

Please click the link below to join the webinar:

<https://us02web.zoom.us/j/84918408686?pwd=UPVhRoZW3b4Ad1ar-NRYSt3RGyNK3w.5cUI9VgghnlJB2ns>

Passcode: 733684 +16469313860 Webinar ID: 849 1840 8686



**CITY OF BEAUFORT**  
1911 BOUNDARY STREET  
BEAUFORT MUNICIPAL COMPLEX  
BEAUFORT, SOUTH CAROLINA 29902  
(843) 525-7070  
**CITY COUNCIL WORKSESSION AGENDA**  
**June 11, 2024**

**STATEMENT OF MEDIA NOTIFICATION**

"In accordance with South Carolina Code of Laws, 1976, Section 30-4-80(d), as amended, all local media was duly notified of the time, date, place and agenda of this meeting."

**WORKSESSION - City Hall, Planning Conference Room, 1st Floor - 5:00 PM**

**Please note, this meeting will be broadcasted via zoom and live streamed on Facebook. You can view the meeting at the City's page; City Beaufort SC**

**I. CALL TO ORDER**

A. Philip Cromer, Mayor

**II. EMPLOYEE NEW HIRE RECOGNITION**

A. Finance Department - Kim White

**III. DISCUSSION ITEMS**

A. Waterfront Park Relieving Platform Inspection Report

**IV. ADJOURN**



---

**CITY OF BEAUFORT**  
DEPARTMENT REQUEST FOR CITY COUNCIL AGENDA ITEM

---

**TO:** CITY COUNCIL **DATE:** 6/5/2024  
**FROM:** Scott Marshall, City Manager  
**AGENDA ITEM**  
**TITLE:** Waterfront Park Relieving Platform Inspection Report  
**MEETING**  
**DATE:** 6/11/2024  
**DEPARTMENT:** City Managers Office

---

***BACKGROUND INFORMATION:***

Bill Barna and David Sweeney will be present to discussion their findings from a periodic inspection of the Relieving Platform at the Waterfront Park.

---

***PLACED ON AGENDA FOR:*** Discussion

***REMARKS:***

**ATTACHMENTS:**

Description	Type	Upload Date
Presentation	Backup Material	6/5/2024
Inspection Report	Backup Material	6/5/2024

CITY OF  
**BEAUFORT**

SOUTH CAROLINA

FOUNDED 1711

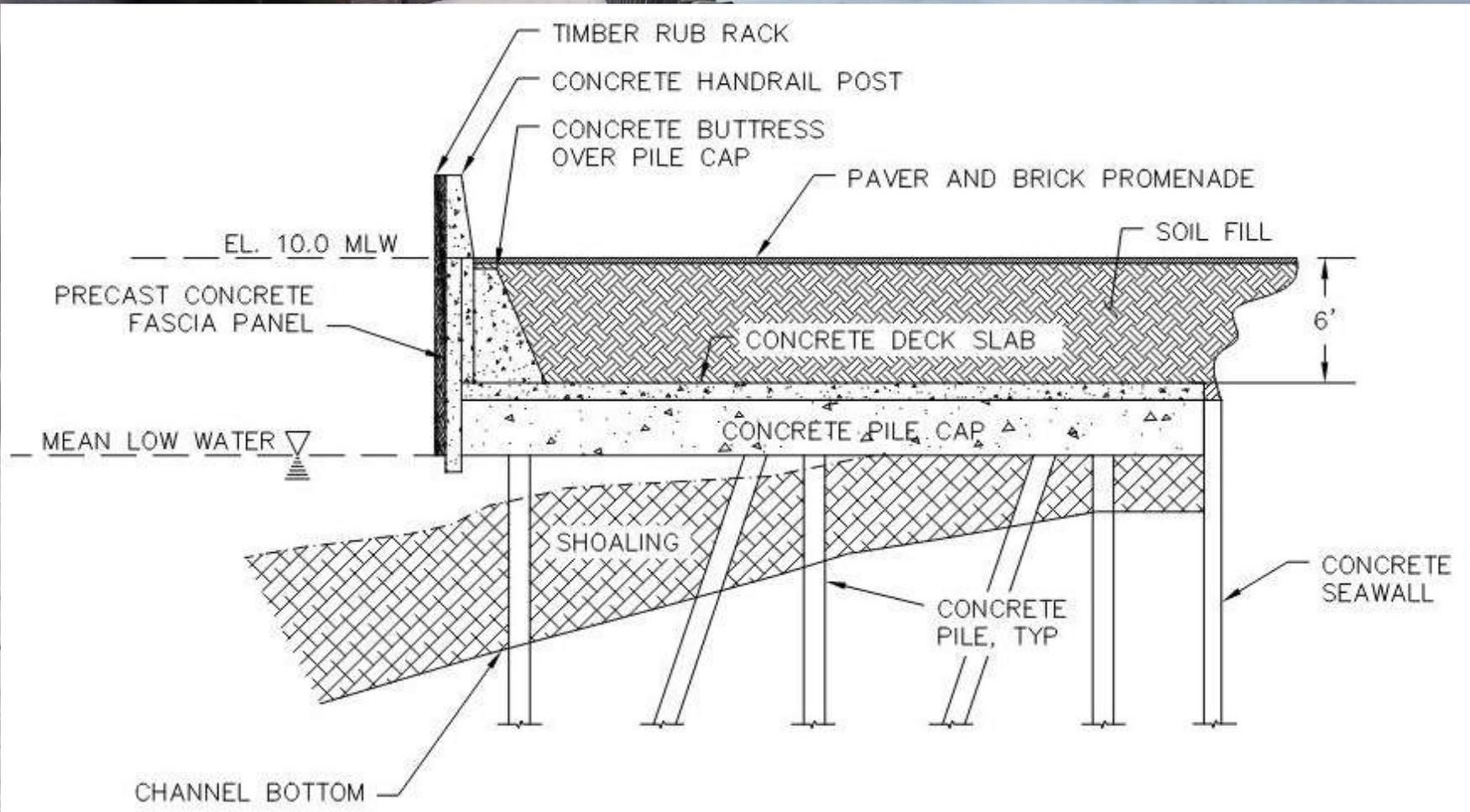
**Henry C. Chambers Waterfront Park**  
Relieving Platform and Seawall Condition Assessment  
2024

*McSweeney*

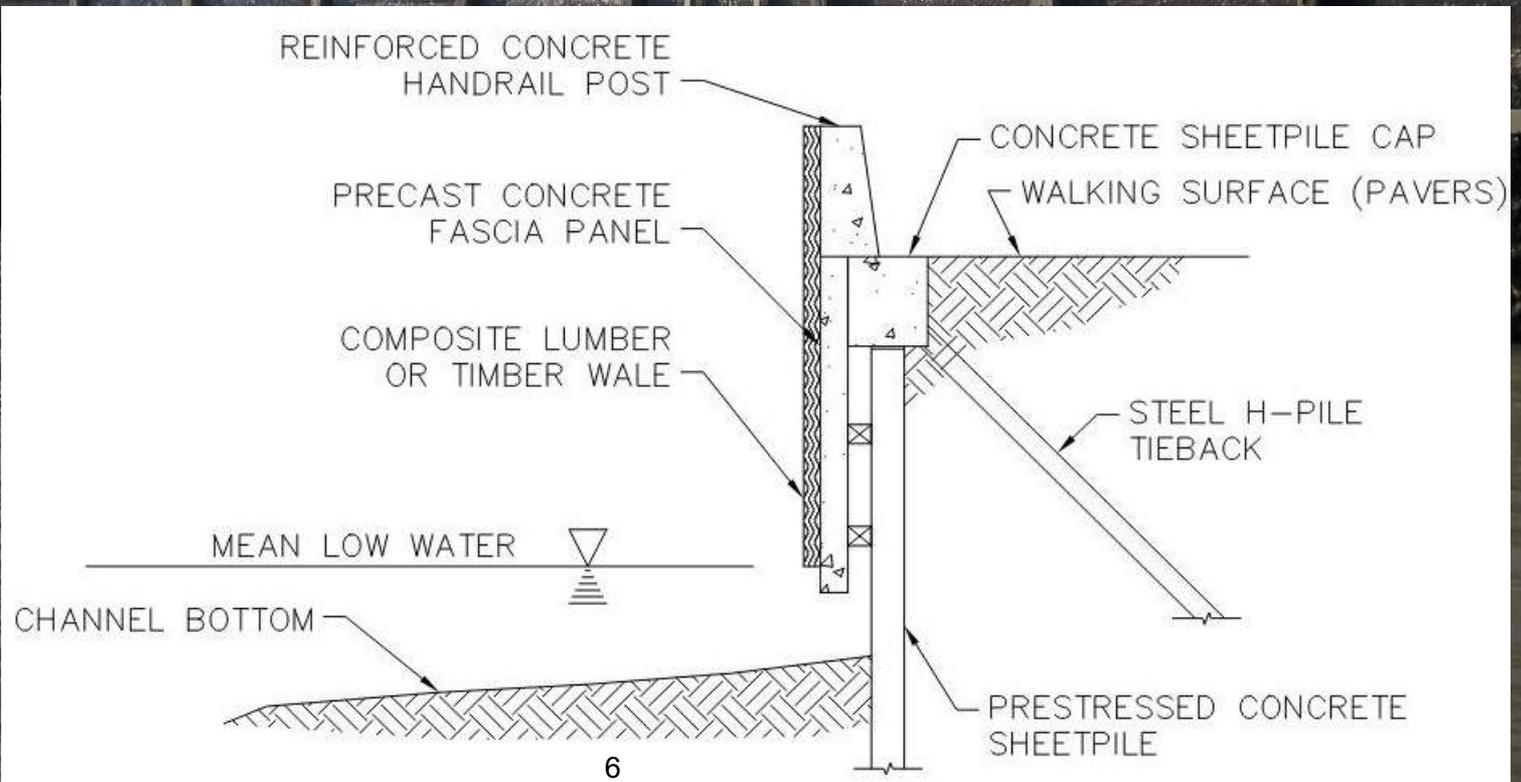
**McSweeney Engineers**



# RELIEVING PLATFORM



# SEAWALL



# STRUCTURAL HISTORY

- 1974 ORIGINAL CONSTRUCTION
- 2003 INSPECTION
- 2008 PARK RENOVATIONS
- 2014 INSPECTION
  - SPALLS ON 177 OUT OF 570 PILES, 5 BROKEN
- 2016 DETAILED PILE INVESTIGATION
  - CLEANED, CORED, TESTED
  - 2 ADDITIONAL BROKEN PILES
- 2018 DAY DOCK INSTALLATION
- 2018 PILE ENCAPSULATION PROEJCT
  - ENCAPSULATED 14 PILES
- 2019 INSPECTION
  - EXTENSIVE SHOALING NOTED
- 2019 PILE ENCAPSULATION PROJECT
  - ENCAPSULATED 33 PILES
- 2023 CRUISE SHIP MOORING INCIDENT
- 2024 INSPECTION

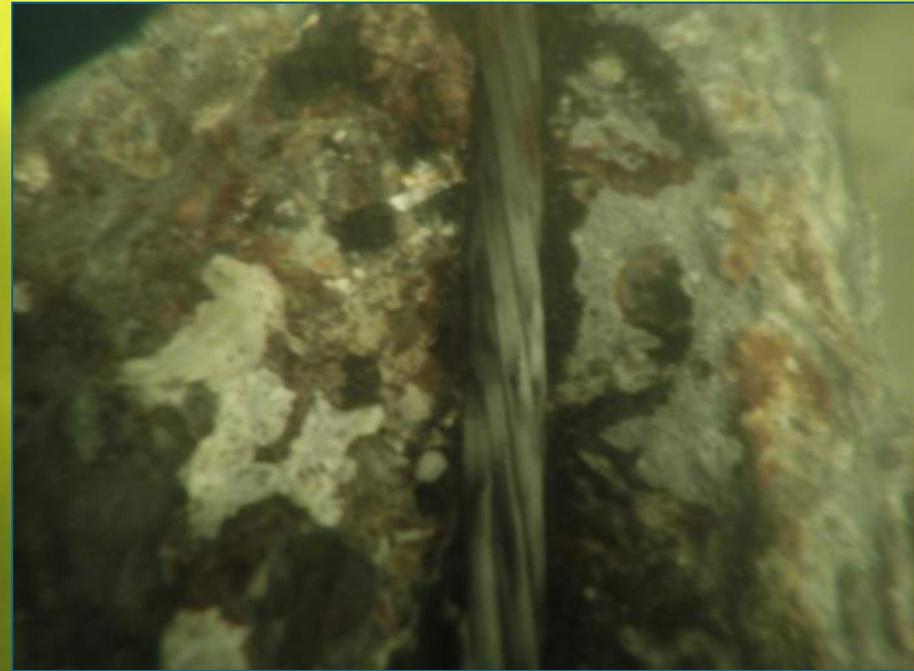


# STRUCTURAL CONDITIONS



- **MINOR TO MODERATE WEATHERING AND DETERIORATION ABOVE THE WATERLINE**
- **MISSING TIMBER FENDER ELEMENTS (RUB RACK), 40 TO 50 PERCENT**

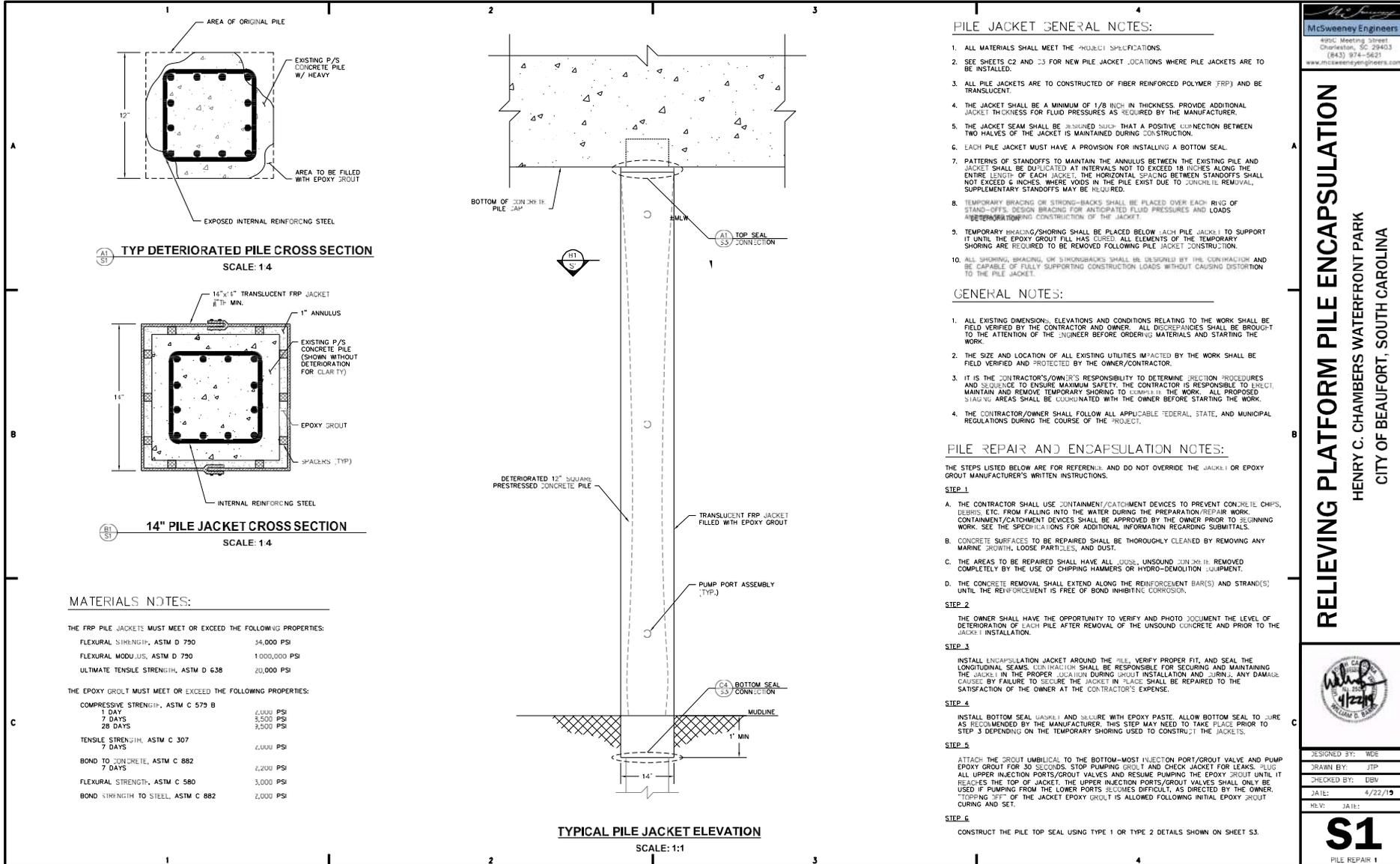
# STRUCTURAL CONDITIONS



- **CAPS AND DECK IN FAIR CONDITION**
- **EXTENSIVE SHOALING**
- **PILE DETERIORATION**
  - **SOFT CONCRETE**
  - **EXPOSED REINFORCING STEEL**
  - **ROUNDED EDGES**
  - **BROKEN**



# STRUCTURAL REPAIRS



### PILE JACKET GENERAL NOTES:

1. ALL MATERIALS SHALL MEET THE PROJECT SPECIFICATIONS.
2. SEE SHEETS C2 AND C3 FOR NEW PILE JACKET LOCATIONS WHERE PILE JACKETS ARE TO BE INSTALLED.
3. ALL PILE JACKETS ARE TO CONSTRUCTED OF FIBER REINFORCED POLYMER (FRP) AND BE TRANSLUCENT.
4. THE JACKET SHALL BE A MINIMUM OF 1/8 INCH IN THICKNESS. PROVIDE ADDITIONAL JACKET THICKNESS FOR FLUID PRESSURES AS REQUIRED BY THE MANUFACTURER.
5. THE JACKET SEAM SHALL BE DESIGNED SUCH THAT A POSITIVE CONNECTION BETWEEN TWO HALVES OF THE JACKET IS MAINTAINED DURING CONSTRUCTION.
6. EACH PILE JACKET MUST HAVE A PROVISION FOR INSTALLING A BOTTOM SEAL.
7. PATTERNS OF STANDOFFS TO MAINTAIN THE ANNULUS BETWEEN THE EXISTING PILE AND JACKET SHALL BE DUPLICATED AT INTERVALS NOT TO EXCEED 18 INCHES ALONG THE ENTIRE LENGTH OF EACH JACKET. THE HORIZONTAL SPACING BETWEEN STANDOFFS SHALL NOT EXCEED 6 INCHES. WHERE VOIDS IN THE PILE EXIST DUE TO CONCRETE REMOVAL, SUPPLEMENTARY STANDOFFS MAY BE REQUIRED.
8. TEMPORARY BRACING OR STRONG-BACKS SHALL BE PLACED OVER EACH RING OF STAND-OFFS. DESIGN BRACING FOR ANTICIPATED FLUID PRESSURES AND LOADS AND ESTABLISH SHORING CONSTRUCTION OF THE JACKET.
9. TEMPORARY BRACING/SHORING SHALL BE PLACED BELOW EACH PILE JACKET TO SUPPORT IT UNTIL THE EPOXY GROUT FILL HAS CURED. ALL ELEMENTS OF THE TEMPORARY SHORING ARE REQUIRED TO BE REMOVED FOLLOWING PILE JACKET CONSTRUCTION.
10. ALL SHORING, BRACING, OR STRONG-BACKS SHALL BE DESIGNED BY THE CONTRACTOR AND BE CAPABLE OF FULLY SUPPORTING CONSTRUCTION LOADS WITHOUT CAUSING DISTORTION TO THE PILE JACKET.

### GENERAL NOTES:

1. ALL EXISTING DIMENSIONS, ELEVATIONS AND CONDITIONS RELATING TO THE WORK SHALL BE FIELD VERIFIED BY THE CONTRACTOR AND OWNER. ALL DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER BEFORE ORDERING MATERIALS AND STARTING THE WORK.
2. THE SIZE AND LOCATION OF ALL EXISTING UTILITIES IMPACTED BY THE WORK SHALL BE FIELD VERIFIED AND PROTECTED BY THE OWNER/CONTRACTOR.
3. IT IS THE CONTRACTOR'S/OWNER'S RESPONSIBILITY TO DETERMINE ERECTION PROCEDURES AND SEQUENCE TO ENSURE MAXIMUM SAFETY. THE CONTRACTOR IS RESPONSIBLE TO ERECT, MAINTAIN AND REMOVE TEMPORARY SHORING TO COMPLETE THE WORK. ALL PROPOSED STAGING AREAS SHALL BE COORDINATED WITH THE OWNER BEFORE STARTING THE WORK.
4. THE CONTRACTOR/OWNER SHALL FOLLOW ALL APPLICABLE FEDERAL, STATE, AND MUNICIPAL REGULATIONS DURING THE COURSE OF THE PROJECT.

### PILE REPAIR AND ENCAPSULATION NOTES:

THE STEPS LISTED BELOW ARE FOR REFERENCE ONLY AND DO NOT OVERRIDE THE JACKET OR EPOXY GROUT MANUFACTURER'S WRITTEN INSTRUCTIONS.

- STEP 1**
- A. THE CONTRACTOR SHALL USE CONTAINMENT/CATCHMENT DEVICES TO PREVENT CONCRETE CHIPS, DEBRIS, ETC. FROM FALLING INTO THE WATER DURING THE PREPARATION/REPAIR WORK. CONTAINMENT/CATCHMENT DEVICES SHALL BE APPROVED BY THE OWNER PRIOR TO BEGINNING WORK. SEE THE SPECIFICATIONS FOR ADDITIONAL INFORMATION REGARDING SUBMITTALS.
  - B. CONCRETE SURFACES TO BE REPAIRED SHALL BE THOROUGHLY CLEANED BY REMOVING ANY MARINE GROWTH, LOOSE PARTICLES, AND DUST.
  - C. THE AREAS TO BE REPAIRED SHALL HAVE ALL LOOSE, UNSOUND CONCRETE REMOVED COMPLETELY BY THE USE OF CHIPPING HAMMERS OR HYDRO-DEMOLITION EQUIPMENT.
  - D. THE CONCRETE REMOVAL SHALL EXTEND ALONG THE REINFORCEMENT BAR(S) AND STRAND(S) UNTIL THE REINFORCEMENT IS FREE OF BOND INHIBITING CORROSION.
- STEP 2**
- THE OWNER SHALL HAVE THE OPPORTUNITY TO VERIFY AND PHOTO DOCUMENT THE LEVEL OF DETERIORATION OF EACH PILE AFTER REMOVAL OF THE UNSOUND CONCRETE AND PRIOR TO THE JACKET INSTALLATION.
- STEP 3**
- INSTALL ENCAPSULATION JACKET AROUND THE PILE. VERIFY PROPER FIT, AND SEAL THE LONGITUDINAL SEAMS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SECURING AND MAINTAINING THE JACKETS IN THE PROPER LOCATION DURING GROUT INSTALLATION AND CURING. ANY DAMAGE CAUSED BY FAILURE TO SECURE THE JACKET IN PLACE SHALL BE REPAIRED TO THE SATISFACTION OF THE OWNER AT THE CONTRACTOR'S EXPENSE.
- STEP 4**
- INSTALL BOTTOM SEAL (GASKET) AND SECURE WITH EPOXY PASTE. ALLOW BOTTOM SEAL TO CURE AS RECOMMENDED BY THE MANUFACTURER. THIS STEP MAY NEED TO TAKE PLACE PRIOR TO STEP 3 DEPENDING ON THE TEMPORARY SHORING USED TO CONSTRUCT THE JACKETS.
- STEP 5**
- ATTACH THE GROUT UMBILICAL TO THE BOTTOM-MOST INJECTION PORT/GROUT VALVE AND PUMP EPOXY GROUT FOR 30 SECONDS. STOP PUMPING GROUT. CHECK JACKET FOR LEAKS. FILL ALL UPPER INJECTION PORTS/GROUT VALVES AND RESUME PUMPING THE EPOXY GROUT UNTIL IT REACHES THE TOP OF JACKET. THE UPPER INJECTION PORTS/GROUT VALVES SHALL ONLY BE USED IF PUMPING FROM THE LOWER PORTS BECOMES DIFFICULT, AS DIRECTED BY THE OWNER. "TOPPING OFF" OF THE JACKET EPOXY GROUT IS ALLOWED FOLLOWING INITIAL EPOXY GROUT CURING AND SET.
- STEP 6**
- CONSTRUCT THE PILE TOP SEAL USING TYPE 1 OR TYPE 2 DETAILS SHOWN ON SHEET S3.

### MATERIALS NOTES:

THE FRP PILE JACKETS MUST MEET OR EXCEED THE FOLLOWING PROPERTIES:

FLEXURAL STRENGTH, ASTM D 790	34,000 PSI
FLEXURAL MODULUS, ASTM D 790	1,000,000 PSI
ULTIMATE TENSILE STRENGTH, ASTM D 638	20,000 PSI

THE EPOXY GROUT MUST MEET OR EXCEED THE FOLLOWING PROPERTIES:

COMPRESSIVE STRENGTH, ASTM C 579 B	
1 DAY	4,000 PSI
7 DAYS	3,500 PSI
28 DAYS	2,500 PSI
TENSILE STRENGTH, ASTM C 307	
7 DAYS	4,000 PSI
BOND TO CONCRETE, ASTM C 882	
7 DAYS	2,200 PSI
FLEXURAL STRENGTH, ASTM C 580	3,000 PSI
BOND STRENGTH TO STEEL, ASTM C 882	2,000 PSI



4950 Meeting Street  
Charleston, SC 29403  
(843) 974-5621  
www.mcsweeneyengineers.com

**RELIEVING PLATFORM PILE ENCAPSULATION**  
HENRY C. CHAMBERS WATERFRONT PARK  
CITY OF BEAUFORT, SOUTH CAROLINA



DESIGNED BY: WDS
DRAWN BY: JTP
CHECKED BY: DBW
DATE: 4/22/19
REV: JAT:2

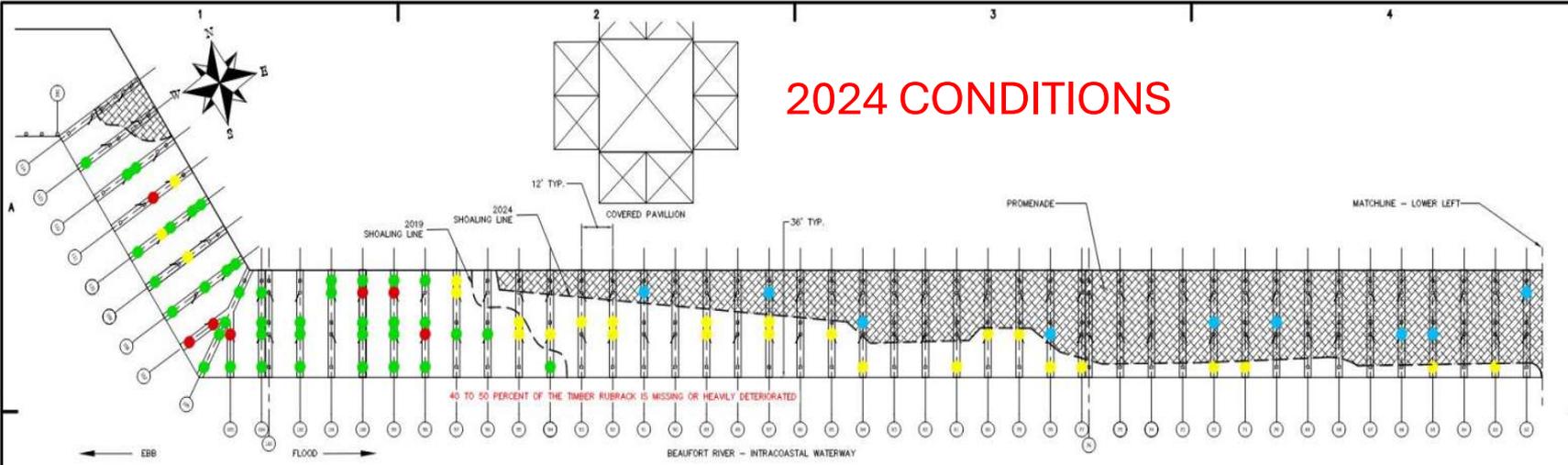


FILE REPAIR 1

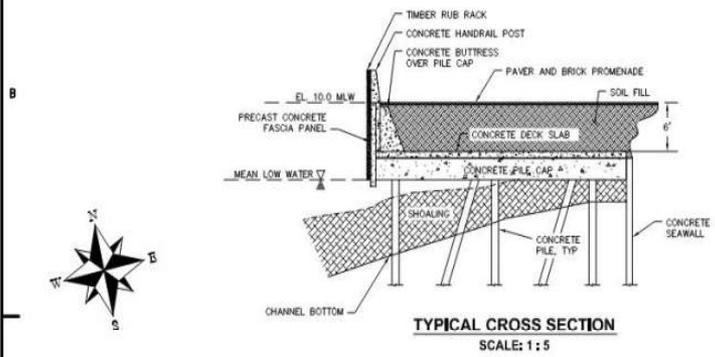
# STRUCTURAL REPAIRS



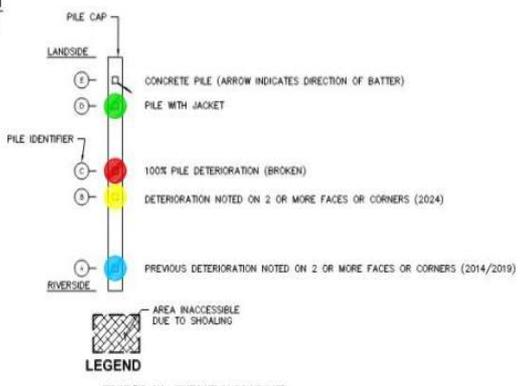
# 2024 CONDITIONS



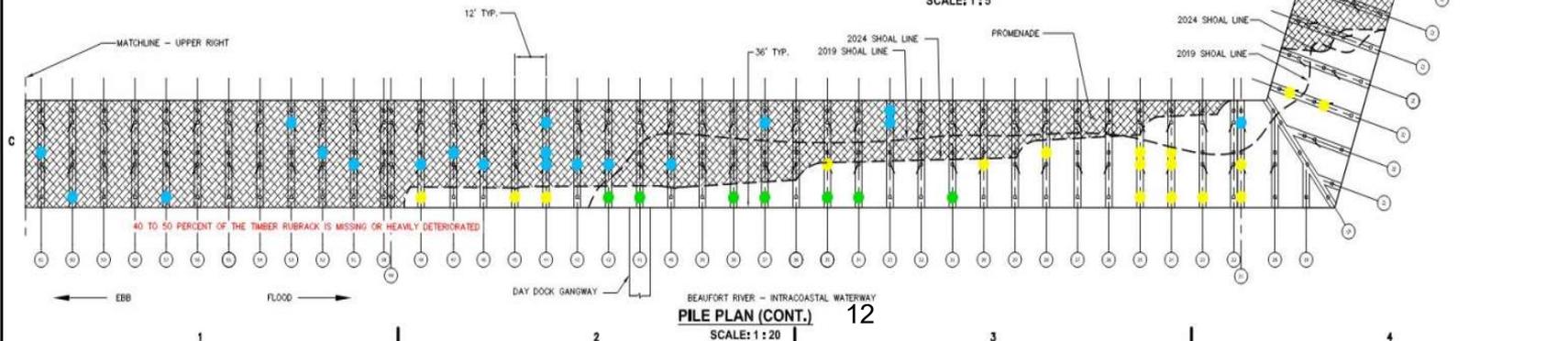
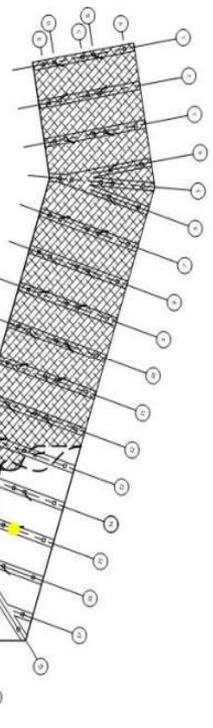
**PILE PLAN**  
SCALE: 1:20



**TYPICAL CROSS SECTION**  
SCALE: 1:5



**TYPICAL BENT LAYOUT**  
SCALE: 1:5



**PILE PLAN (CONT.)**  
SCALE: 1:20

**RELIEVING PLATFORM INSPECTION - 2024**  
 HENRY C. CHAMBERS WATERFRONT PARK  
 CITY OF BEAUFORT, SOUTH CAROLINA

DESIGNED BY:	WOB
DRAWN BY:	WOB
CHECKED BY:	WOB
DATE:	5/20/24
REV.	DATE:

**A2**  
RELIEVING PLATFORM

## **RECOMMENDATIONS:**

- **INCREASE INSPECTION FREQUENCY**
- **RESTRICT COMMERCIAL VESSEL USE UNTIL:**
  - **STRUCTURAL AND MOORING ANALYSIS INDICATES OTHERWISE**
  - **AUXILIARY MOORING STRUCTURES ARE INSTALLED**
- **INITIATE PRELIMINARY STUDIES AND SECURE FUNDING FOR REPLACEMENT OF THE STRUCTURE**
- **INSTALL PILE JACKETS ON DETERIORATED PILES**

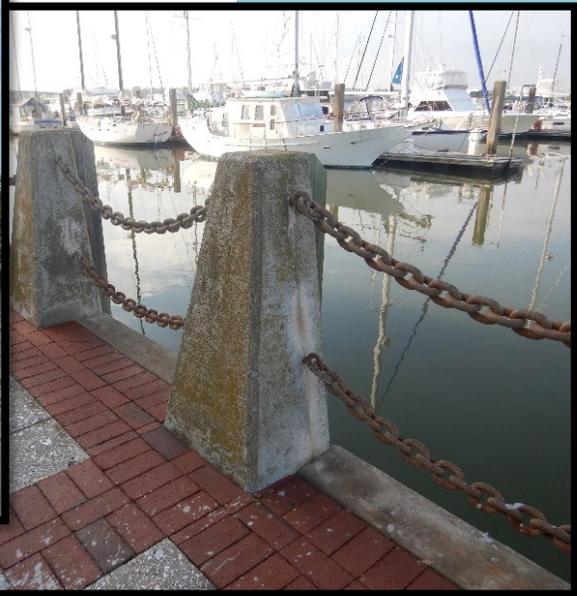


**QUESTIONS?**

# Henry C. Chambers Waterfront Park

## Relieving Platform

### Structural Evaluation - 2024



*McSweeney*

**McSweeney Engineers**

300 W. Coleman Blvd Ste 203B

Mt. Pleasant, SC 29464

(843) 974-5621

[www.mcsweeneyengineers.com](http://www.mcsweeneyengineers.com)

**TABLE OF CONTENTS**

1.0 INTRODUCTION..... 2  
1.1 Purpose and Scope..... 2  
1.2 General Description of the Structures..... 2  
    1.2.1 Eastern Waterfront Structures (Relieving Platform)..... 2  
    1.2.2 Western Seawall..... 3  
1.3 Method of Investigation..... 3  
2.0 SUMMARY OF STRUCTURAL HISTORY ..... 4  
3.0 EXISTING CONDITIONS - 2024 ..... 5  
    3.1 Eastern Waterfront Structures (Relieving Platform)..... 5  
        3.1.1 Relieving Platform Substructure (Piles and Pile Caps) ..... 5  
        3.1.2 Relieving Platform Superstructure (Deck, Fascia Panels, Fender, and Handrail) ..... 5  
    3.2 Western Seawall ..... 6  
4.0 EVALUATION AND COMMENTARY..... 6  
    4.1 Eastern Waterfront Structures (Relieving Platform)..... 6  
    4.2 Western Seawall ..... 8  
5.0 RECOMMENDATIONS..... 8  
    5.1 Eastern Waterfront Structures (Relieving Platform)..... 8  
    5.2 Western Seawall ..... 8  
6.0 CONCLUSION ..... 9

- Attachment A – Site Schematic**
- Attachment B – Photographs**
- Attachment C – Pile Defects Table**

# Relieving Platform Structural Evaluation - 2024

## 1.0 INTRODUCTION

### 1.1 Purpose and Scope

On April 18, 2024, McSweeney Engineers, LLC completed an above and below water investigation of the Eastern Waterfront Structures and Western Seawall at Henry C. Chambers Waterfront Park in Beaufort, South Carolina. The scope of work for this project included a comprehensive evaluation of the structures above and below the waterline. The underwater investigation included a Level I “swim-by” (visual and tactile) inspection of all accessible elements, as well as a Level II (cleaning and close-up visual) inspection of 10 percent of the substructure components. In addition, a topside inspection was also performed. The inspection focused on the identification of structural defects; however, issues which could pose a potential safety hazard to patrons of the facility and the condition of utilities and appurtenances were also noted.

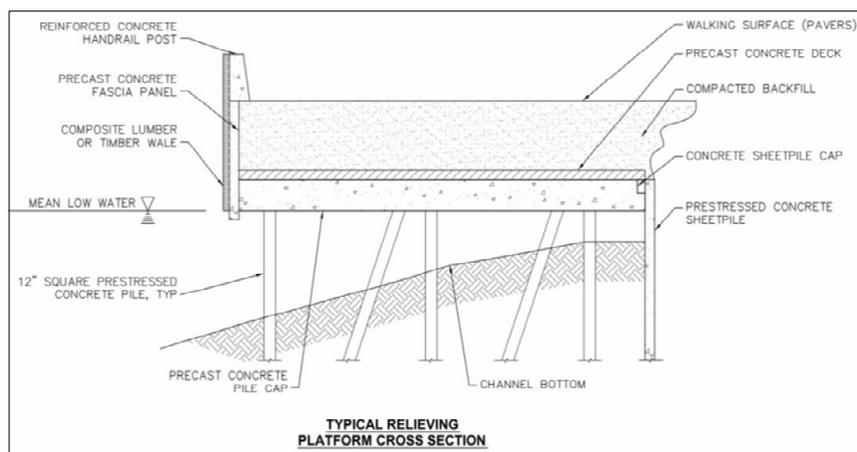
This report includes a description of the structures inspected, the method of assessment and a detailed description of the conditions noted. A condition assessment of the components evaluated and recommendations for follow up action are included. Attachments to this report include representative photographs, a site schematic, and tabular list of significant defects.

### 1.2 General Description of the Structures

#### 1.2.1 Eastern Waterfront Structures (Relieving Platform)

The Eastern Waterfront Structures consist of an approximately 1200 ft long concrete Seawall and Relieving Platform. The Seawall is comprised of 9-in. thick by 4 ft wide prestressed concrete sheet piling and a reinforced concrete pile cap.

The Relieving Platform is in front of (and connected to) the Seawall and consists of 114 concrete pile bents supporting a concrete pile cap and concrete deck slab. There are a total of 570 piles supporting the Relieving Platform. Each pile bent typically consists of five 12-in.



square prestressed concrete piles, two of which are battered at a 4:12 angle. Each bent is typically spaced at approximately 12 ft centers and supports a 2 ft 6-in. wide by 2 ft 8-in. thick precast and prestressed

## Relieving Platform Structural Evaluation - 2024

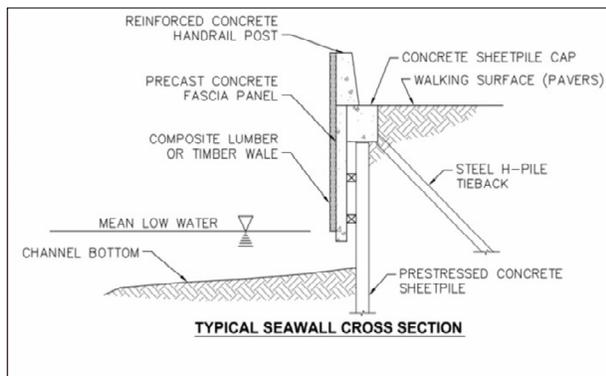
concrete pile cap. Each pile cap supports a 10-in. thick precast concrete deck. The top surface of the concrete deck is covered by approximately 6 ft of compacted backfill and concrete pavers.

The outboard portion of the Relieving Platform is clad with 9-in. thick precast concrete fascia panels that extend from the bottom of the concrete handrail posts to Mean Low Water. 6x6 timber and composite lumber wales act as a fender system for the Relieving Platform. Vertical wales are located at each handrail post and three rows of horizontal wales extend the length of the Relieving Platform.

Concrete handrail posts are spaced typically at 6 ft centers throughout the length of the Relieving Platform and galvanized steel chains are draped between each post and serve as a pedestrian guardrail. Steel cleats, mooring rings, and access ladders are attached to the structure in various locations throughout. A typical cross section of the Relieving Platform is presented on the previous page.

The Pile and Bent designation used throughout this report is consistent with the original design drawings dated August 30, 1974. The pile bents are labeled numerically from east to west and the piles at each bent are labeled alphabetically from south to north.

### 1.2.2 Western Seawall



The Western Seawall is approximately 612 ft long and extends from the west end of the Eastern Waterfront Structures at Bent 114 to the Boat Ramp located at the west end of the facility. The Seawall is comprised of 4 ft wide prestressed concrete sheet piling and supports a 2 ft 9-in. thick by 2 ft 5-in. wide concrete pile cap. According to the available plans the seawall is tied back by 136 steel HP8x36 battered piles.

The precast concrete fascia panels, concrete handrail posts, ladders, mooring rings, and fender system are of similar construction to those found on the Eastern Waterfront Structures. A typical cross section of the seawall is presented above.

### 1.3 Method of Investigation

The work was conducted by a five-person team consisting of three South Carolina-registered Professional Engineer-divers and two engineering technicians. The investigation generally consisted of an above and below water visual/tactile inspection (Level I) over 100 percent of the accessible portions of the facilities with particular attention paid to areas of excessive deterioration or apparent distress. A close-up visual inspection (Level II) over 10 percent of the accessible portions of the facilities was conducted as well, which included cleaning marine growth at the waterline, mid-depth, and channel bottom to facilitate an evaluation of the underlying surfaces. The condition of any existing repairs was also noted.

## Relieving Platform Structural Evaluation - 2024

---

The dive team utilized surface-supplied air and hard hat diving techniques to access below water structural elements. Hand tools were used to remove marine growth from surfaces, which allowed for more detailed inspection of selected members as well as to sound the concrete to help identify areas of unsound material. Photographs were taken with both above and below water cameras, to document the condition of structural elements. Please refer to Attachment B for photographs obtained during the inspection.

### 2.0 SUMMARY OF STRUCTURAL HISTORY

#### 1974 Date of Design Plans

- Assumed construction date

#### 2003 Comprehensive Inspection

- Conducted by Lockwood Green
- Spalling on piles noted but not extensive

#### 2008 Waterfront Park Renovations

- Lower rub rack sections replaced with composite lumber

#### 2014 Comprehensive Inspection

- Spalls were noted on 117 out of 570 piles supporting the Relieving Platform
- 5 piles were broken
- Substructure rated “Fair” to “Poor”

#### 2016 Detailed Pile Investigation

- Piles were cleaned with an underwater pressure washer
- Concrete core samples were taken from select piling and analyzed
  - o Core sample results revealed a high paste concentration within the piling concrete, large air voids throughout, and high levels of chlorides
- 2 additional broken piles were discovered
- Pile encapsulation was recommended
- Recommended restricting vessels from mooring west of the western expansion joint

#### 2018 Day Dock Installation

#### 2018 Pile Encapsulation Project

- Encapsulated 14 piles with high-strength epoxy grout

#### 2019 Comprehensive Inspection

- Extensive shoaling was noted below the Relieving Platform and many piles that were previously inspected were no longer accessible
- Continued deterioration since the 2016 inspection was evident
- Recommended jacketing additional piles

#### 2019 Pile Encapsulation Project

- Encapsulated 33 piles with high-strength epoxy grout

## Relieving Platform Structural Evaluation - 2024

### 2023 Cruise Ship Mooring Incident

- Disconnected handrail posts and displaced bricks
- Repairs in good condition

## 3.0 EXISTING CONDITIONS - 2024

### 3.1 Eastern Waterfront Structures (Relieving Platform)

During the 2014 inspection, the piles supporting the Relieving Platform were largely accessible; however, the 2019 inspection noted significant shoaling had occurred. That condition continues and approximately 90 percent of the inner two piles at each bent (Piles D and E) are completely buried. Bents 36 through 79 are largely inaccessible. Shoaling has increased to the point where a diver, on his belly, with his face in the channel bottom, and reserve air tank touching the ceiling, cannot safely access the piling in these locations. The shoaling consists of very soft silt and has no impact on the structural integrity of the Relieving Platform. Nevertheless, this condition makes detection of new defects or evaluation of older defects nearly impossible.

#### 3.1.1 Relieving Platform Substructure (Piles and Pile Caps)

Of the 570 total piles supporting the structure, approximately 227 were accessible during the inspection, 47 piles have been encapsulated with epoxy grout-filled fiber reinforced polymer encasements, seven piles were broken (beyond repair), and approximately 46 exhibit moderate to major deterioration. This deterioration has resulted in a "soft" outer layer and rounded edges on square piles due to spalling on multiple corners. Most significantly, in isolated locations this deterioration has led to exposure of the internal reinforcing steel. These conditions result in an overall loss of structural capacity in comparison with as-built conditions.

An assessment of the pile encasements installed during the 2018 and 2019 repair projects indicated that they are intact. Slight undermining of the epoxy bottom seal was noted in isolated locations; however, not at penetrations deep enough to reach the original pile.

Most of the pile caps are precast concrete. Cast-in-place concrete pile caps were installed on Bents 4 through 6, 16 through 20, and 105 through 107. Minor spalls and superficial areas of deterioration were observed in random locations throughout. The most notable defect was loss of grout between the precast caps and piles. This has led to voids of several inches between the pile and cap in several locations.

#### 3.1.2 Relieving Platform Superstructure (Deck, Fascia Panels, Fender, and Handrail)

The underside of the concrete deck was the only portion of the deck accessible during the inspection and was typically located below the waterline. There were no significant observed deficiencies associated with the concrete deck.

The precast concrete fascia panels exhibited moderate deterioration in the form of cracks up to 1/4-in. wide with rust staining, an indication that the internal reinforcing steel is corroded.

## Relieving Platform Structural Evaluation - 2024

The timber rub rack consists horizontal and vertical timber wales bolted to the outboard side of the Relieving Platform. The lower portion of the rub rack consists of composite (plastic) 6x6 fenders with stainless steel hardware which were in good condition. The upper two-thirds of the rub rack assembly consists of 6x6 timber fenders. Approximately 40 to 50 percent of these fenders were missing. Most of the remaining timber fender elements were weathered or heavily deteriorated. The connection hardware for these elements was severely corroded.

The condition of the concrete handrail posts, mooring hardware, and galvanized chain forming the safety barrier around the Relieving Platform showed signs of minor to moderate weathering and corrosion.

In December 2023, one handrail post above Bent 102 was torn from its foundation due to a reported “mooring incident” with a commercial cruise vessel utilizing the facility. The area was repaired directly after the incident. The repair was in good condition. Attachment A provides a graphical depiction of the Relieving Platform pile layout and indicates the general pile condition and limits of shoaling.

### 3.2 Western Seawall

Along the length of the seawall, but most predominantly located at the western end, separations between adjacent sheet piles were evident. The separations are at the locations where the trapezoidal “key” forms the tongue and groove component of the prestressed concrete sheet pile. The separations between sheets were a maximum of 2-in. Depressions in the brick promenade, likely due to loss of backfill at the separated joints, were evident throughout. However, no active sinkholes were noted.

Significant shoaling has occurred along the length of the seawall since the previous routine inspection. As such, many of the previously reported defects are buried and no longer accessible.

The deterioration of the concrete fascia panels and wales and the condition of the concrete handrail posts, galvanized chain, mooring rings, and ladders showed marginally more deterioration in the form of weathering, corrosion, and general deterioration in comparison with previous inspections.

## 4.0 EVALUATION AND COMMENTARY

### 4.1 Eastern Waterfront Structures (Relieving Platform)

There is a significant variation in the level of deterioration of the structural elements supporting the Relieving Platform, however, the overriding concern is the condition of the prestressed concrete piles supporting the structure. Previous testing revealed that the piles have the following general properties:

- High variability of compressive strength
- Air content consisting almost entirely of large, trapped air voids
- High cement paste-to-aggregate ratio
- High chloride content

These findings indicate two significant concerns with the piles. The first being the overall lack of pile durability due to a breakdown of the paste-aggregate bond. The second being the high chloride

## Relieving Platform Structural Evaluation - 2024

---

concentration and its ability to accelerate corrosion, as evidenced by the complete breakdown of internal reinforcing steel at some pile locations. These conditions, combined with the near 50-year age of the pilings, has led to the severe and continual deterioration of the foundation elements.

The 47 pile encasements appear to be serving as intended: to preserve the remaining capacity of the piles at the time the encasements were installed. Each encasement extends from the bottom of the pile cap to just below the channel bottom. It is important to note that while the encasements have extended the life of the pile, we have no understanding of the level of pile deterioration below the encasement where the pile enters the mudline. Given the ongoing conditions encountered during multiple inspections, it is entirely possible that the piles below the jacket/mudline have severe deterioration. In addition, given the high chloride content of the piles, it is possible that pile reinforcement is continuing to corrode, even inside the encasements.

An additional concern is the inability to access previous areas exhibiting deterioration due to the silt build-up below the structure. During the current inspection, at least 25 piles that previously exhibited significant deterioration were inaccessible and some of these piles have not been accessed since the 2014 inspection. Given the rate of deterioration seen elsewhere, it is highly probable that these piles currently exhibit severe to total deterioration. Further investigation of the highly shoaled areas would require a significant dredging effort, extensive permitting, and high cost.

It suffices to say that the foundation supporting the Relieving Platform has reached the end of its service life. This assertion is especially true at the west end of the structure. Additional pile jackets, while warranted and recommended, will only serve to marginally extend the life of the structure. The “relieving platform” design of the structure makes pile replacement and/or other “major” repairs impractical. This is due to the low freeboard (no headroom) below the structure, and approximately 6 ft of earthen fill and brick promenade above it. Given the age and current deterioration, consideration must be given to replacing sections of the structure. Any additional repairs, including pile jackets, should be considered stopgap until replacement is implemented.

As discussed, the largest concentration of defects and pile encasements is at the west end of the facility. This is also the location where the commercial cruise vessels moor against the structure, where the water is deepest, and where the current is highest. The ability of the structure to continue withstanding the additional lateral loads from these vessels is highly suspect. Both vessels utilizing the facility are over 220 ft in length and displacing 3,000 gross tons. Lateral loads generated by docking maneuvers and wind pressure acting on the mooring lines can be substantial. Every push or pull from these vessels is an additional force on the structure and this happens continually while the vessels are docked at the facility. In example, completely neglecting the weight of the vessel and the current force, a rough calculation indicates that the wind force alone generated from a 30-mph wind against one of the moored vessels can exceed 13,000 lbs.

## Relieving Platform Structural Evaluation - 2024

---

Additionally, the timber rub rack that makes up the fendering system for the structure is compromised along nearly half its length. Due to this the structure has no effective “built in” protection from repeated impact or docking and must rely on fendering carried aboard each vessel.

To determine with certainty whether the structure can withstand the loads from single or multiple commercial vessels would require an extensive mooring analysis to quantify lateral loads. This study would then be followed up by a structural analysis of the Relieving Platform and mooring hardware, considering load reduction due to deterioration, to quantitatively ascertain if the structure can meet the load demand. Although we have not conducted an analysis of this structure, we do not believe the results would be favorable. Given the age of the structure and the conditions noted, the safest action is to prevent the cruise ships from mooring against the structure until the structure is replaced or until auxiliary mooring systems are installed.

### 4.2 Western Seawall

Except for the significant shoaling, the conditions of the Western Seawall have remained relatively unchanged since the previous inspection. Based on discussion with City Personnel, the reoccurrence of sinkholes in the area has subsided in recent years. It is unclear whether this is due to the City’s previous efforts addressing the sinkholes or the extensive shoaling noted at the face of the structure. Nevertheless, the Western Seawall appears to be in stable condition.

## 5.0 RECOMMENDATIONS

### 5.1 Eastern Waterfront Structures (Relieving Platform)

Based on the conditions noted above and our evaluation of the structure, we offer the following recommendations:

1. Increase inspection frequency to intervals not to exceed 48 months.
2. Restrict commercial cruise vessels from mooring against the structure until:
  - a. a complete structural and mooring analysis indicates otherwise.
  - OR
  - b. auxiliary mooring structures are installed. Auxiliary structures may consist of pile supported breasting and mooring structures placed independently of the Relieving Platform.
3. Initiate preliminary studies and secure funding to begin replacement of the structure.
4. Install pile encasements on piles exhibiting deterioration.

### 5.2 Western Seawall

Continue to monitor the condition of the structure during routine inspections.

## 6.0 CONCLUSION

McSweeney Engineers greatly appreciates the opportunity to continue providing engineering services to the City of Beaufort. If you have any questions or comments about this report, please do not hesitate to contact us.

Respectfully submitted,  
McSweeney Engineers, LLC



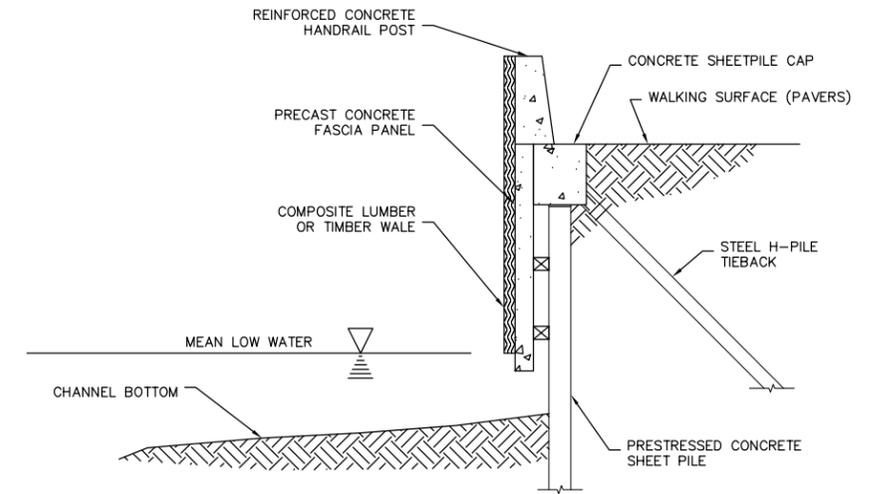
William Barna, P.E.

**Attachment A  
Site Schematic**

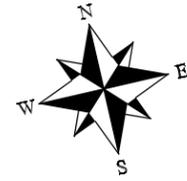
**RELIEVING PLATFORM INSPECTION - 2024**  
 HENRY C. CHAMBERS WATERFRONT PARK  
 CITY OF BEAUFORT, SOUTH CAROLINA

DESIGNED BY:	WDB
DRAWN BY:	WDB
CHECKED BY:	WDB
DATE:	5/20/24
REV.	DATE:

**A1**  
SEAWALL



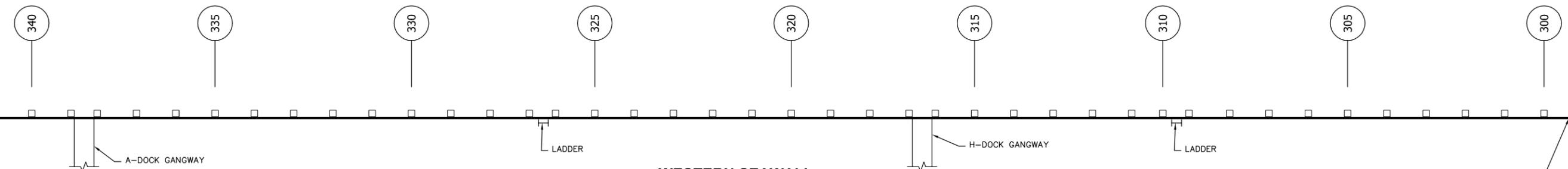
**TYPICAL CROSS SECTION**  
SCALE: 1:25



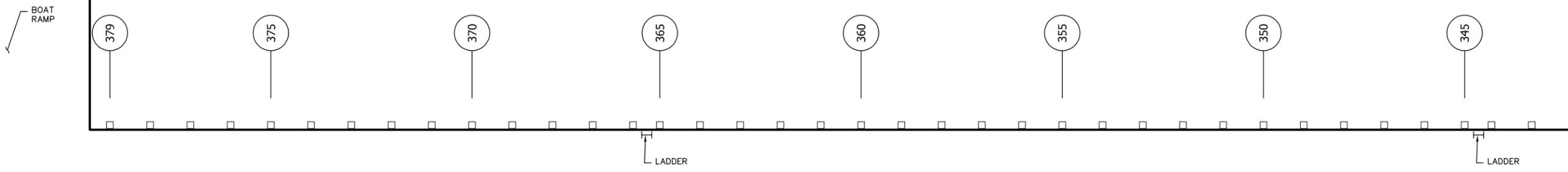
MATCHLINE - SEE LOWER RIGHT

MATCHLINE - SEE SHEET EWS4

MATCHLINE - SEE UPPER LEFT



**WESTERN SEAWALL**  
**HANDRAIL POSTS 300 TO 341**  
SCALE: 1:50



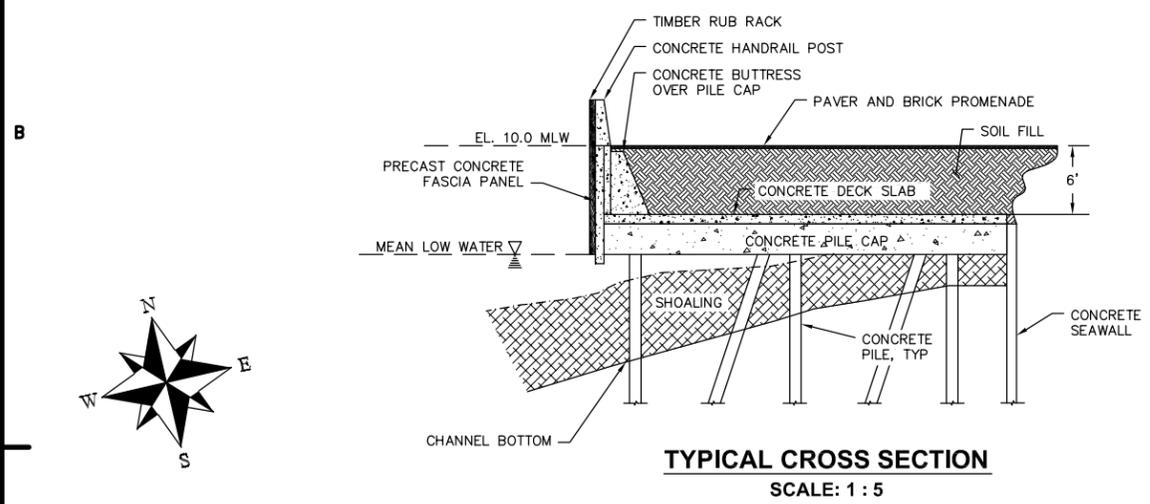
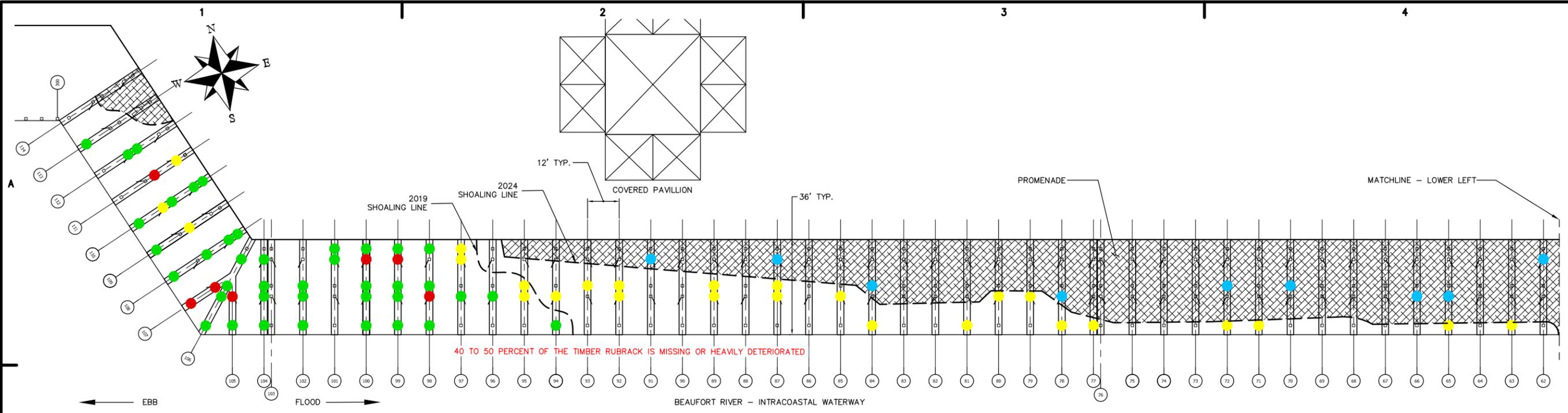
**WESTERN SEAWALL**  
**HANDRAIL POSTS 342 TO 379**  
SCALE: 1:50

**LEGEND**  
 6 CONCRETE HANDRAIL POST DESIGNATION

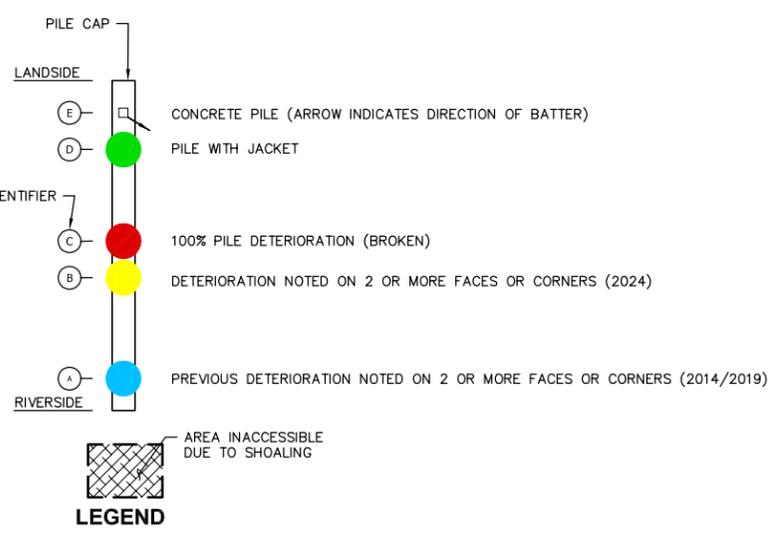
1 2 3 4

1 2 26 3 4

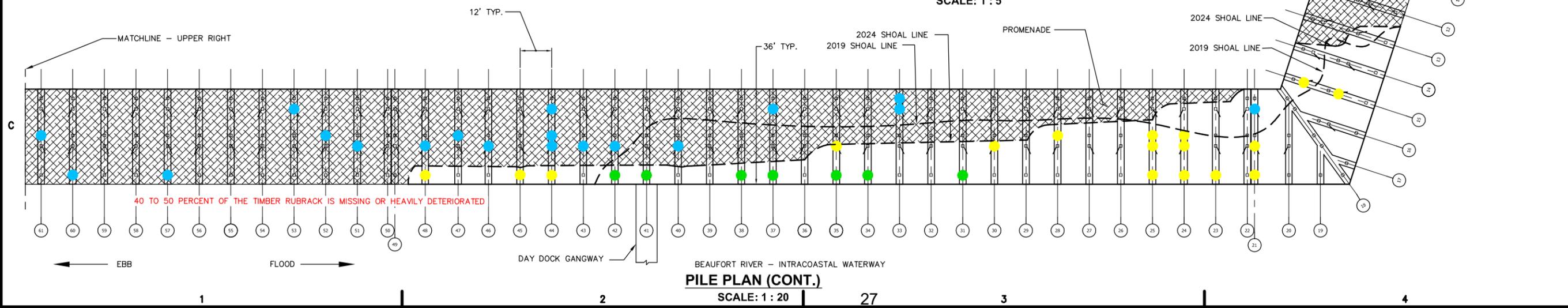
**RELIEVING PLATFORM INSPECTION - 2024**  
 HENRY C. CHAMBERS WATERFRONT PARK  
 CITY OF BEAUFORT, SOUTH CAROLINA



**PILE PLAN**  
 SCALE: 1 : 20



**TYPICAL BENT LAYOUT**  
 SCALE: 1 : 5

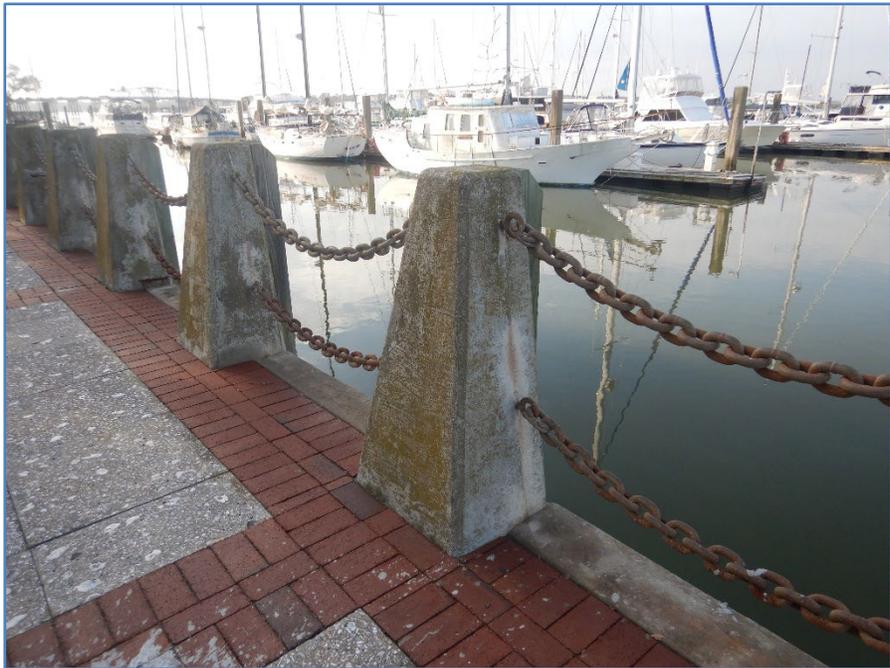


DESIGNED BY:	WDB
DRAWN BY:	WDB
CHECKED BY:	WDB
DATE:	5/20/24
REV.	DATE:

## **Attachment B Photographs**



Photograph 1: Overall View of the Relieving Platform



Photograph 2: Typical Seawall Post and Chain



Photograph 3: Typical Intermittent Spall with Exposed Reinforcing Steel



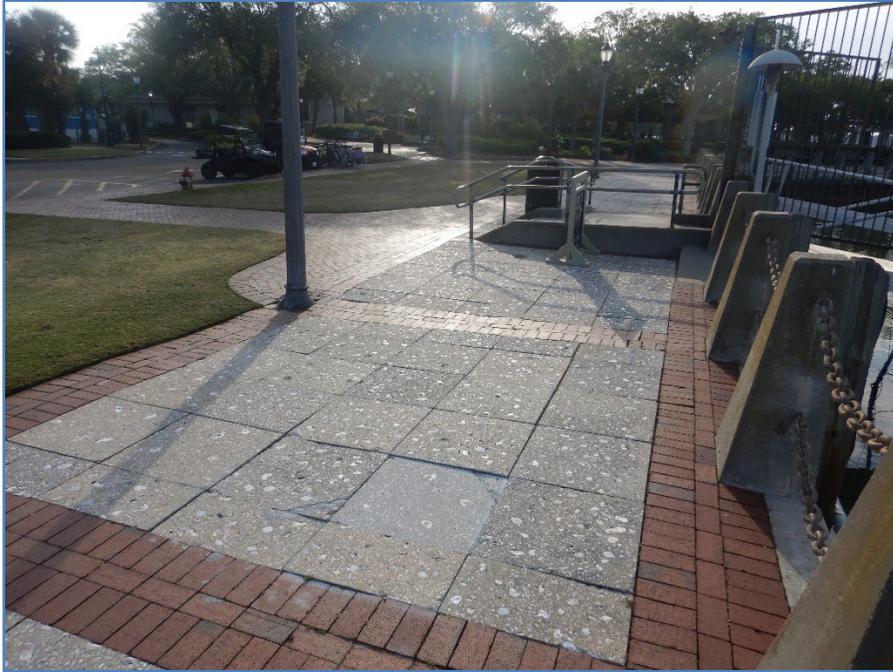
Photograph 4: Typical Rub Rack Condition Above the Waterline



Photograph 5: Typical Sinkhole Behind Seawall



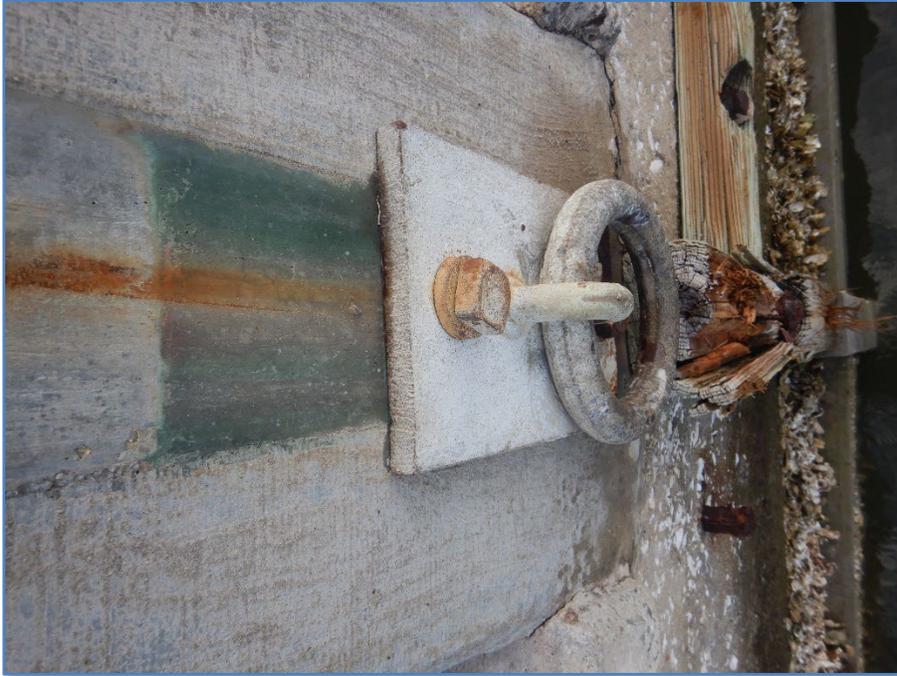
Photograph 6: Typical Chain Condition



Photograph 7: Typical Sinkhole



Photograph 8: Typical Cleat



Photograph 9: Typical Mooring Ring



Photograph 10: Typical Ladder Access



Photograph 11: Typical Hardware with Severe Corrosion and Missing Fascia Board



Photograph 12: Typical Spalling at Chain Connection with Exposed Reinforcement



Photograph 13: Typical Rust Staining at Top of Fascia Curb



Photograph 14: Disconnected Rub Rail



Photograph 15: Broken Swim Ladder



Photograph 16: Typical Cleat Corrosion



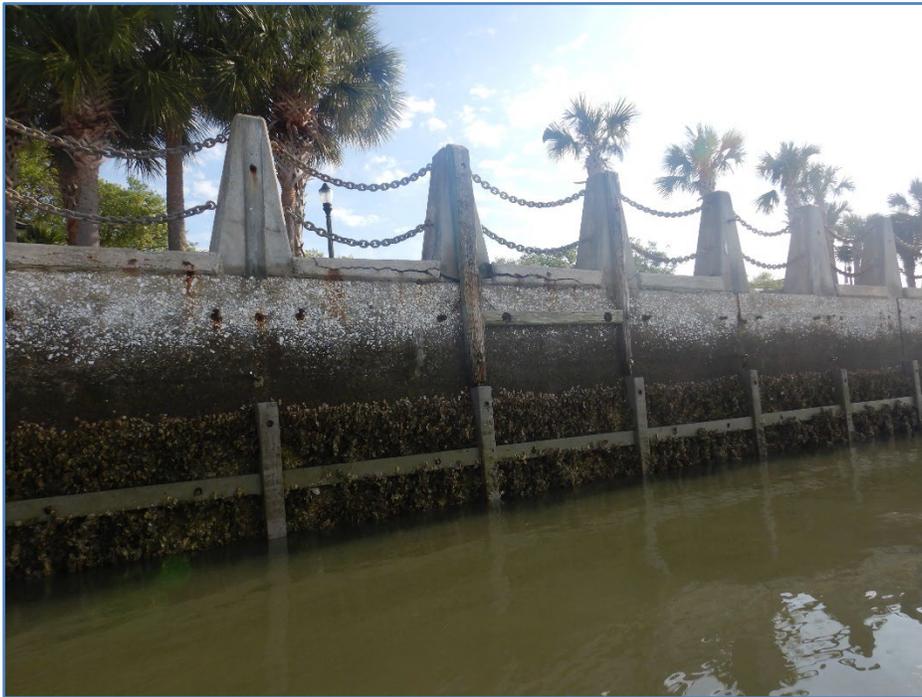
Photograph 17: Typical Expansion Joint



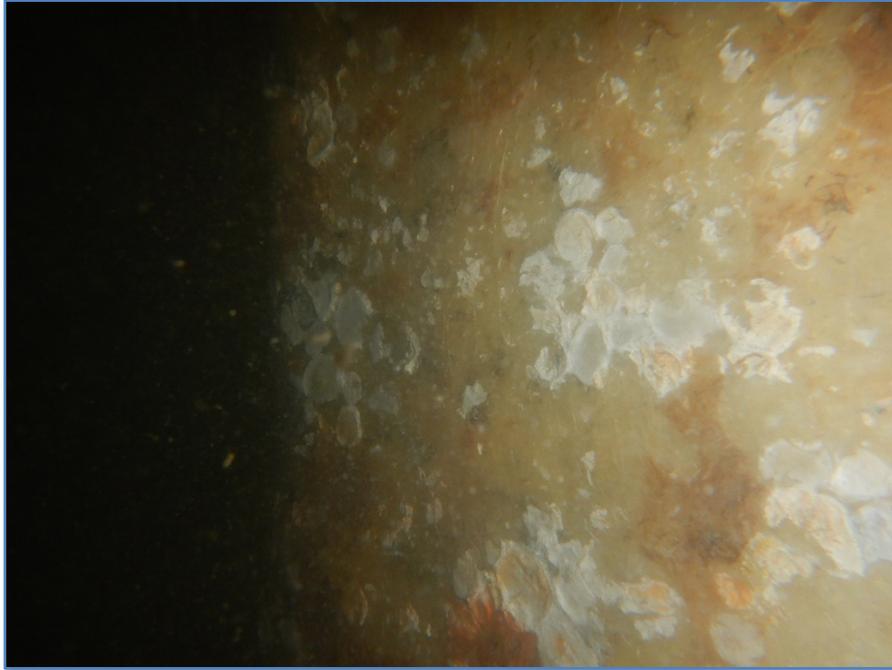
Photograph 18: Approximately 50% Missing Rub Rail



Photograph 19: Typical Seawall Spall



Photograph 20: Typical Horizontal Cracking in Fascia Curb



Photograph 21: Typical Underwater Pile With Jacket



Photograph 22: Typical Underwater Concrete Pile Condition

**Attachment C**  
**Itemized Defects List**

Henry C. Chambers Waterfront Park  
**Eastern Waterfront Structures Itemized Defect List**

<b>Pile Defect Number</b>	<b>Bent</b>	<b>Pile</b>	<b>Defect</b>	<b>Comments</b>
1	1-12	-	-	Inaccessible
2	15	B	Deterioration	5% Loss of Section
3	15	D	Spall	Mudline
4	21	A	Spall	Top of Pile
5	21	B	Deterioration	Loose Concrete
6	23	A	Deterioration	Loose Concrete
7	24	A	Deterioration	Loose Concrete
8	24	B	Deterioration	Loose Concrete
9	24	C	Deterioration	Loose Concrete
10	25	A	Gap	20% Loss of Section, Loose Concrete
11	25	B	Deterioration	(2) Rounded Corners, Loose Concrete
12	25	C	Deterioration	Loose Concrete
13	28	C	Deterioration	(1) Rounded Corners, Loose Concrete
14	30	B	Spall	(1) Corner Spall
15	35	B	Spall	15% Loss of Section

Henry C. Chambers Waterfront Park  
**Eastern Waterfront Structures Itemized Defect List**

<b>Pile Defect Number</b>	<b>Bent</b>	<b>Pile</b>	<b>Defect</b>	<b>Comments</b>
<b>16</b>	44	A	Deterioration	(4) Rounded Corners, 10-15% Loss of Section
<b>17</b>	45	A	Deterioration	(4) Rounded Corners, 15-20% Loss of Section
<b>18</b>	48	A	Deterioration	(2) Rounded Corners, 10-15% Loss of Section
<b>19</b>	63	A	Deterioration	(3) Rounded Corners, 15-20% Loss of Section
<b>20</b>	65	A	Deterioration	(2) Rounded Corners, <10% Loss of Section
<b>21</b>	71	A	Deterioration	5% Loss of Section
<b>22</b>	72	A	Deterioration	(3) Rounded Corners, 15-20% Loss of Section
<b>23</b>	77	A	Deterioration	(2) Rounded Corners, 15-20% Loss of Section

Henry C. Chambers Waterfront Park  
**Eastern Waterfront Structures Itemized Defect List**

<b>Pile Defect Number</b>	<b>Bent</b>	<b>Pile</b>	<b>Defect</b>	<b>Comments</b>
24	78	A	Deterioration	10% Loss of Section
25	79	B	Deterioration	10-20% Loss of Section
26	80	B	Deterioration	<10% Loss of Section
27	81	A	Spall	<5% Loss of Section
28	84	A	Deterioration	<10% Loss of Section
29	85	B	Deterioration	10-15% Loss of Section
30	87	B	Deterioration	<10% Loss of Section
31	87	C	Deterioration	15-20% Loss of Section
32	89	B	Deterioration	10% Loss of Section
33	89	C	Deterioration	<10% Loss of Section
34	92	B	Deterioration	10% Loss of Section
35	92	C	Deterioration	5% Loss of Section
36	93	C	Deterioration	10% Loss of Section
37	94	B	Deterioration	<10% Loss of Section

Henry C. Chambers Waterfront Park  
Eastern Waterfront Structures Itemized Defect List

<b>Pile Defect Number</b>	<b>Bent</b>	<b>Pile</b>	<b>Defect</b>	<b>Comments</b>
38	95	B	Deterioration	Rounded with 10% Loss of Section
39	95	C	Deterioration	Rounded with 10% Loss of Section
40	96	B	Deterioration	5% Loss of Section, Top of Pile
41	97	D	Deterioration	10% Loss of Section
42	97	E	Deterioration	20% Loss of Section
43	98	B	Deterioration	100% Loss of Section
44	98	C	Deterioration	(4) Rounded Corners, 20-30% Loss of Section
45	99	D	Deterioration	100% Loss of Section
46	100	D	Deterioration	100% Loss of Section
47	100	B	Spall	Pile/Cap Interface
48	104	A	Pile Jacket	Undermined Bottom Seal
49	105	B	Deterioration	100% Loss of Section

Henry C. Chambers Waterfront Park  
**Eastern Waterfront Structures Itemized Defect List**

<b>Pile Defect Number</b>	<b>Bent</b>	<b>Pile</b>	<b>Defect</b>	<b>Comments</b>
50	106	E	Deterioration	(4) Rounded Corners, No Steel Visible
51	107	A	Deterioration	100% Loss of Section, Core Sample Previously Taken
52	107	B	Deterioration	100% Loss of Section
53	109	C	Deterioration	(2) Rounded Corners, 10-15% Loss of Section
54	110	B	Deterioration	Rounding, Intermittent Corner Spalls
55	111	C	Deterioration	100% Loss of Section
56	111	D	Deterioration	10-15% Loss of Section

Henry C. Chambers Waterfront Park  
Western Seawall Itemized Defect List

Panel Defect Number	Panel Below or Adjacent to Concrete Post	Defect	Dimensions	Location	Comments
1	300-335	-	-	-	Shoaled In
2	328	Panel Separation	3" Separation, Offset 3" Out-of-Plane	Panel Edge	-
3	338	Panel Separation	3" Separation	Panel Edge	-
4	342	Panel Separation	2" Separation	Panel Edge	-
General Note:	-	-	-	Throughout Seawall	Typical 1-2" Separation Between Seawall Panels