



**Jupiter Reef Club  
Jupiter, FL**

**Seawall Conditions Assessment Report**  
February 27, 2015

Visual inspections of approximately 900 linear feet of seawall at the Jupiter Reef Club were conducted on multiple days during the week of February 23, 2015. For purposes of this report, the approximately 300 linear feet comprising the north and south wing parking lots can be considered in good condition, with many years of remaining service life. This report will concentrate on the 400 linear feet across the east face of the property, and the two 100-foot returns at the north and south ends of the property.

Following is a detailed assessment of the seawall, including a general background on the seawall history; a detailed evaluation of the existing structural conditions; and a description of the regulatory permitting aspects of the project. Following the assessment are a formal recommendation and a preliminary estimate of construction costs to accomplish the recommended work. Relevant sketches and photographs are included at the end of the report.

**General Background**

The existing Jupiter Reef Club seawall consists of an original steel sheetpile seawall and multiple additions and repairs accomplished over the years. Figure 1 shows a typical schematic cross section of the existing conditions, outlined as follows:

- **Original steel sheetpile wall:** the original seawall consists of steel sheetpile, a tieback system attached to a waler on the backside of the sheeting, and a concrete cap. No drawings or details on this original wall are available; its installation date is estimated at the mid-1950's based on anecdotal evidence and the sheetpile type.
- **Secondary toewall:** a secondary toewall was added at some point, consisting of steel sheetpile installed along the lower waterside face of the original seawall, with a large concrete cap. No drawings or details on this toewall are available, but it was installed sometime between the mid-50's and late 70's, as it is clearly evident in multiple photographs from the early 80's.
- **Concrete facing on original sheetpile wall:** in 1982, during installation of the parking lot wings, the original steel seawall was covered with a protective layer of concrete, likely sprayed on (commonly known as shotcrete or gunite). The old steel groins were also

encased in concrete at this time, at their intersection with the seawall. Plans and photographs were found briefly outlining this project, which was accomplished by Murphy Construction.

- **Groin removal:** in 2001, the original steel sheetpile groins were removed, leaving only the small portions sitting atop the concrete toewall cap. This project was accomplished by Anchor Marine Construction, and is documented in the JRC files.
- **Waterside steel walers and tiebacks:** In 2004-2005, following hurricane damage, a repair project was undertaken to add steel waler beams to the outer face of the seawall, with new tiebacks, and a new concrete facing. JRC records indicate that the waler beams and tiebacks were added, but the concrete facing project was cancelled, presumably due to weather-related issues. This project was accomplished by Custom Built Marine Construction, and is documented in the JRC files.
- **Concrete facing on backside of original seawall:** since late 2014 to the present time, a repair project has been underway to patch holes in the original seawall sheeting and to reattach the 2005 tieback system. This project was apparently undertaken after a major loss of backfill at the southeast corner of the property. Photographs provided evidence that both the original seawall sheeting and the 1982 concrete facing had failed, and large holes were allowing the backfill to flow through to the beach. The holes were patched by exposing the backside of the original sheeting, and casting a concrete facing against the backside of the sheeting. This repair at the southeast corner was expanded to include additional areas along the east face. The work is being accomplished by Cornerstone Contracting Group.

At the time of Cornerstone's repair work, the JRC requested an independent assessment of the seawall structural conditions and an evaluation of the regulatory permitting efforts required to proceed with a long-term repair/replacement. This assessment follows:

### **Structural Assessment**

At the time of the inspections, the entire waterward face of the original seawall and concrete facing were visible, as well as the steel waler additions, the toewall concrete cap, and a portion of the toewall steel sheeting. Additionally, due to the ongoing repair work, portions of the backside of the original steel sheeting and walers were visible. Following is a brief evaluation of each of the main seawall components. Typical photographs are included at the end of the report, in support of the descriptions below.

- **Original steel sheetpile wall:** the original steel sheeting is in an advanced state of deterioration. While the waterside face is not visible due to the 1982 concrete facing, the sheeting was visible from the backside during the recent repair work. Significant steel corrosion and loss of cross section is evident, with the concrete facing being visible from the backside in some areas, indicating a complete loss of the steel sheeting. Significant rust-staining and delamination of the concrete facing also indicates advanced steel sheeting corrosion. During the recent southeast corner repair, visible holes were discovered, where both the sheeting and concrete facing were completely gone.
- **Secondary toewall:** the toewall steel sheeting was exposed in varying degrees, from 6" to 24" vertically. Significant corrosion of the toewall sheeting is evident, with holes

developing through the sheeting, in some cases very large. While the toewall undergoes a constant cycle of being covered with sand and then exposed, at the current time it is exposed and backfill is leaking out at an alarming rate. This is particularly the case at the northeast and southeast corners.

- **Concrete facing on original sheetpile wall:** the concrete facing is cracking and spalling (delaminating from the steel sheeting due to excessive rusting and expansion of the steel). In some areas, large sections of concrete have fallen off, exposing additional concrete beneath (possibly a second layer of the concrete facing). The intense wave action against the steel walers and tierods is causing cracking and wallowing of holes through the concrete facing and original steel sheeting. These holes are allowing a loss of backfill behind the wall (some of these tierod holes currently being temporarily sealed and patched).
- **Waterside steel walers and tiebacks:** The steel walers and tierods are in varying states of failure, with beams bowing and falling off, tierods missing nuts and washers, and tierods corroding and rusting. As mentioned above, the current loose condition of the waler beams is exacerbating the damage to the concrete facing and original steel sheeting, through constant vibrations and movements under the wind and wave loads.

### **Regulatory Permitting Assessment**

Since the Jupiter Reef Club seawall is located both east of the coastal construction line and east of the dune vegetation line, it clearly falls under special circumstances, as outlined below.

According to the Department of Environmental Protection (DEP), which handles regulatory permitting for the state, the seawall is considered a non-conforming, vulnerable structure, and is therefore allowed to be repaired and/or replaced within certain conditions. A replacement waterward of the existing seawall will almost certainly never be permitted. A new seawall would have to be installed landward of the existing seawall structure. Some repairs may be allowed to the waterward face, but would likely be limited to waler repairs and a possible concrete refacing; however, permitting of any waterside work would be a very difficult and time-consuming effort, with no guarantee of success. Replacement with a new seawall landward of the existing would be permissible and involve a three to five-month permitting effort. Most importantly, if the existing seawall were to undergo a massive or catastrophic failure, reconstruction would not be allowed by the state.

Regarding the Town of Jupiter, currently the town code does not address seawalls east of the coastal construction line, and, therefore, would not allow for a seawall replacement of any kind. However, the town is currently in the process of revising the seawall codes, and reports that the Jupiter Reef Club will ultimately be exempt from restrictions, making replacement permissible. The new seawall codes are projected for adoption in May 2015.

### **Recommendations**

Given the advanced state of structural deterioration of both the original seawall and the toewall, as well as the 1982 concrete facing and 2004 walers, the seawall should be replaced with a new steel sheetpile seawall, installed landward of the existing. Given the enormous risk associated with a major failure of the existing seawall (i.e., the likely loss of the property with no

option to rebuild), a complete replacement is not only justifiable, but is also imperative.

Since the western half of the 100-foot returns at each end of the property are still in good condition, the 1982 concrete facing is holding up well, and the beach erosion line is at a relatively high elevation, replacement of the returns can be limited to the eastern 50 feet at each end, resulting in a total project length of approximately 500 linear feet.

Since access to the beach with heavy equipment is severely restricted (no equipment at all between March 1 and November 1; and serious weather-related restrictions during the winter months), the seawall would have to be replaced from atop JRC property. Since access to the property is limited (due to space restrictions from the pool, gazebo, and housing units), the sheeting will have to be installed with special equipment. This special pile-driving equipment is available and commonly used in tight seawall areas along the south Florida coast. Smaller supporting equipment (for handling materials and excavation) will likely need to be lifted onto the east deck from the north or south parking lots, using a large crane.

Figure 2 shows the proposed seawall replacement detail, and is used for the cost estimates below.

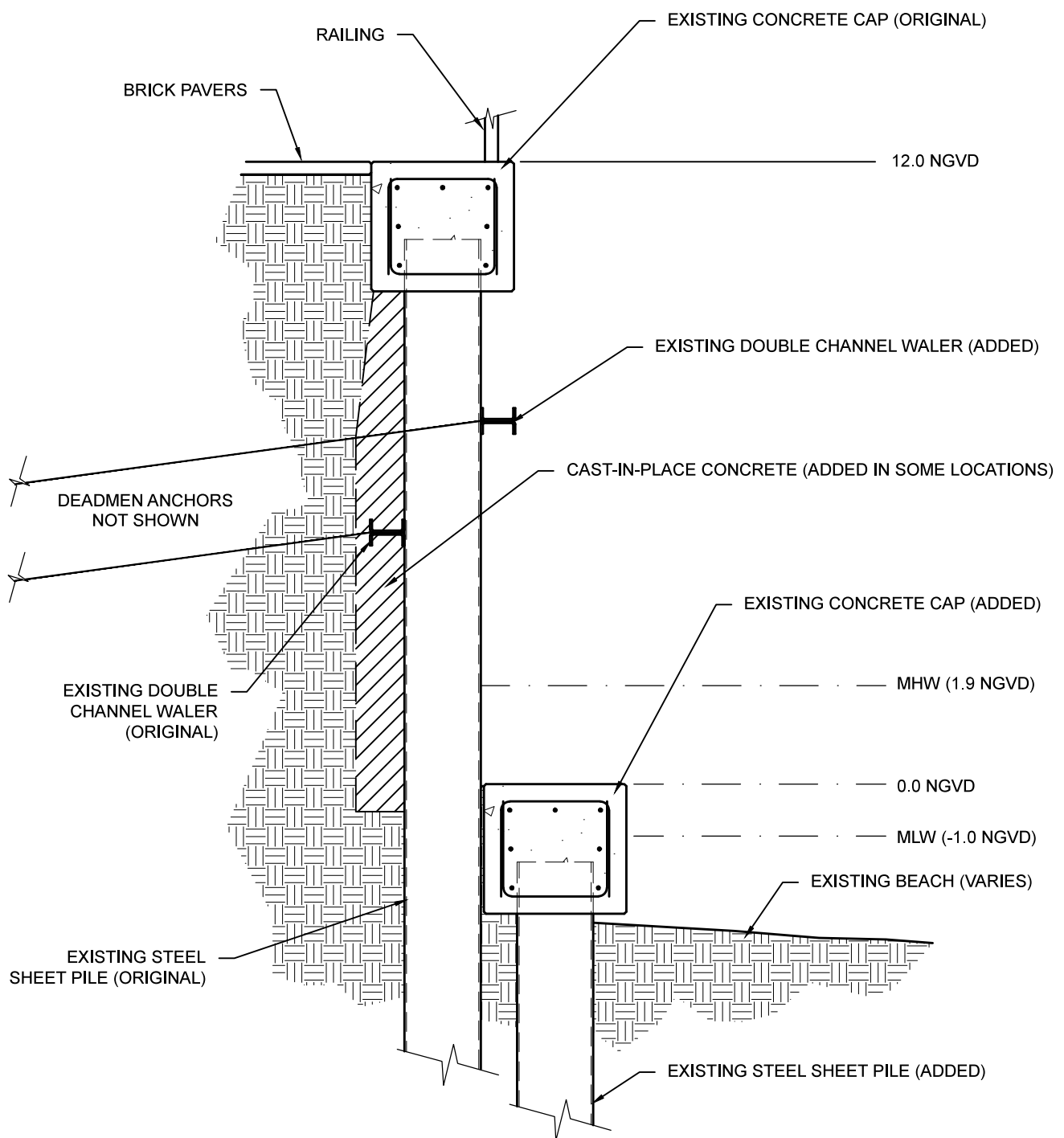
### **Preliminary Estimate of Construction Costs**

In order to obtain final costs for the above-described seawall replacement, soil borings should be obtained, a detailed design should be developed, and qualified marine contractors should be solicited for pricing.

In order to establish a preliminary budget, following is a summary of cost estimates using all information available at this time. These estimates are based on similar types of design and construction, and should be confirmed through the services of a licensed engineer and qualified marine contractors.

•	<b>Soft costs</b>	<b>\$ 35,000</b>
	-regulatory permitting, geotechnical, design, bidding, construction services	
•	<b>Seawall replacement</b>	<b>\$1,450,000</b>
	-500 lf, steel sheetpile with a concrete cap, landward of existing seawall	
•	<b>Upland restoration allowance</b>	<b><u>\$ 50,000</u></b>
	-brick pavers, landscaping, etc.	
	<b>TOTAL SEAWALL BUDGET</b>	<b>\$1,535,000</b>

Any questions on the above report should be directed to Bolchoz Marine Advisors, Inc. The following pages contain two sketches and multiple photographs in support of this report.



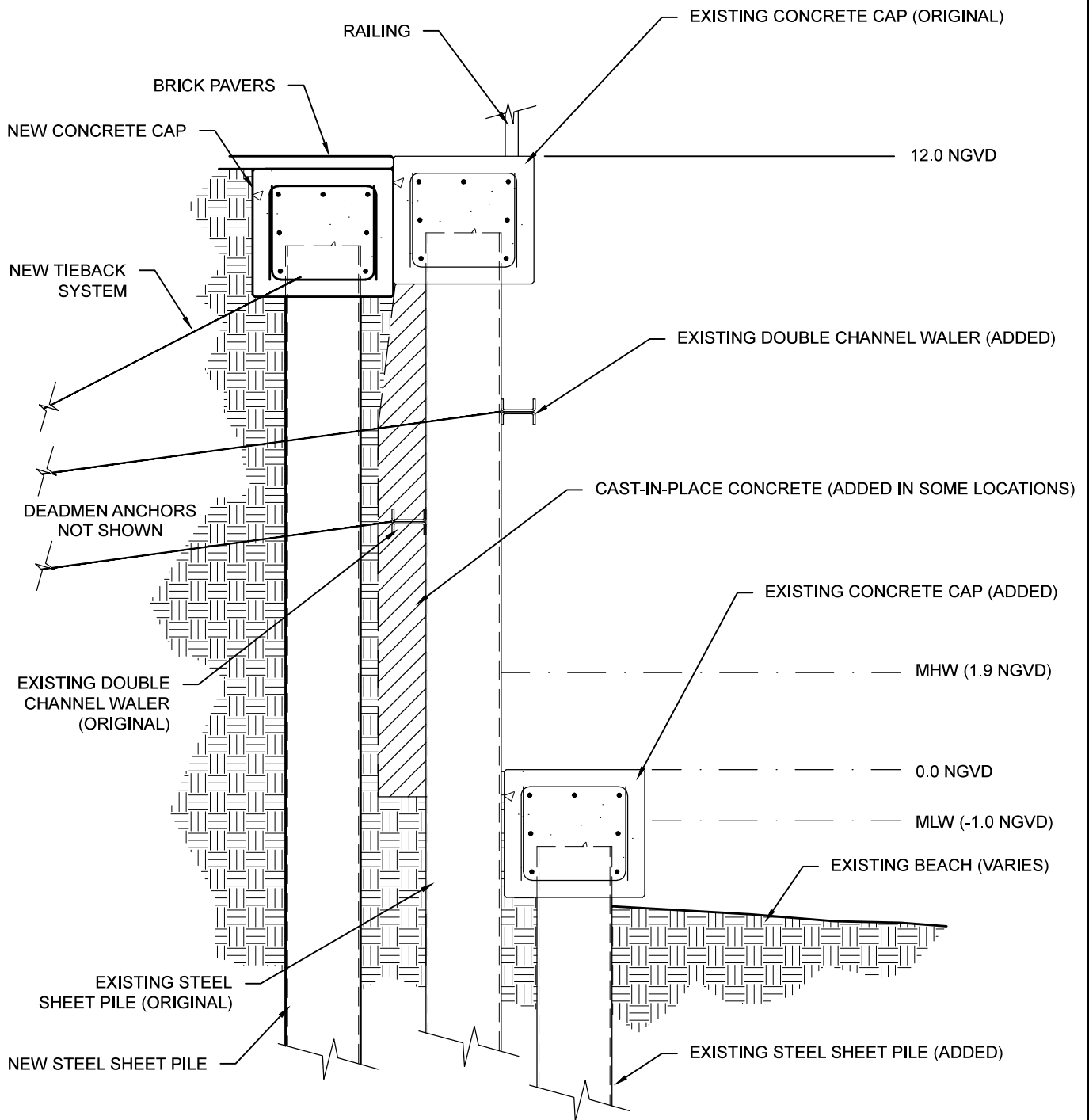
TYPICAL CROSS SECTION SCHEMATIC

SCALE: 1" = 3'

DATE-1  
DWG-1

FIGURE 1  
EXISTING CONDITIONS  
JUPITER REEF CLUB SEAWALL





**TYPICAL CROSS SECTION SCHEMATIC**

SCALE: 1" = 3'

DATE-1

DWG-1

**FIGURE 2**  
**PROPOSED REPLACEMENT**  
**JUPITER REEF CLUB SEAWALL**





Existing elevation at inspection time:



Backside view of original sheeting:



Concrete facing cracking and rusting:



Severe rusting of waler; loss of nuts, washers:





Hole in toewall sheeting, small, leaking:



Hole in toewall sheeting, small, leaking:



Deterioration of toewall sheeting:



Substantial loss of backfill thru toewall hole:





Western end of return, good condition:



Parking lot seawall, good condition:

