ARTIBUS DESIGN
ENGINEERING AND PLANNING

Structural Evaluation Report

for existing Point Buoy

Property Address:
"Southernmost Point"
1400 Whitehead St, Key West, FL 33040

AD Job#: 2301-03
City of Key West P.O.: 097970
Artibus Design
May 2023

DRAFT

Serge Mashtakov, PE, FL License No. 71480

Date

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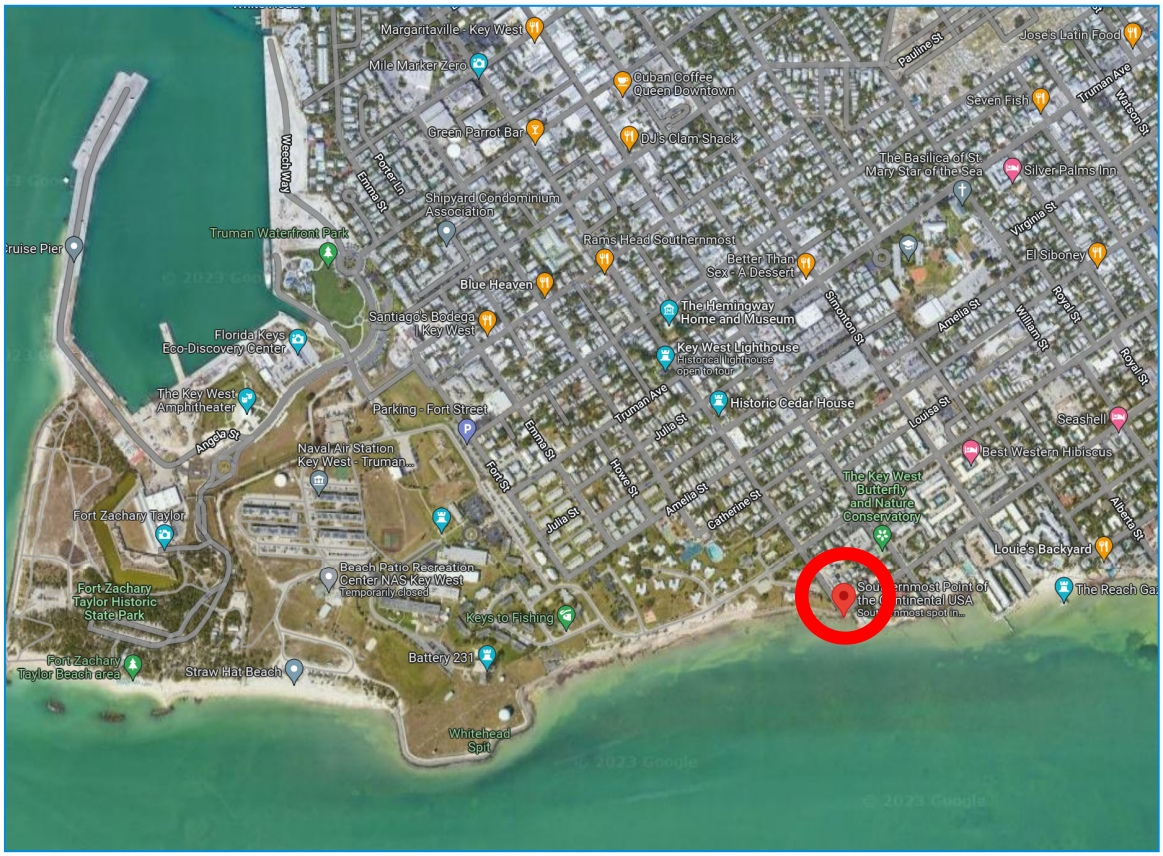

Figure 1. - Site Map

Introduction

Existing structure is a historical landmark Southernmost Point in the Continental United States, anchored concrete buoy and seawalls, located at the corner of South Street and Whitehead Street in Key West. It was installed in 1983 by City of Key West as a tourist attraction and still considered as a top of South Florida monuments to visit. It is 12ft tall 7ft wide and stands around 5 feet above sea level and surrounded with seawalls from two sides approx. 50ft (South-West) and 30 ft (South-East).

Next to the concrete buoy there is also a historic structure of cement telegraph hut named "The Cable Hut", where in the past the underwater telephone cable connected Key West and Havana and installed in the current location in 1917.

Lots of people visit this historic point every day to see a famous concrete buoy and take pictures with it.

The monument area was affected by hurricane Ian in September 2022. Continuous storm surge, severe rainfall and tidal waves have caused damage along seawall line adjacent to the landmark.

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An opinion of current condition estimated repairs together with a probable cost estimate are requested by the City of Key West engineering department.

This report is based on the information gathered during the site inspections by Serge Mashtakov P.E. in January, 2023.

Inspection Procedure

Structure was visually inspected from all sides. Only exposed elements were inspected, subgrade conditions and any covered elements were not inspected.

Core drilling of the sidewalk was performed by the City of Key West Community Services department with a photo and video records for the subgrade conditions.

Background and Findings

The existing length of historical monument shoreline is approximately (32ftx60ft) and together with roadway turn occupy 4,000 sq.ft. area which can be defined as a public square or a pocket park. Currently the line of seawalls together with The Cable Hut are spreading along the 80ft of shoreline and appear at the corner from two sides of South and Whitehead Streets. An exposed grate trench drain is located along the South-West side opening into the seawall and serving as an overflow drainage for common braking wave seawater discharge.

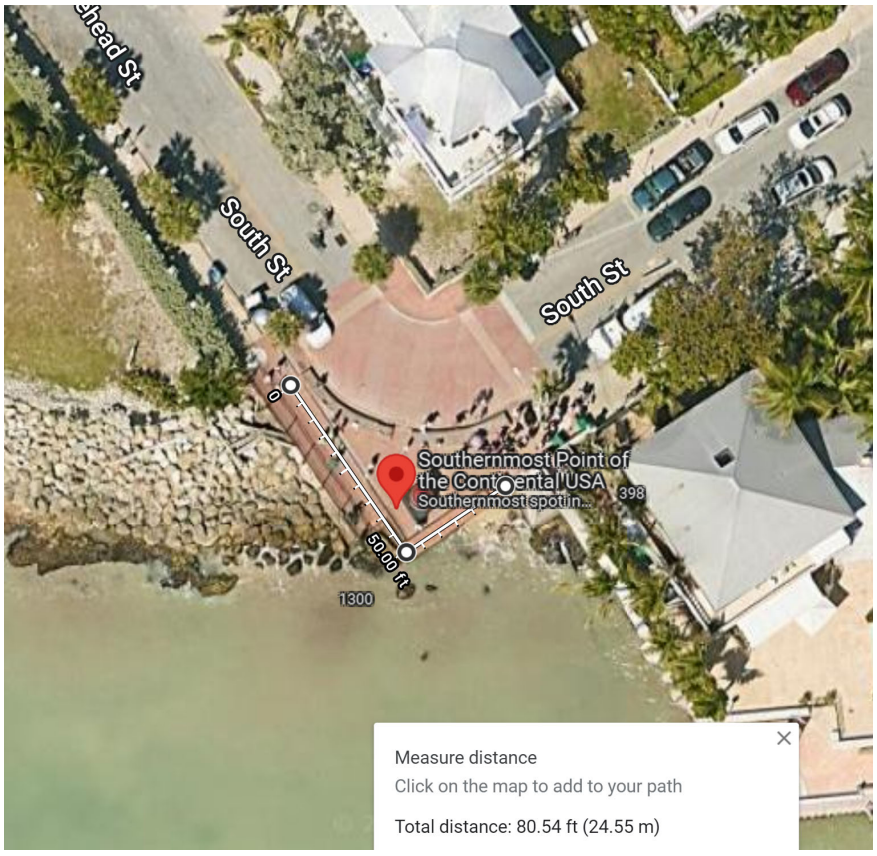

Figure 1. – Existing Site Map. Location of Repairs.

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Photo report. Existing site condition

Location 1. Existing concrete seawall cap between the Cable Hut and corner point
Issue: continuous concrete spalling along the top of seawall approx. Length=15ft. Bleeding rust stains on the outside face of the wall cap with numerous cracks.
Recommendations: A complete seawall cap replacement is recommended. The cracked and compromised chlorine impregnated concrete media no longer protects the reinforcement inside. The reinforcing oxidation products increase in volume and propagate the cracks along the bar exposing new steel surface to the elements. Any patch repairs in such cases can't be considered effective or lasting any meaningful time.

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Location 2. Existing concrete seawall South-East side.
Issue: seawall surface with effects of erosion and a significant opening at the water line. The opening allows constant wave action to enter the space behind the wall and is one of the causes of the soil erosion and pavement settlement.
Recommendations: The seawall requires either complete replacement or installation of new seawall in front of the current to encapsulate any wall penetration and prevent the shoreline erosion.
Additionally, a protective Riprap is recommended to be installed in front of new seawall similarly to the installation immediately westward along the NAVY base shoreline.
The final design of the Riprap shall be based on the detailed design modeling after the bathymetric survey and geotechnical exploration for the project are completed.
Fur budget estimate purposes a 3ft deep riprap rubble over 1ft subbase and filter fabric liner installation. The estimated length is 15ft measured from the seawall face seaward with approximate 65ft of frontage including the cable hut base. Total estimated installed weight of the riprap 290 TN.

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Location 3. Damaged part of existing seawall. Inner corner / return.
Issue: Complete seawall cap damage with part of the wall cap collapsed. Exposed reinforcement.
Recommendations: Complete replacement of the seawall and seawall cap. A properly designed and detailed seawall and seawall cap should be utilized in this location. Highly exposed point with routine storm events causing breaking waves can be considered highly corrosive and harsh environment. Non-corrosive and durable materials shall be used due to the nature of the location and relatively small size of the installation.

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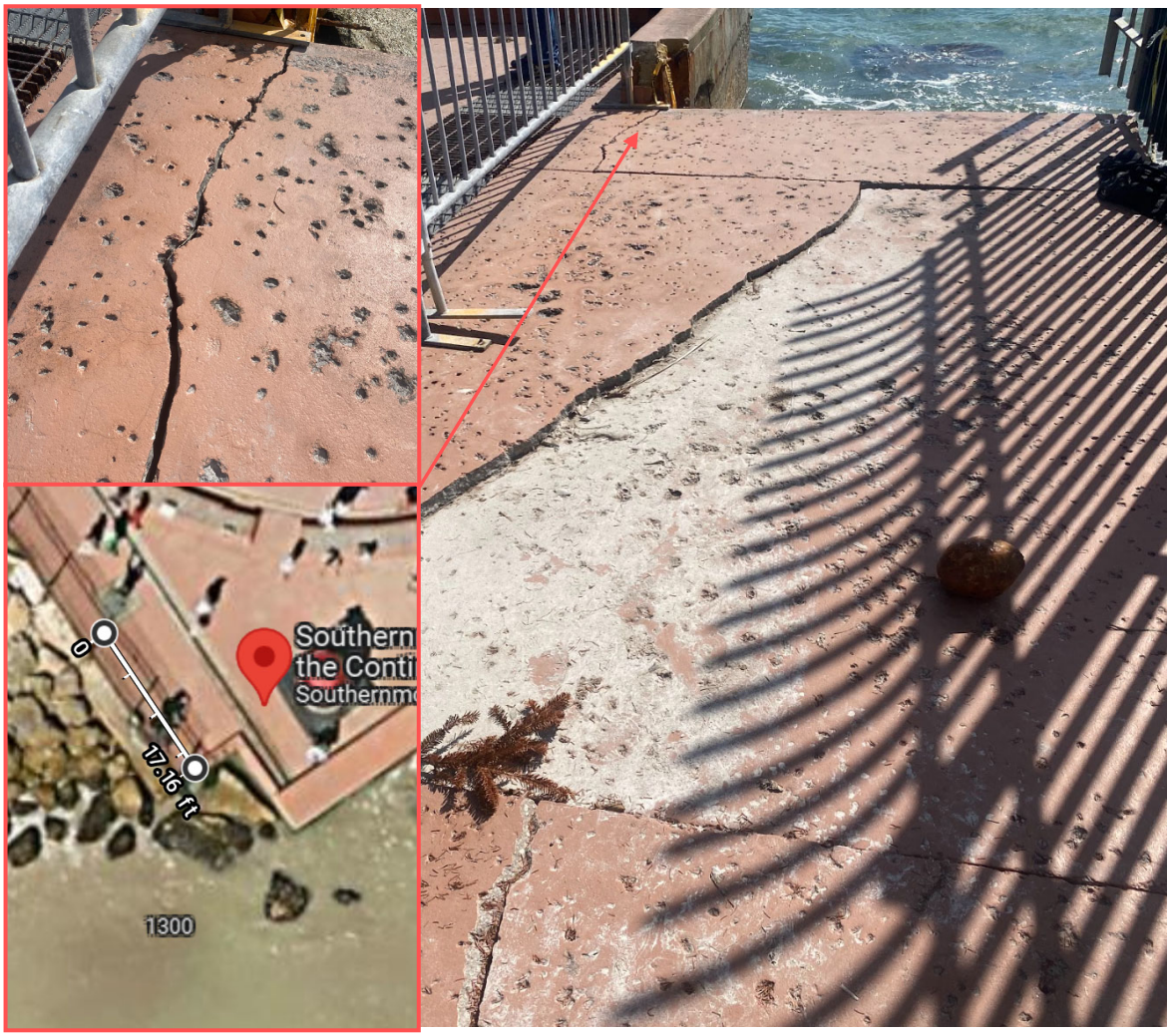

Location 4. Existing condition of concrete sidewalk.
Issue: cracked and failing concrete sidewalk beyond the failed seawall.

Recommendations: Complete replacement of the sidewalk using heavy reinforced slab design over flowable fill concrete instead of soil backfill.

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Location 4. Existing condition of concrete sidewalk.
Coring by City of Key West Community Services.

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Location 4. Existing condition of concrete sidewalk.
Open void below the sidewalk slab.

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Location 4. Existing condition of concrete sidewalk.
Open void below the sidewalk slab. Gap toward the open water.

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Location 5. Existing linear drain system.
Issue: Highly corroded grates
Recommendations: Replacement of the braking wave overflow trench drain and all grating using pedestrian traffic rated ADA cast iron grates.

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Location 6. Existing condition of The Cable Hut structure inside and outside
Issue: from inside: significant concrete spalling around entry door opening (missing door) and roof slab, visible leaking spots around cracks area;
from outside: Damaged concrete corner
Recommendations: repair spalling concrete per final structural details.

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Location 7. Existing condition of Buoy concrete pad and the nearby curb of sidewalk
Issue: failing corners of concrete pad and curb, cracks in the surrounding concrete sidewalks.
Recommendations: Likely erosion of the supporting soils below sidewalks surrounding the landmark requires significant repairs of the area including the removal of the sidewalk. The Southernmost Point Buoy itself may need to be relocated for the duration of the construction activities to provide the access to the famous location and provide for a safe construction zone of the auger cast piled foundations, seawall reconstruction, etc.

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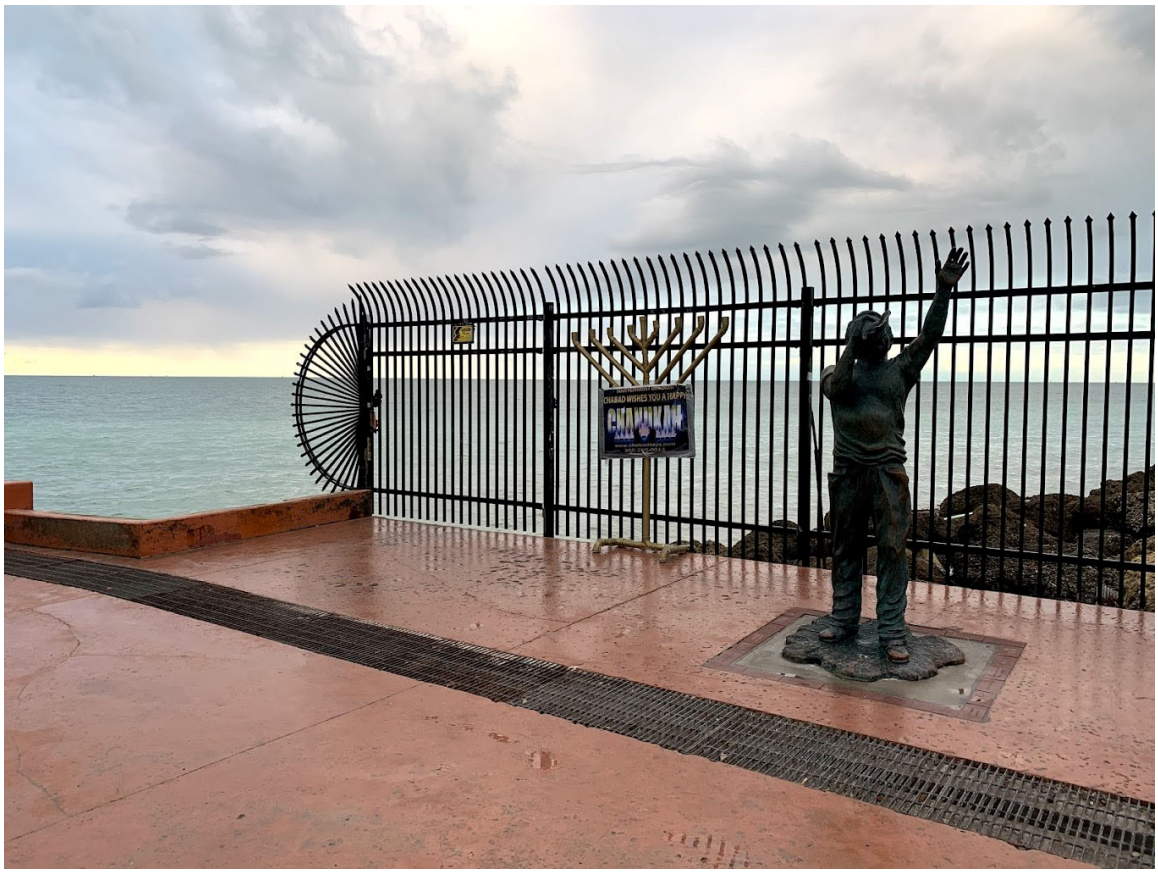

Historic Images: Photo Dated 01-01-2021 (Source: Google Maps). Demonstrating the intact seawall and sidewalk.

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Historic Images: Photo Dated 10-02-2021 (Source: Google Maps). Demonstrating the intact seawall and sidewalk.

In my professional opinion the area directly impacted and affected by the Hurricane Ian damage can be attributed to approximately 654 sq.ft. of sidewalk from the total of 1,632 sq.ft of the pedestrian areas including portion of the seawall along the South West side of the park. Which results in +/- 40% of the pocket park.
The impact on other items can be described as minimal and estimated at 10%.

Please see the updated opinion of probable cost with a total estimate and Hurricane Ian impact portion of the project.

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Conclusions and Recommendations

In my professional opinion the overall condition of the Southernmost Point Park is poor and requires a complete overhaul. The intense surge and wave action during hurricane Ian significantly contributed to the situation and caused significant loss of supporting soils and seawall failure in the corner location.

A comprehensive plan of temporary landmark relocation should be considered with a safe and secure heavy construction zone established in the corner of White St and South Streets with potential road closure anticipated.

The improvements to the seawalls, seawall cups and surrounding fixtures should be considered long term use of the facilities. High tourist traffic and intense use of the surrounding are requiring heavy and durable construction materials and methods and careful planning.

Sincerely,
Artibus Design LLC
Serge Mashtakov, P.E.
President

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Opinion of Probable Cost

No	Work Description	Quantity	Unit	Estimated Unit Cost	Total	% Of Damage Associated with Hurricane Ian Impact	Value Associated with Hurricane Ian Impact
1	Mobilization & Demobilization	1.00	EA	$50,000.00	$50,000.00	35.00%	$17,500.00
2	Demolition and Replacement of seawall and Seawall cap	100.00	L.F.	$3,100.00	$310,000.00	40.00%	$124,000.00
3	Installation of Sewawall Protection RIPRAP including Excavation	290.00	TN	$400.00	$116,000.00	40.00%	$46,400.00
4	Relocation of Southermost Point Bouy and Setup of Temporary Ladmark Site	1.00	L.S.	$40,000.00	$40,000.00	10.00%	$4,000.00
5	Removal and Reinstallation of Navy Base fence and setup of a temporary security fence around project site	1.00	L.S.	$25,000.00	$25,000.00	100.00%	$25,000.00
6	New Foundations and flowable fill behind the seawall and under all sidewalks	1.00	L.S.	$90,000.00	$90,000.00	40.00%	$36,000.00
7	Protection and or relocation of other statues, signage and Historic Artifacts	1.00	L.S.	$25,000.00	$25,000.00	10.00%	$2,500.00
8	Concrete Reapairs to the Cable Hut	1.00	L.S.	$15,000.00	$15,000.00	0.00%	$0.00
9	New sidewalks with decorative finish	2200.00	SQ.FT.	$38.00	$83,600.00	40.00%	$33,440.00
10	New Expansion Joints	100.00	L.F.	$65.00	$6,500.00	40.00%	$2,600.00
11	Replacement Trench Drain with ADA grate	65.00	L.F.	$400.00	$26,000.00	10.00%	$2,600.00
12	Replacement of concrete sitting benches (also acting as traffic guards) with decorative finish	60.00	L.F.	$600.00	$36,000.00	10.00%	$3,600.00
13	Refinishing of the asphalt pavement	1600.00	SQ.FT.	$12.00	$19,200.00	10.00%	$1,920.00
14	Striping	1.00	L.S.	$3,000.00	$3,000.00	10.00%	$300.00
					$845,300.00		**$299,860.00**
	Contingensy and unforceen items	15%			**$126,795.00**		**$44,979.00**
	Engineering and Project administration	8%			**$77,767.60**		**$23,988.80**
	Total				**$1,049,862.60**		**$368,827.80**

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