND RECOMMENDATIONS

7.1 General

All earthwork and construction should be in accordance with the City of Saint Petersburg requirements or alternatively the FDOT Standard Specifications for Road and Bridge Construction (SSRBC) requirements

7.2 Environmental Classification

The seawall is a marine structure adjacent to a body of water with relatively high chloride contents (likely in excess of 6,000 ppm). Based on the anticipated chloride content, it is recommended that the seawall be designed for an extremely aggressive corrosive environment.

7.3 Recommended Soil Parameters

Recommended soil parameters for use by the Structural Engineer in evaluation of the seawalls borings are provided on the attached Recommended Soil Parameters for Sheet Pile Walls. These parameters include soil unit weight, angle of friction, cohesion and wall friction angle. Due to the expected environmental classification to be extremely aggressive, soil parameters for Uncoated Steel Walls were not provided.
8.0 REPORT LIMITATIONS

The analyses, conclusions and recommendations contained in this report are opinions based on the site conditions and project layout described herein and further assume that the conditions observed in the exploratory borings are representative of the subsurface conditions throughout the site, i.e., the subsurface conditions elsewhere on the site are the same as those disclosed by the borings. If, during construction, subsurface conditions different from those encountered in the exploratory borings are observed or appear to be present during construction, we should be advised at once so that we can review these conditions and reconsider our recommendations where necessary.

The scope of our services did not include an environmental assessment for determining the presence or absence of wetlands or hazardous or toxic materials in the soil, bedrock, groundwater, or air, on or below or around this site. Any statements in this report or on the boring logs regarding odors, colors, unusual or suspicious items or conditions are strictly for the information of our client.

This report was prepared for the exclusive use of Cardno, Inc. and their consultants for evaluating the design of the project as it relates to the geotechnical aspects discussed herein. It should be made available to prospective contractors for information on factual data only and not as a warranty of subsurface conditions included in this report. Unanticipated soil conditions may require that additional expense be made to attain a properly constructed project. Therefore, some contingency fund is recommended to accommodate such potential extra costs.
APPENDIX

Report of Core Borings (Sheets 1 through 3)

Grain Size Distribution Report

Recommended Soil Parameters for Sheet Pile Walls
Boring Location Plan

Project Name: PASS-A-GRILLE SEAWALL

GEOLOCATION:

- Easting: 47,888
- Northing: 12,186
- Date: 9/5/2019
- Driller: I. Pooran
- Hammer: Automatic
- Rig: D-25

PAVEMENT AND BASE MATERIAL:

- Gray sand to sand with silt occasionally with few to some shell (SP/SP-SM)
- Gray shelly sand to shelly sand with silt (SP/SP-SM)
- Gray to brown silty sand with few to some shell (SM)

LEGEND

- SP: Unified Soil Classification System (ASTM D 2487) group symbol as determined by visual review and laboratory testing on selected samples for confirmation of visual review.
- N: Numbers to the left of borings indicate SPT value for 12 inches of penetration (unless otherwise noted).
- 50/4: Number of blows for 4 inches of penetration
- HA: Hand augered to verify utility clearance
- -200: Percent passing #200 sieve

NAV D 88: North American Vertical Datum of 1988

- APPROXIMATE SPT BORING LOCATION
- GROUNDWATER (EVE) ENCOUNTERED DURING FIELD EXPLORATIONS

NOTE:

- The locations and ground surface elevations were determined using the GPS coordinates obtained in the field in conjunction with the topographic survey provided by the project surveyor and therefore should be considered approximate.

REPORT OF CORE BORINGS (1)

BORING LOCATION PLAN

BORING TERMINATED AT ELEVATION -52.8 FT (NAVD 88)
Boring Location Plan

BORING LOCATION PLAN

BORING TERMINATED AT ELEVATION -44.5 FT (NAVD 88)

BORING TERMINATED AT ELEVATION -41 FT (NAVD 88)

LEGEND

PAVEMENT AND BASE MATERIAL

- GRAY SAND TO SAND WITH SILT OCCASIONALLY WITH FEW TO SOME SHELL (SP/SP-SM)
- GRAY SHELLY SAND TO SHELLY SAND WITH SILT (SP/SP-SM)
- GRAY TO BROWN SILTY SAND WITH FEW TO SOME SHELL (SM)

SAFETY HAMMER

- AUTOMATIC HAMMER

EXPLANATION

SP
- UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.

N
- NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED)

HA
- HAND AUGERED TO VERIFY UTILITY CLEARANCE

-200
- PERCENT PASSING #200 SIEVE

GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS

APPROXIMATE SPT BORING LOCATION

EASTING
- EASTING COORDINATE REFERENCED TO THE FLORIDA STATE PLANE COORDINATE SYSTEM, FLORIDA WEST ZONE, N.A.D. 83 DETERMINED USING HAND HELD GARMIN ETREX EQUIPMENT WITH A REPORTED ACCURACY OF ± 10 FEET.

NORTHING
- NORTHING COORDINATE REFERENCED TO THE FLORIDA STATE PLANE COORDINATE SYSTEM, FLORIDA WEST ZONE, N.A.D. 83 DETERMINED USING HAND HELD GARMIN ETREX EQUIPMENT WITH A REPORTED ACCURACY OF ± 10 FEET.

NOTES
- THE LOCATIONS AND GROUND SURFACE ELEVATIONS WERE DETERMINED USING THE GPS COORDINATES OBTAINED IN THE FIELD IN CONJUNCTION WITH THE TOPOGRAPHIC SURVEY PROVIDED BY THE PROJECT SURVEYOR AND THEREFORE SHOULD BE CONSIDERED APPROXIMATE.

GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS

APPROXIMATE SPT BORING LOCATION

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GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS

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GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS

APPROXIMATE SPT BORING LOCATION

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GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS

APPROXIMATE SPT BORING LOCATION

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GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS

APPROXIMATE SPT BORING LOCATION

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GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS

APPROXIMATE SPT BORING LOCATION

EASTING
- EASTING COORDINATE REFERENCED TO THE FLORIDA STATE PLANE COORDINATE SYSTEM, FLORIDA WEST ZONE, N.A.D. 83 DETERMINED USING HAND HELD GARMIN ETREX EQUIPMENT WITH A REPORTED ACCURACY OF ± 10 FEET.

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B-4

BORING LOCATION PLAN

BORINGLOCATION PLAN

BOR #  B-4
EASTING  478219
NORTHING  1220504
DATE  9/9/2019
DRILLER  J. ERICKSON
HAMMER  D-25

BORING TERMINATED AT
ELEVATION -2.0 FT (NAVD 88)

LEGEND

GRAY SAND TO SAND WITH SILT OCCASIONALLY
WITH FEW TO SOME SHELL (SP/SP-SM)
GRAY SHELLY SAND TO SHELLY SAND WITH SILT
(SP/SP-SM)
GRAY TO BROWN SILTY SAND WITH FEW
TO SOME SHELL (SM)

PAVEMENT AND BASE MATERIAL

SP
UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487)
GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW
AND LABORATORY TESTING ON SELECTED SAMPLES
FOR CONFIRMATION OF VISUAL REVIEW.

N
NUMBERS TO THE LEFT OF BORINGS INDICATE
SPT VALUE FOR 12 INCHES OF PENETRATION
(UNLESS OTHERWISE NOTED).

50/4
NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION

HA
HAND AUGER TO VERIFY UTILITY CLEARANCE

-200
PERCENT PASSING #200 SIEVE

NAV B8
NORTH AMERICAN VERTICAL DATUM OF 1988

APPROXIMATE SPT BORING LOCATION

GROUNDWATER (EVE) ENCOUNTERED DURING
FIELD EXPLORATIONS

EASTING
EASTING COORDINATE REFERENCED TO THE FLORIDA
STATE PLANE COORDINATE SYSTEM, FLORIDA WEST
ZONE, N.A.D. 83 DETERMINED USING HAND-HELD
GARMIN ETREX EQUIPMENT WITH A REPORTED
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NORTHING
NORTHING COORDINATE REFERENCED TO THE FLORIDA
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NOTES:
THE LOCATIONS AND GROUND SURFACE ELEVATIONS
WERE DETERMINED USING THE GPS COORDINATES
OBTAINED IN THE FIELD IN CONJUNCTION WITH THE
TOPOGRAPHIC SURVEY PROVIDED BY THE PROJECT
SURVEYOR AND THEREFORE SHOULD BE CONSIDERED
APPROXIMATE.

BORING LOCATION PLAN

BOR #  B-4
EASTING  478219
NORTHING  1220504
DATE  9/9/2019
DRILLER  J. ERICKSON
HAMMER  D-25

BORING TERMINATED AT
ELEVATION -2.0 FT (NAVD 88)

LEGEND

GRAY SAND TO SAND WITH SILT OCCASIONALLY
WITH FEW TO SOME SHELL (SP/SP-SM)
GRAY SHELLY SAND TO SHELLY SAND WITH SILT
(SP/SP-SM)
GRAY TO BROWN SILTY SAND WITH FEW
TO SOME SHELL (SM)

PAVEMENT AND BASE MATERIAL

SP
UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487)
GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW
AND LABORATORY TESTING ON SELECTED SAMPLES
FOR CONFIRMATION OF VISUAL REVIEW.

N
NUMBERS TO THE LEFT OF BORINGS INDICATE
SPT VALUE FOR 12 INCHES OF PENETRATION
(UNLESS OTHERWISE NOTED).

50/4
NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION

HA
HAND AUGER TO VERIFY UTILITY CLEARANCE

-200
PERCENT PASSING #200 SIEVE

NAV B8
NORTH AMERICAN VERTICAL DATUM OF 1988

APPROXIMATE SPT BORING LOCATION

GROUNDWATER (EVE) ENCOUNTERED DURING
FIELD EXPLORATIONS

EASTING
EASTING COORDINATE REFERENCED TO THE FLORIDA
STATE PLANE COORDINATE SYSTEM, FLORIDA WEST
ZONE, N.A.D. 83 DETERMINED USING HAND-HELD
GARMIN ETREX EQUIPMENT WITH A REPORTED
ACCURACY OF ± 10 FEET.

NORTHING
NORTHING COORDINATE REFERENCED TO THE FLORIDA
STATE PLANE COORDINATE SYSTEM, FLORIDA WEST
ZONE, N.A.D. 83 DETERMINED USING HAND-HELD
GARMIN ETREX EQUIPMENT WITH A REPORTED
ACCURACY OF ± 10 FEET.

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## Recommended Soil Parameters for Sheet Pile Walls
### Pass-a-Grille Seawall
#### Pinellas County, Florida
#### Tierra Project No. 6511-19-198

<table>
<thead>
<tr>
<th>Reference Boring Number</th>
<th>Approximate Elevation Range (feet, NAVD 88)</th>
<th>Soil Unit Weight (pcf)</th>
<th>Internal Friction Angle</th>
<th>Cohesion</th>
<th>Uncoated Concrete Walls Only*</th>
<th>Vinyl and FRP Walls Only</th>
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<tbody>
<tr>
<td></td>
<td>from</td>
<td>to</td>
<td>Saturated/Moist</td>
<td>Effective</td>
<td>(º)</td>
<td>(psf)</td>
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<td>110</td>
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<td>42.6</td>
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* Wall friction angle and wall/soil adhesion should not be used for coated walls and should apply to uncoated concrete sheet piles ONLY.
Grain Size Distribution Report
Pass-a-Grille Seawall
Tierra Project No.: 6511-19-198

<table>
<thead>
<tr>
<th>Easting</th>
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<th>Sample No.</th>
<th>Depth (ft)</th>
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Grain Size Distribution Curve

Material Description

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<tr>
<th>Material Description</th>
<th>Classification</th>
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<td>Gray Fine Sand</td>
<td>SP</td>
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<table>
<thead>
<tr>
<th>Sieve Number</th>
<th>Diameter (mm)</th>
<th>Percent Finer by Weight (%)</th>
<th>Coefficients</th>
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<tbody>
<tr>
<td>3/4&quot;</td>
<td>19.000</td>
<td>100</td>
<td>D_{10} 0.080, D_{30} 0.111</td>
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<td>3/8&quot;</td>
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<td>99.9</td>
<td>D_{50} 0.154</td>
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<tr>
<td>4</td>
<td>4.750</td>
<td>96.2</td>
<td>D_{85} 1.446, D_{90} 2.822</td>
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<tr>
<td>10</td>
<td>2.000</td>
<td>85.9</td>
<td>D_{95} 4.295</td>
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<tr>
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<td>0.250</td>
<td>77.3</td>
<td>C_{U} 2.314</td>
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<td>0.150</td>
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<td>C_{C} 0.836</td>
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