

# WATERFRONT STRUCTURES AT WHITE BEACH FUEL PIER AND TENGAN SMALL CRAFT BERTH 2018 INSPECTION

## 1. EXECUTIVE SUMMARY

**General Project Description:** The U.S. Army Corps of Engineers (USACE) Dive Team performed a visual and tactile inspection of all above water and underwater waterfront structures and adjacent bank lines of the berthing areas at the White Beach Fuel Pier and Tengan Small Craft Berth and Seawalls in Okinawa, Japan, from April 5 to 18 2018. The structures inspected included: 1,728 LF of Fuel Pier, 250 ft of tetrapod wave protection on the shore end of the pier at White Beach, and 1,200 LF of tetrapod protected concrete seawall, 2100 SF of boat ramp, 800 LF of pile and cap wall, 225 LF of coral/stone wall and 186 LF of concrete block wall at the Tengan Small Craft Basin and Seawalls.

The primary pier (15430) at White Beach is 814 LF in length and consists of a continuous driven steel sheetpile wall with a concrete cap fronted by a row of 37 pipe piles spaced approximately 16' apart along the east and west sides of the pier and a continuous row of pipe piles circling the head. The pier is connected to shore by a 500 LF driven SSP wall with concrete cap fronted by rubblemound stone on the west side and tetrapods on the east side. Rubber fenders are firmly affixed to the concrete cap at regular intervals with stainless steel bolts. The Army Fuel Pier is used by DLA Energy Okinawa who are responsible for providing support regarding bulk petroleum products to all Department of Defense agencies in Okinawa.

The small craft berth consists of a 1200 LF seawall (15431) composed of a concrete block wall with tetrapod wave protection. A berthing facility is accessed by a concrete boat ramp (312BR), and the boat basin (312CB) is encircled by an 800 LF pile and pile cap wall. The northwestern portion of the boat basin is protected by a 225 LF stacked coral wall and 351 LF concrete block wall (312SW). The original construction date is unknown but it pre-dates 1987 when repairs were made to the Seawall. The berthing facility and boat ramp were modifications constructed in 2005.

The pier is primarily used to support LCM or Boston Whalers, and the small craft berth is primarily used for launching and dockage of small craft. The pier is located on the southeastern end of the Katchin-hanto Peninsula on the east side of the Okinawa Islands and faces south into Nakagusuku Bay, branching off the Philippine Sea. The Small Craft Berth is used to launch, retrieve, and berth vessels in support of fuel offloading operations via offshore buoys to upland storage facilities. The protective seawalls face north into Kin Wan Bay, which also leads into the Philippine Sea. The summary condition assessments are presented below for each major berthing area or structure by station.

The focus of this inspection is to assess and report all damage and deterioration of the above water and underwater portions of the structures in comparison with the baseline

inspection performed in June, 2012. The available drawings of the waterfront structures at White Beach were the as-built drawings from 1967 when the pipe piles were installed and the concrete cap re-poured, design drawings and as-builts from the SSP and concrete cap repairs and tetrapod installation in 2007, extensive drawings from the 2012 inspection performed by Appledore Marine Engineering, Inc., and the design drawings from the SSP hole repairs completed in 2017. There is also a current CAD drawings from the 2012 inspection. As-builts were not made available for the Small Craft Berth, however a complete set of CAD drawings from the 2012 assessment by Appledore Marine Engineering, Inc. are available.

In accordance with UFC-4-150-07, all structures were measured and CADD drawings were produced showing dimensions and shapes for all structures. These drawings are based solely on field measurements, since no professional survey was included in the scope of work. These drawings are submitted in addition to this report as part of the baseline inspection documentation and are listed in Appendix C.

The seawall is separated into individual structures/reaches for simplicity in assessment and reporting purposes. An overview of the structures is presented in Figure 1-1 and Figure 1-2. A description, condition assessment, recommended actions, and estimated costs for each area are shown in Table 1-1. Detailed descriptions of each area are given in Section 3 of this report.

**Structure Condition and Recommendation:** Table 1-1 below outlines the Overall Condition Rating of the pier, seawall and associated structures and provides Recommended Action to remediate the problems. The table also provides an Estimated Cost for each structure ID.



**Figure 1-1: White Beach Fuel Pier Assessment Summary**

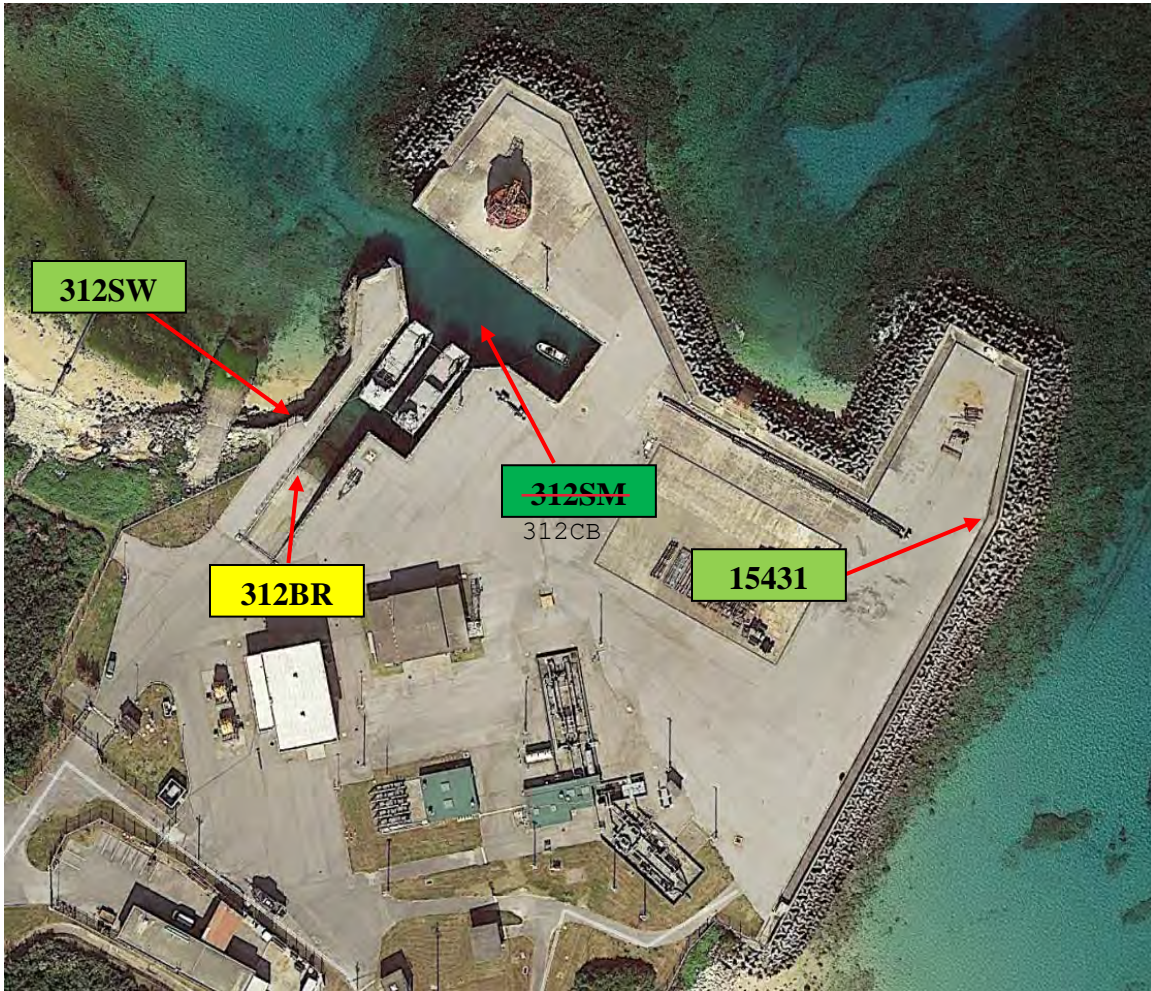


Figure 1-2: Tengan Small Craft Berth Assessment Summary

**Critical Findings:** Table 1-2 below outlines the Critical Areas of the pier and seawall and provides Recommended Action to remediate the problems. The table also provides an Estimated Cost for each structure ID.

**Table 1-2: Summary of Critical Findings and Recommended Actions**

Structure I.D.	Condition Assessment	Recommended Action	Quantity	Estimated Cost
		<ul style="list-style-type: none"> <li>No Critical Findings</li> </ul>		
<b>TOTAL :</b>				

**Future Inspection:** The next complete periodic inspection at the White Beach Fuel Pier and Tengan Small Craft Berth should be performed in 2022 or in accordance with the requirements of UFC 4-150-07 for the appropriate type of infrastructure.

**Cost Estimate:** Preliminary cost estimates have been developed for the given station ranges of waterfront at USAG, White Beach and Tengan Small Craft Berth, Okinawa, Japan. A summary of the costs are presented in Table 7-1. These repairs will bring the most damaged sections of the facility back to good condition. Full scale repairs to the entire pier and small craft facility (beyond the scope of this estimate) would include analysis of the structural capacity, utility issues, drainage as well as overtopping that may occur.

## 2. PROJECT LOCATION

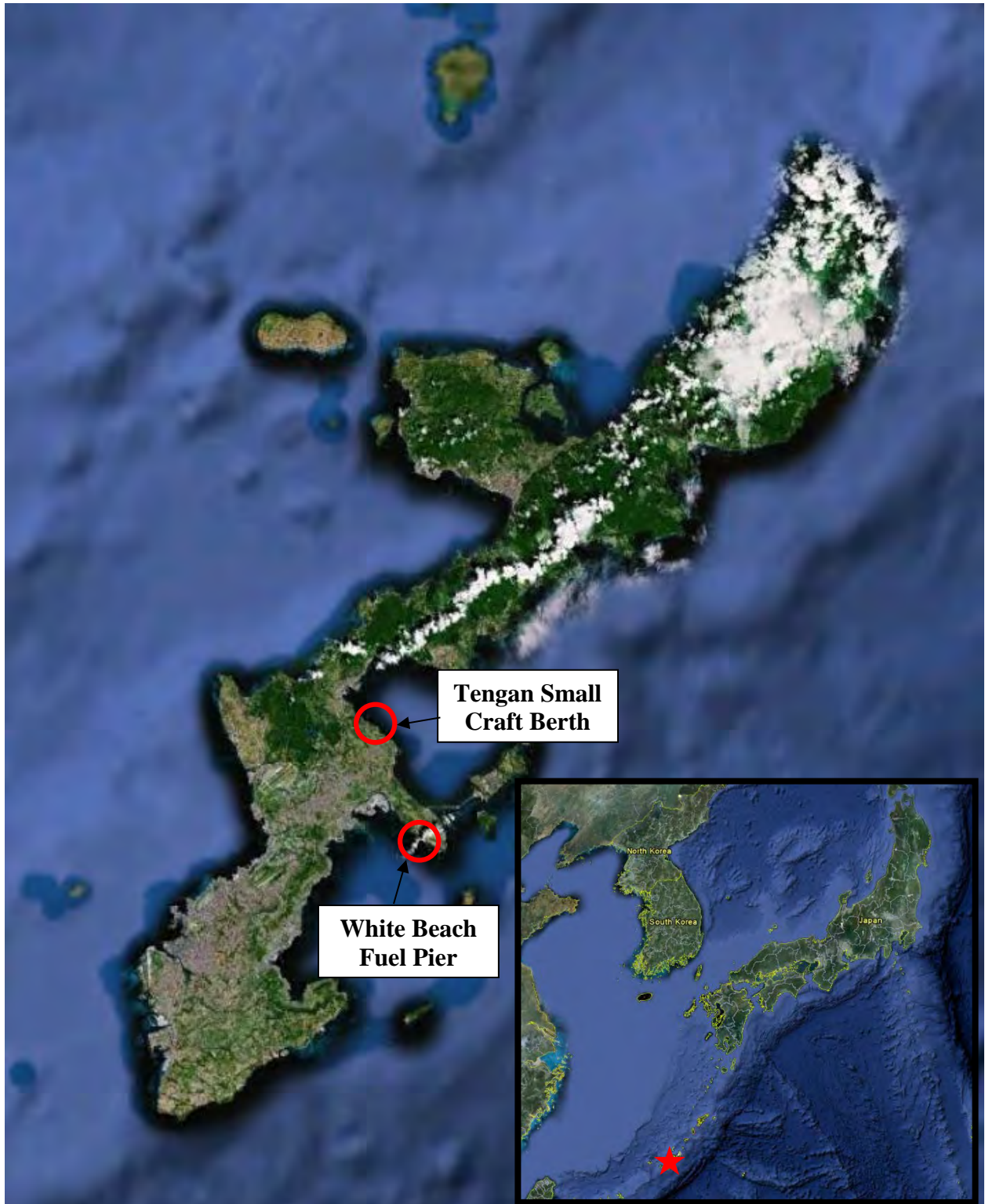


Figure 2-1: Location and Vicinity Map

### 3. WATERFRONT STRUCTURE DESCRIPTION



Figure 3-1: White Beach Fuel Pier Site Plan



Figure 3-2: Tengan Small Craft Berth Site Plan

**White Beach Fuel Pier and Tengan Small Craft Berthing Facility**

<b>Structure Name:</b>	White Beach Fuel Pier Tengan Small Craft Berth
<b>Owner :</b>	Federal Government
<b>County :</b>	Japan
<b>Real Property Number:</b>	N/A
<b>Location:</b>	Okinawa, Japan
<b>White Beach:</b>	
<b>Latitude:</b>	26 <sup>0</sup> 18' 00.6" N
<b>Longitude:</b>	127 <sup>0</sup> 54' 15.1" E
<b>Tengan:</b>	
<b>Latitude:</b>	26 <sup>0</sup> 23' 51.0" N
<b>Longitude:</b>	127 <sup>0</sup> 51' 32.3" E
<b>Installation POC:</b>	Damien O'Neill, P.E. DLA, SRM/MILCON Project Engineer
<b>Installation POC Phone Number:</b>	+011-81-98-938-1111
<b>Date of Previous Inspection:</b>	June 12, 2012
<b>Inspected By:</b>	Weston Cross P.G. Stephen England, P.E. Byron Rupp, P.G. John Bull Brian Dockstader
<b>Date of Inspection:</b>	2-18 April, 2018

**A. Facilities Overview**

The White Beach Army Fuel Pier was originally constructed in 1952, and subsequent repairs were undertaken in 1987, 2001, 2008, and 2017. The 1987 repairs included installation of new steel sheeting around most of the pier; placement of a concrete cap on the new or existing sheeting, with steel pipe piles installed to support the cap along the outboard 600 ft of pier; and casting of a concrete deck on the fill within the pier. The 2001 repairs included steel sheeting breach repairs, installation of new anodes for the steel sheeting, and partial replacement of the fender system. In 2008, repairs were made to the causeway including replacement of a 200 ft section of sheet piling, pile cap and wave protection armoring with the installation of 278 10-ton tetrapods along the east side of the pier. In 2017 repairs to the pier were undertaken based on the recommendations from the 2012 inspection, including patching of the holes identified in the SSP, the existing timber bull rail system was replaced, 10 spalls and defects in the underwater portion of the concrete cap repaired, 19 spalls in the deck of the concrete cap repaired, the boom roller assembly and 18 mooring fittings recoated, and the rubber rendering system was replaced.

The Army Fuel Pier is used by the 505th Quartermaster Battalion who are responsible for providing support regarding bulk petroleum products to all Department of Defense agencies in Okinawa. The pier is primarily used for offloading fuel from tankers to upland storage facilities. This pier is located on the southwest side of Katchin-hanto Peninsula into Nakagusuku Bay, branching off the Philippine Sea.

The Small Craft Berth is used to launch, retrieve and berth vessels in support of fuel offloading operations via offshore buoys to upland storage facilities. The original construction date is unknown but it pre-dates 1987 when repairs were made to the Seawall. The facility was expanded in 2005 to enlarge the boat basin and install the boat ramp, however settlement and shifting of the blocks has been a continual concern since expansion. The protective seawalls face north into Kin Wan Bay, which also leads into the Philippine Sea.

In order to better describe the damage in the port, each port facility has been broken out by stationing or feature to facilitate the structural assessment. The components used in the construction of each port facility and their conditions will be defined in further detail here.

**B. White Beach: Shore Attached Causeway**

**Figure 3-3. 800 LF Shore Attached Causeway**

**Shore Attached Causeway Description:** The causeway connects the fuel pier with the road-network onshore and is approximately 800 LF. It is comprised of driven SSP wall overlain by a concrete cap fronted by medium stone armor on the west side and tetrapods and medium stone armor on the east side. The steel wall is driven into the subsurface and is inaccessible for much of the length except for the seaward section of the east face, which is partially obscured by the tetrapods. There are no steel cleats and bollards on the causeway, however there is security fencing mounted to the causeway supported by steel reinforced concrete fence posts. The causeway is lined on the east and west sides by guardrails for traffic control. The guardrails terminate approximately 150 ft from the seaward end of the causeway and are replaced by epoxy and steel bull rails that line the remainder of the structure.

**Construction Date:** Original – 1952  
Reconstructed to existing configuration – 1987. Repairs completed  
in 2001, 2008, and 2017

**Reference Drawing:** Reference drawings are listed in Appendix E and provided  
separately.

**C. White Beach: Fuel Pier (Fac. Num: 15430)**



**Figure 3-4: White Beach Fuel Pier**

**White Beach Fuel Pier Description:** The pier begins with a connection with the causeway and extends 814 ft into Nakagusuku Bay. It is comprised of a driven SSP wall overlain by a concrete cap. The cap and deck have a width of between 89'-9" and 92'-4" from Station 0+00 to 2+22 and widens to 99'-0" from Station 2+22 to 8+14. The pier is

fronted by a row of 37 30" dia. steel pipe piles along the east and west face (marked A and B respectively) from Station 2+22 to Station 8+14 spaced approximately 16' on center. These pipe piles are driven into the seabed and entirely submerged, even during low tide. The concrete cap encapsulates the top of the steel wall pipe piles and SSP and extends 16' 6" ft vertically. The concrete cap is partially submerged, with the depth of submergence varying due to tidal influences. During the inspection approximately 8-10 ft of concrete was above the water and 6-8 ft was below the water. Steel cleats and bollards for tying off vessels are located along the alignment of the pier. The pier also supports utilities for fuel transport, water transport, grounding cables for use during fuel offloading, electrical utilities including area lighting, a boom roller assembly, and emergency wash station and firefighting utilities. A radiation testing device is mounted to the east face of the pier at Station 2+20. Vertical rubber fenders secured with steel bolts are located along the face of the concrete cap spaced 18 ft on center with horizontal rubber fenders between every other vertical fender. There are also epoxy coated concrete bullrails along the top edge of the wall to prevent vehicles from entering the water.

**Construction Date:** Original – 1952  
Reconstructed to existing configuration – 1987. Repairs completed in 2001, 2008, and 2017

**Reference Drawing:** Reference drawings are listed in Appendix E and provided separately.

#### D. Tengan Small Craft Basin Seawall at CWTF#3 (Fac. Num: 15431)



Figure 3-5: Tengan Small Craft Basin Seawall

**Small Craft Basin Seawall Description:** The seawall is 1200 LF long and is comprised of a pre-cast concrete block seawall fronted by tetrapod wave protection that consist of a mix of 8 and 4 ton tetrapods. The tetrapods are founded on a layer of 1100 lb. stone acting as an underlayer. A boom roller assembly is located at approximately station 4+00 to facilitate fuel offloading from adjacent offshore buoys. During the inspection, spot checks of the tetrapods were made in areas where settlement was visible from the surface, however the underwater portions of the concrete block seawall were inaccessible due to the tetrapods.

**Construction Date:** Original – Pre-dates 1987  
Reconstructed to existing configuration - 2005

**Reference Drawing:** Reference drawings are listed in Appendix E and provided separately.

E. Tengan Small Craft Berth (Fac. Num: ~~312SM~~<sup>312CB</sup>)



Figure 3-6: Tengan Small Craft Boat Basin

**Boat Basin Description:** The boat basin measures approximately 0.4 acres and is lined by an 800 LF wall with a mix of construction types.

- From Station 0+00 to 1+14 the wall consists of 40" dia. piles with a 16'-5" high and 5'-3" thick concrete pile cap. These piles were fully submerged at the time of inspection, and are driven to an elevation of -40.4'.
- From approximately station 1+14 to 2+36 the wall consists of 32" dia. piles with a 16'-5" high 4'-7" thick pile cap. These piles were fully submerged at the time of inspection and are driven to an elevation of -40.4'.
- From Station 2+36 to 6+11 the wall consists of precast stacked concrete blocks of varying widths extending down to an elevation of -11.5'.
- From Station 6+11 to 6+48 the wall consists of driven SSP with a concrete cap, the details of which are not available

- From Station 6+48 to 6+81 the wall consists of 28" dia. piles with a concrete cap, the details of which are not available.
- From Station 6+81 to 8+00 the wall consists of 36" dia. piles with a 16'-5" high and 4'-11" thick concrete pile cap. These piles were fully submerged at the time of inspection, and are driven to an elevation of -39.4'.

Vertical rubber fenders secured with steel bolts are located along the face of the concrete pile cap from Station 0+75 to 2+80, 3+06 to 3+90, and 6+80 7+50 with horizontal rubber fenders at each of the corners. There are also epoxy coated concrete bullrails along the top edge of the wall to prevent vehicles from entering the water.

**Construction Date:** Original – Pre-dates 1987  
Reconstructed to existing configuration - 2005

**Reference Drawing:** Reference drawings are listed in Appendix E and provided separately.

## F. Tengan Small Craft Berth Boat Ramp (Fac. Num: 312BR)



Figure 3-7: Tengan Small Craft Berth Boat Ramp

Figure 3- 1: Berthing Wharf No. 5

**Boat Ramp Description:** The boat ramp consists of a poured concrete pad for the upper 65'-7" starting at an elevation of +14.8' transitioning into pre-cast concrete blocks at elevation +6.6' running for 73'-6". The pre-cast concrete blocks are supported by a pre-cast toe wall at elevation -6.6'.

**Construction Date:** Original – 2005

**Reference Drawing:** Reference drawings are listed in Appendix E and provided separately.

**G. Tengan Small Craft Berth Seawall (Fac. Num: 312SW)**

**Figure 3-8: Tengan Small Craft Berth Seawall**

**Seawall Description:** The seawall consists of a stacked coral and stone wall foundation supporting a 186-ft long concrete block wall beginning at the shoreline and extending along the east side of the basin to the southern opening to the basin, continuing on the north side of the opening to connection with the main seawall (15431). The top of the seawall is at elevation +21.7'.

**Construction Date:** Original – Coral and stone seawall – Unknown  
Concrete block seawall – constructed as part of boat basin expansion in 2005

**Reference Drawing:** Reference drawings are listed in Appendix E and provided separately.

## **4. INSPECTION PROCEDURE**

In accordance with UFC 4-150-07, the detailed visual and tactile inspection was performed on all accessible portions of the waterfront structures and banklines above the water line. All structures were accessible from land for inspection on the top deck and perimeter. Access to inspect the water-side vertical face of port facilities was accomplished by using a small boat and wading in shallow areas.

The dive inspection was conducted by the USACE Dive Team consisting of two professionally registered PE-Divers, a dive supervisor, and two USACE certified divers who performed the inspection. All diving activities were accomplished in accordance with EM 385-1-1 and ER 385-1-86. The dive inspections were conducted using tethered SCUBA diving operations with 2-way voice communications. The tethered SCUBA equipment used included AGA full face masks, 200 ft communication tethers, Amron communication box, 80 cf primary air supply, and 30 cf bailout bottles. Photographs were taken of areas representing typical conditions and deficient structural components using mask mounted outland tech 325/P standard definition and GoPro Hero4 high definition cameras. Any areas of concern that were not accessible have been noted in their appropriate section. The water was shallow enough at the coral and rock seawall locations to allow the inspectors to wade in the water at low tide and inspect the full height of the wall. The inspectors had to dive the remainder of the port facilities due to the depth of the water.

ASCE defines three levels of underwater inspection efforts; during the course of this inspection, the Level I inspection required by the Scope of Work was used to gather information.

- |           |   |
|-----------|---|
| Level I   | This inspection involves no cleaning of any structural elements and, therefore, is the most rapid of the three types of inspection. The purpose of the Level I inspection is to confirm as-built structural plans, provide initial input for an inspection strategy, and detect obvious major damage or deterioration due to overstress, impacts, severe corrosion, or extensive biological growth and attack.  |
| Level II  | A detailed inspection that requires marine growth to be removed from portions of the structure below water. Cleaning is time consuming, hence the need to base the inspection on a representative sampling of components. For piles, a 12-in. high band is cleaned near the low waterline, at the mudline, and midway between the low waterline and mudline. On retaining structures, a 1-ft. x 1-ft. area is cleaned at the same three elevations. This inspection is intended to detect and identify damaged and deteriorated areas that may be hidden by surface biofouling or built up corrosion product. |
| Level III | A detailed inspection that involves nondestructive testing, conducted to detect the extent of corrosion by measuring the remaining steel thickness using ultrasonic testing. This level of inspection is limited to key structural  |

areas required to determine a representative sampling of the remaining sheet pile thickness.

For this Waterfront Facilities Inspection, all accessible structural elements were inspected. This consisted of Level I inspection of all elements above and underwater. A Level II inspection was performed in selected areas to more fully define typical conditions are areas of deficient construction or distress. Significant cleaning was required in these areas due to the presence of up to 2 in of marine growth. Cygnus steel thickness readings were performed at regular intervals along the berths. The results of these readings are presented in Appendix E.

## **5. INSPECTION METRICS AND REPORTING**

### **A. General**

The following inspection ratings are taken from ASCE 101 (Underwater Condition Assessment Ratings) and have been modified slightly to apply to the overall structural conditions exhibited at the White Beach Fuel Pier and Tengan Small Craft Berth Facilities.

**Table 5-1: Routine Underwater Condition Assessment Ratings**  
(From ASCE 101)

<b>Rating</b>	<b>Description</b>
<b>6 Good</b>	<p>No visible damage or only minor damage noted.</p> <p>Structural elements may show very minor deterioration, but no overstressing is observed.</p> <p>No repairs are required.</p>
<b>5 Satisfactory</b>	<p>Limited minor to moderate defects or deterioration are observed, but no overstressing is observed.</p> <p>No repairs are required.</p>
<b>4 Fair</b>	<p>All primary structural elements are sound, but minor to moderate defects or deterioration is observed.</p> <p>Localized areas of moderate to advance deterioration may be present but do not significantly reduce the load-bearing capacity of the structure.</p> <p>Repairs are recommended, but the priority of the recommended repairs is low.</p>
<b>3 Poor</b>	<p>Advance deterioration or overstressing is observed on widespread portions of the structure but does not significantly reduce the load-bearing capacity of primary structural components.</p> <p>Repairs may need to be carried out with moderate urgency.</p>
<b>2 Serious</b>	<p>Advance deterioration, overstressing, or breakage may have significantly affected the load bearing capacity of primary structural components.</p> <p>Local failures are possible and loadings restrictions may be necessary.</p> <p>Repair may need to be carried out on a high-priority basis with urgency.</p>
<b>1 Critical</b>	<p>Very advance deterioration, overstressing, or breakage has resulted in localized failure(s) of primary structural components.</p> <p>More widespread failures are possible or likely to occur, and load restrictions should be implemented as necessary.</p> <p>Repairs may need to be carried out on a very high priority basis with strong urgency.</p>

## B. Facility Operational Ratings

The Facility Operational Ratings are defined as:

**C-1 Facility Operational:** These facilities are in good condition, with no limitations on the original live load or berthing capacity. However, routine maintenance repairs may be required.

**C-2 Facility Mostly Operational:** These facilities typically have moderate deterioration or defects, but the load capacity is unaffected at present. Further deterioration may result in the downgrading of the load capacity in the future, if maintenance repairs are not performed. Facilities that have broken or missing fender systems are also rated as C-2, because vessel berthing is limited.

**C-3 Facility Partially Operational:** These facilities typically have areas or elements with severe deterioration that have caused load restrictions on the structure.

**C-4 Facility Not Operational:** These facilities typically have areas or elements with severe deterioration that have dramatically reduced structural integrity or resulted in localized, partial, or total collapse of the structure.

## C. Typical Damage Descriptions

The following damage descriptions are to be used in conjunction with the damage columns of the tables shown in Section 6-C of this report. Each description below will elaborate on the extent of damage listed in the tables.

### CONCRETE:

#### FINE CRACK:

- Hairline crack that is less than 1/16" wide.

#### SMALL CRACK:

- Crack width ranges from 1/16" to 1/8".
- Water will easily seep into these cracks and corrode the reinforcing steel.

#### LARGE CRACK:

- Crack width is greater than 1/8" wide.
- Corrosion of steel reinforcing is a concern, as well as loss of structural capacity of the member.

#### SURFACE SPALL:

- The area of concrete loss is shallow and does not expose any reinforcing steel.
- This type of damage is primarily cosmetic and repairs are a low priority.

#### DEEP SPALL:

- The area of concrete loss extends into the section far enough to expose reinforcing steel.

- The primary concern is corrosion of the exposed reinforcing
- Corrosion will in time lead to more bursting and spalling of concrete in adjacent areas.

**STONE:****%BK – PERCENT BROKEN ELEMENT:**

- Broken element in terms of percentage of element that is not reusable.

**EARTH:****SNK – SINKHOLE**

- Length, width and depth are recorded in “Length L (ft),” “Width W (ft),” and “Depth D (in)” columns, respectively.

**STEEL:****FAIL**

- Failure of member, loss of structural capacity due to fracture.

**LIGHT CORROSION:**

- Localized areas of corrosion where a steel section loss of 0% to 10% exists.
- Structural capacity remains intact.

**MODERATE CORROSION:**

- Localized areas of corrosion where a steel section loss of 10% to 30% exists.
- More widespread corrosion overall.
- Life expectancy of the material is beginning to be affected.

**SEVERE CORROSION:**

- Localized areas of corrosion where a steel section loss of greater than 30% exists.
- Structural capacity of the steel member is compromised.
- Localized failure is possible if not addressed.

**PNT– PAINT ON SURFACE**

- Percentage of paint chipping off of surface.

**TIMBER:****DECAY – DECAY/ROT**

- All timber that is broken, missing or shows signs of deterioration should be replaced in kind as referenced or addressed, which includes the following: timber fenders piles, decks, stringers and cross bracing.

## D. Repair Priority Key

The following repair priority descriptions are to be used in conjunction with the repair priority columns of the tables shown in Section 6 of this report. Each description below will elaborate on the urgency of the repair listed in the tables.

### M – MONITOR:

- The damage should be monitored during regularly scheduled future inspections and any repair requirements should be re-assessed then.

### L – LOW PRIORITY REPAIR:

- The damage should be repaired, but the urgency of this repair is very low. There will not be any continued deterioration or any further damage to the structure if this repair is not carried out.

### H – HIGH PRIORITY REPAIR:

- The damage should be repaired in a timelier manner than the low priority repairs, as these damages will continue to deteriorate and may cause further damage to the structure until repaired.
- There is no safety or structural capacity concerns for these damages.

### U – URGENT REPAIR:

- The damage should be repaired immediately.
- Monitoring of these locations until repairs can be completed is recommended.
- There is either safety or structural capacity concerns for these damage locations.

### R – REPLACEMENT:

- The damage is extensive and is structurally unsound for the intended use.
- These structures should be replaced in their entirety before removing load restrictions.

## E. Typical Repair Descriptions

The following repair descriptions are to be used in conjunction with the general findings and recommendation summaries and the repair column of the tables shown in Section 6 of this report. Each description below will elaborate on each “Typical” repair listed in the tables. These repairs are considered spot repairs to bring the structure back to as-built conditions.

### Repair Sinkhole Adjacent to Seawall:

Excavate behind seawall to expose source of fill loss. Repair hole in seawall with grout or mortar and place geotextile fabric behind stone wall to prevent further loss of fines and backfill. Backfill behind wall to pre-existing grade and re-seed.

### Repair Open Concrete Spall:

Remove all loose concrete, then saw cut the perimeter of the spall to no deeper than ½” from the surface. Chip the repair area down to the necessary depth to encompass the deepest point of the spall. Do not feather the edges. Chip below exposed

reinforcing a minimum of ½” to allow room for cleaning the bars and a concrete bond around the bars. Pressure wash the area to remove dirt and oil, wire brush or blast the exposed steel reinforcing to remove corrosion until a bright metal finish remains. The concrete finish should be roughened exposed aggregate. Coat the reinforcing with anti-corrosive material. Lightly wet the surface of the repair prior to concrete placement. Coat the exposed areas of concrete with a bonding agent prior to concrete placement.

#### Install Toe Protection

Install sufficient toe protection along the toe of the seawall sized similar to adjacent areas to prevent future scour at the toe of the wall.

#### Replace Failed Steel Members:

Remove all damaged steel members. Clean connections of any dirt/debris and exposed rust/scale. Install new steel member.

#### Protect Steel Sheet Piles by Coating or Jacketing

Clean steel above water with abrasive blasting equipment and underwater with water jet cleaning equipment. Install epoxy-polyamide coating, fiberglass jacket or concrete jacket to prevent further corrosion of piles.

#### Repair Steel Sheet Pile Wall with Concrete Cap and/or Face

Excavate the soil from behind the wall to a level required for the new concrete cap or attachment of form ties for a concrete face. Remove all marine growth and deteriorated steel and clean surfaces. Build forms, place reinforcing, and pour concrete at mean low water. After curing, remove forms and backfill behind wall

#### Patching Steel Sheet Pile Wall:

Clean around area to be patched with either steel plate or epoxy patch. Determine size of patch plate needed. Cut plate to size and bend plate to fit over sheet pile interlocks (if necessary). Weld plate in place.

#### Replace Timber Element (other than piles or bulkhead):

Remove deteriorated portion of timber element and replace in-kind.

#### Replace Existing Steel Sheet Pile Wall

Drive new steel sheet piling in front of existing sheet piling. Install tie rods to deadman anchor or to opposite sheet pile for lateral support. Backfill between old and new sheet piling with light weight concrete or stone fill. Install new cap above new wall and old wall.

## **6. INSPECTION SUMMARY**

### **A. GENERAL**

This section contains inspection results, Structure Condition Rating and Repair Recommendations for the Waterfront Facilities at The White Beach Fuel Pier and Tengan Small Craft Berth described by feature. Inspection results will be presented using the structure naming convention as shown previously in Figure 1-1, Figure 1-2, Table 1-1, and Table 1-2. Stationing for each port facility is along the structure's edge and increases going seaward at the White Beach Fuel Pier, and clockwise around the Tengan Small Craft Berth as specified in the as-built drawings and previous inspection reports. The stationing at the White Beach Fuel Pier is specified by pile line, with the A line on the north side of the pier, and the B line on the south side. The following sections will address the structure by stationing and will include: a brief physical description of the structure (portion), an overall assessment rating of the structure, feature assessments, an explanation of the current structural condition, damage and repair tables, and any unique damage or repair explanations not previously covered in Section 6 of this report.

Each damage and repair table will contain the following columns:

**Drawing No.** - This two-part number is unique to each type of damage description. The numbers before the dash indicates the drawing where this damage label can be found. The number after the dash represents which label on that drawing coincides with the damage and repair description and the damage photograph (i.e. 001 - 01 can be found as label 1 on drawing 001) Damage photographs are in Appendix A. Damage description drawings are in Appendix C.

**Photo No.** – The Photo Number is a numerically sequential number indicating the number of the photo located in Appendix A on which the identified facility repair summary and existing defects can be found.

**Repair Priority** – See the previous Section 5-D for the explanation of this column.

**Damage Description** – This will be split into two parts: first the location or structural member where the damage can be found, and second, a brief description of the damage. The description portion of this column may contain any of the words previously defined in Section 5-B, and where necessary, will be more descriptive.

**Repair Description** – This will contain a brief description of the required repair for each associated damage description. Many will contain “Typical” repair descriptions, which can be found in Section 5-E. If a typical or brief explanation of repair is not possible, this column will refer to a ‘Note’, which will immediately follow the table, and will describe the damage repair in the appropriate detail.

Additional information is provided in the Inspection Inventory in Appendix B and the repair cost estimates in Appendix D. The Project Drawings referenced in this Chapter are listed in Appendix E and submitted separately.

**B. White Beach: Shore Attached Causeway****CONDITION RATING - 4**

**Figure 6-1. Aerial View of Shore Attached Causeway**

**General Findings and Recommendations:**

The overall condition of the Shore Attached Causeway is **Fair**. Figure 6-1 presents an aerial view of the causeway showing the condition rating. Out of the 13 fence posts on the causeway on the east side 12 show signs of corrosion of the reinforcing steel and cracks in the concrete, with an additional 8 damaged in a similar fashion on the west side, one of which has had the foundation of the post fail, leaving the chain mesh supporting the post. The chain mesh is firmly attached to all posts on the east side, but the retaining wires have corroded to failure on 7 of the posts on the west side. The tetrapod wave protection installed on the eastern face of the causeway has shifted significantly since

placement, leaving the tetrapods at the seaward end of the shorearm poorly knitted at risk of further shifting and degradation and limiting the effectiveness of the installed wave protection. The most severe shifting occurs from Station 0+00 to 0+50 of the Fuel pier, discussed in Section 6.C. There is random rock armor placed along the western side of the causeway. This rock armor appears to be sufficient for wave action approaching from the west as it is a smaller fetch with less risk of high energy wave events. The deck of the causeway is constructed of asphalt and is in good condition, with recent repairs evident and no signs of settlement or undercutting. There is minimal to no corrosion on the guardrails lining the east and west extents of the causeway. The guardrail on the east side of the causeway terminates approximately 150' from the seaward end of the causeway with a series of bullrails provide traffic control to the south. These bullrails were recently replaced and are all in good condition. A summary of the GPS coordinates, Overall Condition Rating, and the Facility Operational Rating are presented in Table 6-1.

**Table 6-1. Summary of Overall Condition Rating and Facility Operational Rating, White Beach Fuel Pier Causeway**

<b>FACILITY NAME</b>	<b>LOCATION</b>	<b>OVERALL CONDITION RATING</b>	<b>FACILITY OPERATIONAL RATING</b>	
White Beach – Shore Attached Causeway	N 26° 18' 00.6" E 127° 54' 15.1"	<b>4</b> Fair	C-1	Facility Operational

Specific deficiencies (defects) for the various structural components are tabulated in Appendix B - Inspection Inventory. The locations of the defects are shown in DWG WH-01, WH-02, WH-04, WH-05 and photographs of selected defects are provided in Appendix A on pages A-1 through A-22.

### **Concrete Cap**

The typical condition of the concrete and deck is good and the expansion joints and material are in good condition. There are occasional spalls and hairline to 1/8" cracks in the cap that should be monitored or repaired where reinforcing steel is exposed.

### **Steel Sheet Pile Wall**

The steel sheet pile wall is mostly inaccessible through this reach, however the SSP immediately behind the tetrapods was accessible due to the displacement of the armor units. Extensive repairs to the coating of the SSP have been completed since the last inspection, but one section has either re-chipped or wasn't recoated, and minor corrosion of the SSP was evident at that spot.

### **Security Fence**

Sixteen of the fence posts have cracked and have evidence of corrosion of the reinforcing steel with the chain mesh detached from the fence posts at multiple locations. The foundation of one fence post on the west side is displaced causing deflection in the fence

### **Bullrail**

The bullrail has been replaced with a series of epoxy coated concrete bullrails, which are all in good condition.

### **Steel Cleats and Bollards**

There are no cleats or bollards along this section.

### **Rubber Fender System**

There are no rubber fenders along this section

### **Utilities**

There are a series of water and fuel manholes along this section, with most in good condition. Four (4) manholes have minor surficial corrosion and should be recoated to avoid continued deterioration. The fire hydrant and protective bollards also have minor surface corrosion and should be recoated. Locations of the utilities are shown in DWG WH-07

**Table 6-2. Repair Summary for the White Beach Fuel Pier Causeway**

<b>REPAIR ITEM NO.</b>	<b>REPAIR PRIORITY</b>	<b>PHOTO NO. (APP. A)</b>	<b>DAMAGE DESCRIPTION</b>	<b>QUANTITY</b>	<b>REPAIR DESCRIPTION</b>
001	L	1	Minor corrosion, steel man gate posts	Typ	Repaint/recoat steel
002	L	2	Cracked fence post	1 ea.	Replace post
003	L	3	Cracked fence post	1 ea.	Replace post
004	L	4	Missing wire for mesh	1 ea.	Replace post
005	L	5	Cracked fence post with loose chain mesh	1 ea.	Replace post
006	L	6	Missing wire for mesh and displaced foundation	1 ea.	Replace post
007	M	7	Missing wire for mesh	1 ea.	Replace wire
008	M	8	Missing wire for mesh	1 ea.	Replace wire
009	M	9	Missing wire for mesh	1 ea.	Replace wire
010	L	10	Horizontal Crack in PC	18" x .0625"	Epoxy Cracks and ensure cracks do not propagate
011	L	11	Cracked fence post with loose chain mesh	1 ea.	Replace post
012	L	12	Horizontal Crack in PC	18" x .0625"	Epoxy Cracks and ensure cracks do not propagate
013	L	12	Horizontal Crack in PC	18" x .0625"	Epoxy Cracks and ensure cracks do not propagate
014	L	13	Horizontal Crack in PC	18" x .125"	Epoxy Cracks and ensure cracks do not propagate
015	L	14	Horizontal Crack in PC	18" x .0625"	Epoxy Cracks and ensure cracks do not propagate

REPAIR ITEM NO.	REPAIR PRIORITY	PHOTO NO. (APP. A)	DAMAGE DESCRIPTION	QUANTITY	REPAIR DESCRIPTION
016	L	15	Horizontal Crack in PC	18" x .125"	Epoxy Cracks and ensure cracks do not propagate
017	L	16	Horizontal Crack in PC	18" x .0625"	Epoxy Cracks and ensure cracks do not propagate
018	L	16	Horizontal Crack in PC	18" x .375"	Epoxy Cracks and ensure cracks do not propagate
019	L	17	Horizontal Crack in PC	10" x .25"	Epoxy Cracks and ensure cracks do not propagate
020	L	18	Surface spall of concrete cap	6"L x 1"W x .75"D	Repair open concrete spall
021	L	19	Coating failure of fire hydrant and protective bollards	10%	Repaint hydrant and bollards
022	L	20	Surface spall of concrete cap with exposed rebar	6"L x 3" W x .75" D x 2 spalls	Repair open concrete spall
023	L	23	Missing coating on SSP behind tetrapods	6" dia	Recoat SSP
024	L	24	South end of tetrapods with underlayer exposed	100 SF	Replace/reset tetrapods
025	L	25	South end of tetrapods, with broken tetrapod	1	Replace broken tetrapod
026	H	27	Broken tetrapods (14)	14	Monitor
027	L	28	Cracked fence post	1 ea.	Replace post
028	L	29	Cracked fence post	1 ea.	Replace post
029	L	30	Cracked fence post	1 ea.	Replace post
030	L	31	Cracked fence post	1 ea.	Replace post
031	L	32	Cracked fence post	1 ea.	Replace post
032	L	33	Cracked fence post	1 ea.	Replace post
033	L	34	Cracked fence post	1 ea.	Replace post
034	L	35	Cracked fence post	1 ea.	Replace post
035	L	36	Cracked fence post with spall at top	1 ea.	Replace post
036	L	37	Cracked fence post	1 ea.	Replace post
037	L	38	Cracked fence post	1 ea.	Replace post
038	L	39	Cracked fence post	1 ea.	Replace post
039	L	41	Manhole secured closed, minor surf corrosion	Typ	Recoat manhole

TO BE COMPLETED UNDER ANOTHER PROJECT

REPAIR ITEM NO.	REPAIR PRIORITY	PHOTO NO. (APP. A)	DAMAGE DESCRIPTION	QUANTITY	REPAIR DESCRIPTION
040	L	42	Manhole minor surf corrosion	Typ	Recoat manhole
041	L	43	Manholes, minor surf corrosion	Typ	Recoat manhole
042	L	44	Manhole, moderate corrosion	Typ	Recoat manhole

C. White Beach Fuel Pier (Fac. Num: 15430)

CONDITION RATING - 4



Figure 6-2. Aerial View of the White Beach Fuel Pier

## General Findings and Recommendations:

The overall condition of the White Beach Fuel Pier is **Fair**. Figure 6-2 presents an aerial view of the berthing facility showing the condition rating. The unknitting of the tetrapods has reduced their resistance against wave action and left them vulnerable to additional shifting and degradation as well as exposing the underlayer. Extensive patching of the holes in the SSP noted in the last inspection was completed in 2016, however a number of smaller holes are still present and a 4" wide gap between adjacent sheets is open at pile A13 (Station 4+34). The bullrails on the pier have been recently replaced and are in good condition, and extensive repairs have been completed on the deck. These concrete repairs are generally in good condition with minor map cracking present in some areas. A summary of the GPS coordinates, Overall Condition Rating, and the Facility Operational Rating are presented in Table 6-3.

**Table 6-3. Summary of Overall Condition Rating and Facility Operational Rating, White Beach Fuel Pier**

FACILITY NAME	LOCATION	OVERALL CONDITION RATING	FACILITY OPERATIONAL RATING	
White Beach Fuel Pier	N 26° 18' 00.6" E127° 54' 15.1"	4 Fair	C-1	Facility Operational

Specific deficiencies (defects) for the various structural components are tabulated in Appendix B - Inspection Inventory. The locations of the defects are shown in DWG WH-02, WH-03, WH-05 and WH-06 and photographs of selected defects are provided in Appendix A on pages A-23 through A-110.

### Concrete Cap

The typical condition of the concrete is fair with honeycombing and exposed aggregate typical along the lower chamfer of the cap. Deeper open concrete spalls are present at many areas around the structure, however rebar is exposed at only two of the spalls. Expansion joints and material are in good condition. The interface where the underlying steel sheet pile is embedded concrete cap is generally in good condition with little to no sign of structural deterioration. Marine growth of up to 1 in covers the concrete from the splash zone to its terminus below the waterline.

### Grounding system

The grounding system is in generally good condition along the length of the structure. A total of five (5) ground wire clips have broken and detached from the deck and need to be replaced.

### Utilities

There are a series of water and fuel manholes along this section, with most in good condition. Thirteen (13) manholes have minor surficial corrosion and should be recoated to avoid continued deterioration. The fire hydrant and protective bollards also have minor surface corrosion and should be recoated.

### Boom Roller Assembly

The boom roller assembly has been moved from Station 8+14 to 2+30 and is in good condition, having been recently recoated.

### **Steel Pipe Piles**

The round steel pipe piles are all in good condition with light corrosion and marine growth covering its entirety. The steel typically appears to be in good condition and functioning as intended. Cygnus ultrasonic thickness readings were taken at regular intervals on the pipe piles and found no notable loss of thickness or deterioration with all readings ranging from 0.465”-0.475”

### **Steel Sheet Pile Wall**

The SSP wall is in satisfactory condition with minor surface corrosion and marine growth covering its entirety. Recent repairs have patched the larger holes along the structure, however 59 smaller holes were located along the A and B lines of the structure. These holes are from 1-6” wide and 1-6” high. A significant number of these holes were lacking fill material with >12-16” of penetration. A vertical gap between adjacent piles was also found at Station 4+34 running the entire height of the SSP wall. There was larger core stone present behind this gap, with larger open pore spaces evident between the core stones. This gap is a function of how the SSP wall was constructed and is capable of allowing finer fill material to wash out from the structure.

### **Tetrapod Armor**

The unknitting of the tetrapods is a result of the toe of the armor layer being constructed on a remnant SSP wall at Station 0+50. This SSP has deflected seaward, allowing the tetrapods to shift and reducing their resistance to wave action. This deterioration will continue and requires the SSP to be cutoff and the tetrapods reset and properly knit together with a stable toe. The tetrapods have shifted significantly since installation, as shown in Insert 6-1.



Insert 6-1. Tetrapods at White Beach Fuel Pier, 3 Nov 2007 (L) and 2 April 2018 (R)

### **Bullrail**

An epoxy coated concrete bullrail is located above the concrete cap for the entire length of this reach. Typically this bullrail is in good condition with no deterioration

### **Steel Cleats and Bollards**

There are four (4) steel cleats and twenty two (22) concrete filled steel bollard that are located along this berthing wharf. The steel cleats are 42 in long and are in satisfactory condition, with up to 10% coating failure and minor corrosion. Four of the bollards are 10” in diameter and are in satisfactory condition with up to 5% coating failure and minor

corrosion. Eighteen of the bollards have a diameter of 24 in and are constructed in pairs and are in good condition, having been recently painted. The attachment points for the bollards and cleats are embedded in concrete, but the attachments appear to be secure.

### **Rubber Fender System**

There are thirty six (36) vertical rubber fenders along each of the A and B faces between Station 2+25 and 8 +14, plus an additional four (4) along each line between Station 0+00 and 2+ 25 for a total of eighty (80) fenders measuring approximately 4 ft wide by 6 ft tall that are are firmly affixed to the vertical face of the concrete cap with steel bolts. The rubber fenders at a 16.4 ft spacing and are typically in good condition. The bolts have minor corrosion but are secure. An additional five (5) smaller vertical fenders are firmly affixed to each of the seaward corners of the structure and are in good condition. Thirty six (36) horizontal rubber fenders were installed in pairs (an upper fender above the waterline and a lower fender at the waterline at low-tide) on each side of the pier for a total of seventy two (72) horizontal fenders. All 36 of the upper fenders are firmly affixed to the structure with the mounting hardware in good condition. On the A line, 7 of the lower horizontal fenders have become detached from the structure, and additional 5 on the B line have detached from the structure and should be replaced.

**Table 6-4. Repair Summary for White Beach Fuel Pier (Fac. Num: 15430)**

REPAIR ITEM NO.	REPAIR PRIORITY	PHOTO NO. (APP. A)	DAMAGE DESCRIPTION	QUANTITY	REPAIR DESCRIPTION
044	L	46	Open concrete spall in cap with rebar exposure	30"H x 18" V x 11"D	Repair open concrete spall
045	L	47	Open concrete spall in cap	36"H x 4.5" V x 6"D	Repair open concrete spall
046	L	48	Open concrete spall in cap	18"H x 4" V x 6"D	Monitor
047	L	49	Open concrete spall in cap	4'H x 8" V x 5"D	Repair open concrete spall
048	L	50	Spiderweb cracking in cap at lower edge	6'H x 2"V x 2"D	Repair open concrete spall
049	L	51	Honeycombing at chamfer of cap	2'H x 1"V x 1"D	Repair cracks
050	M	53	Fender detached and hanging by south anchorage (right side)	1 ea.	REPLACE FENDER <del>Monitor</del>
051	L	54	Honeycombing in concrete under where fender was (Fender now detached)	6'H x 8"V	MONITOR <del>Replace fender</del>
052	M	55	Honeycombing in concrete 5'H 2"D, 1"V	5'H x 1"V x 2"D	Monitor
053	M	56	Lower fender missing	1 ea.	REPLACE FENDER <del>Monitor</del>
054	L	57	Hole in SSP	1"H x 4"V x 3"D	MONITOR <del>Replace fender</del>
055	M	58	Hole in SSP	1"H x 4"V x 3"D	Monitor
056	M	59	Vertical gap 4" separation at interlocks from PC to ML, core stone is visible	4"H x 18'V	Monitor
057	L	60	Failing concrete patch 4' below top of cap	12"H x 12"V x 4"D	Repair opening

LIGHTENING HOLE NOT A DEFECT

REPAIR ITEM NO.	REPAIR PRIORITY	PHOTO NO. (APP. A)	DAMAGE DESCRIPTION	QUANTITY	REPAIR DESCRIPTION
058	L	61	Honeycombing in bottom 2' of cap	6'H x 2"V x 2"D	Replace patch
059	M	62	Hole in flange of SSP 8" below pile cap 5' left of A16	2.5"H x 4.5"V x 14"D	Monitor
060	M	63	Hole in flange of SSP 1" below pile cap immediately behind A16	2"H x 3"V x >14"D	Monitor
061	M	64	Hole in web of SSP	2"H x 5"V	Monitor
062	M	65	2" dia hole immediately below pile cap	2" Dia	Monitor
063	M	66	Honeycombing and loss of concrete at lower corner of pile cap	8'H x 14"V x 12" D	Monitor
064	M	67	Honeycombing and loss of concrete at lower corner of pile cap	6'H x 5"V x 4"D	Monitor
065	M	68	Lower fender missing	1 ea.	<del>REPLACE FENDER</del> Monitor
066	L	69	Hole in SSP 4' below pile cap, 2' North of Pile A20	2"H x 5"V x 6"D	MONITOR <del>Replace fender</del>
067	M	70	Lower fender missing	1 ea.	<del>REPLACE FENDER</del> Monitor
068	L	71	Lower fender missing	1 ea.	Replace fender
069	L	72	Lower fender missing	1 ea.	Replace fender
070	L	73	Hole in SSP web behind A29 immediately below pile cap	2"H x 5"V	MONITOR <del>Replace fender</del>
071	M	74	Hole in SSP web	1.5"H x 4"V x 2"D	Monitor
072	M	75	Hole in SSP immediately below pile cap	4" Dia	Monitor
073	M	76	Hole in SSP web 5' below pile cap	2.5"H x 4"V	Monitor
074	M	77	large piece of debris sticking 10 ft off bottom extending 5 ft west of pier	1 ea.	Monitor
075	L	78	Hole in SSP immediately below PC in web	3"H x 4"V	Remove debris
076	M	79	Hole in SSP web 1.5' below pile cap in web	2"H x 4" V x 4"D	Monitor
077	M	80	Hole in SSP web 6' below pile cap	2"H x 4"V x 12"D	Monitor
078	M	81	Hole in SSP web 6' below pile cap	2"H x 4"V x 5"D	Monitor
079	M	82	Hole in SSP web 6' below pile cap	1.5"H x 3" V x 2" D	Monitor
080	M	83	Hole in SSP web 5' below pile cap	4"H x 1.5"H	Monitor
081	M	84	Hole in SSP web 3' below pile cap	2"H x 4"V x >12"D	Monitor
082	M	85	Hole in SSP web 3' below pile cap	2"H x 4"V x >12"D	Monitor

REPAIR ITEM NO.	REPAIR PRIORITY	PHOTO NO. (APP. A)	DAMAGE DESCRIPTION	QUANTITY	REPAIR DESCRIPTION
083	M	86	Hole in SSP web 1' below pile cap	2"H x 4"V x 12"D	Monitor
084	M	87	Honeycombing/incomplete fill along lower chamfer of pile cap	4' H	Monitor
085	M	88	Hole in SSP web 1' below pile cap	2"H x 4"V x 3"D	Monitor
086	M	89	Hole in SSP web 5' below pile cap	2"H x 4"V x 6"D	Monitor
087	M	90	Honeycombing/incomplete fill along lower chamfer of pile cap	12"H x 16"V x 9"D	Monitor
088	M	91	Honeycombing/incomplete fill along lower chamfer of pile cap	5'H x 12"V x 16"D	Monitor
089	M	92	Void in concrete at SSP interface	16"H x 18"V x 5"D	Monitor
090	M	93	Lower fender missing	1 ea.	Monitor
091	L	94	Spalling of concrete cap at construction joint with no rebar	9"H x 16"V x 6"D	<del>MONITOR</del> <del>Replace fender</del>
092	L	95	Hole in SSP 4' below pile cap	4"H x 4.5"V x <1"D	Repair open concrete spall
093	M	96	Hole in SSP at pile cap	3"H x 4.5"V x 12"D	Monitor
094	M	97	Hole in SSP at pile cap	1"H x 3"V x 8"D	Monitor
095	M	98	Hole in SSP 3' below pile cap	2"H x 4"V x 12"D	Monitor
096	M	99	Hole in SSP 5' below pile cap	2.5"H x 5"V x 12"D	Monitor
097	M	100	Slice in SSP on flange 10' below pile cap	9"H x 0.75"V x 1"D	Monitor
098	M	101	Hole in SSP web 1.5' below pile cap	2.5"H x 4.5"V x 3"D	Monitor
099	M	102	Hole in SSP web immediately below pile cap	2.5"H x 4.5"V x 3"D	Monitor
100	M	103	Hole in SSP web 2' below pile cap	3"H x 4.5"v x 8"D	Monitor
101	M	104	Hole in SSP web 4' below pile cap	3"H x 4"V x 4"D	Monitor
102	M	105	Hole in SSP web 4' below pile cap	2.5"H x 5"V x 7"D	Monitor
103	M		Lower fender missing	1 ea.	<del>REPLACE FENDER</del> <del>Monitor</del>
104	L	106	Hole in SSP web immediately below pile cap	3"H x 6"V x 7"D	<del>MONITOR</del> <del>Replace fender</del>
105	M	107	Hole in SSP web immediately below pile cap	3"H x 4"V x 5"D	Monitor
106	M		Lower fender missing	1 ea.	<del>REPLACE FENDER</del> <del>Monitor</del>
107	L		Lower fender missing	1 ea.	Replace fender

LIGHTENING HOLE NOT A DEFECT

REPAIR ITEM NO.	REPAIR PRIORITY	PHOTO NO. (APP. A)	DAMAGE DESCRIPTION	QUANTITY	REPAIR DESCRIPTION
108	L	109	failed/missing patch 5' off bottom and hole in SSP flange	2"H x 3"V	<del>MONITOR</del> <del>Replace fender</del>
109	M	110	Spalling of concrete cap at vertical fender with no rebar	4"H x 8"V x 4"D	Monitor
110	L		Lower fender missing	1 ea.	<del>Repair open</del> <del>concrete spall</del>
111	L	112	Hole in SSP web 6' below pile cap	3"H x 5"V x 12"D	<del>MONITOR</del> <del>Replace fender</del>
112	M	113	Hole in SSP web immediately below pile cap	3"H x 5"V x 5"D	Monitor
113	M	114	Honeycombing/incomplete fill along lower chamfer of pile cap		Monitor
114	M	115	Hole in SSP web	3"H x 5"V	Monitor
115	M	116	Lower fender missing	1 ea.	<del>REPLACE FENDER</del> <del>Monitor</del>
116	L	117	Hole in SSP web	3"H x 5"V x >12"D	<del>MONITOR</del> <del>Replace fender</del>
117	M	118	Hole in SSP web	3"H x 5"V x >12"D	Monitor
118	M	119	Hole in SSP web	3"H x 5"V x >12"D	Monitor
119	M	120	Spalling of concrete cap with no exposed steel	12'H x 4"V x 3"D	Monitor
120	M	121	Horizontal crack in bottom of cap	6'H x 1"V x 1"D	Monitor
121	M	122	Honeycombing/incomplete fill along lower chamfer of pile cap	5'H	Monitor
122	M	123	Honeycombing/incomplete fill along lower chamfer of pile cap	5'H	Monitor
123	M	124	Spalling of concrete at fender connections with no exposed steel	10"H x 5"V x 5"D	Monitor
124	L	125	Hole in SSP web	3"H x 5"V x 6" D	<del>Repair open</del> <del>concrete spall</del>
125	M	126	Hole in SSP web	3"H x 5"V x 6" D	Monitor
126	M	127	Hole in SSP web	3"H x 5"V x 6" D	Monitor
127	M	128	Slice in SSP web and flange with deflection seaward	14"H x 5"V x 3"D	Monitor
128	M	129	Hole in SSP web	3"H x 5"V x 6"D	Monitor
129	M	130	Open void in concrete cap	9"H x 3"V x 3"D	Monitor
130	M	131	Hole in SSP web	4"H x 5"V 6"D	Monitor
131	M	132	Hole in SSP web	4"H x 5"V 6"D	Monitor
132	M	133	Hole in SSP web	4"H x 5"V 6"D	Monitor

REPLACE FENDER

MONITOR

REPAIR ITEM NO.	REPAIR PRIORITY	PHOTO NO. (APP. A)	DAMAGE DESCRIPTION	QUANTITY	REPAIR DESCRIPTION
133	M	134	Hole in SSP web	4"H x 5"V 6"D	Monitor
134	M	135	Hole in SSP web	4"H x 5"V 6"D	Monitor
135	M	136	Void in concrete at interface with pipe pile	4"H x 5"V 6"D	Monitor
136	M	137	Hole in SSP web 12' below pile cap	2"H x 4"V x10"D	Monitor
137	M	138	Slice in SSP web and flange with no deflection	21"H x .75"V x5"D	Monitor
138	M	139	Hole in SSP web 13' below pile cap	3"H x 4"V x 16"D	Monitor
139	M	140	Hole in SSP web 10' below pile cap	2.5" x 3.5"V x 6"D	Monitor
140	M	141	Open concrete spall in pile cap with exposed rebar	6"H x 2"V x 4"D	Monitor
141	L	142	Hole in SSP web 13' below pile cap	2"H x 1.5"V x6"D	Repair open concrete spall
142	M	143	Hole in SSP flange 18' below pile cap	3"H x 2"V x >16"D	Monitor
143	M	144	Open concrete spall in pile cap with no exposed rebar	15"H x2"V x5"D	Monitor
144	L	145	Open concrete spall in pile cap at lower corner with no exposed rebar	30"H x 10"V x 11"D	Repair open concrete spall
145	L	146	Honeycombing/incomplete fill along lower chamfer of pile cap with exposed rebar cage	16"H x 6"V x 6"D	Repair open concrete spall
146	L	147	Honeycombing/incomplete fill along lower chamfer of pile cap	10'H	Repair open concrete spall
147	M	148	Open concrete spall in pile cap at lower corner with no exposed rebar	24"H x 5"V x2.5"D	Monitor
148	L	149	Toe of tetrapods founded on remnant SSP causing deflection and unknitting of tetrapod armor layer		Repair open concrete spall
149	H	150	Open concrete spall in pile cap with exposed rebar	24"H x 8"V x7"D	Cutoff SSP, reset tetrapod toe and tetrapods
150	L	151	Settlement along alignment, no chg. since last inspection		<del>Repair open concrete spall</del>
151	M	152	Settlement and standing water along A line, no change since last inspection		MONITOR
152	M	153	Settlement of cap up to 1/4" with standing water, no change since last inspection		Monitor
153	M	154	Settlement of cap up to 1.5", no change since last inspection		Monitor

TO BE COMPLETED  
BY ANOTHER  
PROJECT

REPAIR ITEM NO.	REPAIR PRIORITY	PHOTO NO. (APP. A)	DAMAGE DESCRIPTION	QUANTITY	REPAIR DESCRIPTION
154	M	155	Manhole, minor corrosion, moderate cracking in slab	10%	Monitor
155	L	156	42" Cleat - minor coating failure, minor corrosion	5%	Recoat <del>manhole</del> CLEAT
156	L	157	10" Bollard - minor coating failure, minor corrosion	10%	Recoat <del>cleat</del> BOLLARD
157	L	158	10" Bollard - minor coating failure, minor corrosion	10%	Recoat bollard
158	L	159	42" Cleat - minor coating failure	5%	Recoat <del>bollard</del> CLEAT
159	L	162	Fire hydrant and protective bollards - 10% coating failure	10%	Recoat <del>cleat</del> GUARD POST
160	L	163	10" Bollard - minor coating failure, minor corrosion	5%	Recoat bollards
161	L	164	Ladder - minor corrosion	5%	<del>Recoat bollard</del> MONITOR
162	L	165	Elec Manhole, minor surface corrosion	5%	<del>Recoat ladder</del> MONITOR
163	L	166	10" Bollard - minor coating failure, minor corrosion	10%	Recoat <del>manhole</del> BOLLARD
164	L	167	42" Cleat - minor coating failure, minor corrosion	10%	Recoat <del>bollard</del> CLEAT
165	L	168	42" Cleat - minor coating failure	5%	Recoat cleat
166	L	172	Series of small patches with minor map cracking, standing water due to settlement		Recoat <del>cleat</del> BOLLARD
167	M	178	Water valve access and base of UTE2-E, concrete in good condition, minor surface corrosion on 3- 8" dia water access covers	5%	Monitor
168	L	179	Secured elec manhole and 2 water access cover, minor surficial corrosion, base of UTE2-W	5%	Recoat access covers
169	L	182	Repairs to CCS, minor map cracking entire width of cap		<del>Recoat manhole</del> MONITOR
170	M	183	Fire hydrant and protective bollards - 50% coating failure, minor corrosion on hydrant	50%	RECOAT GUARD POSTS <del>Monitor</del>
171	L	184	Repairs to CCS, minor map cracking		MONITOR <del>Recoat bollards</del>
172	M	185	24" Bollard, 5% paint loss	5%	RECOAT BOLLARD <del>Monitor</del>
173	L	186	Damage to grounding clip	1 ea.	Recoat bollard
174	L	190	Patch at corner of building, minor map cracking		MONITOR <del>Replace clip</del>
175	M	191	Elec Manhole minor surficial corrosion, UTE base	10%	Monitor
176	L	195	Ladder intact, railing dented	1 ea.	<del>Recoat manhole</del> MONITOR

REPAIR ITEM NO.	REPAIR PRIORITY	PHOTO NO. (APP. A)	DAMAGE DESCRIPTION	QUANTITY	REPAIR DESCRIPTION
177	L	198	Elec Manhole, minor surface corrosion	5%	RECOAT MH COVER <del>Repair ladder</del>
178	L	199	Frayed and split grounding wire at clip	1 ea.	<del>Recoat</del> <del>manhole</del> REPLACE G/WIRE
179	L	202	2 broken grounding wire clips	2 ea.	Replace clip
180	L	205	Broken grounding wire clip	1 ea.	Replace clips
181	L	206	10" dia manhole, minor corrosion	5%	RECOAT MH COVER <del>Replace clip</del>
182	L	207	10" dia manhole, minor corrosion	5%	Recoat manhole COVER
183	L	210	Water valve access at base of E fire hydrant, minor corrosion	5%	Recoat manhole COVER
184	L	211	Water valve access at base of W fire hydrant, minor corrosion	5%	Recoat valve access COVER
185	L	212	Water valve access at base of E fire hydrant, minor corrosion - looking N on pier	5%	Recoat valve access COVER
186	L	213	Fire hydrant and protective bollards - 90% coating failure, 10% corrosion on bollards, 5% corrosion on hydrant	90%	RECOAT GUARD POSTS <del>Recoat valve</del> <del>access</del>
187	L	214	Minor corrosion on bollards at fire hydrant, 30% coating failure, 10% corrosion	30%	RECOAT GUARD POSTS <del>Recoat bollards</del>
188	L	219	10" dia manhole, moderate corrosion	30%	RECOAT MH COVER <del>Recoat bollards</del>
189	L	220	Boom roller assembly mounts cut off, closed concrete spall at remnant anchorage	2'H x 0.5"D	REPAIR CONC. SPALLING <del>Recoat</del> <del>manhole</del>
190	L	221	10" dia manhole, moderate corrosion	30%	<del>Repair closed</del> <del>concrete spall</del> RECOAT MH COVER

THIS REPAIR  
ITEM IS AT  
TENGAN BASIN

**D. Tengan Small Craft Basin Seawall at CWTF#3 (Fac. Num: 15431)****CONDITION RATING - 5**

**Figure 6-3. Aerial View of Tengan Small Craft Basin Seawall at CWTF#3 (15431)**

**General Findings and Recommendations:**

The overall condition of the Tengan Small Craft Basin Seawall is Satisfactory. Figure 6-3 presents an aerial view of the seawall showing the condition rating. A summary of the GPS coordinates, Overall Condition Rating, and the Facility Operational Rating are presented in Table 6-5.

**Table 6-5. Summary of Overall Condition Rating and Facility Operational Rating, Berth 0003**

FACILITY NAME	LOCATION	OVERALL CONDITION RATING	FACILITY OPERATIONAL RATING	
TSCB Seawall 15431	N 26 <sup>o</sup> 23' 50.93" E127 <sup>o</sup> 51' 32.76"	<b>5</b> <b>Satisfactory</b>	C-1	Facility Operational

Specific deficiencies (defects) for the various structural components are tabulated in Appendix B - Inspection Inventory. The locations of the defects are shown in DWG TE-01 and photographs of selected defects are provided in Appendix A on pages A-111 through A-130.

### **Concrete Seawall**

The typical condition of the concrete is Satisfactory with irregular hairline to 1/8 cracking along the top face of the seawall. Expansion joints and material are in good condition. The connection of the seawall and the substructure was not accessible, however no settlement of foundation issues are manifested in the seawall itself.

### **Tetrapod Armor**

The tetrapod armor is in Satisfactory condition with limited settlement observed at Station 1+55, where the toe of the tetrapods are placed on a section of remnant SSP at risk of deflection seaward. Occasional areas of lower tetrapod density, either due to loss of a tetrapod, or not placing a tetrapod at construction are in place between Station 8+00 and 12+00.

### **Railings/Roller Boom**

The roller boom is in Good Condition, having been recently repainted. The railing at the roller boom assembly is missing, and the railing at Station 12+00 has up to 80% section loss and requires replacement.

**Table 6-6. Repair Summary for the Tengan Small Craft Basin Seawall at CWTF#3 (Fac. Num: 15431)**

REPAIR ITEM NO.	REPAIR PRIORITY	PHOTO NO. (APP. A)	DAMAGE DESCRIPTION	QUANTITY	REPAIR DESCRIPTION
T-A_01	M	224	Tetrapod toe on SSP	Typ	Cutoff SSP and Reset Tetrapods
T-A_02	M	228	Typical light abrasion damage on outer face of seawall	Typ	Monitor
T-A_03	M	229	Typical light abrasion damage on outer face of seawall, slight settlement in tetrapods	Typ	Monitor
T-A_04	L	230	Horizontal Crack in Seawall	12" x .125"	Epoxy Cracks and ensure cracks do not propagate
T-A_05	L	231	Horizontal Crack in Deck Slab	48" x .125"	Epoxy Cracks and ensure cracks do not propagate

REPAIR ITEM NO.	REPAIR PRIORITY	PHOTO NO. (APP. A)	DAMAGE DESCRIPTION	QUANTITY	REPAIR DESCRIPTION
T-A_06	L	232	Horizontal Crack in Seawall	18" x .0625	Epoxy Cracks and ensure cracks do not propagate
T-A_07	L	233	Horizontal Crack in Seawall	24" x .125"	Epoxy Cracks and ensure cracks do not propagate
T-A_08	L	234	Horizontal Crack in Seawall	18" x .0625	Epoxy Cracks and ensure cracks do not propagate
T-A_09	L	235	Horizontal Crack in Seawall	42" x .125"	Epoxy Cracks and ensure cracks do not propagate
T-A_10	L	236	Horizontal Crack in Seawall	20" x .125"	Epoxy Cracks and ensure cracks do not propagate
T-A_11	L	238	Horizontal Crack in Seawall	24" x .125"	Epoxy Cracks and ensure cracks do not propagate
T-A_12	M	239	Minor unknitting of tetrapods at corner	Typ	Monitor
T-A_13	H	240	Handrail Missing	1 Ea.	Replace Handrail
T-A_14	L	241	Open concrete spall at railing mount	12" x 12" x 8"	Patch Spall
T-A_15	L	242	Horizontal Crack in Seawall	30" x .125"	Epoxy Cracks and ensure cracks do not propagate
T-A_16	M	243	Minor tetrapod settlement	Typ	Monitor
T-A_17	M	244	Minor tetrapod settlement	Typ	Monitor
T-A_18	L	245	Horizontal Crack in Seawall	30" x .125"	Epoxy Cracks and ensure cracks do not propagate
T-A_19	M	246	Missing/poorly spaced tetrapod	1 Ea.	Monitor
T-A_20	M	247	Horizontal Crack in Seawall	30" x .125"	Epoxy Cracks and ensure cracks do not propagate
T-A_21	M	248	Minor tetrapod settlement	Typ	Monitor
T-A_22	M	249	Minor tetrapod settlement	Typ	Monitor
T-A_23	M	250	Minor tetrapod settlement	Typ	Monitor
T-A_24	M	251	Missing/poorly spaced tetrapod	Typ	Monitor

REPAIR ITEM NO.	REPAIR PRIORITY	PHOTO NO. (APP. A)	DAMAGE DESCRIPTION	QUANTITY	REPAIR DESCRIPTION
T-A_25	M	252	Minor tetrapod settlement	Typ	Monitor
T-A_26	M	253	Horizontal Crack in Seawall	30" x .125"	Monitor
T-A_27	L	254	Open Concrete Spall	6" x 2" x 5"	Patch Spall
T-A_28	M	255	Missing/poorly spaced tetrapod	Typ	Monitor
T-A_29	M	256	Missing/poorly spaced tetrapod	Typ	Monitor
T-A_30	M	257	Missing/poorly spaced tetrapod	Typ	Monitor
T-A_31	H	258	Corrosion of handrail, up to 80 pct. section loss	5 Ea.	Replace Handrail
T-A_32	L	259	Fence mounts - moderate corrosion	100%	Replace/Repair mounts

E. Tengan Small Craft Berth (Fac. Num: ~~312SM~~<sup>312CB</sup>)

CONDITION RATING - 6

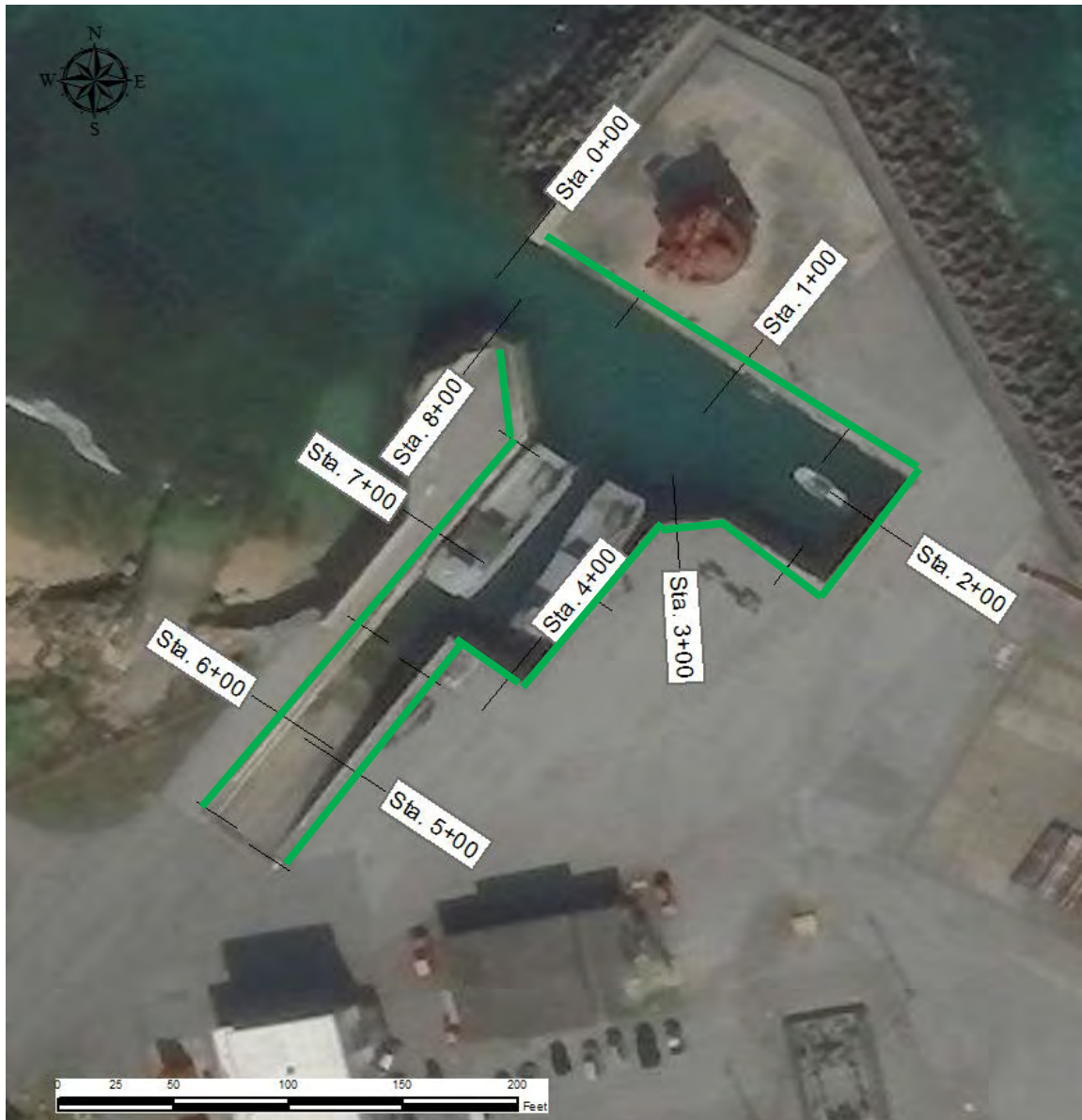


Figure 6-4. Aerial View of the Tengan Small Craft Berth (Fac. Num: ~~312SM~~)

312CB

**General Findings and Recommendations:**

The overall condition of the Small Craft Berth is **Good**. Figure 6-4 presents an aerial view of the berthing facility showing the condition rating. Sedimentation has resulted in a total water depth 6 to 8 ft at the entrance at low tide. The sand bottom rapidly slopes to a depth of between 12 to 14 ft in the areas immediately adjacent to the berthing wall. A summary of the GPS coordinates, Overall Condition Rating, and the Facility Operational Rating are presented in Table 6-7

**Table 6-7. Summary of Overall Condition Rating and Facility Operational Rating, Tengan Small Craft Berth (Fac. Num: ~~312SM~~ 312CB)**

FACILITY NAME	LOCATION	OVERALL CONDITION RATING	FACILITY OPERATIONAL RATING	
TSCB Berthing Facility <del>(312SM)</del> 312CB	N 26° 23' 52.35" E127° 51' 31.09"	<b>6 Good</b>	C-1	Facility Operational

Specific deficiencies (defects) for the various structural components are tabulated in Appendix B - Inspection Inventory. The locations of the defects are shown in DWG TE-02 and TE-03 and photographs of selected defects are provided in Appendix A on pages A-130 through A-151.

### **Concrete Pile Cap**

The typical condition of the concrete is Good with two (2) locations of minor spalling along the top edge with no exposed rebar. Expansion joints and material are in good condition. The interface between the Pile Cap and underlying piles is generally in good condition with little to no sign of structural deterioration. Marine growth of up to 2 in covers the concrete from the splash zone to its terminus below the waterline.

### **Round Pile Wall**

The steel sheet pile exterior wall has minor surface corrosion and marine growth covering its entirety. The piles range in diameter from 32" to 40" and are firmly embedded into the substrate and the pile cap. The anodes are firmly affixed to the piles and typically have approximately 30% loss. Overall the steel piles typically appear to be in good condition and functioning as intended.

### **Stacked Masonry Wall**

The stacked masonry wall has minor marine growth and some open gaps at block intersections, but does not appear to be deflecting or showing signs of deterioration or stress. There are occasional corner spalls in the masonry blocks, but the wall overall is in Good condition.

### **Bullrail**

An epoxy coated concrete bullrail is located above the concrete cap for the entire length of this berth. Typically this concrete parapet is in good condition with no significant spalls, and the rail has been recently replaced or painted.

### **Steel Cleats and Bollards**

There are sixteen (16) concrete filled bollards and one (1) 30-Ton double bit that are located along the top of the pile cap. The bollards range from 3.4 to 28 ton. Minor deterioration of the coating is evident on most of the bollards, however recoating was taking place at the time of the inspection. The attachment points for the bollards and cleats are embedded in concrete, but the attachments appear to be secure.

### **Rubber Fender System**

There are thirty six (36) vertical rubber fenders measuring approximately 1 ft wide by 8 ft tall by 10 in thick are firmly affixed to the vertical face of the concrete cap with steel bolts. The rubber fenders are typically in good condition. There are smaller, 3 ft long

horizontal fenders located at the outside corners of the berth. These horizontal fenders are in good condition and firmly affixed to the wall. The bolts are typically minorly corroded but secure.

**Table 6-8. Repair Summary for the Tengan Small Craft Berth (Fac. Num: ~~312SM~~ 312CB)**

REPAIR ITEM NO.	REPAIR PRIORITY	PHOTO NO. (APP. A)	DAMAGE DESCRIPTION	QUANTITY	REPAIR DESCRIPTION
T-B_01	H	262	Shoaling at entrance	Typ	Evaluate stability to dredge
T-B_02	M	264	Softer concrete and honeycombing at bottom of pilecap	3H' x 6"V x 6"D	Monitor
T-B_03	M	266	Separation up to 2" stacked wall showing interface with block joints lined up	Typ	Monitor
T-B_04	M	267	Corner spall at block intersection	10"H x 8"V x 6"D	Monitor
T-B_05	M	268	Corner spall at block intersection	4"H x 3.5"V x 6"D	Monitor
T-B_06	M	269	Corner spall at block intersection	8"H x 3.5"V x 3"D	Monitor
T-B_07	M	270	Corner spall at block intersection	10"H x 10"V x 6"D	Monitor
T-B_08	M	271	Corner spall at block intersection - 2.5" dia x 4 in D at top of lower block	2.5"H x 2.5"V x 4"D	Monitor
T-B_09	L	274	Moderate corrosion of fender hardware	Typ	Recoat/replace
T-B_10	L	279	Bollard 3 - 3.4 ton - minor corrosion, being repaired	5%	Recoat Bollard
T-B_11	L	280	Bollard 4 - 3.4 ton - minor corrosion, being repaired	5%	Recoat Bollard
T-B_12	L	281	Bollard 5 - 3.4 ton - minor corrosion, being repaired	5%	Recoat Bollard
T-B_13	L	285	Bollard 8 - 3.4 ton - 25% coating loss due to abrasion	25%	Recoat Bollard
T-B_14	L	286	Bollard 1 - 3.4 ton - 75% coating loss	75%	Recoat Bollard
T-B_15	L	287	Bollard 2 - 3.4 ton - 50% coating loss	50%	Recoat Bollard
T-B_16	L	294	Ramp control gate - minor corrosion	10%	Recoat gate
T-B_17	L	295	Bollard 8 - 3.4 ton -10% coating loss	10%	Recoat Bollard
T-B_18	L	296	Bollard 7 - 10% coating loss	10%	Recoat Bollard
T-B_19	L	297	Storm drain and grate - 20% coating loss and minor corrosion	20%	Recoat Drain GRATING
T-B_20	L	298	Bollard 6 - 3.4 Ton - 30% coating loss and minor corrosion	30%	Recoat Bollard
T-B_21	L	299	Abrasion damage to fender	Typ	Replace Fender

TO BE ACCOMPLISHED UNDER DIFFERENT PROJECT →

<b>REPAIR ITEM NO.</b>	<b>REPAIR PRIORITY</b>	<b>PHOTO NO. (APP. A)</b>	<b>DAMAGE DESCRIPTION</b>	<b>QUANTITY</b>	<b>REPAIR DESCRIPTION</b>
T-B_22	L	300	Open concrete spall on deck	12" x 8" x 0.5"D	Repair Open Concrete Spall
T-B_23	L	301	Bollard - - 3.4 ton - 10% coating loss	10%	Recoat Bollard
T-B_24	L	302	Open concrete spall on Pile Cap	10" x 8" x 1"D	Repair Open Concrete Spall

**F. Tengan Small Craft Berth Boat Ramp (Fac. Num: 312BR)****CONDITION RATING - 4**

Figure 6-5. Aerial View of the Tengan Small Craft Berth Boat Ramp (Fac. Num: ~~312SM~~ 312BR)

**General Findings and Recommendations:**

The overall condition of the Boat Ramp is **Fair** due to the settlement of the pre-cast concrete blocks that form the ramp. Figure 6-5 presents an aerial view of the berthing facility showing the condition rating. A summary of the GPS coordinates, Overall Condition Rating, and the Facility Operational Rating are presented in Table 6-9.

**Table 6-9. Summary of Overall Condition Rating and Facility Operational Rating, Tengan Small Craft Berth Boat Ramp (Fac. Num: 312BR)**

FACILITY NAME	LOCATION	OVERALL CONDITION RATING	FACILITY OPERATIONAL RATING	
TSCB Berthing Facility <del>(312SM)</del> 312CB	N 26° 23' 52.35" E127° 51' 31.09"	<b>4 Fair</b>	C-1	Facility Operational

Specific deficiencies (defects) for the various structural components are tabulated in Appendix B - Inspection Inventory. The locations of the defects are shown in DWG TE-02 and photographs of selected defects are provided in Appendix A on pages A-152 through A-153.

### **Precast Concrete Block Ramp**

The typical condition of the concrete is good with no signs of deterioration in the concrete itself. The ramp has settled significantly, and up to 12" of void space was found at the block joints. This settlement has caused a 4" vertical gap where the blocks meet the above water portion of the ramp and settlement can be expected to continue if not repaired

### **Concrete End Wall**

The seaward end of the precast concrete blocks are contained by an endwall that is generally in satisfactory condition. There are no cracks or defects in the concrete itself to note, however the wall has tilted seaward by up to 2" in response to the settlement of the precast concrete blocks.

**Table 6-10. Repair Summary for Tengan Small Craft Berth Boat Ramp (Fac. Num: 312BR)**

REPAIR ITEM NO.	REPAIR PRIORITY	PHOTO NO. (APP. A)	DAMAGE DESCRIPTION	QUANTITY	REPAIR DESCRIPTION
T_BR	H	303,304, 305,306	Settling of ramp at lower end had resulted in a 4" dropoff and shifting of the ramp slabs	Typ	Repair settling via injected flowable fill or resetting blocks

**G. Tengan Small Craft Berth Seawall (Fac. Num: 312SW)****CONDITION RATING - 4**

**Figure 6-6. Aerial View of Tengan Small Craft Berth Seawall (Fac. Num: 312SW)**

**General Findings and Recommendations:**

The overall condition of the Small Craft Berth Seawall is **Fair** due to the loss of concrete in the coral seawall foundation as well as corrosion of the reinforcing steel in the fence posts adjacent to the seawall. Figure 6-6 presents an aerial view of the seawall showing the condition rating. A summary of the GPS coordinates, Overall Condition Rating, and the Facility Operational Rating are presented in Table 6-11.

**Table 6-11. Summary of Overall Condition Rating and Facility Operational Rating, Tengan Small Craft Berth Seawall (Fac. Num: 312SW)**

FACILITY NAME	LOCATION	OVERALL CONDITION RATING	FACILITY OPERATIONAL RATING	
TSCB Berthing Facility (312SW)	N 26 <sup>0</sup> 23' 51.85'' E127 <sup>0</sup> 51'29.73''	<b>4 Fair</b>	C-1	Facility Operational

Specific deficiencies (defects) for the various structural components are tabulated in Appendix B - Inspection Inventory. The locations of the defects are shown in DWG NA-02 and photographs of selected defects are provided in Appendix A on pages A-154 through A-164.

#### **Concrete Block Seawall**

The typical condition of the concrete is **Good** with no spalling, cracking, or settlement observed.

#### **Coral and Stone Wall**

The typical condition of the coral and stone seawall is **Fair** due to cracking in the mortar between blocks and occasional voids reducing the overall support for the wall. This reduction in support does not appear to be impacting the overlying concrete block seawall

#### **Security Fence**



Eight (8) of the fence posts have cracked and have evidence of corrosion of the reinforcing steel. The access for the disused boat launch west of the facility has minor corrosion of the steel.



Table 6-12. Tengan Small Craft Berth Seawall (Fac. Num: 312SW)



REPAIR ITEM NO.	REPAIR PRIORITY	PHOTO NO. (APP. A)	DAMAGE DESCRIPTION	QUANTITY	REPAIR DESCRIPTION
T_C_01	M	307	Typical view of deck with minor vegetation in construction joints	Typ	Remove vegetation
T_C_02	M	310	Coral seawall at corner - concrete present between stones but cracked	Typ	Monitor
T_C_03	M	311	Void in concrete filling - coral not loose but poorly cemented, void goes back 5', >4' tall	Typ	Monitor
T_C_04	M	313	Dislodged coral and void in wall	Typ	Monitor
T_D_01	L	318	Light post and bollards - 15% coating loss on bollards (marked 24)	15%	Recoat bollards
T_D_02	L	319	Cracked fence post	1 ea.	Replace post
T_D_03	L	320	Cracked fence post	1 ea.	Replace post
T_D_04	L	321	Cracked fence post	1 ea.	Replace post
T_D_05	L	322	Cracked fence post	1 ea.	Replace post
T_D_06	L	323	Cracked fence post	1 ea.	Replace post
T_D_07	L	324	Cracked fence post	1 ea.	Replace post
T_D_08	L	325	Cracked fence post	1 ea.	Replace post
T_D_09	L	326	Cracked fence post	1 ea.	Replace post
T_D_10	L	327	Former access gate - minor corrosion	10%	Recoat gate



# **Appendix A**

## **Photographs**


<p><b>PHOTOLOG SHEET</b></p>	
<p><b>Client Name:</b> White Beach Fuel Pier Okinawa, Japan</p>	
<p><b>Date:</b> 4/16/18</p>	
<p><b>Site Location:</b> White Beach Causeway</p>	
<p><b>Photo No:</b> 1</p>	
<p><b>Description:</b> Sta. -6+30A – Minor corrosion, steel man gate posts</p>	
<p><b>PHOTOLOG SHEET</b></p>	
<p><b>Client Name:</b> White Beach Fuel Pier Okinawa, Japan</p>	
<p><b>Date:</b> 4/16/2018</p>	
<p><b>Site Location:</b> White Beach Causeway</p>	
<p><b>Photo No:</b> 2</p>	
<p><b>Description:</b> Sta. -5+70A – Cracked fence post</p>	



<p><b>PHOTOLOG SHEET</b></p>	
<p><b>Client Name:</b> White Beach Fuel Pier Okinawa, Japan</p>	
<p><b>Date:</b> 4/16/18</p>	
<p><b>Site Location:</b> White Beach Causeway</p>	
<p><b>Photo No:</b> 3</p>	
<p><b>Description:</b> Sta -5+10A – Cracked fence post</p>	
<p><b>PHOTOLOG SHEET</b></p>	
<p><b>Client Name:</b> White Beach Fuel Pier Okinawa, Japan</p>	
<p><b>Date:</b> 4/16/18</p>	
<p><b>Site Location:</b> White Beach Causeway</p>	
<p><b>Photo No:</b> 4</p>	
<p><b>Description:</b> Sta. -4+60A – Missing wire for mesh</p>	


<p><b>PHOTOLOG SHEET</b></p>	
<p><b>Client Name:</b> White Beach Fuel Pier Okinawa, Japan</p>	
<p><b>Date:</b> 4/16/18</p>	
<p><b>Site Location:</b> White Beach Causeway</p>	
<p><b>Photo No:</b> 5</p>	
<p><b>Description:</b> Sta. -4+50A - Cracked fence post with loose chain mesh</p>	
<p><b>PHOTOLOG SHEET</b></p>	
<p><b>Client Name:</b> White Beach Fuel Pier Okinawa, Japan</p>	
<p><b>Date:</b> 4/16/18</p>	
<p><b>Site Location:</b> White Beach Causeway</p>	
<p><b>Photo No:</b> 6</p>	
<p><b>Description:</b> Sta. -4+40A – Missing wire for mesh and displaced foundation</p>	


<p><b>PHOTOLOG SHEET</b></p>	
<p><b>Client Name:</b> White Beach Fuel Pier Okinawa, Japan</p>	
<p><b>Date:</b> 4/16/18</p>	
<p><b>Site Location:</b> White Beach Causeway</p>	
<p><b>Photo No:</b> 7</p>	
<p><b>Description:</b> Sta. -4+30A – Missing wire for mesh</p>	
<p><b>PHOTOLOG SHEET</b></p>	
<p><b>Client Name:</b> White Beach Fuel Pier Okinawa, Japan</p>	
<p><b>Date:</b> 4/16/18</p>	
<p><b>Site Location:</b> White Beach Causeway</p>	
<p><b>Photo No:</b> 8</p>	
<p><b>Description:</b> Sta. -4+20A – Missing wire for mesh</p>	



<p><b>PHOTOLOG SHEET</b></p>	
<p><b>Client Name:</b> White Beach Fuel Pier Okinawa, Japan</p>	
<p><b>Date:</b> 4/16/18</p>	
<p><b>Site Location:</b> White Beach Causeway</p>	
<p><b>Photo No:</b> 9</p>	
<p><b>Description:</b> Sta. -4+10A – Missing wire for mesh</p>	

<p><b>PHOTOLOG SHEET</b></p>	
<p><b>Client Name:</b> White Beach Fuel Pier Okinawa, Japan</p>	
<p><b>Date:</b> 4/16/18</p>	
<p><b>Site Location:</b> White Beach Causeway</p>	
<p><b>Photo No:</b> 10</p>	
<p><b>Description:</b> Sta. -4+10A – Horizontal Crack in PC</p>	

<p><b>PHOTOLOG SHEET</b></p>	
<p><b>Client Name:</b> White Beach Fuel Pier Okinawa, Japan</p>	
<p><b>Date:</b> 4/16/18</p>	
<p><b>Site Location:</b> White Beach Causeway</p>	
<p><b>Photo No:</b> 11</p>	
<p><b>Description:</b> Sta. -4+00A - Cracked fence post with loose chain mesh</p>	
<p><b>PHOTOLOG SHEET</b></p>	
<p><b>Client Name:</b> White Beach Fuel Pier Okinawa, Japan</p>	
<p><b>Date:</b> 4/16/18</p>	
<p><b>Site Location:</b> White Beach Causeway</p>	
<p><b>Photo No:</b> 12</p>	
<p><b>Description:</b> Sta. -3+95A – 2 x Horizontal Crack in PC</p>	

<p><b>PHOTOLOG SHEET</b></p>	
<p><b>Client Name:</b> White Beach Fuel Pier Okinawa, Japan</p>	
<p><b>Date:</b> 4/16/18</p>	
<p><b>Site Location:</b> White Beach Causeway</p>	
<p><b>Photo No:</b> 13</p>	
<p><b>Description:</b> Sta. -3+85A – Horizontal Crack in PC</p>	

<p><b>PHOTOLOG SHEET</b></p>	
<p><b>Client Name:</b> White Beach Fuel Pier Okinawa, Japan</p>	
<p><b>Date:</b> 4/16/18</p>	
<p><b>Site Location:</b> White Beach Causeway</p>	
<p><b>Photo No:</b> 14</p>	
<p><b>Description:</b> Sta. -3+75A – Horizontal Crack in PC</p>	

<p><b>PHOTOLOG SHEET</b></p>	
<p><b>Client Name:</b> White Beach Fuel Pier Okinawa, Japan</p>	
<p><b>Date:</b> 4/16/18</p>	
<p><b>Site Location:</b> White Beach Causeway</p>	
<p><b>Photo No:</b> 15</p>	
<p><b>Description:</b> Sta. -3+80A – Horizontal Crack in PC</p>	
<p><b>PHOTOLOG SHEET</b></p>	
<p><b>Client Name:</b> White Beach Fuel Pier Okinawa, Japan</p>	
<p><b>Date:</b> 4/16/18</p>	
<p><b>Site Location:</b> White Beach Causeway</p>	
<p><b>Photo No:</b> 16</p>	
<p><b>Description:</b> Sta. -3+10A – 2 x Horizontal Crack in PC</p>	

<p><b>PHOTOLOG SHEET</b></p>	
<p><b>Client Name:</b> White Beach Fuel Pier Okinawa, Japan</p>	
<p><b>Date:</b> 4/16/18</p>	
<p><b>Site Location:</b> White Beach Causeway</p>	
<p><b>Photo No:</b> 17</p>	
<p><b>Description:</b> Sta. -2+85A – Horizontal Crack in PC</p>	
<p><b>PHOTOLOG SHEET</b></p>	
<p><b>Client Name:</b> White Beach Fuel Pier Okinawa, Japan</p>	
<p><b>Date:</b> 4/16/18</p>	
<p><b>Site Location:</b> White Beach Causeway</p>	
<p><b>Photo No:</b> 18</p>	
<p><b>Description:</b> Sta. -2+00A – Surface spall of concrete cap</p>	

<p><b>PHOTOLOG SHEET</b></p>	
<p><b>Client Name:</b> White Beach Fuel Pier Okinawa, Japan</p>	
<p><b>Date:</b> 4/16/18</p>	
<p><b>Site Location:</b> White Beach Causeway</p>	
<p><b>Photo No:</b> 19</p>	
<p><b>Description:</b> Sta. -1+50A – Coating failure of fire hydrant and protective bollards</p>	
<p><b>PHOTOLOG SHEET</b></p>	
<p><b>Client Name:</b> White Beach Fuel Pier Okinawa, Japan</p>	
<p><b>Date:</b> 4/16/18</p>	
<p><b>Site Location:</b> White Beach Causeway</p>	
<p><b>Photo No:</b> 20</p>	
<p><b>Description:</b> Sta. -1+40A – Surface spall of concrete cap with exposed rebar</p>	