

# CITY OF NEW PORT RICHEY PARKS SEAWALL CONDITION ASSESSMENT REPORT

Prepared for:

CITY OF NEW PORT RICHEY  
DEPARTMENT OF PUBLIC WORKS



Prepared by:

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## 1. INTRODUCTION

### 1.1. AUTHORIZATION

At the request of the City of New Port Richey, Stroud Engineering Consultants, Inc. prepared a Scope of Services Proposal and was issued a Task Order in January 2017 to prepare the Seawall Condition Assessment Report (Report).

### 1.2. PURPOSE

The City owns approximately 3,540-linear feet of seawalls, throughout their parks located along the Pithlachascotee River. The type of wall designed and constructed at these locations is actually termed a bulkhead, which is a vertical shoreline stabilization structure that primarily prevents erosion of the river banks, protects vegetation and facilities constructed along the river front, and provides minimal protection from wave action. However, for the purposes of maintaining consistency with the City's records, the term seawall will be used throughout this Report. The walls provide an economical approach for vertical shoreline stabilization, allowing the City to maximize upland property area and recreation use. The seawalls are located at five (5) City-owned parks along the river and include the following:

- Sims Park Riverwalk
- Sims Park Boat Ramp
- Cotee River Park
- Jasmine Park
- Grand Boulevard Park

During yearly inspections of the seawalls by City staff, they observed a number of changes to the seawalls that were occurring. The changes noted from the inspections included seawall cracking, settlement, increasing separation between the seawall and sidewalk, increasing separation at seawall construction joints, erosion of sediment from the seawall foundation, and leaning of seawalls toward the river. The location and layout of the City's riverfront park system is shown on **Figure 1**.

Stroud Engineering has conducted an investigation of the current condition of the seawalls at each park location. The investigation consisted of the visual inspection or survey of the existing seawalls and included the use of ground penetrating radar (GPR) to identify the location of voids at the seawalls. This investigation report includes the following key elements:

1. Condition assessment for each existing seawall location.
2. Viable construction repair methods for each seawall deterioration category.
3. Repair recommendations with an opinion of the probable construction costs associated with each of the seawall repair locations.
4. Prioritization of the repair locations based upon the severity of deterioration and frequency of use.
5. Preliminary construction phasing plan, in coordination with City staff, to meet the City's yearly fiscal budgets allocated for the seawall repair.

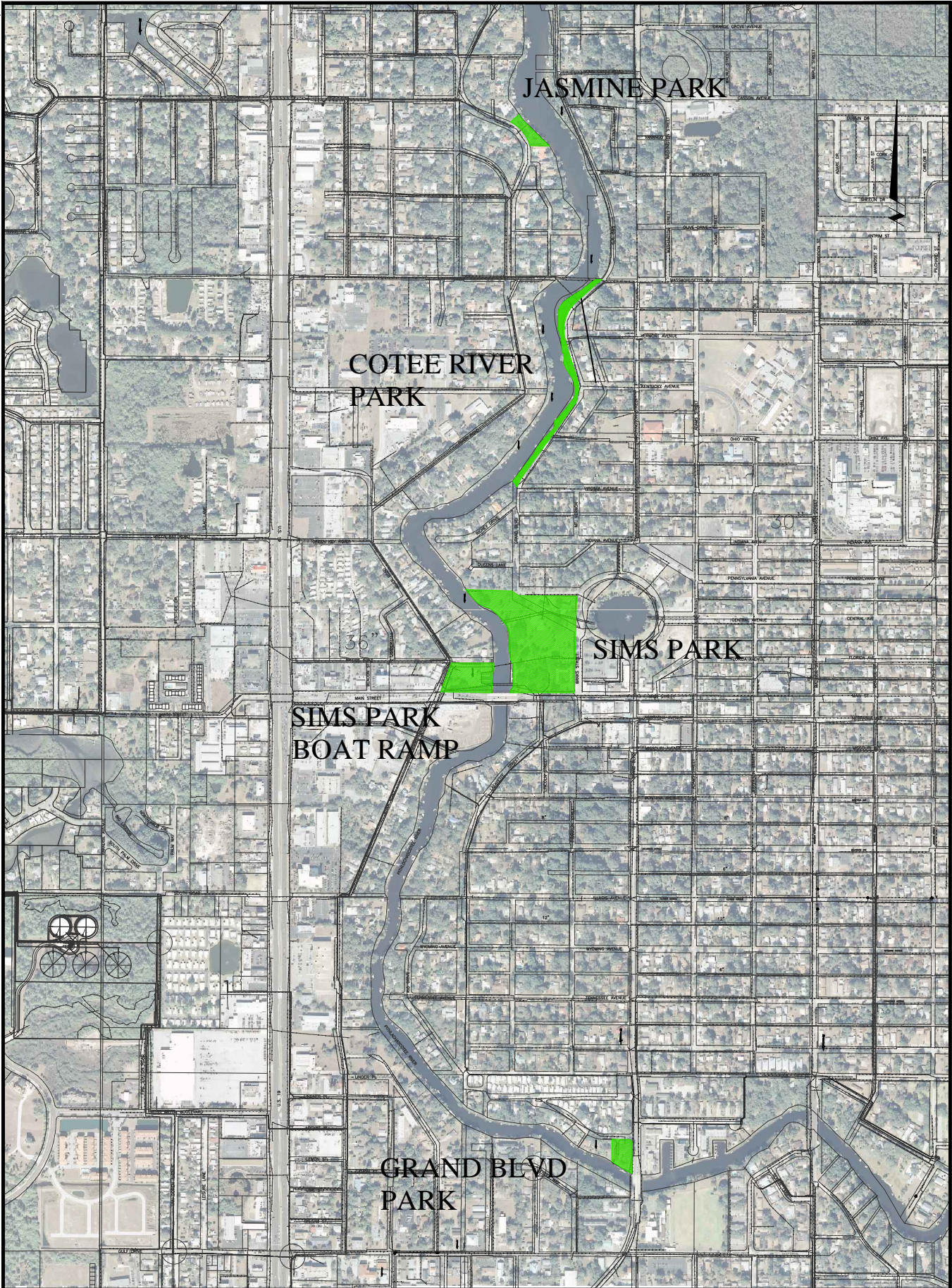


FIGURE 1  
CITY RIVERFRONT PARKS  
LOCATION MAP

## **2. SEAWALL INVESTIGATION**

The investigation consisted of a dual approach: (1) visual inspection of the seawall and (2) the use of Ground Penetrating Radar (GPR) along the seawall. GPR is a geophysical exploration tool used to provide a graphic cross-sectional view of subsurface conditions. The investigation included a review of the existing seawall design drawings, as available. Additionally, the City conducted test excavations at three separate park seawall locations to gain confirmation of the seawall construction and tie-back system condition.

### **2.1. ELEMENTS OF SEAWALL DESIGN**

Standards that apply to typical seawall design have been developed by the Army Corps of Engineers (EM 1110-2-1614, Design of Revetments, Seawalls, and Bulkheads, USACE, 1995). The following elements need to be considered during the design process:

- Topography of the wall location – elevations, grading, depth of water, etc. The amount of soil that is required to be supported is a component in the structural design of the wall.
- Soil properties – unit weight of soil; the ratios of sand, clay, or silt. Soil types and drainage properties are important design considerations, especially as backfill material to the adjacent wall structure.
- Embedment/Stability – depth of wall for stability is a major design consideration to provide sufficient foundational support and to prevent erosion from the foundation.
- Water Table – differential water levels behind and in front of walls which can impart differential hydraulic loading (hydrostatic pressure) on the walls. It is a vital design element to provide methods to relieve hydrostatic pressure from the wall, as this is one of the most common reasons for wall failures.
- Wall Material Properties – the type of material, strength of material, performance in marine environment, etc. needs to be considered to factor corrosion prevention and wall life-span.
- Surcharge Loads – the inclusion of additional loads on and behind the walls, such as wall caps, structures, vehicles, etc. needs to be factored in the structural design of the wall and foundation.
- Stormwater Runoff – include methods to allow overland stormwater to flow over walls to reduce the potential for seepage or channeling of water behind the walls which contributes to structural erosion loss.
- Wave Action Forces – while wave action on bulkhead walls are anticipated to be minimal, wave action needs to be accounted for in the design of the wall foundation.
- Toe Scour – velocities of water flowing along wall impart hydraulic forces along the base of the wall, and also contribute to the design of the wall foundation and embedment depth.

The City was able to provide records of park improvements projects for three (3) of the seawall locations which included design revisions to the walls. These projects only added concrete caps, sidewalks, and cap drains to the existing seawall structures. There were no records found for the original seawall design or construction.

Therefore, much of the design criteria as described above cannot be verified for the seawalls. If a wall is damaged or deteriorated, the original design – and/or the improvements constructed – may not have accounted for the design criteria.

## 2.2. EXISTING SEAWALL CONDITION

The assessment of seawall condition is based on not only the physical condition of the seawall, but the likely reasons which caused or contributed to the detriment. Since it is believed the majority of the seawalls were constructed over 30 years ago, there can be an expected level of deterioration, as the average life-span of concrete seawalls is 30 years. Maintenance programs can extend the wall life well beyond the average life-span.

Most seawalls fail due to erosion of soil, either below the foundation or from behind the wall. This condition is caused due to water-conveyed erosion, where water seeps in behind the wall and over time, develops erosion channels and creates voids. These voids remove the structural bearing capacity, allowing cracks to form in the wall, which allows more erosion and exacerbates the deterioration. As the walls settle, and more foundation material is eroded, they typically begin to rotate or tilt from the vertical position.

The details of the condition assessment are presented below for each park location. The GPR Survey is included in **Attachment A** to this Report.

### 2.2.1. GRAND BOULEVARD PARK

This park is located along the west side of Grand Boulevard, on the north side of the Pithlachascotee River. This park was constructed in 2006 and improvements to the existing 135-ft long seawall were constructed during that project. These improvements included the addition of a 24-inch concrete cap connected to the existing concrete seawall by use of vertical 8-inch long steel dowels set at 4'-0" on center (O.C.). Drainage spillways were built into the new cap structure and a concrete sidewalk with expansion joint was constructed adjacent to the new concrete cap. The width of the existing seawall is not known, however it is reasonable to assume a minimum thickness of 8-inches. The GPR investigation did not find evidence of a void at this location. Also, there was no observed soil erosion at the wall cap to sidewalk joint, or at the wall toe/foundation. **Table 1** provides a summary of the deterioration found at the seawall. **Figure 2** shows the park site with the location of the wall deterioration identified. **Figure 3** is a photograph of the wall damage noted during the inspection.

**Table 1 – Grand Boulevard Park Summary**

Item No.	Description of Seawall Deterioration	Station
1	Wall Crack at Base – Vertical	1+26

Other deficiencies of this wall include the lack of drainage pipes to allow groundwater to drain from behind the wall into the river. This condition creates hydrostatic pressure behind the wall and exerts forces that can contribute to wall cracks.



FIGURE 2  
GRAND BOULEVARD PARK  
SEAWALL DETERIORATION



Figure 3 – Wall Crack at Base/Waterline

## 2.2.2. SIMS PARK BOAT RAMP

This park is located along the west side of the Pithlachascotee River, on the north side of Main Street. There were no records provided to determine when this seawall was originally constructed. The condition of the seawall and cap show excessive deterioration and damage, indicating a long period of time has elapsed since the wall was constructed. Numerous areas of the wall and cap had cracking of the concrete, spalling of the concrete, and insufficient sealing of wall construction joints. The total length of seawall at this park is 375-ft.

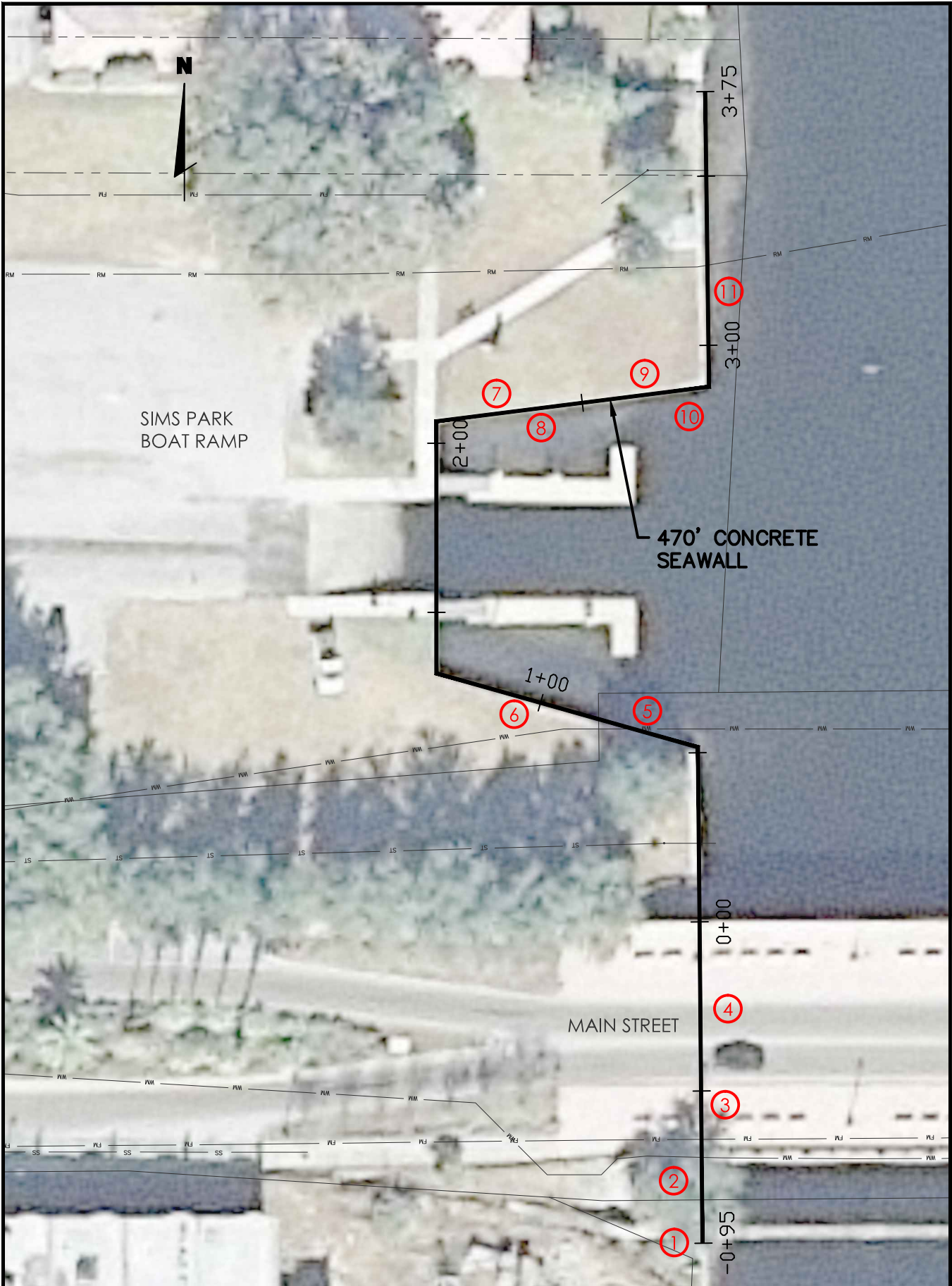
The cap width varies between 12-inches and 16-inches, with the grade elevation of the park matching the top elevation of the cap. There appear to be mortar repairs to the existing cap at previous concrete damage areas. The width of the existing seawall is not known, however it is reasonable to assume a minimum thickness of 8-inches. The GPR investigation did find evidence of a void at one location along the wall. **Table 2** provides a summary of the deterioration found at the seawall. **Figure 4** shows the park site with the location of the wall deterioration areas identified. **Figures 5, 6, 7, and 8** are photographs of the wall damage noted during the inspection.

**Table 2 – Sims Park Boat Ramp**

Item No.	Description of Seawall Deterioration	Station
1	Erosion at Wall Joint	-0+95
2	Erosion Behind Wall	-0+95 to -0+75
3	Crack at Wall Cap – Horizontal	-0+75 to -0+30
4	Cap Damage – Spalling	-0+25
5	Cap Damage – Spalling	0+80
6	Erosion at Wall Joint	1+02
7	Crack at Wall – Vertical	2+28
8	Cap Damage – Spalling	2+41
9	Erosion at Wall Joint – Possible Void Detected	2+61
10	Cap Damage - Spalling	2+85
11	Cap Cracking, Wall Joint Separation, Exposed Rebar	3+08

There are drainage pipes in the wall, however, the condition and construction details of the drain pipes are not known. In addition, the location and number of drain pipes appear to be insufficient for proper drainage of groundwater from behind the wall.

In addition to the repair of the seawalls, the City plans to construct new wall caps and sidewalks. These improvements are intended to match the decorative and design features of Sims Park directly across the river.



**FIGURE 4**  
**SIMS PARK BOAT RAMP**  
**SEAWALL DETERIORATION**



**Figure 5 – Vertical Wall Crack**



**Figure 6 - Drainage Pipe at Wall Joint**



**Figure 7 - Damaged Wall Caps**



**Figure 8 - Deterioration at Wall Joint**

### 2.2.3. SIMS PARK

Sims Park is located along the east side of the Pithlachascotee River, on the north side of Main Street and directly across from Sims Park Boat Ramp. The original construction date of the seawall is unknown. This park has had a number of park improvement projects, the latest completed in 2015 which involved the reconstruction of portions of the sidewalks abutting the seawall cap. That project also included an emergency repair of an observed void under the sidewalk and adjacent to the wall near the northern edge of the park. The total length of seawall at this park is approximately 940-ft.

A prior project, completed in 1999, involved the construction of new 18-inch wide concrete caps connected to the existing concrete seawall by use of vertical 8-inch steel dowels set at 4'-0" on center (O.C.). Drainage channels were built into the new cap structure and a concrete sidewalk with expansion joint was constructed adjacent to the new concrete cap. The width of the existing seawall is not known, however it is reasonable to assume a minimum thickness of 8-inches. There are no observable drainage pipes in the wall. The GPR investigation did find evidence of voids at several locations along the wall. **Table 3** provides a summary of the deterioration found at the bulkhead wall. **Figures 9, 10, and 11** show the park seawall layout along with the locations of the wall deterioration identified during the visual inspection. **Figures 12 and 13** are photographs of the wall damage noted during the inspection.

**Table 3 – Sims Park Wall Deterioration Summary**

Item No.	Description of Seawall Deterioration	Station
1	Wall cap crack - horizontal	-0+60 to 0+00
2	Loss of expansion joint between wall cap and sidewalk	0+58
3	Sidewalk settlement at spillway – minor crack on old wall cap	1+06
4	Wall crack – vertical	1+21
5	Sidewalk settlement at spillway – water ponding	1+33
6	Wall crack – vertical – possible void detected (GPR)	1+54
7	Cap damage – spalling at wall joint	1+66
8	Wall cap crack	1+97
9	Possible void detected – erosion channel visible inside wall	2+38
10	Large crack at wall joint, wall cap spalling	2+42
11	Possible void detected (GPR)	2+42
12	Wall joint separation/spalling	2+71
13	Wall crack – vertical, wall appears to be leaning at crack	3+14
14	Wall joint separation	3+75
15	Wall crack at joint	4+37
16	Possible void detected (GPR)	4+65
17	Wall crack – vertical, located next to outfall pipe	5+80
18	Wall joint separation	6+75

19	Wall to sidewalk joint separation and void	7+30 to 7+60
20	Wall joint separation/spalling	7+80
21	Wall crack at joint	8+48
22	Wall crack – vertical	9+12
23	Wall damage – spalling	9+22
24	Wall crack at end of wall joint	9+42







FIGURE 11  
SIMS PARK SEAWALL  
DETERIORATION



**Figure 12 – Wall Crack/Spalling**



Figure 13 – Wall Crack/Shifting Outward

#### 2.2.4. COTEE RIVER PARK

The Cotee River Park is located along the west side of Grand Boulevard with a northern terminus near the intersection of Massachusetts Avenue, and bordered on the west side by the Pittlachascotee River. This park is linearly aligned along the river with approximately 1,850-ft of seawall. Information about the construction of the original seawall is unknown. The last park improvements project was constructed in 2003, and involved the construction of new 18-inch wide concrete caps connected to the existing concrete seawall by use of vertical 8-inch steel dowels set at 4'-0" O.C. Drainage spillways were built into the new cap structure and a concrete sidewalk with expansion joint was constructed adjacent to the new concrete cap. The width of the existing seawall is not known, however it is reasonable to assume a minimum thickness of 8-inches. The GPR investigation did not find evidence of voids at this location. The City also excavated a concrete tie-back and this structure appeared to be in good condition.

**Table 4** provides a summary of the deterioration found at the seawall. **Figures 14, 15, 16, 17, and 18** show the locations of the wall deterioration identified during the visual inspection. **Figures 19 and 20** are photographs of the wall damage noted during the inspection.

**Table 4 – Cotee River Park Seawall Damage Summary**

Item No.	Description of Seawall Deterioration	Station
1	Wall cap spillway crack - horizontal	1+35
2	Minor cracking at wall cap and seawall	1+85
3	Wall cap crack - minor	2+95
4	Wall cap spillway crack - horizontal	3+30
5	Horizontal crack at wall cap spillway and vertical crack at storm drain wall penetration	3+90
6	Wall cap spillway crack – horizontal	4+20
7	Wall cap crack – minor	4+36
8	Crack at wall – vertical	4+45
9	Wall cap crack – minor	4+99
10	Wall cap spillway crack - horizontal	5+44
11	Wall joint separation	5+68
12	Wall cap spillway crack – horizontal Wall cap damage - spalling	6+02
13	Wall crack – horizontal approx.. 4' long	6+08
14	Wall cap spillway – sidewalk settlement	6+32
15	Wall joint separation	6+77
16	Wall joint separation	7+75
17	Wall cap spillway crack – horizontal Settlement of adjacent sidewalk	8+13
18	Wall joint separation	9+00
19	Wall joint separation Wall foundation crack	10+00

20	Wall cap spillway – sidewalk settlement	10+82
21	Wall cap crack – minor	11+58
22	Wall joint separation	12+06
23	Crack at wall – vertical	12+65
24	Wall joint separation Wall joint deterioration	13+04
25	Separation of wall and sidewalk	13+10
26	Wall cap spillway crack – horizontal Wall crack - vertical	13+24
27	Wall cap spillway crack – horizontal Wall crack - vertical	13+84
28	Wall joint separation	14+06
29	Wall cap spillway crack – horizontal Wall crack - vertical	14+43
30	Wall and foundation crack - irregular	14+80
31	Wall joint separation	15+12
32	Wall crack – irregular	15+33
33	Wall cap spillway crack – horizontal Wall crack – vertical	15+60
34	Wall joint separation	16+25
35	Wall cap spillway crack – horizontal Wall crack – vertical	16+54
36	Wall joint separation	17+42
37	Wall cap spillway crack – horizontal Wall crack – vertical	18+12

Other deficiencies of this wall include the lack of drainage pipes to allow groundwater to drain from behind the wall into the river. This condition creates hydrostatic pressure behind the wall and exerts forces that can contribute to wall cracks. While the wall has no drainage pipes, the park designer did provide for overland stormwater runoff by sloping the sidewalks to the wall cap spillways.

Also, near station 15+00, there appears to be increased separation at the expansion joint between the sidewalk and the concrete slab of a shade pavilion. The determination of movement from either the seawall or the pavilion structure is unknown. This condition should be monitored to determine if the structure separation worsens.



FIGURE 14  
COTEE RIVER PARK  
SEAWALL DETERIORATION



FIGURE 15  
 COTEE RIVER PARK  
 SEAWALL DETERIORATION

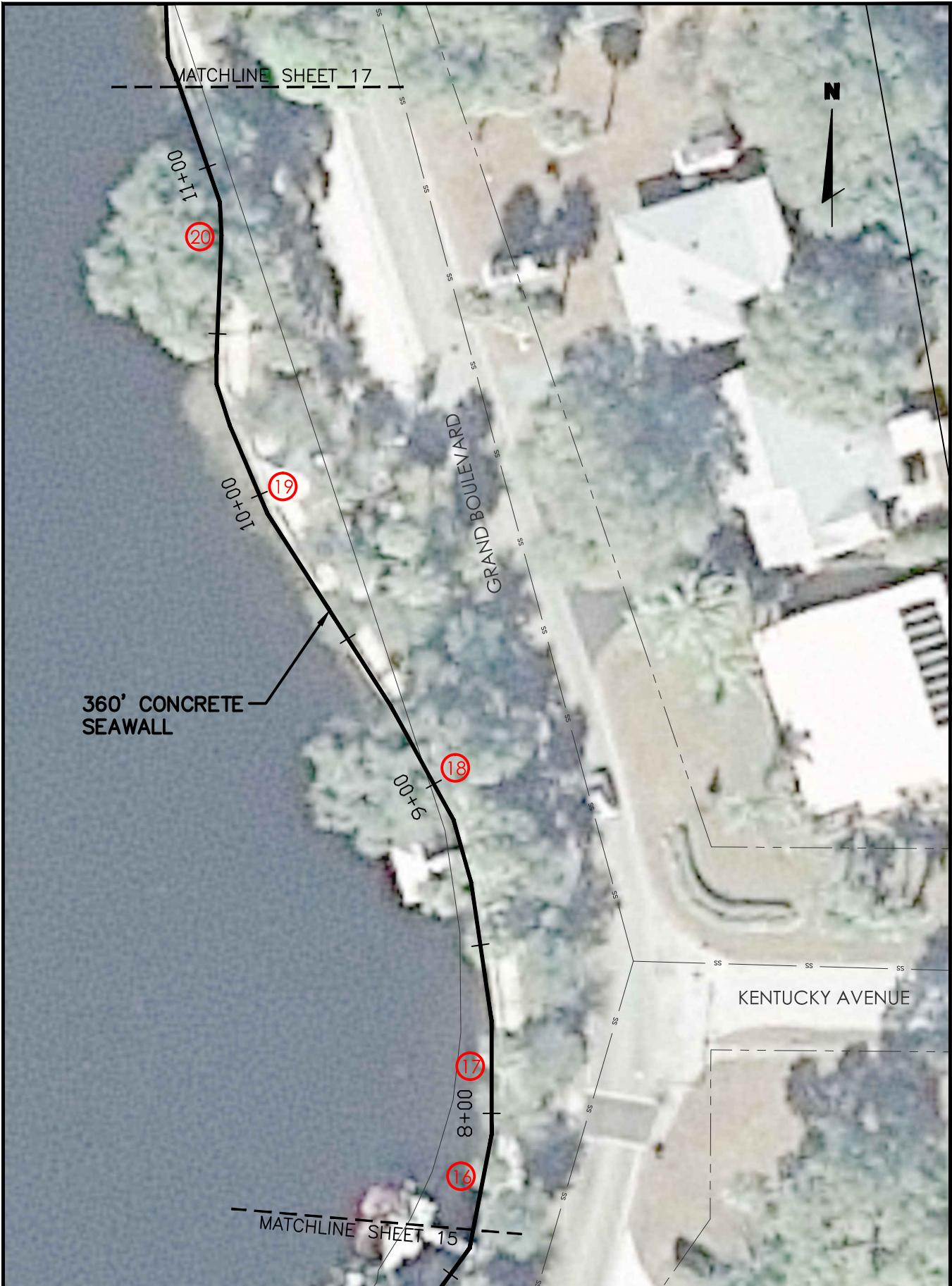


FIGURE 16  
COTEE RIVER PARK  
SEAWALL DETERIORATION

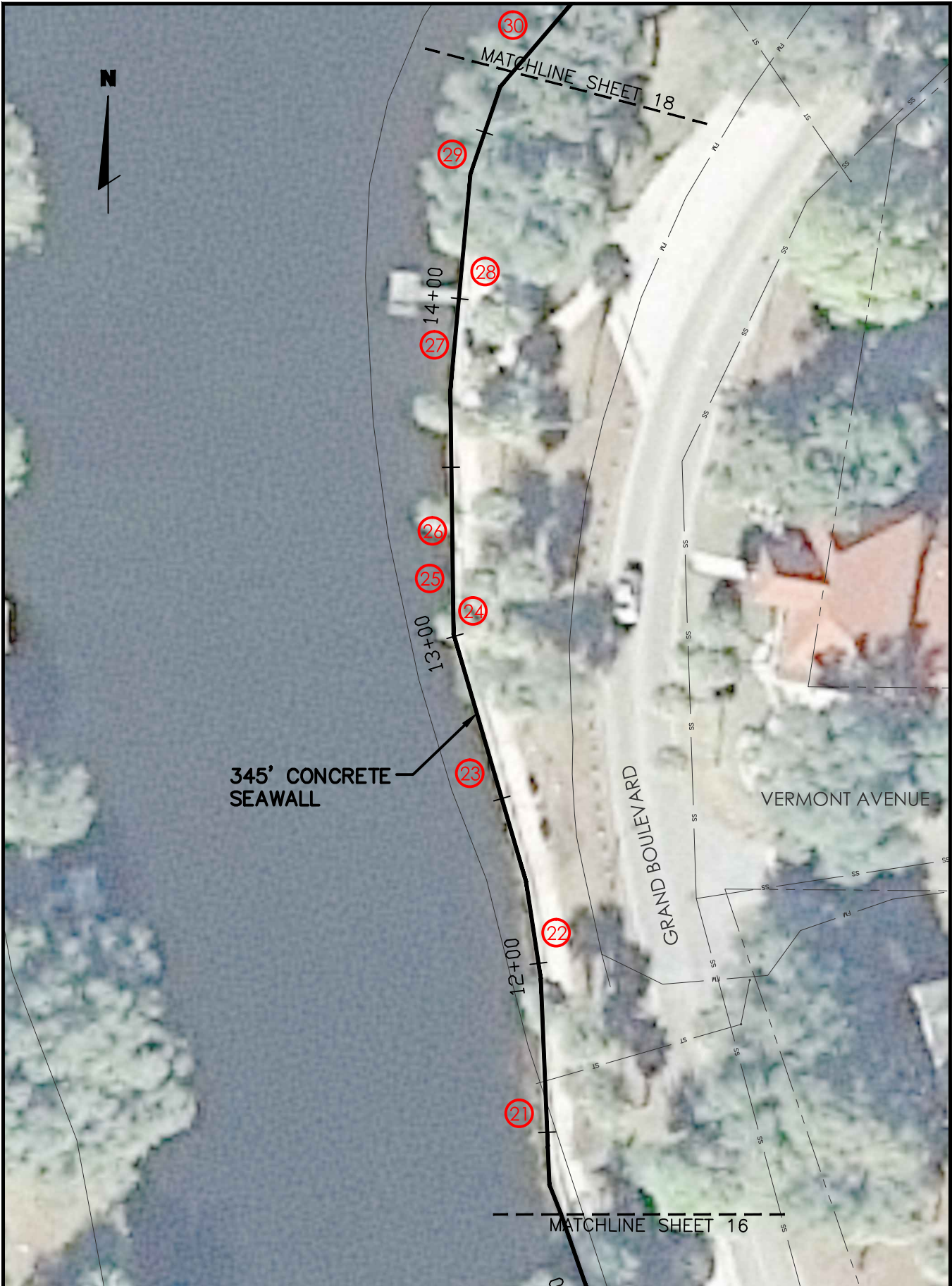


FIGURE 17  
COTTEE RIVER PARK  
SEAWALL DETERIORATION

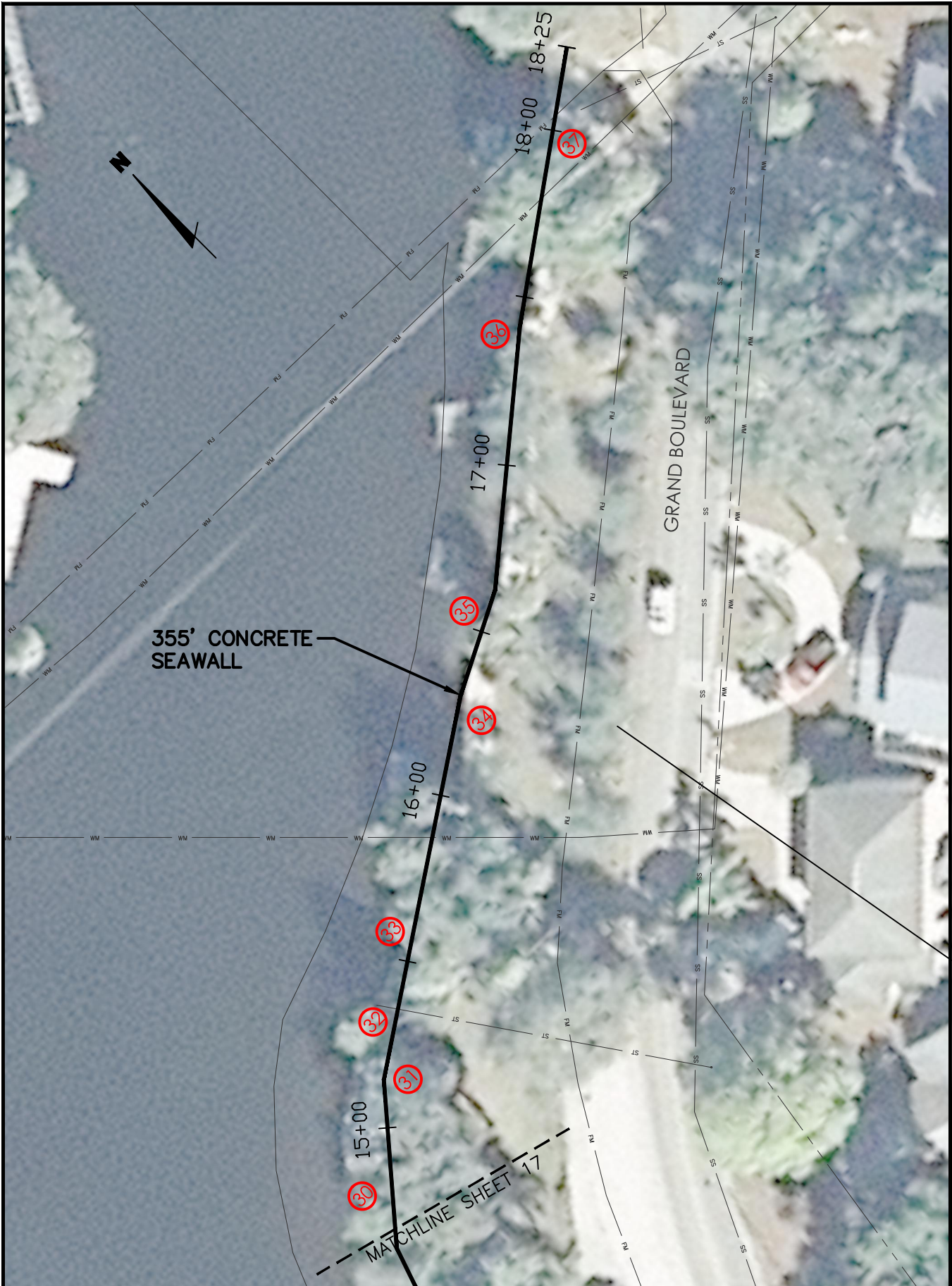


FIGURE 18  
COTÉE RIVER PARK  
SEAWALL DETERIORATION



**Figure 19 – Wall Crack at Spillway**



**Figure 20 – Wall Joint Separation/Spalling**

### 2.2.5. JASMINE PARK

Jasmine Park is located along the west side of the Pithlachascotee River and along the east side of Jasmine Drive. The original construction date of this bulkhead wall is unknown. During the visual inspection, there was evidence of improvements or repairs to the wall, in an attempt to prevent or limit wall failure. These improvements included the installation of drainage pipes along the wall every 6' and the installation of steel rod tie-backs to subsurface mass concrete deadmans (i.e thrust blocks). At the top of the wall is a 4" thick x 2'-6" wide concrete cap. The width of the existing seawall was measured during the tie-back excavation and verified at a thickness of 8-inches. The total length of seawall at this park is 260-ft.

The City performed an excavation of an existing tie-back for both an original concrete wall tie-back and one of the retrofitted steel rod tie-backs. The excavation also exposed one of the 2" diameter drainage holes in the wall, which revealed the lack of a soil filter to prevent erosion through the hole. It is possible this condition exists for the other drainage holes.

The GPR investigation did find evidence of voids at several locations along the wall. **Table 5** provides a summary of the deterioration found at the bulkhead wall. **Figure 21** shows the park seawall layout along with the locations of the wall deterioration identified during the visual inspection. **Figures 22, 23, 24, 25, and 26** are photographs of the wall damage noted during the inspection.

**Table 5 – Jasmine Park**

Item No.	Description of Seawall Deterioration	Station
1	Wall Joint Damage - Erosion	0+00
2	Wall Cap Damage - Spalling	0+10 to 0+33
3	Possible Void Detected	0+40 to 0+70
4	Wall Leaning Outward 2-3 Degrees	0+70 to 0+97
5	Wall Crack – Vertical	0+97
6	Possible Void Detected	0+97 to 1+31
7	Wall Leaning Outward 4-5 Degrees	1+31 to 1+75
8	Possible Void Detected	2+10 to 2+30

In addition to the repair or replacement of the seawalls, the City plans to construct new wall caps and sidewalks. These improvements are intended to match the decorative and design features of the other riverfront parks. However, we recommend additional investigation of the seawall foundation be conducted during the design phase to assure the wall is capable of supporting the new wall cap structure. It may be necessary to provide additional structural support or seawall replacement prior to constructing the wall cap and sidewalk additions.



FIGURE 21  
JASMINE PARK SEAWALL  
DETERIORATION



**Figure 22 - Wall Failure/Crack**



**Figure 23 - Wall Leaning Toward River – Separation at Construction Joint (Looking South)**



**Figure 24 - Wall Leaning Toward River – Vertical Wall Crack (Looking North)**



**Figure 25 - Jasmine Park Seawall Drainage Hole Excavation – No Filter or Slotted Pipe Protection to Prevent Soil Erosion Through Hole**



**Figure 26 - Jasmine Park Bulkhead Concrete Tie-Back Excavation**

### 3. SEAWALL REPAIR EVALUATION

The condition assessment provided a detailed understanding of the current state of the City’s riverfront park seawalls. The existing seawalls do require maintenance and repair on a periodic basis. Even with the limited knowledge of the current age of the seawall structures, they appear to be meeting their intended purpose which is to protect the adjacent upland properties. However, a number of the seawalls require significant repair to extend their operational life-span.

#### 3.1. REPAIR METHODS

The condition assessment identified repair areas for each seawall location. Based upon the type of condition noted and the severity of the wall deterioration, repair methods were determined for each location. The recommended repair methods for each wall deterioration area are shown in **Table 6**. The repair methods include a number of different technologies and materials, which are discussed in detail below.

**Table 6 – Seawall Repair Methods**

Deterioration Description	Recommended Repair Method
Wall Joint Damage - Separation	Seal exterior of wall joint with epoxy grout, inject 1-part hydrophobic polyethylene resin to stabilize and seal joint from interior
Wall Crack – Vertical and Horizontal	Clean concrete surface at crack location, seal crack from exterior side, inject hydrophobic grout behind wall crack to seal interior
Wall Cap Damage - Spalling	Clean concrete surface at spalled location, construct wood form, apply Sika portland cement mortar to match adjacent surfaces
Wall Cap Damage - Cracks	Bevel each edge of concrete crack, clean concrete surface, apply Sika portland cement mortar to seal crack
Sidewalk Settlement	Inject 2-part structural polyurethane resin to lift concrete sidewalk back to original grade
No or Insufficient Wall Drainage Pipes	Coring of the bulkhead walls and installation of new 4” diameter drainage pipes, including flap valve and filter at specified locations along each wall
Possible Void Detected	Inject 2-part structural polyurethane resin to fill void
Wall Leaning Outward	Remove concrete seawall and replace with steel reinforced concrete foundation and wall. Reuse existing tie-back system if suitable. Connect to existing seawall with VROD composite rebar.
Damaged Tie-Back System	Install helical ground anchors with steel rod to connect to wall anchors

## 3.2. REPAIR MATERIALS

The following section of this Report provides a brief discussion for each of the proposed repair products identified in Table 6.

### 3.2.1. SOIL STABILIZING POLYURETHANE (1-PART)

The 1-part polyurethane is a thin liquid resin that reacts with moisture when injected into soil, forming a rock hard, water-tight mass. Conditions behind the seawall require working with wet soils and often below the waterline. This product is often referred to as hydrophobic grout and is used to stabilize loose soils or sands, stopping underground water flows and leaking seawalls. This material is virtually unaffected by fluctuation in the moisture content and retains its strength, size, and impermeability under almost all soil conditions. This product is NSF certified for use in potable water tanks.

For the seawall repair, holes are drilled in the concrete sidewalk or seawall, depending on the application, to accommodate ½” pipes that are driven to the bottom of the void at the structure. The polyurethane chemical resin is injected through the pipes to stabilize and seal any leaks at the structure foundation. This procedure will be conducted along the wall perimeter at each crack or construction joint location to stabilize and seal any leaks at the structure foundation.

### 3.2.2. STRUCTURAL FOAM POLYURETHANE (2-PART)

The 2-part polyurethane product is used to provide structural support to concrete structures, and is used in combination with the 1-part polyurethane product depending on the repair need. These products are NSF certified for use in potable water tanks.

For the seawall repair, holes are drilled in the concrete sidewalk or seawall, depending on the application, to accommodate ½” pipes that are driven to the bottom of the void at the structure. A polyurethane chemical resin is injected through the pipes. This polyurethane foam material chemically expands to fill voids and cracks in the walls, and impart pressure on the concrete structures. This procedure will be conducted along the seawall at each deteriorated area to stabilize and fill any voids along at the wall.

### 3.2.3. EPOXY GROUT

To repair cracks near or below the waterline, the proposed repair product is a two component, fast curing epoxy sealing system. The epoxy grout is applied with low pressure injection into the cracks of structural concrete. Examples of this type of epoxy sealing system are the Sikadur Resin products.

### 3.2.4. PORTLAND CEMENT MORTAR

To repair spalled or smaller wall or wall cap cracks, the proposed repair product is a cementitious patching material that is troweled onto the cleaned concrete surface and formed to match the adjacent surfaces. Examples of this type of product are SikaRepair 222 and 223.

### 3.2.5. WALL DRAINAGE PIPES

A significant amount of seawall structure failures occur due to the build-up of excessive hydrostatic pressure caused by inadequate drainage from the upland side of the structure. To provide positive drainage to reduce the hydrostatic pressure, the existing seawalls will require the installation of new drainage pipes. These drain pipes are constructed of 4-inch diameter stainless steel pipe, with a flanged face to mount to the wall exterior, a flap valve to allow the discharge of water and prevent intrusion of water from the river, and a stainless steel filter assembly to prevent the loss of soil from the wall interior. This type of product is also produced in a 2.5-inch diameter for use in retrofitting existing weep holes.

### 3.2.6. FIBERGLASS CONNECTING RODS

To connect new seawall panels to the existing panels requires the use of tension resisting structural members, typically steel rebar. For the purposes of exposure to marine environments, particularly with this application, the use of composite rebar made from high strength glass or carbon fibers and vinyl ester resin is recommended. The glass/carbon fibers impart strength to the rod while the vinyl ester resin provides corrosion resistance in harsh environments. This product can also be used to provide a structural repair to walls experiencing heavy crack development.

### 3.2.7. HELICAL GROUND ANCHORS

Helical seawall tie-backs are used for new seawall construction and retrofitting failing seawalls. They have advantages over conventional deadman tie-backs because they can be installed quickly and tensioned immediately for reduced construction times. These anchors can be installed from land or water side of the wall, they are removable and extendable, and can be installed underneath existing structures. Helical anchors are classified as soil anchors and loads are developed based upon the capacity of the soil behind the wall. Holding capacity is proportional to installation torque. Length and bearing area of the anchors can be adjusted in the field to meet the specified load requirements.

### 3.3. ESTIMATED COSTS

Estimated costs of each repair location discussed in Section 2 were determined and are listed in the table below. The costs for each method were based on estimation of quantities and unit prices from projects of similar construction elements, and use of material unit prices from a qualified local seawall repair contractor. The level of accuracy of the cost estimates is expected to be between +/- 25%. **Table 7** presents the total capital costs for each project location.

**Table 7 – Repair Cost Summary and Project Ranking**

Park Location	Estimated Repair Cost	Engineering, Permitting, and Survey Cost	Total Capital Cost	Project Ranking
Grand Boulevard Park	\$12,280	\$1,840	\$14,120	4
Sims Park Boat Ramp	\$233,230	\$35,000	\$268,230	3
Sims Park	\$170,500	\$25,600	\$196,100	1
Cotee River Park	\$156,800	\$23,500	\$180,300	2
Jasmine Park	\$175,500	\$26,300	\$201,800	5

Capital costs include engineering, permitting, equipment/material purchase, and construction of the improvements. A 25% contingency amount was included in the capital costs. Detailed cost spreadsheets for each park location are included in **Attachment B** of this Report.

Project rankings, shown in **Table 7**, were developed based on comparing (1) the estimated repair costs for each location, (2) the amount and frequency of recreational use at each park, and (3) the inclusion of the seawall repairs with the City’s overall park improvements objectives. Each project ranking is discussed below:

1. Even though Sims Park has a high repair cost, this park was ranked with the highest priority to receive repairs since the City has recently completed the first phase of the Sims Park Improvements project. This park has the highest resident recreational use and is a high profile park within the City.
2. The next project ranking priority is for the Cotee River Park. This park also went through a major improvements project within the past 15 years and is heavily used, and completing repairs in a timely manner will help limit the potential for continued seawall deterioration and future costly repairs.
3. The Sims Park Boat Ramp was ranked 3<sup>rd</sup> in priority, as this park is planned for park improvements to mirror the recently completed Sims Park. The seawall repair and improvements for this park could also be included in the future park improvements project construction phase.
4. Grand Boulevard Park was ranked 4<sup>th</sup> in priority, as the seawall is in relatively good condition. With the low estimated cost this seawall can be repaired as the City’s budget allows.
5. Jasmine Park was ranked 5<sup>th</sup> in priority, as this park bears a high repair cost while it has a total seawall length significantly less than the top 3 ranked parks. This park is also mainly a

neighborhood park with limited parking or other facilities that would improve City resident access. Also, with the City’s plan is to add new wall caps and sidewalks, should further evaluation require a greater amount of seawall replacement, the overall project cost could increase significantly.

### 3.4. RECOMMENDATIONS

The goal of this Report was to conduct a condition assessment of the City’s riverfront parks, identify construction methods to repair the seawall deficiencies, provide estimated construction costs of the proposed repairs, and prioritize the repair of each park seawall.

In order to provide the City with a projection of project funding, a phasing plan for the proposed seawall repairs has been developed and is shown in **Table 8**.

**Table 8 – Phasing Plan**

Park Location	Project Year			
	2018	2019	2020	2021
Grand Boulevard Park				X
Sims Park Boat Ramp			X	
Sims Park	X			
Cotee River Park		X		
Jasmine Park				X
<b>Total Yearly Project Allocation</b>	<b>\$196,100</b>	<b>\$180,300</b>	<b>\$268,230</b>	<b>\$215,920</b>

Based on the condition assessment presented within this Report and the associated costs estimated for each park seawall repair project, we recommend the City move forward with the project phasing plan for fiscal years 2018 through 2021.

# **ATTACHMENT A**



# UNIVERSAL ENGINEERING SCIENCES

Consultants in: Geotechnical Engineering • Environmental Engineering  
Construction Materials Testing • Threshold Inspection • Private Provider Inspection

OFFICES IN  
• Atlanta, GA  
• Daytona Beach, FL  
• Fort Myers, FL  
• Fort Pierce, FL  
• Gainesville, FL  
• Jacksonville, FL  
• Leesburg, FL  
• Miami, FL  
• Ocala, FL  
• Orange City, FL  
• Orlando, FL  
• Palm Coast, FL  
• Panama City, FL  
• Pensacola, FL  
• Rockledge, FL  
• Sarasota, FL  
• St. Augustine, FL  
• Tampa, FL  
• West Palm Beach, FL

March 17, 2017

Brent Heath, P.E.  
Stroud Engineering Consultants  
10503 Cyndee Lane  
Odessa, FL 33556

Reference: ***Ground Penetrating Radar Survey – Void Detection  
City of New Port Richey - Seawall  
New Port Richey, Pasco County, Florida  
Universal Project No. 0830.1700044.0000  
RPT No. 1438562***

Dear Mr. Heath:

Universal Engineering Sciences, Inc. (Universal) has completed a ground penetrating radar (GPR) survey along the seawall of Grand Boulevard Park, Sims Boat Ramp, Sims Park, Cotee River Park, and Jasmine Park located in New Port Richey, Pasco County, FL. The following report presents the results of our field exploration with an interpretation as related to any voids along the seawalls.

## 1.0 SURVEY METHODOLOGY

The exploration took place on March 6, 2017. The GPR survey was conducted throughout the area of interests as shown in the Geophysical (GPR) Exploration Plans on **Figures 1 through 10**. The field data was processed in the office utilizing computer analysis to filter and enhance results.

Ground Penetrating Radar (GPR) is a geophysical exploration tool used to provide a graphic cross-sectional view of subsurface conditions. This cross-sectional view is created from the reflections of repetitive, short-duration electromagnetic (EM) waves which are generated by an antenna in contact with the ground surface as the antenna is pulled in linear traverses across the ground surface. The reflections occur at the subsurface contacts between materials with differing electrical properties. The electrical property contrast that causes the reflections is the dielectric permittivity, which is directly related to the electrical conductivity of the material. The GPR method is commonly used to identify such targets as underground utilities, underground storage tanks, buried debris, or geological features. This recorded information can be used to assist in siting locations for geotechnical borings. The greater the electrical contrast between the surrounding earth materials and the target of interest, the greater the amplitude of the reflected return signal. Unless the buried object/target of interest is highly conductive, only part of the signal energy is reflected back to the antenna located on the ground surface with the remaining portion of the signal continuing to propagate downward to be reflected by deeper features. If there is little or no electrical contrast between the target of interest and the surrounding earth materials, it would be very difficult, if not impossible to identify the object using GPR.

The depth of penetration of the GPR is very site specific and is controlled by two primary factors: subsurface soil conditions and antenna frequency. The GPR signal is attenuated (absorbed) as it passes through earth materials. As the energy of the GPR signal is diminished due to

attenuation, the energy of the reflected waves is reduced, eventually to a level where the reflections can no longer be detected. In general, the more conductive the earth materials, the greater the GPR signal attenuation. In Florida, typical soil conditions which severely limit the GPR signal penetration are near-surface clays, organic materials, and the presence of saline water in the soil pore water space.

A GPR survey is conducted along survey lines (transects), which are measured paths along which the GPR antenna is moved. Available known reference points (i.e., building corners, driveways, topographic features etc.) are placed on a master map, which includes traces of the GPR transect lines overlying the survey geometry. The survey map allows for correlation between the GPR data and the position of the GPR antenna on the ground. Features most commonly associated with potential voids are:

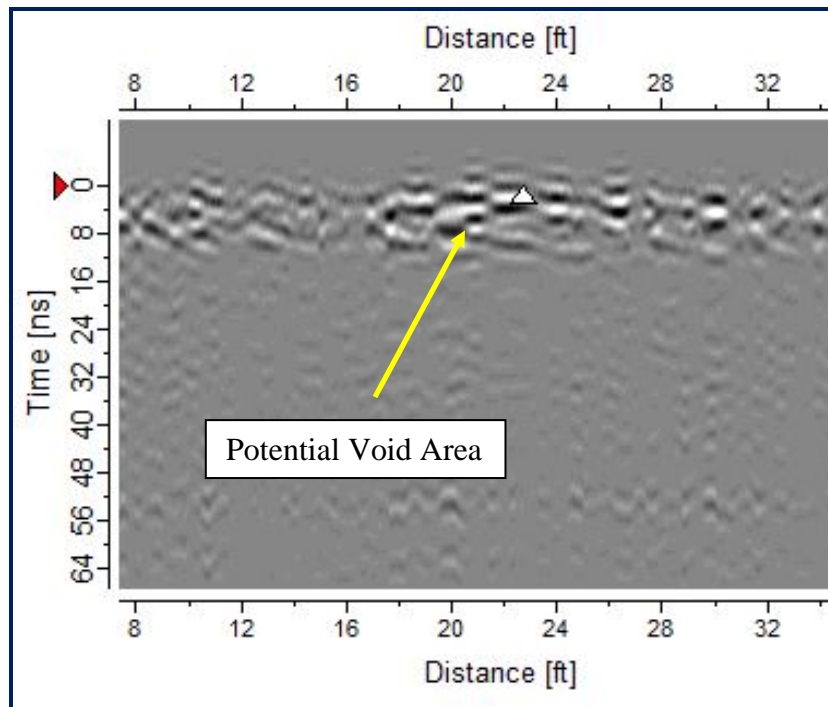
- A strong reflection or a higher contrast area imaged within a transect with no definite shape.

## 2.0 FIELD SURVEY AND CONCLUSIONS

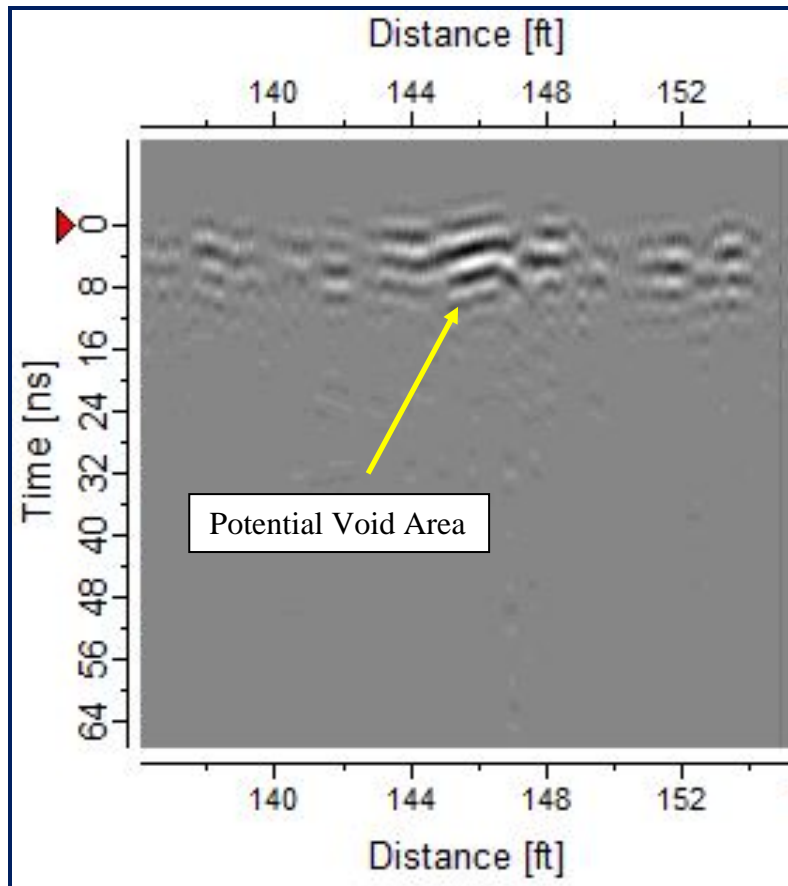
### 2.1 Ground Penetrating Radar

The GPR survey was conducted along transect lines established within the survey area, as shown on the Exploration Plans, **Figures 1 through 10**. A RAMAC X2M integrated radar with a 500-megahertz antenna with a time window of 78 nanoseconds (ns) was used to perform the GPR survey. A total of sixty four (64) transects were completed in continuous mode. The GPR was coupled with a Trimble AgGPS 114 differential global positioning system (GPS) receiver to obtain latitude and longitude coordinates along each GPR trace. The equipment settings for, and date of GPR data collection are included on the GPR Exploration Plan. In addition to potential voids, underground pipes, culverts and tiebacks were imaged.

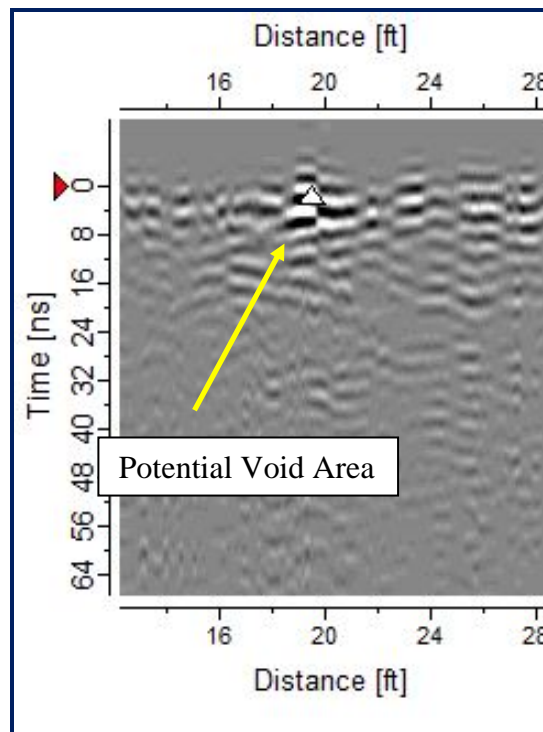
Within imaged GPR profiles, Universal encountered seven areas which were imaged to be a potential void.



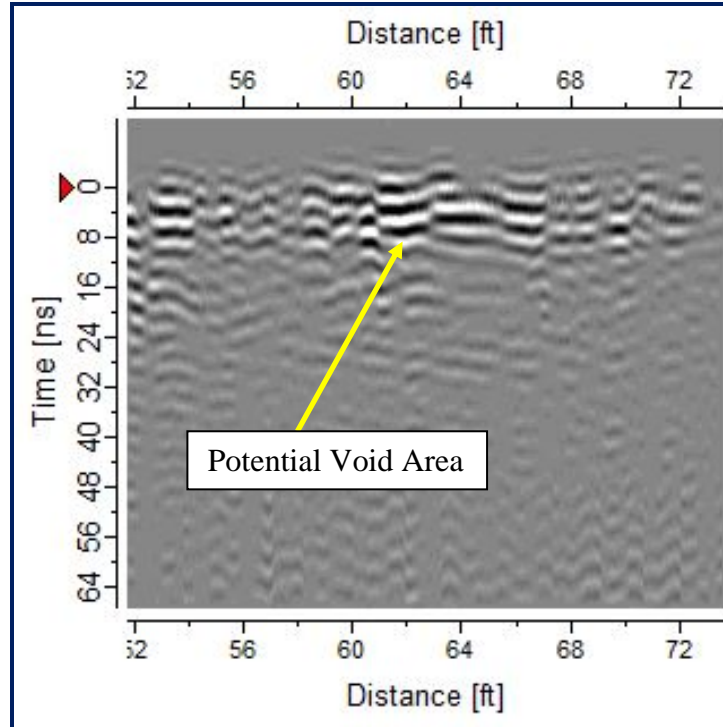
**Radargram 6 – Showing potential void along the seawall at Sims Boat Ramp.**



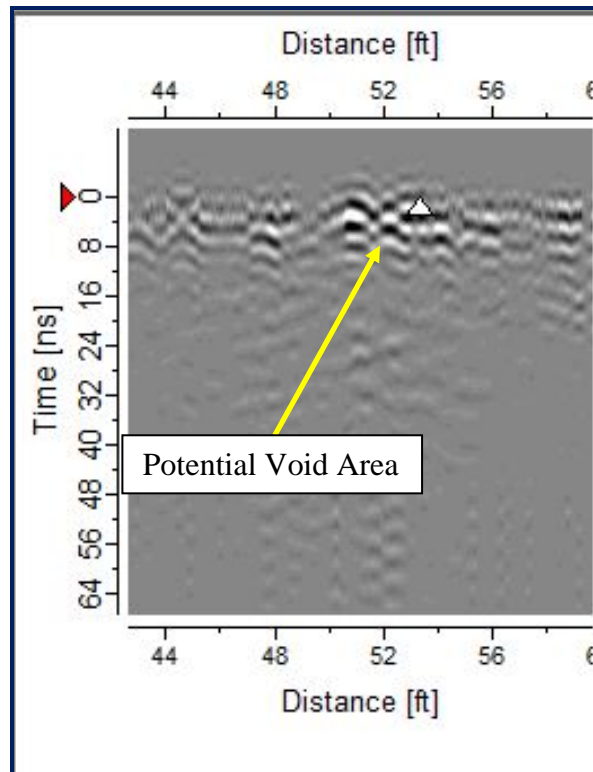
**Radargram 30 – Showing potential void along the seawall at Sims Park.**



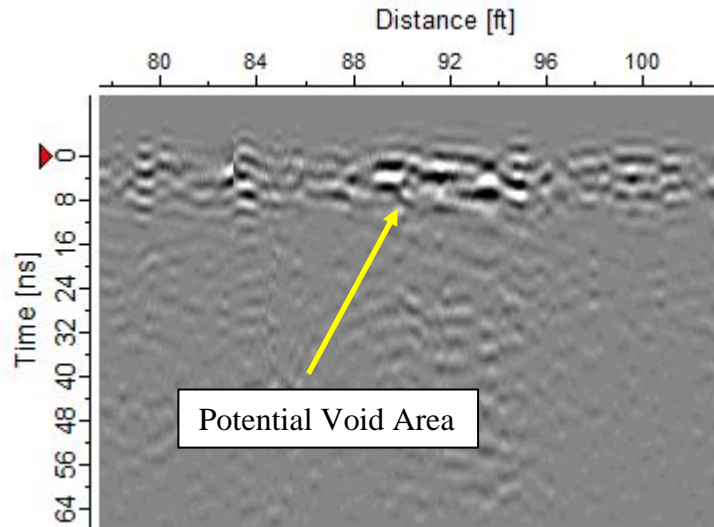
**Radargram 31 – Showing potential void along the seawall at Sims Park.**



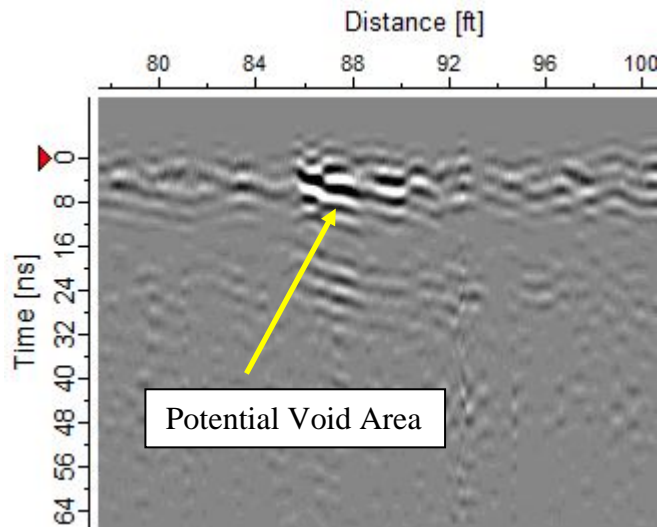
**Radargram 35 – Showing potential void along the seawall at Sims Park.**



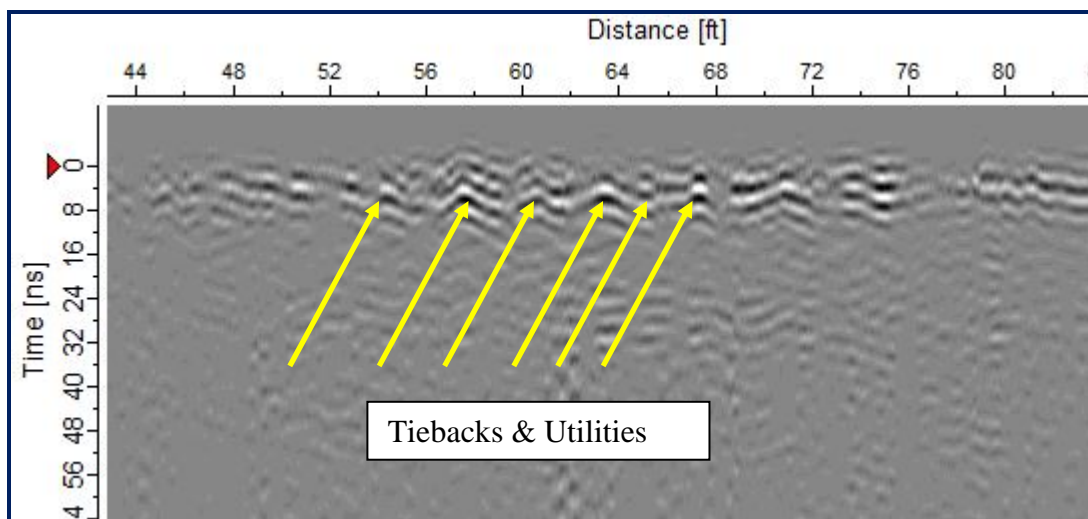
**Radargram 39 – Showing potential void along the seawall at Sims Park.**



**Radargram 61 – Showing potential void along the seawall at Jasmine Park.**



**Radargram 62– Showing potential void along the seawall at Jasmine Park.**



**Radargram 64 – Showing tiebacks and utilities on approximately three foot centers along the seawall at Jasmine Park.**

## 2.2 Conclusions

Universal, observed potential void areas along the Sims Boat Ramp, Sims Park, and Jasmine Park seawalls which were identified in the GPR transects completed during the survey. Within the transects completed along Grand Boulevard Park and Cotee Rive Park, no potential void areas were imaged. Other voids may exist along the seawalls however, were too small to be imaged with the antenna used in this survey. The GPS coordinates of the potential voids have been saved for future reference. The void areas are estimated to be at the greatest depth, .5 to 1.5 feet below the sidewalks/area along the seawall and 2 to 5 feet in length. The locations of the potential voids can be seen in **Figures 1 through 10**. The area of the void should be verified and recommendations for filling the area can be provided upon request.

Respectfully submitted,


**UNIVERSAL ENGINEERING SCIENCES, INC.**

Certificate of Authorization No. 549/GB33



## **FIGURES**



**LEGEND:**  
 GPR TRANSECT (500MHz - TIME WINDOW = 78ns)

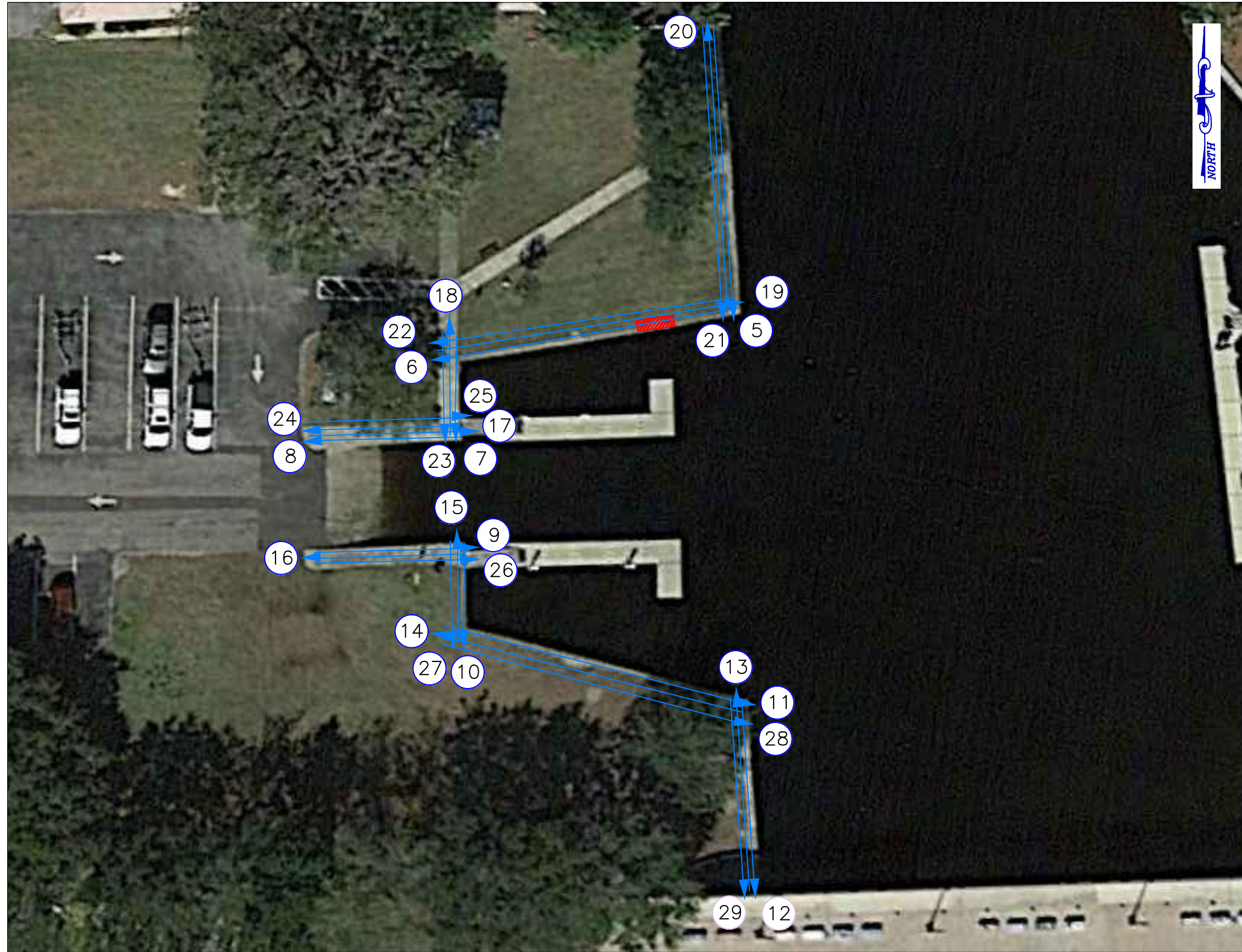



CLIENT: STROUD ENGINEERING			
DRAWN BY: JC	DATE: MAR 17, 2017		
SURVEYED BY: JC	DATE: MAR 6, 2017		
REPORT NO:	SCALE: NTS		
PROJECT NO: 0830.1700044.0000			

NEW PORT RICHEY SEAWALL  
 NEW PORT RICHEY, PASCO COUNTY, FLORIDA  
 GEOPHYSICAL (GPR) EXPLORATION PLAN - GRAND BLVD PARK



Figure 1



**LEGEND:**  
 GPR TRANSECT (500MHz - TIME WINDOW = 78ns)


CLIENT: STROUD ENGINEERING			
DRAWN BY: JC	DATE: MAR 17, 2017		
SURVEYED BY: JC	DATE: MAR 6, 2017		
REPORT NO:	SCALE: NTS		
PROJECT NO: 0830.1700044.0000			

NEW PORT RICHEY SEAWALL  
 NEW PORT RICHEY, PASCO COUNTY, FLORIDA  
 GEOPHYSICAL (GPR) EXPLORATION PLAN - SIMS BOAT RAMP



Figure 2



**LEGEND:**  
 GPR TRANSECT (500MHz - TIME WINDOW = 78ns)

CLIENT: STROUD ENGINEERING			
DRAWN BY: JC	DATE: MAR 17, 2017		
SURVEYED BY: JC	DATE: MAR 6, 2017		
REPORT NO:	SCALE: NTS		
PROJECT NO: 0830.1700044.0000			

NEW PORT RICHEY SEAWALL  
 NEW PORT RICHEY, PASCO COUNTY, FLORIDA  
 GEOPHYSICAL (GPR) EXPLORATION PLAN - SIMS PARK

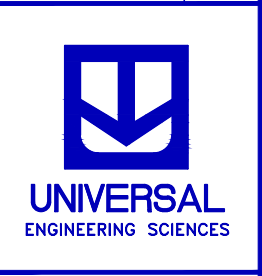
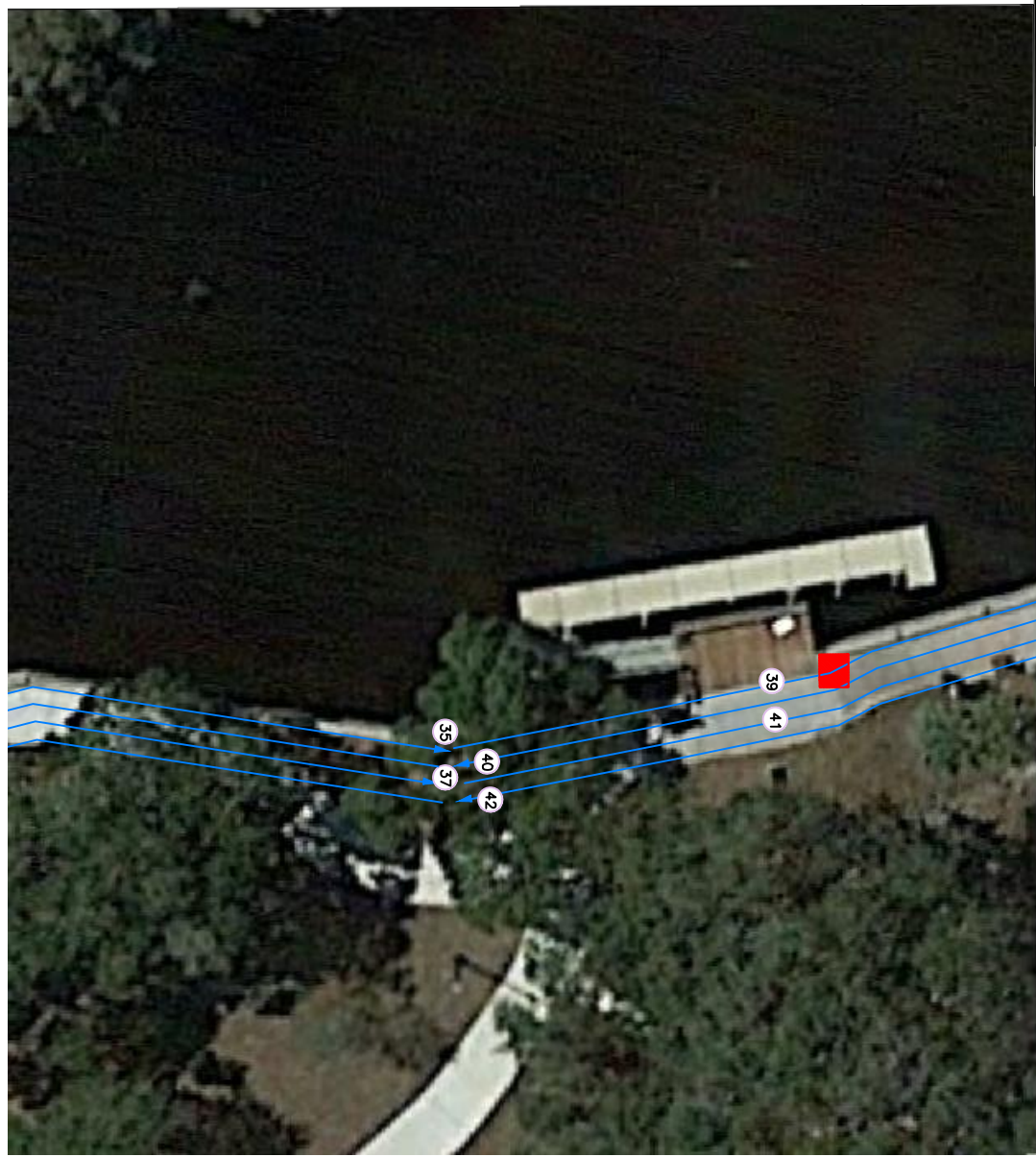



Figure 3



**LEGEND:**  
 GPR TRANSECT (500MHz - TIME WINDOW = 78ns)

CLIENT: STROUD ENGINEERING	
DRAWN BY: JC	DATE: MAR 17, 2017
SURVEYED BY: JC	DATE: MAR 6, 2017
REPORT NO:	SCALE: NTS
PROJECT NO: 0830.1700044.0000	

NEW PORT RICHEY SEAWALL  
 NEW PORT RICHEY, PASCO COUNTY, FLORIDA  
 GEOPHYSICAL (GPR) EXPLORATION PLAN - SIMS PARK

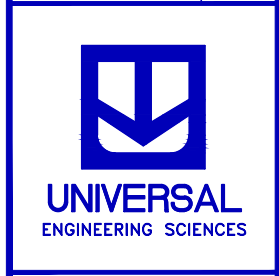


Figure 4



**LEGEND:**

→ GPR TRANSECT (500MHz - TIME WINDOW = 78ns)


CLIENT: STROUD ENGINEERING			
DRAWN BY: JC	DATE: MAR 17, 2017		
SURVEYED BY: JC	DATE: MAR 6, 2017		
REPORT NO:	SCALE: NTS		
PROJECT NO: 0830.1700044.0000			

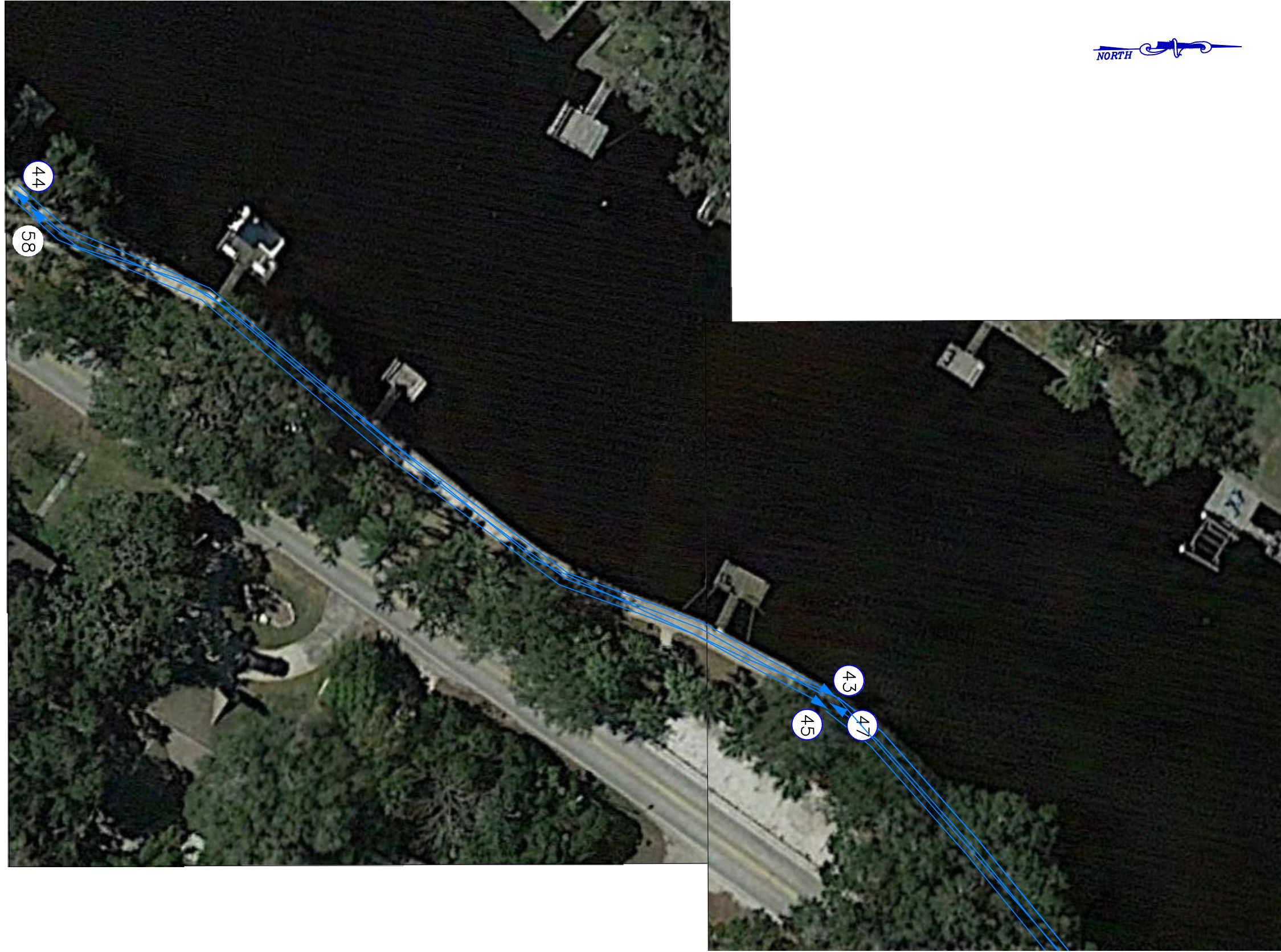
NEW PORT RICHEY SEAWALL  
 NEW PORT RICHEY, PASCO COUNTY, FLORIDA  
 GEOPHYSICAL (GPR) EXPLORATION PLAN - SIMS PARK



Figure 5

**LEGEND:**

 GPR TRANSECT (500MHz - TIME WINDOW = 78ns)



CLIENT: STROUD ENGINEERING

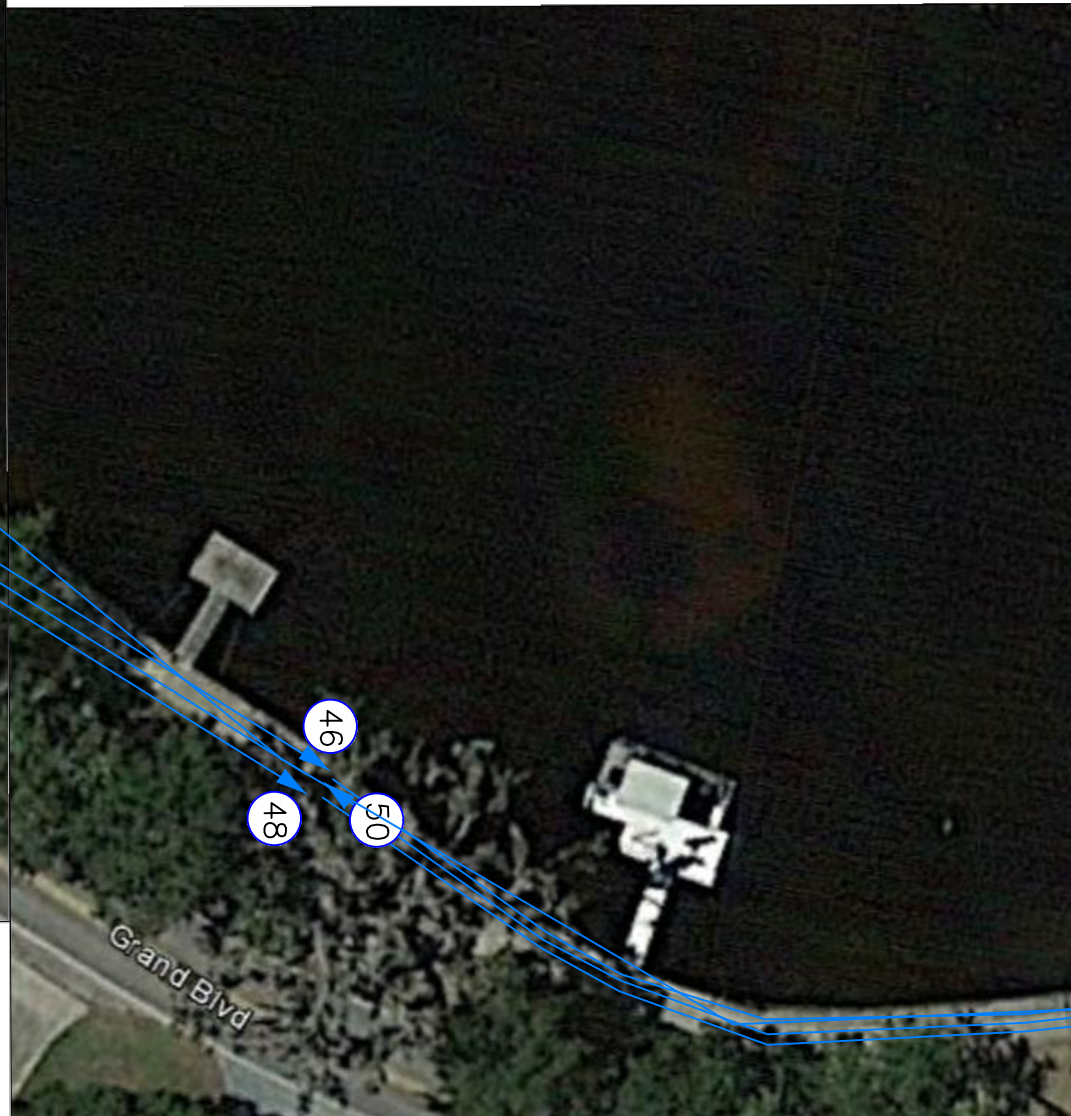
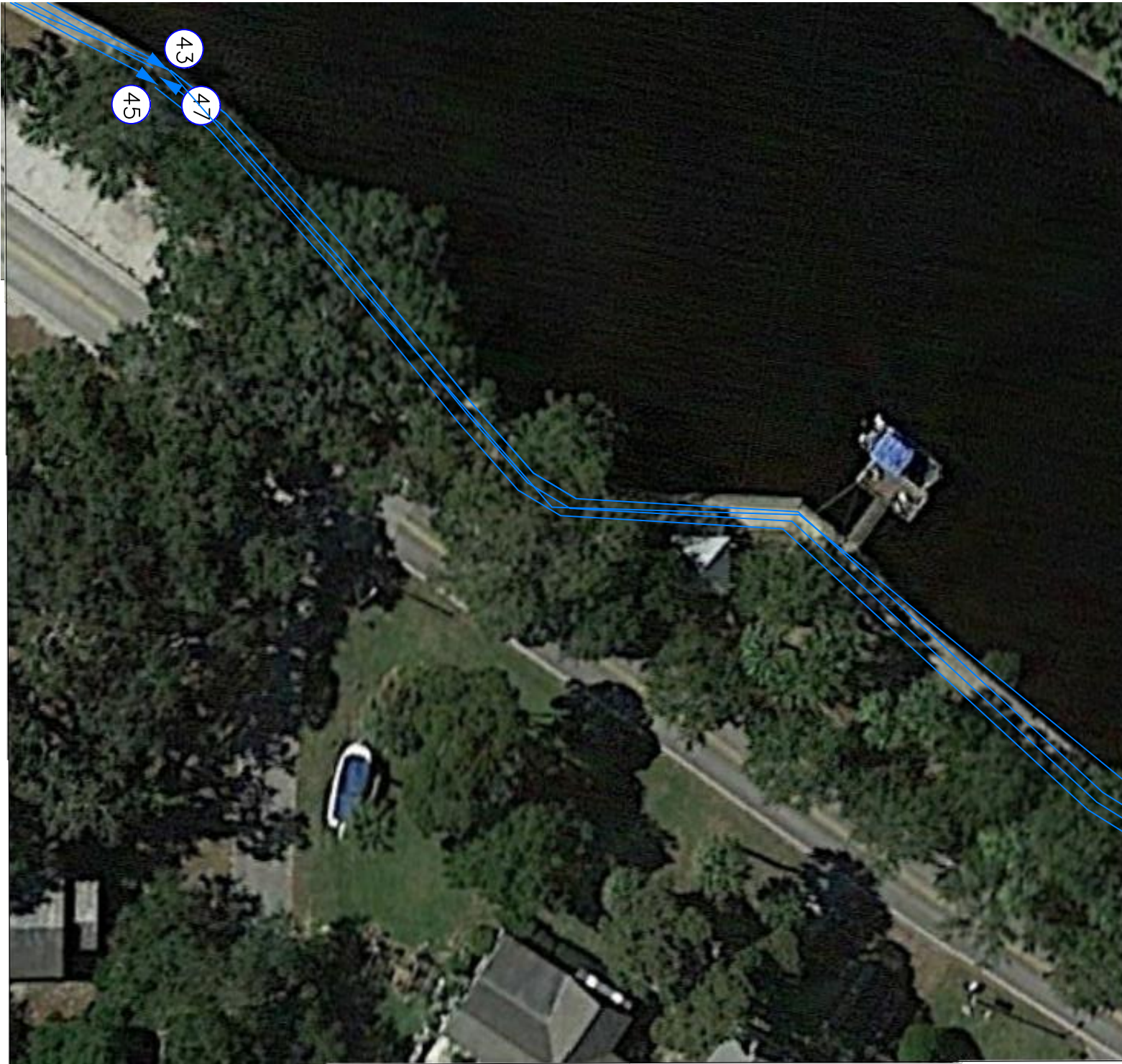
DRAWN BY: JC	DATE: MAR 17, 2017
SURVEYED BY: JC	DATE: MAR 6, 2017
REPORT NO:	SCALE: NTS
PROJECT NO: 0830.1700044.0000	

NEW PORT RICHEY SEAWALL  
NEW PORT RICHEY, PASCO COUNTY, FLORIDA

GEOPHYSICAL (GPR) EXPLORATION PLAN - COTEE RIVER PARK



Figure 6



**LEGEND:**

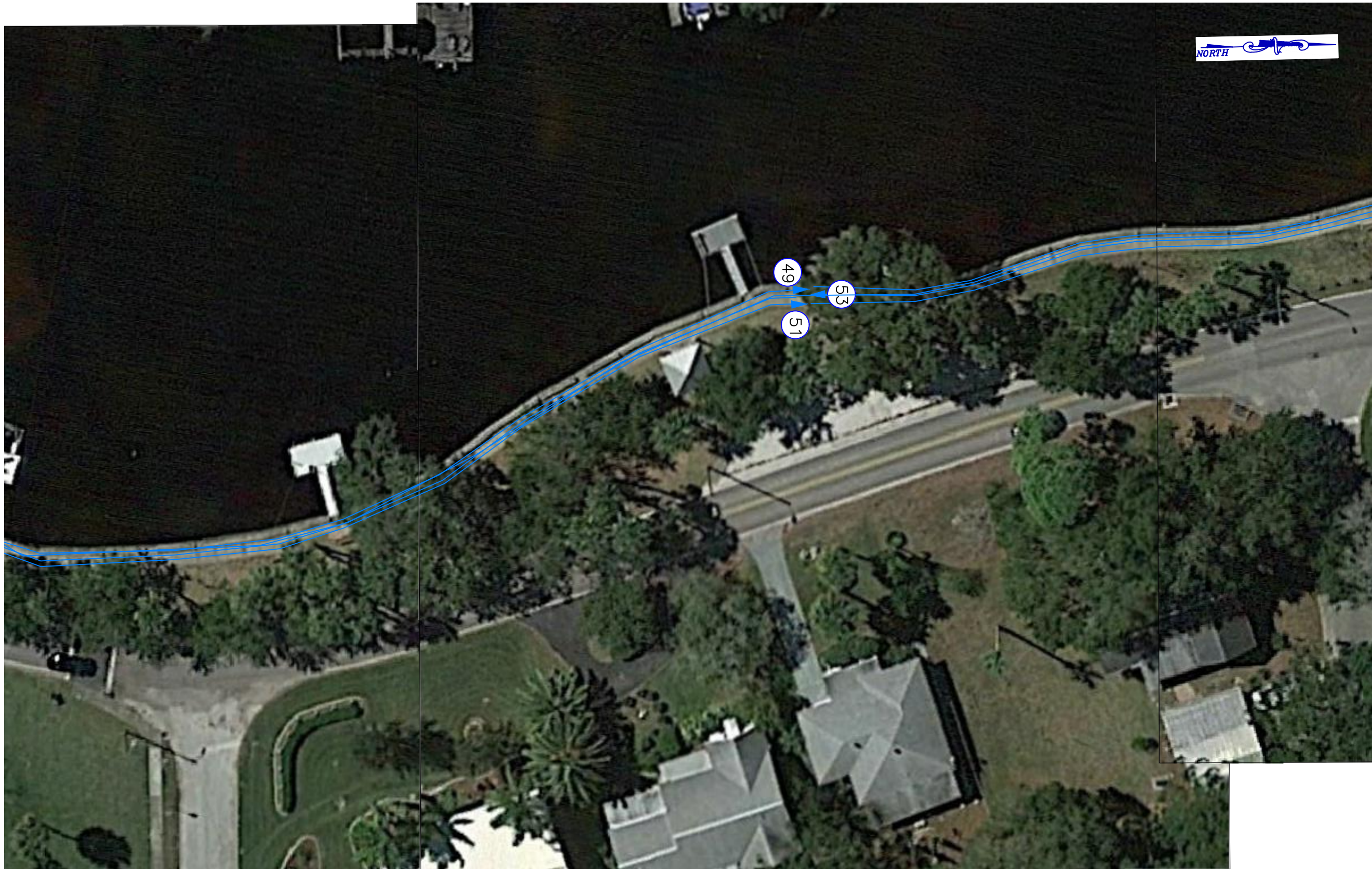
→ GPR TRANSECT (500MHz - TIME WINDOW = 78ns)


CLIENT: STROUD ENGINEERING			
DRAWN BY: JC	DATE: MAR 17, 2017		
SURVEYED BY: JC	DATE: MAR 6, 2017		
REPORT NO:	SCALE: NTS		
PROJECT NO: 0830.1700044.0000			

NEW PORT RICHEY SEAWALL  
 NEW PORT RICHEY, PASCO COUNTY, FLORIDA  
 GEOPHYSICAL (GPR) EXPLORATION PLAN - COTEE RIVER PARK



Figure 7



**LEGEND:**  
 GPR TRANSECT (500MHz - TIME WINDOW = 78ns)

CLIENT: STROUD ENGINEERING			
DRAWN BY: JC	DATE: MAR 17, 2017		
SURVEYED BY: JC	DATE: MAR 6, 2017		
REPORT NO:	SCALE: NTS		
PROJECT NO: 0830.1700044.0000			

NEW PORT RICHEY SEAWALL  
 NEW PORT RICHEY, PASCO COUNTY, FLORIDA  
 GEOPHYSICAL (GPR) EXPLORATION PLAN - COTEE RIVER PARK

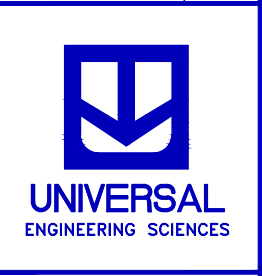
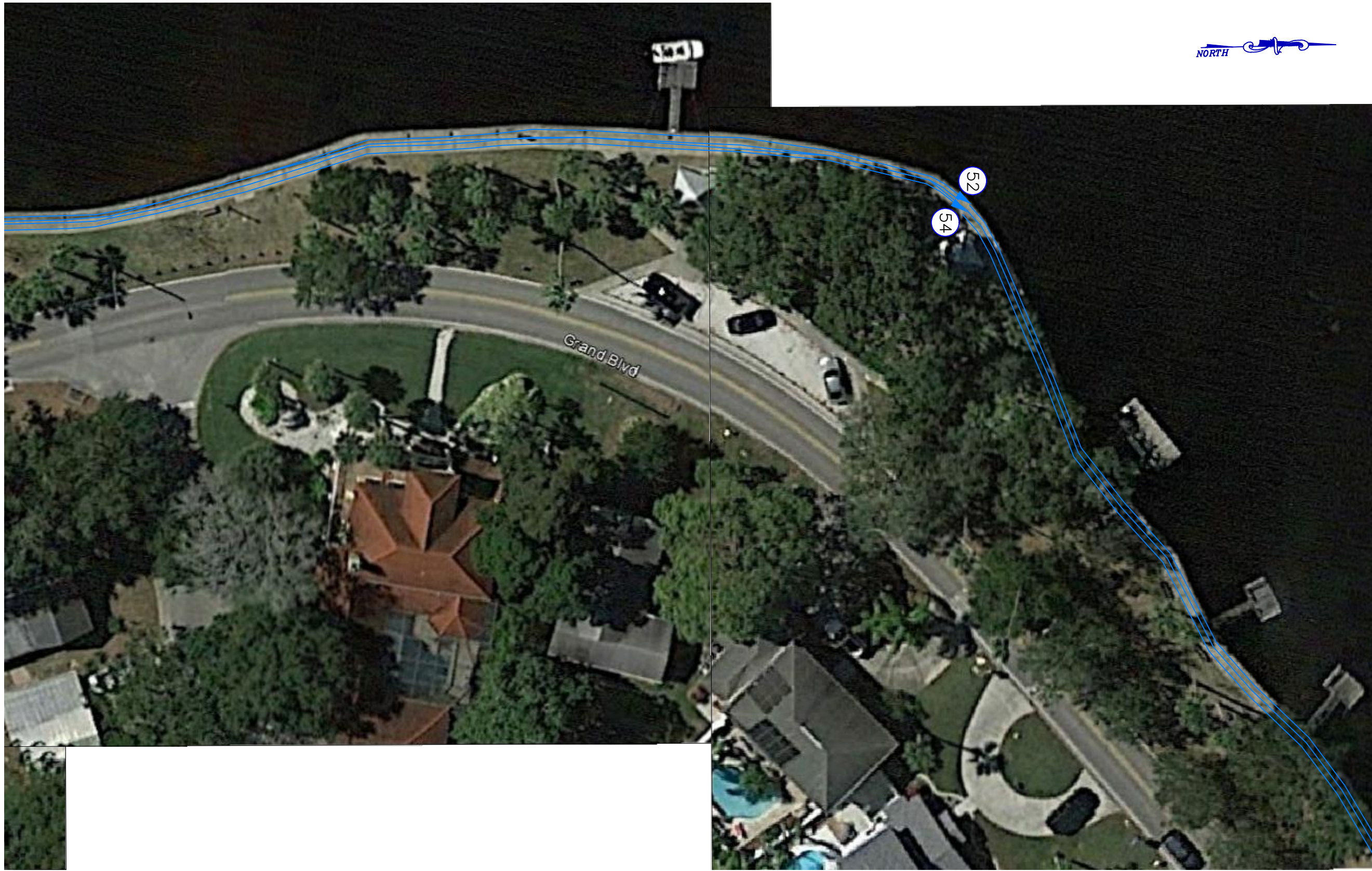


Figure 8



**LEGEND:**

→ GPR TRANSECT (500MHz - TIME WINDOW = 78ns)

CLIENT: STROUD ENGINEERING

DRAWN BY: JC	DATE: MAR 17, 2017
SURVEYED BY: JC	DATE: MAR 6, 2017
REPORT NO:	SCALE: NTS
PROJECT NO: 0830.1700044.0000	

NEW PORT RICHEY SEAWALL  
 NEW PORT RICHEY, PASCO COUNTY, FLORIDA


GEOPHYSICAL (GPR) EXPLORATION PLAN - COTEE RIVER PARK



**UNIVERSAL**  
 ENGINEERING SCIENCES

Figure 9



**LEGEND:**  
 GPR TRANSECT (500MHz - TIME WINDOW = 78ns)



CLIENT: STROUD ENGINEERING			
DRAWN BY: JC	DATE: MAR 17, 2017		
SURVEYED BY: JC	DATE: MAR 6, 2017		
REPORT NO:	SCALE: NTS		
PROJECT NO: 0830.1700044.0000			

NEW PORT RICHEY SEAWALL  
 NEW PORT RICHEY, PASCO COUNTY, FLORIDA  
 GEOPHYSICAL (GPR) EXPLORATION PLAN - JASMINE PARK



Figure 10

# **ATTACHMENT B**



**New Port Richey  
Grand Boulevard Park**

**Preliminary Cost Estimate**

**May 30, 2017**

**Seawall Repair**

<b>Item</b>	<b>Description</b>	<b>Unit Measure</b>	<b>Unit Cost</b>	<b>Quantity</b>	<b>Cost</b>
1	MOBILIZATION/DEMobilIZATION/BONDS (10%)	LS	\$893.00	1	\$893
2	PREVENTION, CONTROL, AND ABATMENT OF EROSION AND WATER POLLUTION	LS	\$500.00	1	\$500
3	FLOATING TURBIDITY BARRIER	LF	\$10.00	50	\$500
4	SEAWALL VERTICAL JOINT SEALING (URETHANE INJECTION)	GAL	\$150.00	20	\$3,000
5	VENT INSTALLATION	EA	\$400.00	12	\$4,800
6	CRACK REPAIR (EPOXY GROUT AND SEAL)	LF	\$65.00	2	\$130
7	LINEAR JOINT SEALING (URETHANE INJECTION)	LF	\$25.00	0	\$0
8	CAP REPAIR (PRESSURE WASH, RENEW COAT)	SF	\$20.00	0	\$0
9	SPALL PATCHING	SF	\$75.00	0	\$0
10	INITIAL CONTINGENCY AMOUNT (25%)	LS	\$2,455.75	1	\$2,456
<b>Capital Cost Total:</b>					<b>\$12,279</b>
ENGINEERING, SURVEYING, PERMITTING (15%)					<b>\$1,842</b>
<b>Project Cost Total:</b>					<b>\$14,121</b>



**New Port Richey  
Sims Park Boat Ramp**

**Preliminary Cost Estimate**

May 30, 2017

**Seawall Repair**

Item	Description	Unit Measure	Unit Cost	Quantity	Cost
1	MOBILIZATION/DEMobilIZATION/BONDS (10%)	LS	\$16,962.50	1	\$16,963
2	PREVENTION, CONTROL, AND ABATMENT OF EROSION AND WATER POLLUTION	LS	\$2,000.00	1	\$2,000
3	FLOATING TURBIDITY BARRIER	LF	\$10.00	500	\$5,000
4	SEAWALL VOID FILL (URETHANE INJECTION)	GAL	\$150.00	150	\$22,500
5	VENT INSTALLATION	EA	\$400.00	30	\$12,000
6	CRACK REPAIR (EPOXY GROUT AND SEAL)	LF	\$65.00	500	\$32,500
7	LINEAR JOINT SEALING (URETHANE INJECTION)	LF	\$25.00	500	\$12,500
8	SPALL PATCHING	SF	\$75.00	100	\$7,500
9	SEAWALL SURFACE REPAIR (PRESSURE WASH, RENEW COAT)	SF	\$20.00	2000	\$40,000
10	CONCRETE/PAVER SIDEWALK	SF	\$20.00	375	\$7,500
11	SEAWALL CONCRETE CAP	LF	\$75.00	375	\$28,125
12	INITIAL CONTINGENCY AMOUNT (25%)	LS	\$46,646.88	1	\$46,647
<b>Capital Cost Total:</b>					<b>\$233,234</b>
ENGINEERING, SURVEYING, PERMITTING (15%)					<b>\$34,985</b>
<b>Project Cost Total:</b>					<b>\$268,220</b>

New Port Richey  
Sims Park



Preliminary Cost Estimate

May 30, 2017

Seawall Repair

Item	Description	Unit Measure	Unit Cost	Quantity	Cost
1	MOBILIZATION/DEMobilIZATION/BONDS (10%)	LS	\$12,400.00	1	\$12,400
2	PREVENTION, CONTROL, AND ABATMENT OF EROSION AND WATER POLLUTION	LS	\$2,500.00	1	\$2,500
3	FLOATING TURBIDITY BARRIER	LF	\$10.00	500	\$5,000
4	SEAWALL VOID FILL (URETHANE INJECTION)	GAL	\$150.00	400	\$60,000
5	VENT INSTALLATION	EA	\$400.00	90	\$36,000
6	CRACK REPAIR (EPOXY GROUT AND SEAL)	LF	\$65.00	150	\$9,750
7	LINEAR JOINT SEALING (URETHANE INJECTION)	LF	\$25.00	150	\$3,750
8	CAP REPAIR (PRESSURE WASH, RENEW COAT)	SF	\$20.00	0	\$0
9	SPALL PATCHING	SF	\$75.00	40	\$3,000
10	HELICAL ANCHOR	EA	\$2,000.00	2	\$4,000
11	INITIAL CONTINGENCY AMOUNT (25%)	LS	\$34,100.00	1	\$34,100
<b>Capital Cost Total:</b>					<b>\$170,500</b>
ENGINEERING, SURVEYING, PERMITTING (15%)					<b>\$25,575</b>
<b>Project Cost Total:</b>					<b>\$196,075</b>

**New Port Richey  
Cotee River Park**



**Preliminary Cost Estimate**

May 30, 2017

**Seawall Repair**

Item	Description	Unit Measure	Unit Cost	Quantity	Cost
1	MOBILIZATION/DEMobilIZATION/BONDS (10%)	LS	\$11,400.00	1	\$11,400
2	PREVENTION, CONTROL, AND ABATMENT OF EROSION AND WATER POLLUTION	LS	\$2,500.00	1	\$2,500
3	FLOATING TURBIDITY BARRIER	LF	\$10.00	500	\$5,000
4	SEAWALL VOID FILL (URETHANE INJECTION)	GAL	\$150.00	100	\$15,000
5	VENT INSTALLATION	EA	\$400.00	180	\$72,000
6	CRACK REPAIR (EPOXY GROUT AND SEAL)	LF	\$65.00	200	\$13,000
7	LINEAR JOINT SEALING (URETHANE INJECTION)	LF	\$25.00	200	\$5,000
8	CAP REPAIR (PRESSURE WASH, RENEW COAT)	SF	\$20.00	0	\$0
9	SPALL PATCHING	SF	\$75.00	20	\$1,500
10	INITIAL CONTINGENCY AMOUNT (25%)	LS	\$31,350.00	1	\$31,350
<b>Capital Cost Total:</b>					<b>\$156,750</b>
ENGINEERING, SURVEYING, PERMITTING (15%)					<b>\$23,513</b>
<b>Project Cost Total:</b>					<b>\$180,263</b>

New Port Richey  
Jasmine Park



**Preliminary Cost Estimate**

May 30, 2017

Seawall Repair

Item	Description	Unit Measure	Unit Cost	Quantity	Cost
1	MOBILIZATION/DEMOBILIZATION/BONDS (10%)	LS	\$6,700.00	1	\$6,700
2	PREVENTION, CONTROL, AND ABATMENT OF EROSION AND WATER POLLUTION	LS	\$5,000.00	1	\$5,000
3	FLOATING TURBIDITY BARRIER	LF	\$10.00	500	\$5,000
4	SEAWALL VOID FILL (URETHANE INJECTION)	GAL	\$150.00	200	\$30,000
5	VENT INSTALLATION	EA	\$150.00	40	\$6,000
6	CRACK REPAIR (EPOXY GROUT AND SEAL)	LF	\$65.00	100	\$6,500
7	LINEAR JOINT SEALING (URETHANE INJECTION)	LF	\$25.00	100	\$2,500
8	SPALL PATCHING	SF	\$75.00	160	\$12,000
9	REMOVE CONCRETE SEAWALL	LF	\$200.00	60	\$12,000
10	CONSTRUCT CONCRETE SEAWALL	LF	\$500.00	60	\$30,000
11	CONCRETE/PAVER SIDEWALK	SF	\$20.00	260	\$5,200
12	SEAWALL CONCRETE CAP	LF	\$75.00	260	\$19,500
13	INITIAL CONTINGENCY AMOUNT (25%)	LS	\$35,100.00	1	\$35,100
<b>Capital Cost Total:</b>					<b>\$175,500</b>
ENGINEERING, SURVEYING, PERMITTING (15%)					<b>\$26,325</b>
<b>Project Cost Total:</b>					<b>\$201,825</b>