FINAL REPORT
JUN 5, 2017

Port of San Francisco

Dry Dock EUREKA

Structural Assessment Report

June 2017

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1. Executive Summary

Dry Dock "EUREKA" is currently in poor condition and cannot be rated to safely lift any vessel load. At numerous locations, the pontoon deck plate exhibits significant section loss due to corrosion, along with cracks and fractures in the underdeck serrated stiffeners. This finding is in general agreement with the January 2017 commercial inspection conducted by Heger Dry Dock, Inc.

2. Introduction

2.1 Scope of Work

GHD-Telamon Engineering Consultants, Inc (TECI) Joint Venture was retained by the Port of San Francisco to perform an independent inspection and analysis of Dry Dock "EUREKA" to determine its lifting capacity and propose short-term and long-term repairs. The inspection and analysis would consist of corrosion engineers performing ultrasonic thickness (UT) meter readings, a dive team for underwater assessments, and structural engineers analyzing the structure using finite element modeling. Additionally, GHD-TECI was tasked to review and summarize the previous reports and certifications.

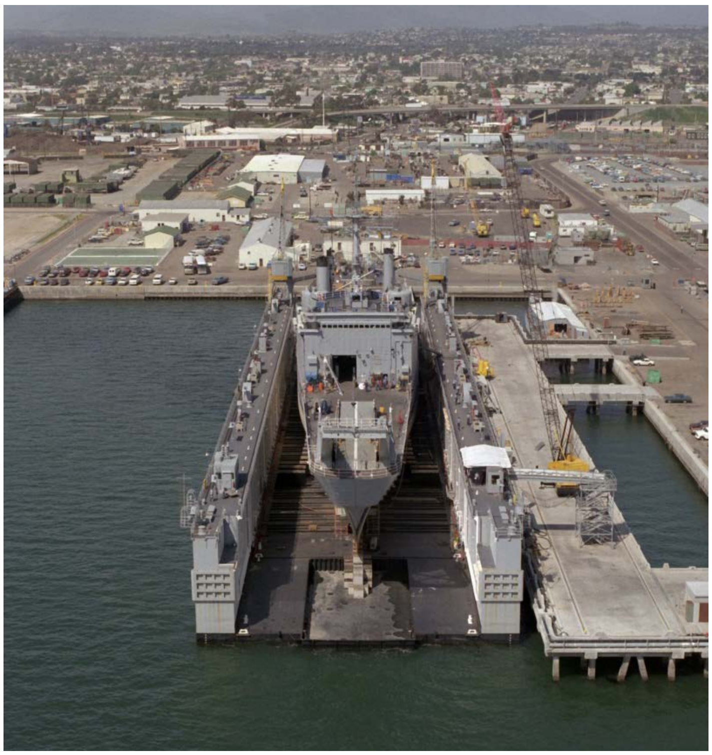


Figure 1: AFDM 14 at Naval Base San Diego (1986)

2.2 Description

The "EUREKA" dry dock, formerly known as "STEADFAST" (AFDM 14), was built by Pollock-Stockton Shipbuilding in Stockton, California. The dock was completed in July of 1945. The dock is a Frederick Harris design three piece welded steel sectional dock capable of self docking.

At the time of construction, the dock was designated as YFD 71 and rated capable of lifting a maximum ship of 17,500 long tons. On February 1, 1983 the dock was reclassified as an AFDM.

The dock was operated at the Naval Station in San Diego, California before it was obtained by the city of San Francisco in 1998. The dock was previously operated by BAE Systems, but as of January 2017 it is operated by Puglia Engineering.

Dry Dock ”EUREKA” currently is moored to a stationary pier at the Puglia Shipyard at the Port of San Francisco. The dry dock is oriented with the apron and access ramp at the south and the port side moored to the adjacent pier.

The “EUREKA” is one of two floating dry docks owned by the Port of San Francisco and located at the San Francisco Shipyard at Pier 70. Both dry docks are included in long-term lease agreements with ship repair contractors (tenant). The tenants are responsible for the maintenance and upkeep of the dry docks, along with bi-annual inspection and certification. The most recent inspection took place in January 2017 and did not pass certifications for lifting operations.

The vessel has been recently used at the shipyard to dry dock liquid bulk barges, United States Coast Guard (USCG) cutters, tugs and Navy Sealift command ships.

GHD-TECI completed the ultrasonic thickness (UT) testing and external corrosion assessment survey of selected ballast tanks on March 2 and March 3, 2017, and spot checks of the pontoon deck plate was surveyed on March 8, 2017. To inspect the hull, a 4-person dive team from Collins Engineering, a specialty contractor experienced in underwater inspections, performed an underwater inspection from March 6 through March 10, 2017.

Principal Characteristics of Dry Dock “EUREKA”:

- Length over pontoons: 528’-0
- Length Overall: 569’-0”
- Breadth overall: 118’-0”
- Width Between Wing Walls (molded): 90’-0”
- Clear Width Between Fenders: 86’-0”
- Height Overall: 52'-2"
- Height of Wing Deck above Pontoon Deck: 36’-0”
- Height of Pontoon Deck at Centerline: 16’-2”
- Design Draft over Pontoon Deck: 33’-0”
- Lightship Draft: 5’-0”
- Current Maximum Draft over Pontoon Deck[1]: 12’-0”

Note 1: The shipyard noted that the maximum achievable submergence draft of the dock has decreased to about 12ft over the pontoon deck due to sediment accumulation in the submergence pit.

The pontoon sections are divided into a total of 16 ballast compartments (8 per side) and 10 centerline void tanks. The dock is subdivided into 16 ballast tanks, seven trim tanks, seven buoyancy chambers, plus various machinery rooms and miscellaneous compartments on the second deck (safety deck).

A plan of the deck and compartments is shown below as Figure 2.

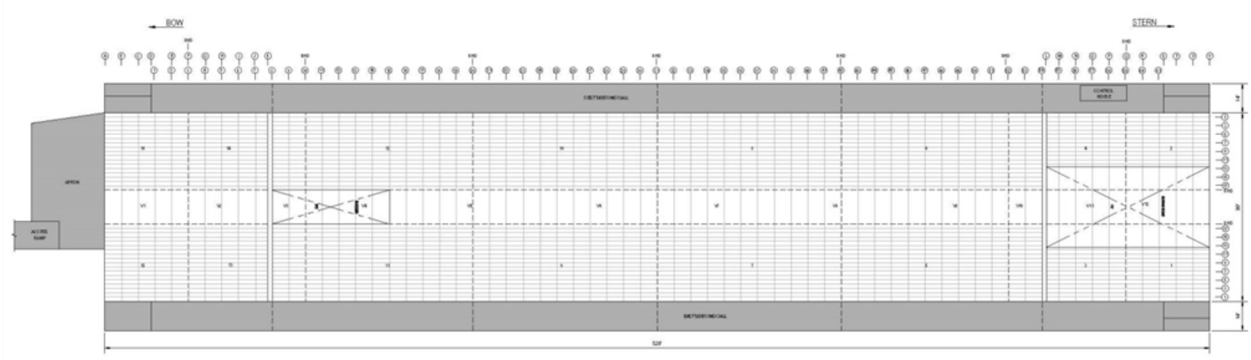


Figure 2: Dry Dock EUREKA Plan

A typical floating dry dock is shown in section as Figure 3 below.

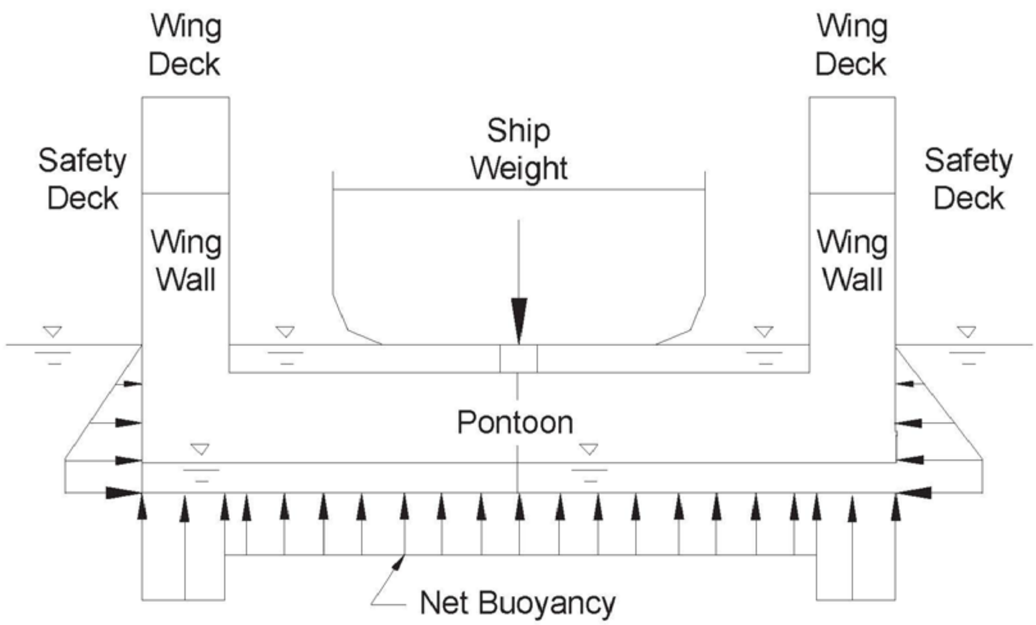


Figure 3: Typical Floating Dry Dock Section

Floating Dry Dock Displacement

Displacement of a floating vessel is equivalent to the weight of the water it displaces; therefore, displacement is another way of expressing the weight of the vessel itself. The displacement of a dock without a ship in dock equals the gross weight of the dock. The displacement of a loaded dock equals the gross weight of the dock plus the weight of the ship.

The draft of the EUREKA dock varies with the displacement. Table 1 indicates the displacement of the dock at various pontoon freeboards and corresponding drafts (pontoon freeboard is measured at the lowest point of pontoon deck, which occurs at the sidewall.

The total weight of the EUREKA structure is estimated to be 6,200 long tons. It is estimated that approximately 600 long tons of residual water cannot be pumped out by the main deballasting pumps. This produces a minimum gross weight of 6,800 long tons. The EUREKA was originally rated as a 14,000-ton lifting capacity drydock at 18-inch freeboard when keel block loadings are limited to 27.5 long tons per foot average and 33 long tons per foot maximum.

Table 1: Dry Dock EUREKA Displacement

Pontoon Freeboard	Dock Draft	Displacement (long tons)
10'-8"	5'-0"	5,400
9'-8"	6'-0"	7,050
8'-8"	7'-0"	8,750
7'-8"	8'-0"	10,450
6'-8"	9'-0"	12,200
5'-8"	10'-0"	13,900
4'-8"	11'-0"	15,650
3'-8"	12'-0"	17,450
2'-8"	13'-0"	19,200
1'-8"	14'-0"	20,950
1'-6"	14'-2"	21,300
0'-8"	15'-0"	22,800
0'-0"	15'-8"	24,000

2.3 Basis of Assessment

The following documents were referenced in the condition assessment of Dry Dock EUREKA.

- Structural and Operational Inspection Report for EUREKA, Heger Dry Dock, Inc., January 2015.
- UT/VT Survey Report for EUREKA, International Inspection, May 2015.
- EUREKA Dry Dock Ultrasonic Thickness Inspection, DRS Marine Inc., December 2016.
- Tandem Barge Docking Feasibility Review, Heger Dry Dock, Inc., January 2017.
- Commercial Inspection for EUREKA Floating Dry Dock, Revision 1, Heger Dry Dock, Inc., January 2017.

The following standards were used in the inspection and assessment of Dry Dock EUREKA:

- US Coast Guard Barge Inspection Guide Surface Forces Logistics Center (SFLC) Standard Specification 8634.
- General Information Book for Auxiliary Floating Dry Dock (AFDM) 14 – "Steadfast".
- American Bureau of Shipping (ABS), Rules for Building and Classing Steel Floating Dry Docks, 2009.
- NAVSEA Design Data Sheet DDS 100-4, 1982.

3. Timeline of Dry Dock EUREKA

Table 2: Summary of Condition and Ratings

Year	Condition	Rating	Notes
1945	New	17,500 LT	Constructed in Stockton, CA, and initially designated YFD 71.[1]
1981-1985	Renewed	N/A	Major rework and repair at a cost of over $20 million. Reclassified as AFDM 14 "Steadfast" in 1983.[1]
1995		N/A	All ballast and trim tanks were sandblasted to white metal and coated with long-lasting preservative.[1]
1997		N/A	Towed to Suisun reserve fleet and moth balled.[1]
1999		N/A	Sold to City of San Francisco, and towed to San Francisco dry dock.[1]
2000	Excellent	N/A	Condition survey found the dry dock to be in excellent condition and well-maintained.[1]
2004		N/A	The 2006 certification noted that there was an inspection performed along with underwater inspection in 2004. GHD-TECI and the Port of San Francisco did not have access to records from this inspection.[2]
2006		14,000 LT 33 LT/ft	While the certification checklist noted that all structural components were in satisfactory condition, it was based on the 2004 inspection.[2]
2008		14,000 LT 33 LT/ft	While the certification checklist noted that all structural components were in satisfactory condition, it was based on the 2004 inspection.[3]

Year	Condition	Rating	Notes
2010		14,000 LT 33 LT/ft	While the certification checklist noted that all structural components were in satisfactory condition, it was based on the 2004 inspection. There was an inspection that used UT sounding every five feet along the 6 bands. Additionally, a 3-man dive team performed underwater inspection of the hull. They noted that the hull was in good condition with observable coatings in good condition. The sacrificial anodes at the intake screens were 50% used.[4]
2012	Fair to Good	14,000 LT 27 LT/ft	Pontoon deck plating has little to no paint protection remaining, condition varies from moderate rust to heavy rust with pitting, scaling, and holes. Pinholes are noted in some areas at the underside of the pontoon deck and stiffeners. Heger inspected the ballast tanks and noted the steel is structurally in good condition with no signs of overstressing.[5]
2015	Fair to Good	14,000 LT 27 LT/ft	Pontoon deck plating has little to no paint protection remaining, condition varies from moderate rust to heavy rust with pitting, scaling, and holes. Heger inspected the ballast tanks and noted stress cracks at the serrated stiffeners inside the ballast tanks. They counseled the operator to develop a plan to repair or replace these stiffeners on an ongoing basis.[6]
2017	Poor	Not Certified	Widespread fractures at the under deck serrated stiffeners and a significant portion of the deck plate exhibit 25%-50% corrosion. All anodes have wasted away.[7]

Sources:

1. K.D. Moore Associates Underwriting Survey of Condition & Value of Dry Dock "Eureka" dated February 11, 2000

2. USCG Certification, dated December 21, 2006

3. USCG Certification, dated December 15, 2008

4. USCG Certification, dated December 15, 2010

5. Structural and Operational Inspection Report of Dry Dock "Eureka", by Heger Dry Dock, Inc, dated December 2012

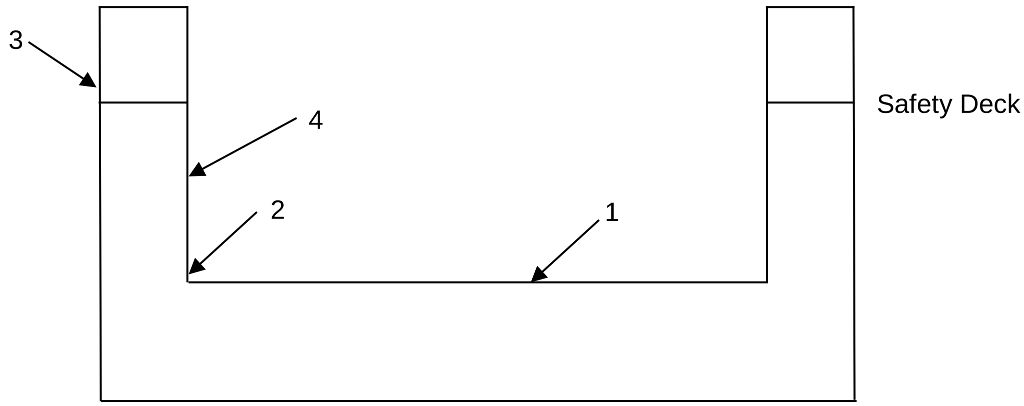
6. Structural and Operational Inspection Report of Dry Dock "Eureka", by Heger Dry Dock, Inc, dated January 2015

7. Commercial Inspection for Eureka Floating Dry Dock, by Heger Dry Dock, Inc, dated January 2017

4. Dry Dock Inspection

Previous inspections and condition assessment of Dry Dock EUREKA observed that the dry dock has extensive deterioration in the pontoon deck and longitudinal stiffeners due to corrosion and heavy use. Steel hulled dry docks typically deteriorate at varying rates throughout the hull. Many times badly corroded steel will be found near steel with little to no corrosion.

1. In general, certain areas of the dock generally corrode faster than other locations. These areas of greater corrosion rates typically found on a steel floating dock include: Pontoon deck, usually one of the first areas to show heavy corrosion.
2. Intersection of the inboard wing wall and the pontoon deck.
3. Intersection of the safety deck and the wing wall side shell plate and/or vertical frames (from the safety deck up about 6 inches)
4. Internal portion of the wing wall from the pontoon deck level up to about 10 feet below the safety deck.



The pontoon deck is generally one of the first areas to show deterioration. Heavy corrosion is evident on EUREKA, particularly due to large amounts moisture trapped on the underside of the pontoon deck. Rust scale is being continually worn away on the deck plate by high traffic, heavy wear, and recoating, therefore ultrasonic testing (UT) of the deck plate is usually performed to confirm remaining thickness.

4.1 Pontoon Deck Conditions

GHD-TECI engineers observed that the top surface of the pontoon deck exhibits numerous locations of failed coating and loss of steel. A typical photo is shown as Figure 4 below.

Figure 4: Typical Pontoon Deck Corrosion

GHD-TECI obtained ultrasonic thickness gauge measurements at several pontoon deck locations to confirm the findings of the 2015 UT survey. Results of GHD-TECI's confirmation survey showed plate thicknesses ranging from 0.45 inch to 0.24 inch. This represents a loss from the original steel thickness of up to 50%. These readings are similar to those taken in the 2015 survey.

The EUREKA's deteriorating pontoon deck structure presents two issues. The pontoon deck plate is experiencing significant diminution in material thickness. The deck plate is typically a floating dry dock's most susceptible region to metal loss as the pontoon deck experiences the highest amount of wear due to work performed on the docked vessels, vehicular traffic and high exposure to weathering effects such as rain and sun. These factors ultimately cause accelerated coating failure and corrosion of the deck plating. The diminution of the pontoon deck is of particular concern as it acts as one of the critical structural components in supporting a ship load during a lifting operation on a floating dry dock The loss of plate thickness on a longitudinally strengthened pontoon deck, such as EUREKA's, exponentially decreases the compressive buckling strength of the pontoon deck. Prior ultrasonic thickness surveys and confirmed by GHD-TECI showed a significant number of readings (nearly half of all readings) with corrosion in the range of 25% - 50% on the original 7/16-inch pontoon deck plating. The corroded plate in its current condition drastically reduces the transverse strength of the dock

The second structural issue is the pontoon deck's longitudinal stiffeners are the serrated channel type, commonly used in the AFDM Harris docks constructed in the World War II era. This channel type is known for flaws associated with the serrated channel type stiffener. The serrated channel design optimized the steel material to strength ratio but also introduced high stress concentration zones at the corners of the serrated notches and the connection of the stiffener to the pontoon deck plating.

This structural element is susceptible to failures in way of the stress concentrations typically taking the form of localized deck corrosion or fractures in the channel web. The fatigue failures are commonly prominent on the pontoon deck stiffeners that not only have to resist hydrostatic head pressures, but are also exposed to cyclical loading due to equipment and vehicles. The serrated channel failures drastically reduce the strength of the stiffener. If not repaired promptly, adjacent stiffeners become more susceptible to failure due to an increased local strength demand.

In the 2015 inspection, it was noted the pontoon deck's serrated channels were beginning to fracture. In response, an in-depth visual survey mapping out the extent of the deck stiffener fractures was performed in May 2015. A pontoon deck repair plan was outlined in the previous inspection reports. By the time of the 2017 dock inspection, it was observed that no repairs had been made to the fractured stiffeners and the failures had become more widespread bringing uncertainly to the dock's ability to resist head pressure and vehicular traffic loads.

An example of heavy corrosion damage to the channel stiffeners is shown in Figure 5 below, compared against an undamaged stiffener shown in Figure 6.

Figure 5: Pontoon Deck Stiffener Damage Example

Figure 6: Undamaged Serrated Stiffener Example

4.2 Interior Compartment Conditions

GHD-TECI engineers conducted an assessment of the pontoon interior compartments by performing a nondestructive evaluation using ultrasonic thickness measurements of localized bulkhead and hull plate thickness, wide flange framing members, corrosive pitting examination, and visual assessment of corrosion-related damage to the steel plates and frame member surface. Eight (8) thickness measurements were recorded at each of the locations measured which was used to determine average steel thickness at each location tested. Beam flange thicknesses were measured using a digital micrometer. Flanges were cleaned and prepared for assessment using a wire brush with a scraping tool to remove residual contaminants and corrosion product, where applicable. The interior compartments were found to be in fair condition with some steel loss noted at several locations.

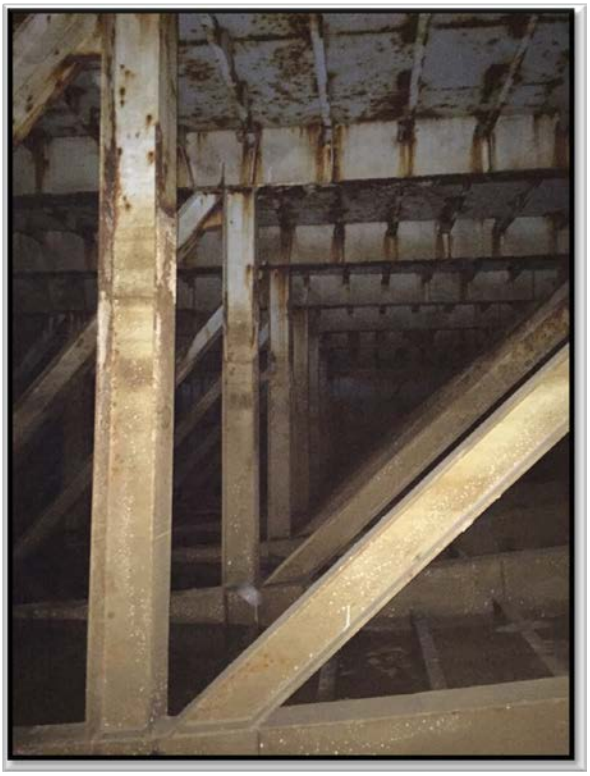


Figure 7: Typical Observations on Transverse Framing

Figure 8: Interior Shell Plates and Anodes

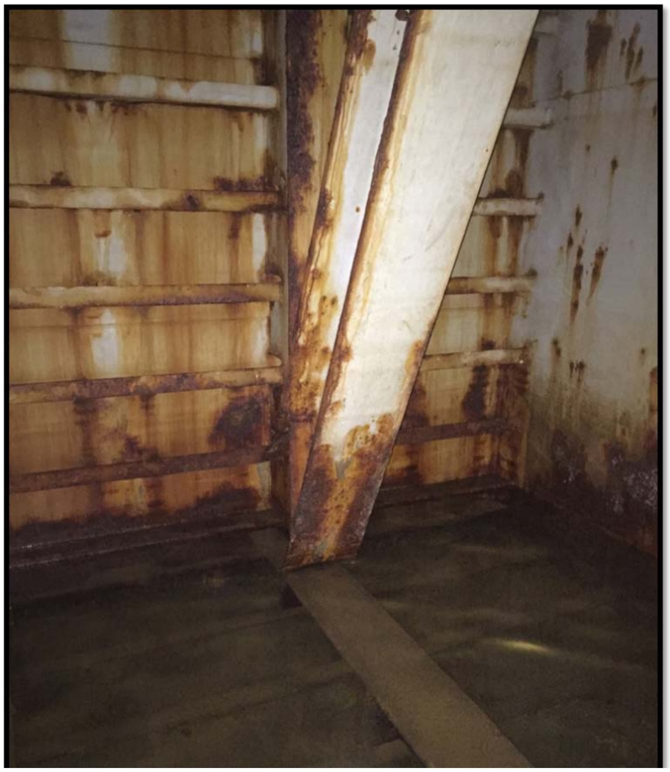


Figure 9: Corrosion Observed on Framing at Keel

4.3 Hull Condition

An underwater condition assessment of Dry Dock EUREKA was conducted from March 5th to March 10th, 2017 to evaluate the condition of the hull. Overall, the hull was estimated to be in fair condition with minor deterioration consisting of section loss as ascertained by ultrasonic thickness gauge measurement. The underwater condition assessment report is included in Appendix D.

The underwater inspection consisted of Level I, II and III level investigation. At the time of the inspection the dry dock ballast tanks were emptied of water such that the primary hull chine was at the water surface. Level II cleanings to gather Level III ultrasonic thickness (UT) gauge readings were taken along “belt lines” as shown in Figure 10 below.

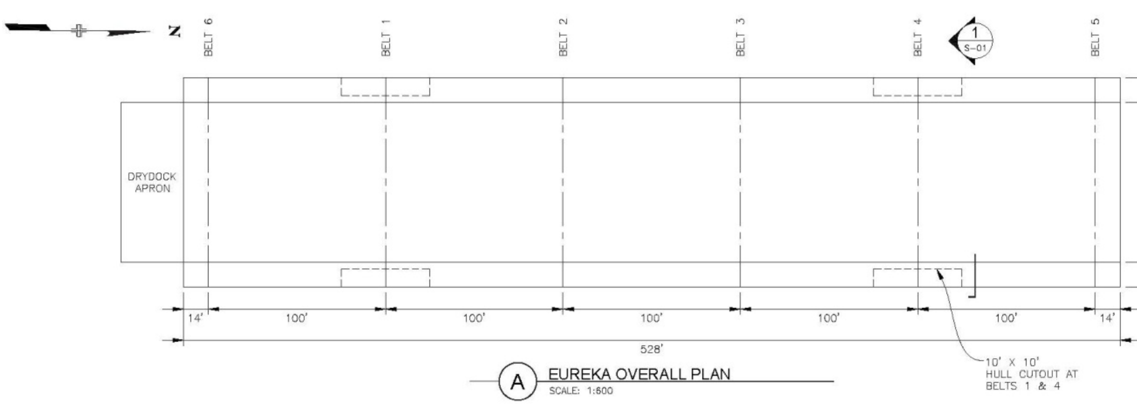


Figure 10: Dry Dock EUREKA Plan

Belt lines 1 to 5 were chosen based on the locations used to gather UT readings by DRS Marine for their December 2016 inspection. Belt line 6 was added for this inspection to further investigate the hull condition. A fixed line was placed along each belt line to guide the engineer-diver while taking UT readings and to ensure that UT readings could be gathered along the same line during future inspections. Level I visual/tactile inspection for the entire submerged portion of the hull was performed by using a tether line linking the engineer-diver to the guide line to facilitate sweeping of the hull for 50 feet in both directions away from the guide line and oriented parallel to the long axis of the hull. Engineer-divers were deployed from the D/V James Eads which was moored to the starboard (west) side of the dry dock at each belt line.

The Hull of Dry Dock 1 was found to be in FAIR condition. The average distance between UT readings and the maximum and minimum UT reading values for each belt line was as shown in Table 3 below.

Table 3: Dry Dock EUREKA Hull UT Gauge Readings

Belt Line	Average Distance Between UT Readings ft-in	Max UT Reading in	Min UT Reading in	Steel Thickness Remaining %
1	5’-2”	0.415	0.315	72.1%
2	3’-8”	0.430	0.325	74.3%
3	3’-6”	0.420	0.345	78.9%
4	4’-6”	0.430	0.305	69.7%
5	4’-0”	0.435	0.320	73.1%
6	4’-4”	0.435	0.385	88.0%

We note that maximum UT reading values exceeding 0.437 inches (design hull plate thickness) were excluded from the table above. These greater than design thickness values are attributed to weldments on the interior of the hull being picked up by the UT gauge and are excluded as they are not indicative of the current hull plate condition. Complete UT gauge readings are given in Appendix D.

In general, there was little to no observable evidence of corrosion on the exterior submerged portion of the dry dock hull. Marine growth present on the hull consisted of various types of hard and soft marine flora and fauna including muscles. Marine growth fully covered the hull within a perimeter zone that extended from the hull edge in towards the keel for a distance of 20 feet around the full perimeter of the hull. Between this perimeter zone and nearer to the keel line marine growth was sparser and covered the hull in small clumps that were randomly distributed.

Plate welds and the hull coating system appeared to be intact and functioning as intended. Upon cleaning, hull coating presented with a reddish color indicating the presence of anti-fouling properties. Sacrificial anodes were randomly encountered during the course of the inspection but were not explicitly part of the inspection scope. Observed anode conditions in combination with the overall presentation of exterior hull condition indicate that, although the anodes are being consumed and show loss of section, they are functioning as intended. Photographs of typical conditions as described above are given in Appendix C.

During the course of hull inspection, mudline depths were gathered beneath the keel for each belt line by using the pneumo-fathometer system integrated into the engineer-diver's umbilical. The time and date that depths were taken were also recorded for subsequent comparison to local tide tables and calculation of the mudline elevation as compared to a mean-lower-low-water (MLLW) datum.

Mudline elevations below the keel are as shown in Table 4 below.

Table 4: Observed Keel Mudline Elevations

Belt Line	Date/Time	Keel Depth (ft)	M/L Depth (ft)	M/L Elev. (ft)
1	3/7/17 @ 1300 hrs	6	24	23
2	3/7/17 @ 1532 hrs	6	26	25
3	3/8/17 @ 1206 hrs	6	27	24
4	3/8/17 @ 1430 hrs	6	27	26
5	3/9/17 @ 1102 hrs	6	33	28
6	3/6/17 @ 1022 hrs	6	30	27

Note: M/L Elevation calculated using tide station 9414334 Protero Point, CA, MLLW datum and rounding to the nearest foot.

5. Structural Assessment

5.1 Discussion of Structural Condition

Dry dock vessel EUREKA was originally rated with a nominal lifting capacity of 14,000 LT (long tons). In the past it has been certified for lifting 14,500 LT with evenly distributed keel loading of 27.5 LT per foot arranged along the centerline of the vessel. Recent inspections and tests to determine the degree of steel loss through corrosion as discussed in Section 4 of this report have led to significant derating of EUREKA.

Several reports as listed in Section 3 discuss the revised capacity of the EUREKA. Of particular significance are the Commercial Inspection report by Heger Dry Dock, Inc. dated January 2017 and the assessment for tandem barge lifting also by Heger Dry dock dated January 19, 2017. Both reports find the dry dock unusable in its current condition.

These documents provide a detailed discussion of corrosion, especially in the pontoon top deck plate and its significance in reducing operational capability of the floating dry dock.

The vessel pontoon is built of transverse frames, typically spaced at 8 feet on center, which span across the 90 foot pontoon width. These transverse truss frames are supported by the docks wing walls. The pontoon deck plate and vessel bottom plate are integral parts of the transverse trusses. The top plate provides compression capacity for truss loading and functions as a significant part of the top chord of each frame.

At select locations, bulkhead frames are plated to form solid bulkhead separations which divide the vessel into chambers. There are two watertight bulkheads longitudinally offset from the vessel centreline about 8 feet. There are 5 transverse watertight bulkheads in the center section of the vessel. Some of the chambers created are now used as trim tanks which fill with water and are no longer water tight.

Plating on these bulkheads has an effect of stiffening the bulkhead however the maximum transverse bending capacity, and therefore lifting capacity of the vessel, are based on each typical transverse frame without bulkhead plating. This is because bulkheads, whether plated or not, do not share vessel keel loading. Each transverse frame must support its own share of load independently.

The top plate also resists hydrostatic loads when the dock is submerged and supports all other miscellaneous loads such as vehicles and personnel.

The deck plate is supported by stiffeners installed at approximately 24 inch on center. These stiffeners simultaneously support hydrostatic loads and other deck loads. For Dry Dock EUREKA, these stiffeners are oriented along the longitudinal axis of the vessel and therefore cannot provide additional compression capacity for transverse loading. Because of this, reduction in thickness of the deck plate has significant impacts to the compression capacity of the deck.

Pontoon decks that are stiffened longitudinally have steel plate panels oriented with their long axis parallel to the longitudinal axis of the dock and perpendicular to the line of transverse compressive stress in the plate when docking a vessel. This orientation results in a panel that will buckle under a much lower stress than that of a similarly sized panel orientated transversely to the dock's axis, depicted in Figure 11.

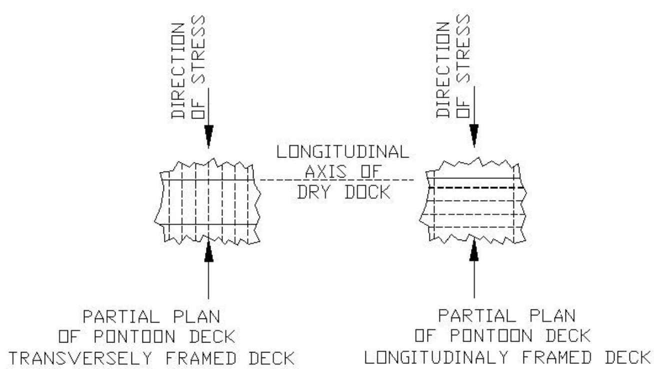


Figure 11: Pontoon Deck Framing–Transverse and Longitudinally Stiffened Panels

Several floating dry docks having longitudinally framed pontoon decks have buckled while the vessel was being lifted. This does not represent a problem if the dock is operated within its design limits, keeping the actual compressive stresses in the pontoon deck below the ultimate buckling stress of the panel. It can become a factor however once the design limits are exceeded or the deck plate experiences loss of metal thickness due to corrosion, since the factor of safety against buckling in a longitudinally framed plate is less than that for a similarly sized panel framed transversely.

The amount of corrosion loss varies significantly across EUREKA's pontoon deck. The most critical section for transverse loading is along the centerline of the vessel. Plate thickness loss ranges as high as 57% in this area. There are also a very high number of fractured stiffeners which contribute to the unsafe condition of the vessel.

5.2 Structural Evaluation

GHD-TECI evaluated the dry dock structure for loading scenarios that would apply compressive stress to the pontoon deck.

The transverse strength of the dry dock is provided by the transverse bulkheads (watertight and non-watertight) and/or transverse trusses in the pontoon.

The pontoon structure must distribute the concentrated load of the ship along the dock's centerline to the buoyant support of the water over its entire width by its transverse strength.

<u>Maximum Transverse Bending</u>

The maximum positive transverse bending moment occurs at the point when the exterior water is at the top of the keel blocks. At this time, there is 100% of the vessel weight on the floating dock while the pontoon and the submerged section of the wingwalls provide lift.

The submerged section of the wing provides additional buoyancy farther away from the dock centerline, which increases the bending moment. For this case 100% of the ship's weight is assumed to act on the keel blocks at the transverse centerline as shown on Figure 12 below. This puts the bottom (keel) plate in tension and the pontoon deck plate in compression.

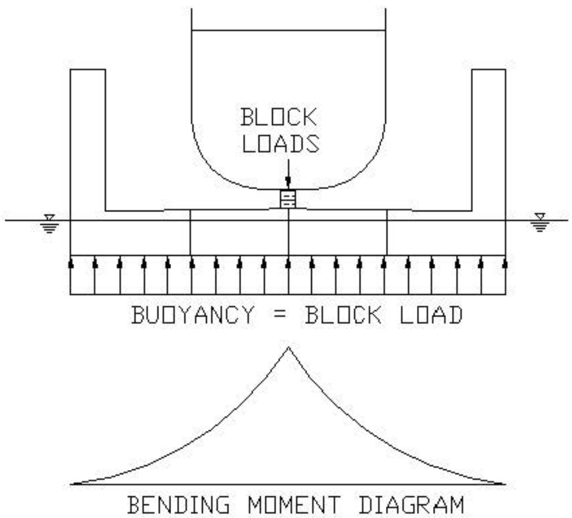


Figure 12: Transverse Bending Moment Diagram

An additional scenario is a partial vessel load combined with maximum hydrostatic pressure as seen on Figure 13 below.

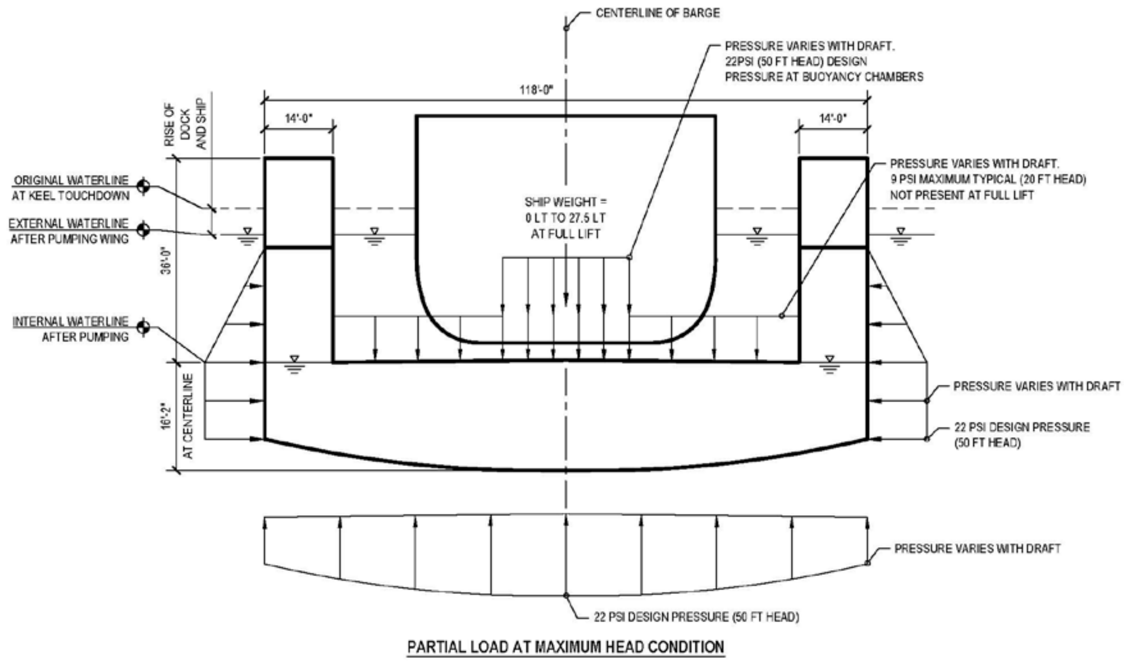


Figure 13: Partial Load with Max Hydrostatic head

GHD-TECI prepared a simplified analysis model using SAP2000 structural analysis software to evaluate transverse dock loading due to lifting keel-supported vessels where the entire load is assumed placed at the centerline of the dock as shown in Figure 14. GHD-TECI also verified calculation of plate thickness and stiffener strength to support the principal hydrostatic loading for a submerged dock.

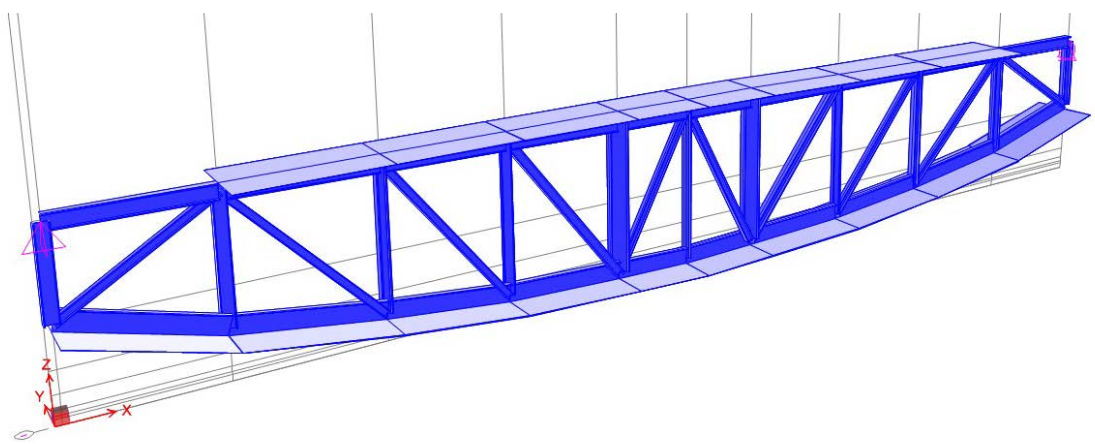


Figure 14: SAP2000 Model – Pontoon Frame

A vessel keel loading of 27.5 LT per foot was placed on a single representative frame modelled in two dimensions as shown in Figure 15. A reduction of plate thickness of 43% was used in our analysis to compute compression and plate bending stresses. Since the original plate thickness was 0.4375" (7/16") we used a remaining thickness of 0.25" for our estimates of stress. This represents a reduction in steel area to resist compression of about 40% for the top chord of the frame.

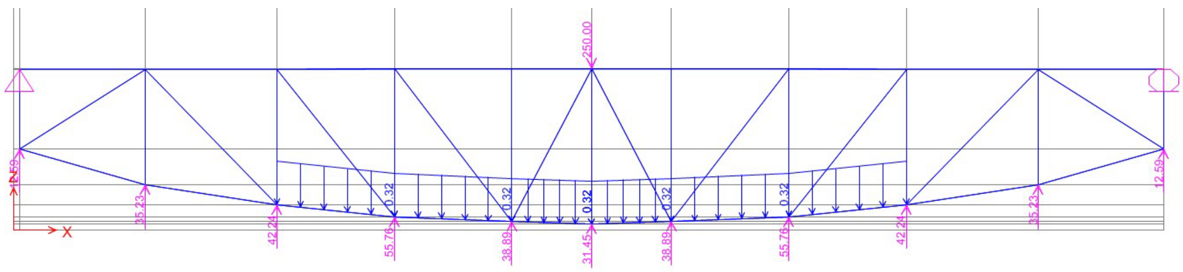


Figure 15: SAP2000 Loading Diagram

This design loading, equal to the originally rated capacity of 14,500 LT causes an effective demand compression stress of about 7,000 psi in the remaining section of the corroded pontoon deck plate.

The original 7/16-inch plate normally has a compression capacity over 9,200 psi at its full thickness. Reduction in thickness drastically reduces compression capacity of the plate section to about 30 to 35% of its original value. For a net remaining section of 0.25 inch for the pontoon top deck, GHD-TECI computed an average available stress capacity of 3,000 psi. It can easily be determined that this is an unacceptable loading.

The stress ratio of demand/resistance is 7000psi/3000psi=2.33. This ratio is limited to 1.0 or less therefor the plate will be considerably overstressed if loads are lifted in the pontoon deck's current condition.

We reduced the keel loading to a value of 13.5 LT per foot in order to evaluate the resultant compressive stress on the corroded deck plate. The resulting stress is less than 3000psi which would indicate that the pontoon may be capable in its current condition of lifting reduced loads.

Hydrostatic Pressure and Deck Plate Bending

The capacity of the plate deck to resist submerged hydrostatic pressures remains the limiting factor preventing use for even small lifted vessels. Plate loading used in the analysis is shown in Figure 13. GHD-TECI analysis indicates that areas where 0.25 inch plate remains can support approximately 12.5 feet of head pressure while submerged. Some areas of the deck are as thin as 0.2 inches or less which can support less than 8 feet of water pressure Typical evaluation of plate for head pressure loading is done by checking plate bending stresses using a standard formula for a beam element spanning between supports. In this case, stiffeners are typically spaced at 24.6" on center. A closer spacing is used near the vessel centerline where plate was designed to support head pressure over buoyancy chambers.

The calculation for maximum allowable head pressure given reduced plate thickness is as shown below.

$$M_{capacity} = 27000psi\ x\ \left(\frac{1"(0.25"}{6})\right) = 281\ in - lbs$$

$$Pressure\ Allowable = \frac{12(281in - lbs)}{(24.6)^2} = 5.5psi$$

$$Equivalent\ Head = \frac{5.5psi(144sqin)}{64pcf} = 12.5\ ft\ head$$

Where stiffeners are fractured, the available capacity to support hydrostatic loads is not able to be calculated due to the broken element. The capacity is almost zero in this case. Only redundancy in the deck with the ability of plate to span in multiple directions has allowed continued functionality to this point in time.

5.3 Current Vessel Lifting Capacity

The structural evaluations above indicate that Dry Dock EUREKA has very little capacity in its current condition. While it has some transverse lifting capacity based on pontoon deck plate compressive stresses, it has little to no capacity to safely submerge and resist hydrostatic pressures on the pontoon deck plate. Further, areas of reduced deck plate strength and fractured stiffeners are unsafe for operational loading such as personnel and vehicles.

GHD-TECI is in agreement with recent opinions by Heger Dry Dock that the dock is currently unsafe for use.

With limited repairs to the deck, that may allow safe vertical deck loading and hydrostatic pressures, some lifting may be accomplished even without repair of the deck plate. If all of the damaged deck stiffeners are repaired, GHD-TECI estimates that the dock could possibly be rated to lift approximately 7,000 long tons with a limit of about 13.5 LT per foot of keel block loading.

6. Corrosion Assessment

6.1 Testing Methodology

The assessment of the pontoon interior compartments included a visual and nondestructive evaluation using ultrasonic thickness measurements of localized wall thickness, corrosive pitting examination, and visual assessment of corrosion-related damage to the steel wall surfaces. The ballast and void tank compartments of the pontoon were reviewed. Steel surfaces were cleaned and prepared for assessment using a wire brush with a scraping tool to remove residual contaminants and corrosion product, where applicable.

Wall thickness measurements were obtained using an Olympus 38 DL Plus Ultrasonic Thickness Gage Dual Transducer (THRU-COAT Transducer # D7906-SM) and glycerin couplant. Eight (8) thickness measurements were recorded at each of the locations measured which was used to determine average wall thickness at each location tested. Figure 16 depicts typical process to take UT measurement of wall thickness. Selected beam web thicknesses were measured using a General UltraTECH digital micrometer. The webs were cleaned and prepared for assessment using a wire brush with a scraping tool to remove residual contaminants and corrosion product, where applicable.

Figure 16: Process for Typical UT Measurement

6.2 Tank 5A

The Tank 5A North Wall average wall thickness is reported as 0.512 inches. The remaining three (3) interior walls average thickness is approximately 0.40 inches. Coating assessed at selected locations appeared intact with negligible defects, loss of adherence, or other visible losses in integrity. Coating thickness of up to 20 mils was measured. See Table 5 and Table 6 for summary.

Table 5: Tank 5A UT Summary

Location	Coating Thickness (mils)	Nominal Wall Thickness (inches)	Average (inches)	Minimum (inches)	Maximum (inches)
North Wall 112" from E. Wall 58" Height	-	0.528	0.512	0.478	0.540
	-	0.492			
	6	0.504			
	-	0.503			
	5	0.530			
	5	0.540			
	8	0.478			
	9	0.524			
East Wall 38" from N. Wall 55" Height	-	0.407	0.394	0.380	0.408
	8	0.394			
	-	0.408			
	9	0.393			
	8	0.388			
	13	0.380			
	8	0.395			

	8	0.389			
South Wall 112" from E. Wall 58" Height	17	0.418	0.418	0.411	0.430
	11	0.414			
	18	0.415			
	19	0.411			
	10	0.430			
	14	0.416			
	18	0.420			
	16	0.416			
West Wall 105" from N. Wall 72" Height	16	0.401	0.395	0.381	0.407
	17	0.386			
	7	0.405			
	5	0.407			
	20	0.381			
	6	0.403			
	10	0.382			
	15	0.395			
Overall Average			0.430	0.413	0.446

Table 6: Tank 5A Measured Thicknesses

Member	Thickness (in)
Diagonal	0.57
Post	0.64
Bottom Chord	0.51

6.3 Tank 5

The Tank 5 average wall thickness is reported as approximately 0.39 inches. Coating assessed at selected locations appeared intact with negligible defects, loss of adherence, or other visible losses in integrity. Coating thickness of up to 27 mils was measured. Figure 17 depicts indications of corrosion and coating failure on the tank ceiling and the diagonal, post and lower chord members. See Table 7 and Table 8 for summary.

Table 7: Tank 5 UT Summary

Location	Coating Thickness (mils)	Nominal Wall Thickness (inches)	Average (inches)	Minimum (inches)	Maximum (inches)
North Wall 38" from E. Wall 63" Height	8	0.422	0.419	0.406	0.425
	8	0.408			
	13	0.406			
	-	0.422			
	17	0.424			
	-	0.420			
	-	0.425			
	9	0.423			
East Wall 99" from S.	15	0.396	0.402	0.396	0.407
	12	0.407			

Wall 94" Height	19	0.406			
	11	0.396			
	11	0.399			
	14	0.404			
	12	0.406			
	12	0.403			
South Wall 72" from S. Wall 120" Height	16	0.354	0.368	0.354	0.387
	14	0.373			
	10	0.387			
	17	0.360			
	22	0.369			
	20	0.364			
	16	0.370			
	13	0.366			
West Wall 79" from N. Wall 120" Height	27	0.398	0.389	0.365	0.398
	22	0.365			
	18	0.394			
	18	0.380			
	14	0.397			
	16	0.389			
	17	0.394			
	16	0.394			
Overall Average			0.394	0.380	0.404

Table 8: Tank 5 Measured Thicknesses

Member	Thickness (in)
Diagonal	0.67
Post	0.69
Bottom Chord	0.52

Figure 17: Tank 5 Corroded Members

6.4 Tank 6A

The Tank 6A North Wall average wall thickness is reported as 0.472 inches. The Tank 6A Wing Wall Interior average wall thickness is reported as 0.438 inches. The remaining three (3) interior walls average thickness is approximately 0.38 inches. Coating assessed at selected locations appeared intact with negligible defects, loss of adherence, or other visible losses in integrity. Coating thickness of up to 19 mils was measured. Figure 18 depicts indications of corrosion and coating failure on the tank ceiling and the diagonal, post and lower chord members. See Table 9 and Table 10 for summary.

Table 9: Tank 6A UT Summary

Location	Coating Thickness (mils)	Nominal Wall Thickness (inches)	Average (inches)	Minimum (inches)	Maximum (inches)
North Wall 38" from W. Wall 67" Height	-	0.378	0.359	0.336	0.386
	9	0.336			
	6	0.346			
	-	0.386			
	-	0.363			
	14	0.338			
	12	0.355			
	12	0.368			

East Wall 40' from S. Wall 66" Height	17	0.368	0.388	0.368	0.403
	8	0.389			
	8	0.395			
	14	0.392			
	15	0.382			
	13	0.403			
	-	0.391			
	-	0.383			
South Wall Inaccessible	-	-	-	-	-
	-	-			
	-	-			
	-	-			
	-	-			
	-	-			
	-	-			
	-	-			
West Wall 40' from S. Wall 51" Height	6	0.385	0.379	0.362	0.398
	5	0.382			
	22	0.362			
	20	0.375			
	6	0.375			
	8	0.398			
	-	0.387			
	14	0.370			
Overall Average			0.375	0.355	0.396

Table 10: Tank 6A Measured Thicknesses

Member	Thickness (in)
Diagonal	0.58
Post	0.63
Bottom Chord	0.53

Figure 18: Typical Corrosion at Roof of Tank 6A

6.5 Tank 6

The Tank 6 average wall thickness is reported as approximately 0.38 inches. Coating assessed at selected locations appeared intact with negligible defects, loss of adherence, or other visible losses in integrity. Coating thickness of up to 22 mils was measured. See Table 11 and Table 12 for summary.

Table 11: Tank 6 UT Summary

Location	Coating Thickness (mils)	Nominal Wall Thickness (inches)	Average (inches)	Minimum (inches)	Maximum (inches)
North Wall 38" from W. Wall 67" Height	-	0.378	0.359	0.336	0.386
	9	0.336			
	6	0.346			
	-	0.386			
	-	0.363			
	14	0.338			
	12	0.355			
	12	0.368			
East Wall 40' from S. Wall	17	0.368	0.388	0.368	0.403
	8	0.389			
	8	0.395			

66" Height	14	0.392			
	15	0.382			
	13	0.403			
	-	0.391			
	-	0.383			
South Wall Inaccessible	-	-	-	-	-
	-	-			
	-	-			
	-	-			
	-	-			
	-	-			
	-	-			
	-	-			
West Wall 40' from S. Wall 51" Height	6	0.385	0.379	0.362	0.398
	5	0.382			
	22	0.362			
	20	0.375			
	6	0.375			
	8	0.398			
	-	0.387			
	14	0.370			
Overall Average			0.375	0.355	0.396

Table 12: Tank 6A Measured Thicknesses

Member	Thickness (in)
Diagonal	0.58
Post	0.63
Bottom Chord	0.53

6.6 Tank 7

The Tank 7 average wall thickness is reported as approximately 0.38 inches. Coating assessed at selected locations appeared intact with negligible defects, loss of adherence, or other visible losses in integrity. Coating thickness of up to 16 mils was measured. See Table 13 and Table 14 for summary.

Table 13: Tank 7 UT Summary

Location	Coating Thickness (mils)	Nominal Wall Thickness (inches)	Average (inches)	Minimum (inches)	Maximum (inches)
North Wall 83" from E. Wall 61" Height	-	0.401	0.401	0.400	0.403
	-	0.402			
	-	0.400			
	11	0.400			
	-	0.403			
	-	0.400			

	-	0.401			
	6	0.402			
East Wall 64" from S. Wall 84" Height	-	0.365	0.360	0.340	0.369
	-	0.368			
	13	0.344			
	-	0.363			
	13	0.340			
	-	0.361			
	-	0.369			
	-	0.367			
South Wall 50" from E. Wall 54" Height	16	0.365	0.380	0.365	0.389
	10	0.379			
	11	0.385			
	12	0.373			
	12	0.374			
	7	0.389			
	6	0.388			
	-	0.385			
West Wall 68" from S. Wall 112" Height	8	0.396	0.394	0.383	0.397
	-	0.396			
	-	0.395			
	6	0.396			
	10	0.383			
	-	0.397			
	7	0.394			
	13	0.393			
Overall Average			0.384	0.372	0.390

Table 14: Tank 7 Measured Thicknesses

Member	Thickness (in)
Diagonal	0.67
Post	0.52
Bottom Chord	0.41

6.7 Tank 8

The Tank 8 average wall thickness is reported as approximately 0.39 inches. Coating assessed at selected locations appeared intact with negligible defects, loss of adherence, or other visible losses in integrity. Coating thickness of up to 18 mils was measured. See Table 15 and Table 16 for summary.

Table 15: Tank 8 UT Summary

Location	Coating Thickness (mils)	Nominal Wall Thickness (inches)	Average (inches)	Minimum (inches)	Maximum (inches)
North Wall 60" from W.	18	0.388	0.387	0.380	0.398
	9	0.386			

Wall 55" Height	11	0.388			
	11	0.386			
	6	0.398			
	10	0.380			
	8	0.386			
	8	0.386			
East Wall 69" from S. Wall 79" Height	0	0.405	0.405	0.388	0.413
	8	0.395			
	0	0.413			
	0	0.413			
	0	0.411			
	13	0.388			
	8	0.404			
	8	0.407			
South Wall 51" from W. Wall 56" Height	13	0.390	0.393	0.385	0.404
	7	0.404			
	5	0.401			
	-	0.399			
	12	0.385			
	14	0.388			
	11	0.390			
	10	0.385			
West Wall 34" from S. Wall 55" Height	18	0.388	0.387	0.380	0.398
	9	0.386			
	11	0.386			
	11	0.386			
	6	0.398			
	10	0.380			
	8	0.386			
	8	0.386			
Overall Average			0.393	0.383	0.403

Table 16: Tank 8 Measured Thicknesses

Member	Thickness (in)
Diagonal	0.65
Post	0.52
Bottom Chord	0.52

6.8 Tank 9

The Tank 9 average wall thickness is reported as approximately 0.40 inches. Coating assessed at selected locations appeared intact with negligible defects, loss of adherence, or other visible losses in integrity. Coating thickness of up to 18 mils was measured. Figure 19 depicts galvanic anodes directly affixed to the tank wall. See Table 17 and Table 18 for summary.

Table 17: Tank 9 UT Summary

Location	Coating Thickness (mils)	Nominal Wall Thickness (inches)	Average (inches)	Minimum (inches)	Maximum (inches)
North Wall 40" from E. Wall 39" Height	11	0.370	0.379	0.368	0.390
	-	0.386			
	-	0.381			
	10	0.368			
	-	0.384			
	-	0.380			
	-	0.390			
	10	0.369			
East Wall 123" from N. Wall 54" Height	14	0.388	0.388	0.387	0.389
	15	0.387			
	13	0.387			
	14	0.387			
	14	0.389			
	13	0.388			
	14	0.388			
	12	0.388			
South Wall 107" from W. Wall 58" Height	13	0.408	0.407	0.390	0.419
	11	0.409			
	12	0.403			
	6	0.418			
	12	0.409			
	11	0.403			
	-	0.419			
	18	0.390			
West Wall 48" from N. Wall 61" Height	-	0.408	0.411	0.404	0.419
	-	0.419			
	-	0.404			
	-	0.410			
	8	0.405			
	-	0.409			
	-	0.412			
	-	0.419			
Overall Average			0.396	0.387	0.404

Table 18: Tank 9 Measured Thicknesses

Member	Thickness (in)
Diagonal	0.73
Post	0.63
Bottom Chord	0.53

Figure 19: Tank 9 Wall

6.9 Tank 10

The Tank 10 average wall thickness is reported as approximately 0.38 inches. Coating assessed at selected locations appeared intact with negligible defects, loss of adherence, or other visible losses in integrity. Coating thickness of up to 20 mils was measured. See Table 19 and Table 20 for summary.

Table 19: Tank 10 UT Summary

Location	Coating Thickness (mils)	Nominal Wall Thickness (inches)	Average (inches)	Minimum (inches)	Maximum (inches)
North Wall 59" from W. Wall 59" Height	10	0.371	0.380	0.371	0.387
	9	0.372			
	10	0.372			
	7	0.385			
	11	0.387			
	8	0.385			
	8	0.385			
	7	0.386			
East Wall 42" from S. Wall 42" Height	15	0.376	0.379	0.366	0.391
	16	0.379			
	-	0.391			
	20	0.377			
	15	0.366			
	5	0.389			
	12	0.377			

	12	0.378			
South Wall 90" from W. Wall 62" Height	9	0.383	0.388	0.382	0.397
	12	0.383			
	14	0.382			
	-	0.397			
	-	0.394			
	12	0.383			
	13	0.387			
	-	0.397			
West Wall 60" from N. Wall 61" Height	7	0.358	0.356	0.340	0.379
	12	0.357			
	8	0.344			
	5	0.340			
	-	0.379			
	8	0.343			
	-	0.358			
	-	0.367			
Overall Average			0.376	0.365	0.389

Table 20: Tank 10 Measured Thicknesses

Member	Thickness (in)
Diagonal	0.67
Post	0.61
Bottom Chord	0.45

6.10 Tank 20A

The Tank 20A North Wall average wall thickness is reported as 0.502 inches. The remaining three (3) interior walls average thickness is approximately 0.39 inches. Coating assessed at selected locations exhibit moderate defects including failure and other visible losses in integrity. Coating thickness of up to 17 mils was measured. Figure 20 depicts indications of corrosion and coating failure on the tank wall, diagonals, and vertical posts. See Table 21 and Table 22 for summary.

Table 21: Tank 20A UT Summary

Location	Coating Thickness (mils)	Nominal Wall Thickness (inches)	Average (inches)	Minimum (inches)	Maximum (inches)
North Wall 87" from W. Wall 75" Height	13	0.491	0.502	0.491	0.517
	11	0.491			
	11	0.495			
	9	0.505			
	10	0.497			
	-	0.513			
	10	0.510			
	-	0.517			
East Wall	10	0.396	0.402	0.385	0.416

74" from S. Wall 57" Height	10	0.393			
	10	0.415			
	-	0.415			
	9	0.416			
	10	0.385			
	11	0.398			
	10	0.395			
South Wall 91" from W. Wall 84" Height	5	0.387	0.385	0.370	0.392
	13	0.370			
	-	0.391			
	-	0.388			
	6	0.386			
	16	0.377			
	6	0.392			
	5	0.385			
West Wall 72" from N. Wall 43" Height	17	0.384	0.389	0.382	0.398
	12	0.382			
	10	0.398			
	9	0.394			
	9	0.394			
	13	0.384			
	9	0.393			
	13	0.385			
Overall Average			0.419	0.407	0.431

Table 22: Tank 20A Measured Thicknesses

Member	Thickness (in)
Diagonal	0.57
Post	0.53
Bottom Chord	-

Figure 20: Tank 20A Side Wall and Diagonal

6.11 Tank 22

The Tank 22 average wall thickness is reported as approximately 0.39 inches. Coating assessed at selected locations appeared intact with negligible defects, loss of adherence, or other visible losses in integrity. Coating thickness of up to 14 mils was measured. See Table 23 and Table 24 for summary.

Table 23: Tank 22 UT Summary

Location	Coating Thickness (mils)	Nominal Wall Thickness (inches)	Average (inches)	Minimum (inches)	Maximum (inches)
North Wall 25" from E. Wall 83" Height	11	0.378	0.359	0.336	0.386
	11	0.336			
	11	0.346			
	11	0.386			
	11	0.363			
	11	0.338			
	13	0.355			
	11	0.368			
East Wall 73" from S. Wall 84" Height	8	0.386	0.377	0.372	0.386
	13	0.373			
	13	0.372			
	12	0.373			
	9	0.386			
	13	0.373			

	12	0.372			
	14	0.382			
South Wall 28" from W. Wall 81" Height	-	0.405	0.398	0.385	0.407
	8	0.402			
	11	0.385			
	-	0.407			
	-	0.404			
	-	0.407			
	13	0.385			
	11	0.386			
West Wall 74" from N. Wall 59" Height	8	0.409	0.413	0.408	0.425
	5	0.421			
	9	0.425			
	0	0.420			
	8	0.408			
	8	0.408			
	7	0.408			
	7	0.408			
Overall Average			0.387	0.375	0.401

Table 24: Tank 22 Measured Thicknesses

Member	Thickness (in)
Diagonal	0.68
Post	0.61
Bottom Chord	-

6.12 Tank 23

The Tank 23 South Wall average wall thickness is reported as 0.446 inches. The remaining three (3) interior walls average thickness is approximately 0.37 inches. Coating assessed at selected locations appeared intact with negligible defects, loss of adherence, or other visible losses in integrity. Coating thickness of up to 19 mils was measured. See Table 25 and Table 26 for summary.

Table 25: Tank 23 UT Summary

Location	Coating Thickness (mils)	Nominal Wall Thickness (inches)	Average (inches)	Minimum (inches)	Maximum (inches)
North Wall 73" from E. Wall 64" Height	8	0.377	0.384	0.377	0.391
	-	0.391			
	12	0.377			
	14	0.382			
	4	-			
	-	0.391			
	11	0.379			
	-	0.391			
East Wall	5	0.397	0.391	0.376	0.400

35" from S. Wall 46" Height	10	0.395			
	-	0.400			
	7	0.392			
	10	0.376			
	-	0.394			
	-	0.388			
	-	0.387			
South Wall 72" from W. Wall 62" Height	18	0.438	0.446	0.428	0.469
	12	0.468			
	18	0.430			
	17	0.428			
	10	0.469			
	17	0.443			
	18	0.449			
	18	0.443			
West Wall 38" from S. Wall 62" Height	18	0.327	0.324	0.320	0.328
	19	0.320			
	17	0.327			
	17	0.320			
	17	0.326			
	17	0.324			
	16	0.328			
	17	0.320			
Overall Average			0.386	0.375	0.397

Table 26: Tank 23 Measured Thicknesses

Member	Thickness (in)
Diagonal	0.69
Post	0.56
Bottom Chord	0.70

7. Conceptual Repairs

GHD-TECI reviewed several alternative short and long term repair strategies for Dry Dock Eureka. The short term and long term repair options found to be most cost-effective and requiring the least amount of down-time for the dry dock are presented below. Repair concepts are shown on drawings in Appendix B.

7.1 Short-Term Repair Strategies

Primary short term repair strategies include repairing or replacing fractured stiffeners and patching the thinnest areas of the pontoon deck plate in order to allow partial submergence of the dry dock. This solution will also allow safe traffic and personnel use of the deck. With properly completed short term repairs, the dock could possibly be used for lifting in the 7,000 long ton range as discussed in Section 5.3.

All fractured stiffeners should be repaired by removing the fractured area and splicing in an angle repair piece. Each new segment of angle will be welded in place to patch the cut stiffener. In some locations, where there are multiple fractures in a single stiffener, it may be more efficient to replace the whole stiffener of add a supplemental stiffener alongside the existing one. Replacement and repair of stiffeners will provide significant new strength for resisting hydrostatic loading during submerging. At this point, the thinnest areas of deck plate that pose a problem with hydrostatic load or point loads such as equipment wheel loads need to be addressed with repairs.

- Areas with less than 25% loss of steel thickness (0.33 inch remaining) do not need to be repaired as part of a short term strategy. Areas of deck plate with more steel loss than 25% will need to be patch or overlaid with supplemental plate in order to allow full submergence of the vessel.
- Areas with less than 43% loss of steel thickness (0.25 inch remaining) may not need to be repaired if operations are limited to approximately 12.5 feet of hydrostatic head over the submerged pontoon deck.
- Areas with more than 43% loss will need to be patched or overlaid in any case.

7.2 Long-Term Repair Strategies

Long term strategies are assumed to be those that would return the EUREKA to between 12,000 and 14,000 LT rated lifting capacity with an expected service life following completion of 20 to 25 years. Replacement of the pontoon deck will be required in this scenario. Deck plate will be removed in sections and replaced with new prefabricated units which include new deck plate and pre-welded stiffeners. This opportunity should be used to patch and repaint affected areas of the main frames where each panel will attach.

New panels can be fabricated in 8 feet wide sections to an easily manageable length in the opposite direction. The 8 foot width will match the frame spacing. We agree with the previous recommendation of using 1/2 inch deck plates with new continuous angle stiffeners pre-attached by fully welding each face and then painted. The center 1/4 section of dock should be repaired first in the case of a staged repair project. Remaining sections from the center outwards towards the wing walls should be repaired next. Deck plate matching the original thickness of 7/16 inch can be used in these areas. Welded joints should be stripe coated and painted to match the shop coat to complete coating of the entire replaced steel area. The top deck should be coated with a protective wearing surface to prevent future corrosion.

Long term repairs should also include repair and patching of upper deck plating and wing wall plating where section loss has occurred.

Cleaning and recoating of the entire vessel is recommended to prevent future section loss in other areas and prolong the life of the vessel.

GHD-TCI also recommends the installation of new cathodic protection as discussed in Section 8.1.

8. Corrosion Protection

8.1 Anodes

The dry dock structure requires anode replacement for the permanently submerged surfaces. Cathodic protection design should be conducted by a NACE Cathodic Protection Specialist which involves modelling the DC current requirement and DC current distribution. The sizing, quantity, and location of galvanic anodes should be based on achieving cathodic protection per NACE criteria at all continuously wetted surfaces and a 20-year minimum anode service life. Reuse of existing studs and should be maximized as a part of the cathodic protection design where possible. Anodes which will not be replaced should be abandoned in place if greater than 50% of the original anode cross section remains or if the anode cannot be removed due to fouling of the mechanical connection. New or replacement anodes should be installed by bolting anode core straps to the pre-existing threaded bolts or by spot welding new threaded bolts followed by mechanical anode connection.

Following installation of replacement and/or supplemental galvanic anodes, a cathodic protection survey should be conducted under the direct supervision of a NACE Cathodic Protection Specialist to assess whether cathodic protection per NACE criteria has been achieved. The survey should include, at a minimum, measurement of structure-to-water potential versus a stable reference electrode at various locations at the midpoint between anodes on the hull exterior and at midpoints between anodes within each tank.

8.2 Coating

The replacement pontoon deck plate and stiffeners will have a primer coat applied over the prepared steel surface using a reinforced inorganic zinc silicate or zinc-rich, aromatic urethane. An intermediate coat is then applied using polyamidoamine epoxy or cycloaliphatic amine epoxy. A finish coat is applied using a heavy duty epoxy anti-slip coating, applied to a DFT of 6 to 8 mils in a single coat.

For the long term repairs, all sections of the interior compartments will have the same coating system applied after the existing rust scale and loose paint has been removed using an abrasive method.

9. Cost Estimate for Repair Concepts

The cost estimates developed for the short term and long tern repair scenarios assume that all work will be self-performed by the shipyard’s labor force. The short term repair scenario described in Section 7 is estimated to cost approximately $1,800,000.

The long term repair scenario including a complete replacement of the pontoon deck and recoating of the dock interior areas is estimated to be approximately $6,500,000.

Preliminary cost estimates for the repair concepts were developed by GHD-TECI’s subconsultant, M. Lee Corporation and the report is included in Appendix A.

10. Conclusions and Recommendations

It is GHD-TECI's opinion that Dry Dock EUREKA is currently unsafe for vessel lifting operations. The two main issues regarding the dry dock EUREKA are reduced thickness of the pontoon deck plate due to corrosion and fracture and corrosion of the supporting stiffeners.

The pontoon deck is a key structural component with regard to the structural integrity of the dock. As discussed in this report, a significant number of UT thickness readings show current steel thickness at 25%-50% of the original due to corrosion. The corroded deck plate in its current condition has drastically reduced the transverse strength of the dock.

The extensively corroded deck plating is also coupled with widespread fractures and damage in the longitudinal serrated stiffeners. These fractures are due to the original design of the longitudinal stiffeners. The serrations lead to areas of high stress concentration and many years of cyclical loading and unabated corrosion have caused widespread structural failure of these members. These stiffeners are responsible for resisting transverse bending loads, local head pressure loading, and vehicle and equipment loading on the deck. When compromised, these members significantly decrease the overall structural capacity of the dock.

Other structural dock components were inspected including internal frame members and interior bulkheads. Thickness readings show relatively small amounts of steel section loss in specific areas. Provided that these locations are cleaned, prepared and recoated with the long term repairs, extended service life for the dock can be expected provided the recommended structural repairs are made. It is also recommended that the dock wingwalls and upper deck areas be inspected for deterioration prior to undertaking the long term repairs.

The recommended long term solution for the pontoon deck structural issues is a complete deck replacement, to replace thinned deck plate and to replace the notched stiffeners with a more robust design. Smaller local repairs can be performed in the shorter term to marginally increase the docks structural capacity and allow the dock to go back into service. If sections of pontoon deck stiffeners, or even all of the pontoon deck stiffeners, are replaced, there will still be limited transverse strength and head pressure capacities due to the pontoon deck plate thickness. Therefore, the short term repair plan is considered a temporary solution to the observed fractured stiffeners and not a viable long term solution, due to the excessively corroded pontoon deck plate.

GHD-TECI recommends that the entire pontoon deck be replaced to enable the dock to achieve an approximate 14,000 LT vessel lift capacity as originally rated. Stiffener replacement must also be completed with the longer term plan in accordance with recommended deck plate replacement. The pontoon deck can be replaced in sections using pre-fabricated stiffened panels.

Future certification at a specified vessel tonnage capacity and allowable head pressure will be based on performance of a design and implementation plan to repair or replace sections of the pontoon deck. On-site inspection of the repairs and a successful submergence of the dock will be required for re-certification.

GHD-TECI also recommends that sacrificial anodes be replaced throughout the hull exterior and dock internal compartments. As section loss of hull plating was indicated via UT gauge readings and as there was little or no outward evidence of underwater hull plate corrosion, it is recommended that the interior of the hull plating be cleaned and recoated.

Appendix A

Preliminary Estimate of Probable Repair Costs Report

PORT OF SAN FRANCISCO
DRY DOCK EUREKA REPAIR

PRELIMINARY ESTIMATE OF PROBABLE REPAIR COSTS BASED ON DRAFT STRUCTURAL ASSESSMENT REPORT

Owner:
PORT OF SAN FRANCISCO

Prepared for
GHD
655 Montgomery Street, Suite 1010
San Francisco, CA 94111
Contact: Craig Lewis, SE, Sr Project Manager
(415) 296-3605
Email: Craig. Lewis@ghd.com

Prepared by
M LEE CORPORATION
Construction Management & Consulting
Cost Estimating and Project Scheduling
311 California Street, Suite 610
San Francisco, CA 94104
Contact: Franklin Lee, PE, LEED AP, CEP
Certified Estimating Professional
(415) 693-0236
Email: flee@mleecorp.com

Date: 6/2/2017R1

1255 Dry Dock Eureka Repair Estimate 20170602R1

PORT OF SAN FRANCISCO
DRY DOCK EUREKA REPAIR

PRELIMINARY ESTIMATE OF PROBABLE REPAIR COSTS
BASED ON DRAFT STRUCTURAL ASSESSMENT REPORT

Table of Contents: **Page Nos.**

Date: 6/2/2017R1

1255 Dry Dock Eureka Repair Estimate 20170602R1

Port of San Francisco, Dry Dock Eureka Repairs
Preliminary Estimate of Probable Repair Costs
Based on Structural Assessment Report
1) Basis of Estimate

Date: 6/2/2017R1

1 **Purpose of the Estimate**

This estimate has been prepared for the purpose of establishing a preliminary estimate of probable cost of construction based on the Draft Structural Assessment Report by GHD/Telamon JV, dated April 2017.

2 **Content of the Estimate**

This construction cost estimate, which represents our opinion of probable construction cost, consists of the following integral sections:

a Preamble (Basis of Estimate)
b Estimate Summary
c Estimate Details

Basis of Estimate

2 The scope of estimate is based on the following:

a Dry Dock Eureka Draft Structural Assessment Report, prepared by GHD/Telamon JV, dated April 2017, a total of 127 pages
b Drawings/Plans (part of above Structural Assessment Report)
Appendix A Existing Drawings, prepared by GHD/Telamon JV dated 3/28/2017 , a total of 3 sheets including the following: SK1.0, SK1.3, SK1.4
Appendix B Repair Concept Drawings, prepared by GHD/Telamon JV dated 3/28/2017, a total of 5 sheets including the following: SK2.1, SK2.2, SK2.3, SK2.4, SK3.0
c Assumptions for Short Term and Long Term repairs per GHD email on 4/27/2017.
d Responses to queries, attached, which take precedence over the April 2017 Report.
e Verbal clarifications with designers.
f Interior compartment coating quantities provided by GHD on 5/24/2017
g Incorporation of comments from design team and Port of San Francisco on the draft estimate.
h Revised quantities per comments received from GHD and Port of San Francisco on estimate dated 5/25/2017.

4 **Scope of Estimate**

The estimate includes the following general scope of work:

a **Short Term Repairs** to restore the dry dock to 7,000 long ton lifting capacity. Repair scope includes:

1) Repair or replace cracked stiffeners by removing fractured area and splicing in an angle repair piece. Where multiple fractures exist in a single stiffener, the entire stiffener maybe supplemented by adding a supplemental stiffener alongside the existing one.
2) Install doubler plate over thinnest areas of pontoon deck plate
3) Installcover plates over center of pontoon deck
4) Ladder rung replacement at top three runs at each tank
5) Cathodic protection

b **Long Term Repairs** to restore the dry dock to 14,000 long ton lifting capacity. Repair scope includes:

1) Replacement of pontoon deck. Deck plate will be removed in sections and replaced with new prefabricated units, which include new deck plates and stiffeners.
2) Patch and repaint affected areas of the main frames where each panel will attach.
3) Coat top deck with protective wearing surface to prevent future corrosion.
4) Interior coating of compartments (floor, wall and ceiling) for 32 compartments.
5) Ladder rung replacement at top three runs at each tank
6) Cathodic protection

5 **Exclusions**

The estimate specifically excludes the following items:

- a Legal fees and finance costs
- b Permit & plan check fees
- c Utility connection fees
- d Owner's administration costs
- e Design services
- f Other soft costs
- g Survey services, materials lab
- h Project/Construction management
- i Change orders during construction
- j Cost escalation beyond the date of this estimate

It is assumed that the above items, if needed, are included elsewhere in the owner's overall project budget.

6 **Construction Schedule**

All work to be performed during regular working hour. No overtime work allowed in the estimate.
A rough construction duration has been derived from manpower hour estimates with assumed crews sizes and number of crews which gives 10 months for short term repairs and 25 months for long term repairs

Actual durations may vary depending on labor and crew availability and sequencing.

7 **Procurement Method**

The estimate reflects probable construction costs obtainable in the project locality on the date of this estimate assuming that work will be performed by shipyard's own labor forces.

8 **Bid Conditions - N/A**

9 **Basis of Quantities**

Wherever possible, this estimate has been based upon the actual measurement of different items of work.
For the remaining items, parametric measurements were used in conjunction with references from other projects of a similar nature.
Quantities used in this estimate are based on query responses attached, which differ than the quantities shown on the drawings

10 **Basis of Direct Cost Pricing**

- a The unit prices used in the direct cost estimate section are composite unit prices which include costs for material, labor, equipment and subcontractor's/supplier's mark-ups.
- b Subcontractor’s overhead and profit is included in each line item unit cost.
- c Labor costs are based on State of California prevailing wages for San Francisco.
- d In pricing the estimate, we have made references to the following sources for cost data:
  Historical cost data of similar projects
  2017 RS Means Building Construction Cost Data by RS Means
  2017 RS Means Heavy Construction Cost Data by RS Means
  2017 National Construction Estimator by Craftsman
  Construction Economics in Engineering-News-Record (ENR)
  Walker's Building Estimator's Reference Book by Frank R. Walker Company

Prevailing wage rates for constructions workers for City and County of San Francisco.

Based on the above cost sources, our analysis of the project specific requirements and our judgment of the current market conditions, we have determined the unit costs specifically for this project.

11 **Markups**

Markups are added to the direct estimated cost to cover the following markups based on a self-performed contract:
General Contractor's general conditions and general requirements
General contractor's overhead and profit, bonds and insurance
Design phase and estimating contingency

12 **Cost Escalation**

The estimate is based on current May 2017 dollars. No cost escalation is included.
Based on current market conditions, we recommend an allowance for cost escalation at 6% per year for the next two years, compounded annually from today to the mid-point of construction.

13 **Items Impacting Costs**

The following is a list of some items that may affect the cost estimate:

a Modifications to the scope of work or assumptions included in this estimate
b Special phasing requirements
c Restrictive technical specifications or excessive contract conditions
d Any specified item of equipment, material, or product that cannot be obtained from at least three different sources
e Any other non-competitive bid situations.

14 **Limitations**

a Client acknowledges that our estimating service is consistent with and limited to the standard of care applicable to such services, which is that we provide our services consistent with the professional skill and care ordinarily provided by consultants practicing in the same or similar locality under the same or similar circumstances. The estimate is intended to be a determination of fair market value for the project construction. Since we have no control over market conditions, costs of labor, materials, equipment and other factors which may affect the bid prices, we cannot and do not warrant or guarantee that bids or ultimate construction costs will not vary from the cost estimate. We make no other warranties, either expressed or implied, and are not responsible for the interpretation by others of the contents herein the cost estimate.

b It should be noted that the cost estimate is a "snapshot in time" and that the reliability of this opinion of probable construction cost will inherently degrade over time. The estimate should be updated as design progresses or when market condition has been changed.

c Please note that the estimate has been prepared based on preliminary information and design assumptions which are subject to verifications and changes as the design progresses. An updated estimate should be prepared when more specific and detailed design information is available.

15 **Abbreviations used in the estimate:**

CY = cubic yard
EA= each
GSF = gross square foot
LB = pound
LF = linear foot
LOC=location
LS = lump sum
SF = square foot
ROM = rough order of magnitude

Port of San Francisco, Dry Dock Eureka Repairs
Preliminary Estimate of Probable Repair Costs **Date: 6/2/2017R1**
Based on Structural Assessment Report
2) Estimate Summary

Items	Short Term Repair Estimated Amount	Long Term Repair Estimated Amount
From attached details:		
Material Cost	$556,240	$3,525,688
Labor Cost	$1,130,897	$2,747,105
Equipment Cost	$85,991	$258,353
Estimated Total Construction Cost (Hard Cost)	**$1,773,128**	**$6,531,146**

ROM Estimated Construction Duration (Months), assuming a crew of 4 working sequentially	15	25

All in 2017 dollars, no cost escalation included above

Based on shipyard self-performing all work and based on labor rates provided by Shipyard on 4/25/2017

Please read the attached "Basis of Estimate" and 'Estimate Details" for assumptions, exclusions, qualifications and scope of work.

Port of San Francisco, Dry Dock Eureka Repairs
Preliminary Estimate of Probable Repair Costs
Based on Structural Assessment Report
3) Estimate Details - Short Term Repairs

Date: 6/2/2017R1

LINE REF.	ITEM NO.	DESCRIPTION	QUANTITY	UNIT	MATERIAL $		DURATION	LABOR $		EQUIPMENT $		TOTAL	TOTAL
					U.C.	TOTAL	HRS	U.C.	TOTAL	U.C.	TOTAL	UNIT COST	ESTIMATE $
1	A	**Short Term Repairs**											
2													
3		Repair of Stiffer at One Typical Location, work from inside compartment - overhead work											
4		Watchman for confined space work	1	Loc			2.00	157.00	157			157.00	157
5		Inspect for pin holes or corrosion exceeding limit	1	Loc			0.25	20.00	20	5.00	5	25.00	25
6		Localized abatement of LBP	1	EA	5.00	5	1.00	78.00	78	2.00	2	85.00	85
7		Cut & remove fractured corroded steel	1	EA			1.00	66.00	66	3.00	3	69.00	69
8		New L7x4x3/8 16" long welded to existing angle, about 18 lb/ea	1	EA	22.61	23	1.00	133.00	133	2.00	2	157.61	158
9		Coating at repair including wire brush, prime, intermediate and finish coats	1	EA	3.00	3	0.50	42.00	42			45.00	45
10													
11		Total per one typical location of stiffener repair	1	EA		31	5.75		496		12		539
12													
13		Total repair stiffeners at 866 locations	866	EA	31.00	26,846	208.79	496.00	429,536	12.00	10,392	539.00	466,774
14		Allow for skid as work platform inside compartment	244	Days						200.00	48,800	200.00	48,800
15		Add 1/2" doubler plate, about 20.16 lb/sf	7,000	SF	20.16	141,120	700.00	13.00	91,000			33.16	232,120
16		Coating at repair including wire brush, prime, intermediate and finish coats	7,000	SF	5.00	35,000	700.00	17.00	119,000			22.00	154,000
17		Add 1" cover plate, about 40.32 lb/sf	3,800	SF	40.32	153,216	190.00	7.00	26,600			47.32	179,816
18		Replace top 3 rungs of steel rungs at each tank	32	LOC	150.00	4,800	128.00	531.00	16,992			681.00	21,792
19		Cathodic Protection: 23 lb Zinc Anodes	325	EA	83.00	26,975	325.00	405.00	131,625	15.00	4,875	503.00	163,475
20		Cathodic Protection: 60 lb Magnesium Anodes	32	EA	200.00	6,400	128.00	1,724.00	55,168	65.00	2,080	1,989.00	63,648
21													
22	------------	--	-----------------	----------	--------------	-----------------	-----------------	--------------	----------------	-------------	----------------	------------------	------------------
23		Subtotal Direct Cost				394,357	2,380	Hours	869,921		66,147		1,330,425

Port of San Francisco, Dry Dock Eureka Repairs
Preliminary Estimate of Probable Repair Costs
Based on Structural Assessment Report
3) Estimate Details - Short Term Repairs

Date: 6/2/2017R1

LINE REF.	ITEM NO.	DESCRIPTION	QUANTITY	UNIT	MATERIAL $ U.C.	MATERIAL $ TOTAL	DURATION HRS	LABOR $ U.C.	LABOR $ TOTAL	EQUIPMENT $ U.C.	EQUIPMENT $ TOTAL	TOTAL UNIT COST	TOTAL ESTIMATE $
24							15	months for a crew of 4					
25		Sales Tax @ 8.50%				33,520							33,520
26	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------
27		Subtotal				427,877			869,921		66,147		1,363,945
28		Design Development And Estimating Contingency @ 30%				128,363			260,976		19,844		409,183
29	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------
30		Subtotal - Estimated Repair Costs Self-Perform by Shipyard Crews				556,240			1,130,897		85,991		1,773,128
31		General Conditions/Requirements		**N/A**									
32	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------
33		Subtotal											
34		Bonds & Insurance @ 2%		**N/A**									
35	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------
36		Subtotal											
37		General Contractor's Overhead And Profit @ 10%		**N/A**									
38	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------
39		**Total Estimated Repair Costs, Self-Performed**				556,240			1,130,897		85,991		**1,773,128**

Port of San Francisco, Dry Dock Eureka Repairs
Preliminary Estimate of Probable Repair Costs
Based on Structural Assessment Report
4) Estimate Details - Long Term Repairs

Date: 6/2/2017R1

LINE REF.	ITEM NO.	DESCRIPTION	QUANTITY	UNIT	MATERIAL $ U.C.	MATERIAL $ TOTAL	DURATION HRS	LABOR $ U.C.	LABOR $ TOTAL	EQUIPMENT $ U.C.	EQUIPMENT $ TOTAL	TOTAL UNIT COST	TOTAL ESTIMATE $
1	**B**	**Long Term Repairs**											
2		Key Quantities											
3		Replace corroded deck plate and stiffeners with pre-fabricated deck plate with stiffeners	30,500	sf									
4		Assume each pre-fab unit is 8'Wx10'L	382	ea									
5		Use	400	ea									
6													
7		Estimate per pre-fab unit											
8		Watchman for confined space work	1	Loc			3.00	235.00	235			235.00	235
9		Localized abatement of LBP	1	EA	50.00	50	4.00	314.00	314	25.00	25	389.00	389
10		Cut & remove fractured corroded deck plate and stiffeners	1	EA			4.00	531.00	531	50.00	50	581.00	581
11		Pre-fabricated deck plate, 1/2" thick with L7x4x3/8 stiffener including shop coating, about 1,750 lb/ea, FOB jobsite	1	EA	3,500.00	3,500	1.00	235.00	235	100.00	100	3,835.00	3,835
12		Shop coating for pre-fabricated deck assembly	180	SF	2.50	450	1.80	2.00	360			4.50	810
13		Mobile crane	1	EA	42.00	42	2.00	127.00	127	42.97	43	211.97	212
14		Weld pre-fabricated section to existing stiffeners & deck	1	EA	72.00	72	4.00	531.00	531	220.00	220	823.00	823
15		Field coating of joints after completion of welding	1	EA	200.00	200	2.00	169.00	169			369.00	369
16													
17		Total per one typical location	1	EA		4,314	21.80		2,502		438		7,254
18													
19		Total repair deck assuming 400 units, 32,000 SF/ea	400	EA	4,314.00	1,725,600	258.46	2,502.00	1,000,800	438.00	175,200	7,254.00	2,901,600
20		Fixed platform, setup and demob - with Interior Compartment Coating Section below											
21		Prepare top deck plating to receive new protective coating, excludes new deck plate	12,710	SF			54.00	1.40	17,794			1.40	17,794
22		Protective coating at new deck and existing deck	43,210	SF	0.50	21,605	162.00	1.30	56,173			1.80	77,778
23		Replace top 3 rungs of steel rungs at each tank	32	LOC	150.00	4,800	128.00	531.00	16,992			681.00	21,792
24		Cathodic Protection: 23 lb Zinc Anodes	325	EA	83.00	26,975	325.00	405.00	131,625	15.00	4,875	503.00	163,475

Port of San Francisco, Dry Dock Eureka Repairs
Preliminary Estimate of Probable Repair Costs
Based on Structural Assessment Report
4) Estimate Details - Long Term Repairs

Date: 6/2/2017R1

LINE REF.	ITEM NO.	DESCRIPTION	QUANTITY	UNIT	MATERIAL $ U.C.	MATERIAL $ TOTAL	DURATION HRS	LABOR $ U.C.	LABOR $ TOTAL	EQUIPMENT $ U.C.	EQUIPMENT $ TOTAL	TOTAL UNIT COST	TOTAL ESTIMATE $
25		Cathodic Protection: 60 lb Magnesium Anodes	32	EA	200.00	6,400	128.00	1,724.00	55,168	65.00	2,080	1,989.00	63,648
26													
27		Interior Compartment Coating at 32 locations total											
28		Watchman for confined space work	32	Loc			960.00	2,352.00	75,264			2,352.00	75,264
29		Fixed platform, setup and demob	45,120	SF	1.50	67,680	225.63	3.00	135,360			4.50	203,040
30		Prepare flooring to receive new coating	45,120	SF			169.25	1.30	58,656	0.10	4,512	1.40	63,168
31		Prepare walls to receive new coating	75,540	SF			325.75	1.50	113,310	0.10	7,554	1.60	120,864
32		Prepare ceiling to receive new coating	45,120	SF			223.75	1.70	76,704	0.10	4,512	1.80	81,216
33		Coating at floor - primer, intermediate & finish	45,120	SF	3.90	175,968	236.88	1.80	81,216			5.70	257,184
34		Coating at walls - primer, intermediate & finish	75,540	SF	3.90	294,606	535.39	2.40	181,296			6.30	475,902
35		Coating at ceiling - primer, intermediate & finish	45,120	SF	3.90	175,968	331.63	2.50	112,800			6.40	288,768
36	------	------	------	------	------	------	------	------	------	------	------	------	------
37		Subtotal Direct Cost				2,499,602	4064.00	Hours	2,113,158		198,733		4,811,493
38							25	months for a crew of 4					
39		Sales Tax @ 8.50%				212,466							212,466
40	------	------	------	------	------	------	------	------	------	------	------	------	------
41		Subtotal				2,712,068			2,113,158		198,733		5,023,959
42		Design Development And Estimating Contingency @ 30%				813,620			633,947		59,620		1,507,187
43	------	------	------	------	------	------	------	------	------	------	------	------	------
44		Subtotal - Estimated Repair Costs Self-Perform by Shipyard Crews				3,525,688			2,747,105		258,353		6,531,146
45		General Conditions/Requirements		**N/A**									
46	------	------	------	------	------	------	------	------	------	------	------	------	------
47		Subtotal											
48		Bonds & Insurance @ 2%		**N/A**									

Port of San Francisco, Dry Dock Eureka Repairs
Preliminary Estimate of Probable Repair Costs
Based on Structural Assessment Report
4) Estimate Details - Long Term Repairs

Date: 6/2/2017R1

LINE REF.	ITEM NO.	DESCRIPTION	QUANTITY	UNIT	MATERIAL $ U.C.	MATERIAL $ TOTAL	DURATION HRS	LABOR $ U.C.	LABOR $ TOTAL	EQUIPMENT $ U.C.	EQUIPMENT $ TOTAL	TOTAL UNIT COST	TOTAL ESTIMATE $
49	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------
50		Subtotal											
51		General Contractor's Overhead And Profit @ 10%		**N/A**									
52	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------
53		**Total Estimated Repair Costs base on Self-Performed work by Shipyard Crews**				3,525,688			2,747,105		258,353		**6,531,146**

M Lee Corporation

Project Query Sheet

TO: **Craig Lewis of GHD**

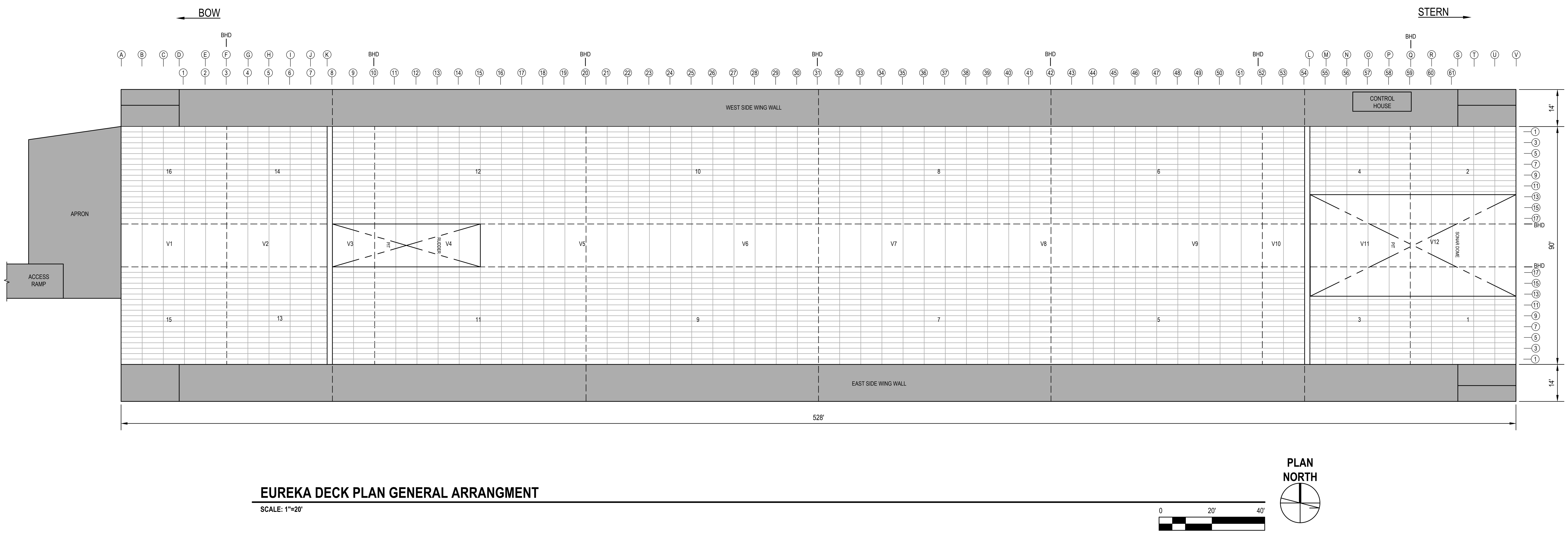
FROM: **Franklin Lee of M Lee Corp**

MLC Job No.	***1255***	*Sheet No.*
Job Name:	**Eureka Dry Dock Repair**	*Date: 5/16/2017*

Item	Drwg/Spec	Queries	Answers
1	Short Term Repairs	What length of angle should be assumed for each damaged stiffener location?	Each damaged stiffener location is repaired with 16" long section of L7x4 per Detail 1/Sheet SK3.0.
2	Short Term Repairs	What percent of damaged areas noted on SK2.1 and 2.2 should receive new 1/2" plate?	30% of damaged areas noted on SK 2.1 and 2.2 receive new ½" plate (~7,000 square feet.)
3	Short Term Repairs	What is the extent of coating?	Coating is limited to weld locations and new plate and stiffeners.
4	Long Term Repairs	What area of deck will be repaired?	32,000 square feet of deck area receives Detail 2/Sheet SK3.0. As mentioned in the meeting, the deck area would be cut out from above, removed by small mobile crane and replaced with a panel section consisting of plate with L7 stiffeners pre-welded. Welding to the existing frame members would be done from inside the compartments.
5	Long Term Repairs	Please clarify the extent of coating.	Panels sections are coated prior to being installed. Field coating is done after installation and welding. Compartment interiors will be recoated as well.
6			
7			
8			
9			

Appendix B

Drawings – Existing Conditions



EUREKA DECK PLAN GENERAL ARRANGMENT

SCALE: 1"=20'

PLAN NORTH

PRELIMINARY - NOT FOR CONSTRUCTION

NO.	DATE	DESCRIPTION	BY	APP.

TABLE OF REVISIONS
CHECK WITH TRACING TO SEE IF YOU HAVE LATEST REVISION

REFERENCE INFORMATION & FILE NO. OF SURVEYS

SAN FRANCISCO PORT COMMISSION
PORT OF SAN FRANCISCO
DEPARTMENT OF ENGINEERING

GHD | TELAMON ENGINEERING CONSULTANTS, INC. — A Joint Venture

DESIGNED: JP DATE: 3/28/17
DRAWN: PS DATE: 3/28/17
CHECKED: CL DATE: 3/28/17

APPROVED BY SAN FRANCISCO PORT COMMISSION
DATE: ________
CHIEF HARBOR ENGINEER

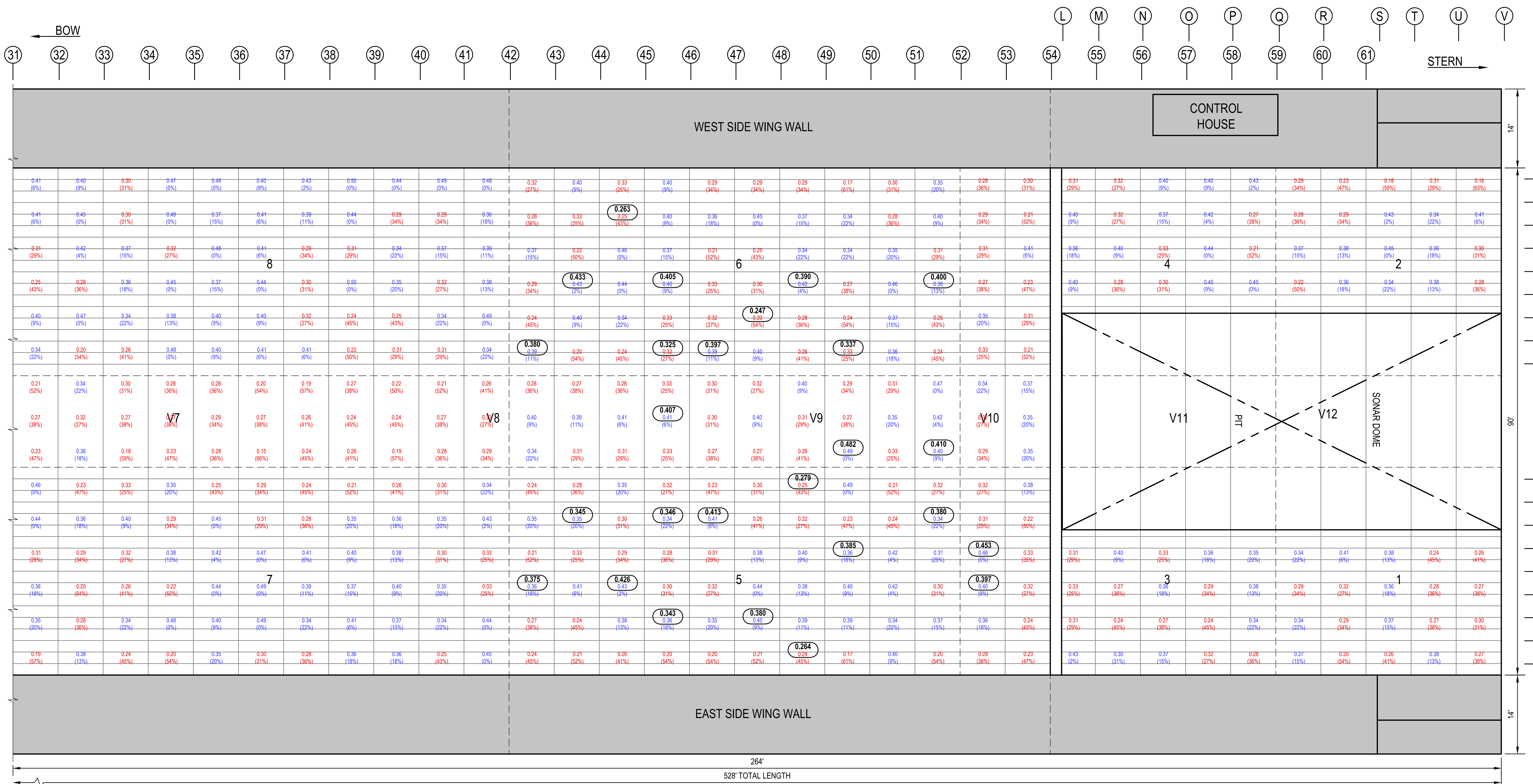
SCALE: AS SHOWN
REV. NO. -

PIER 70 DRYDOCK EUREKA CERTIFICATION
TECHNICAL REVIEW AND INSPECTION

DECK PLAN
GENERAL ARRANGEMENT

CONTRACT NO. GT-02
DRAWING NO. -
SHEET NO. SK1.0 -

Filename: N:\US\San Francisco\Projects\111\11136689 GT-JV SFP Pier 70 Dry Dock Eval\06-CAD\Sheets\11136689 SK1.0.dwg
Plotted By: Pat Scheetz
Plot Date: 2 June 2017 - 3:20 PM



EUREKA DECK PLATE THICKNESS CONFIRMATION SURVEY

SCALE: 3/32"=1'-0"

PLAN NORTH

SHEET GENERAL NOTES

1. DRAWING REFLECTS ULTRA SONIC TEST READINGS IDENTIFIED IN INTERNATIONAL INSPECTIONS UT/VT SURVEY CONDUCTED IN MAY 2015, AND GHD CONFIRMATION SURVEY CONDUCTED IN MARCH 2017.

LEGEND

- (A) (1) FRAME LETTER AND NUMBER
- 0.453 GHD MEASURED THICKNESS (INCHES)
- 0.43 (2%) MEASURED THICKNESS (INCHES) / ULTRA SONIC THICKNESS GAUGING - CORROSION / PERCENT CHANGE FROM ORIGINAL THICKNESS
- 0.43 (2%) MEASURED THICKNESS (INCHES) / ULTRA SONIC THICKNESS GAUGING - EXCESSIVE CORROSION / PERCENT CHANGE FROM ORIGINAL THICKNESS

PRELIMINARY - NOT FOR CONSTRUCTION

NO.	DATE	DESCRIPTION	BY	APP.

TABLE OF REVISIONS
CHECK WITH TRACING TO SEE IF YOU HAVE LATEST REVISION

REFERENCE INFORMATION & FILE NO. OF SURVEYS

SAN FRANCISCO PORT COMMISSION
PORT OF SAN FRANCISCO
DEPARTMENT OF ENGINEERING

PORT OF SAN FRANCISCO

GHD | TELAMON ENGINEERING CONSULTANTS, INC. A Joint Venture

DESIGNED: JP	DATE: 3/28/17	
DRAWN: PS	DATE: 3/28/17	
CHECKED: CL	DATE: 3/28/17	

APPROVED BY SAN FRANCISCO PORT COMMISSION
DATE: ________
CHIEF HARBOR ENGINEER

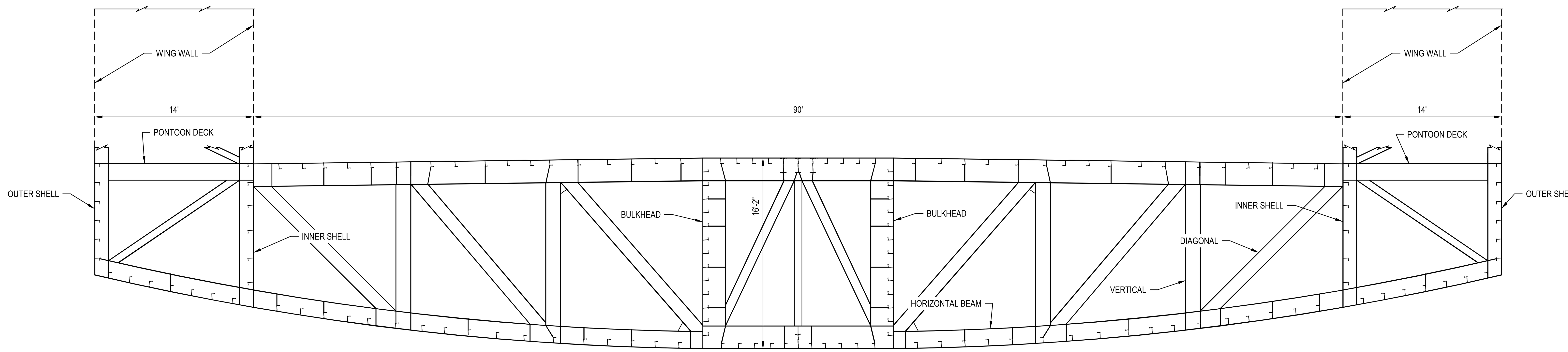
SCALE: AS SHOWN
REV. NO. -

PIER 70 DRYDOCK EUREKA CERTIFICATION TECHNICAL REVIEW AND INSPECTION

EUREKA DECK PLATE THICKNESS CONFIRMATION SURVEY

CONTRACT NO. GT-02
DRAWING NO. -
SHEET NO. SK1.3 -

Filename: N:\US\San Francisco\Projects\111\11156689 GT-JV SFP Pier 70 Dry Dock Eval\06-CAD\Sheets\11156689 SK1.3.dwg
Plotted By: Pat Schweitz
Plot Date: 2 June 2017 - 3:21 PM



TYPICAL PONTOON FRAME SECTION

SCALE: 3/16"=1'-0"

0 4' 8' 12'

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DATE: ________
CHIEF HARBOR ENGINEER

SCALE: AS SHOWN
REV. NO. –

PIER 70 DRYDOCK EUREKA CERTIFICATION
TECHNICAL REVIEW AND INSPECTION

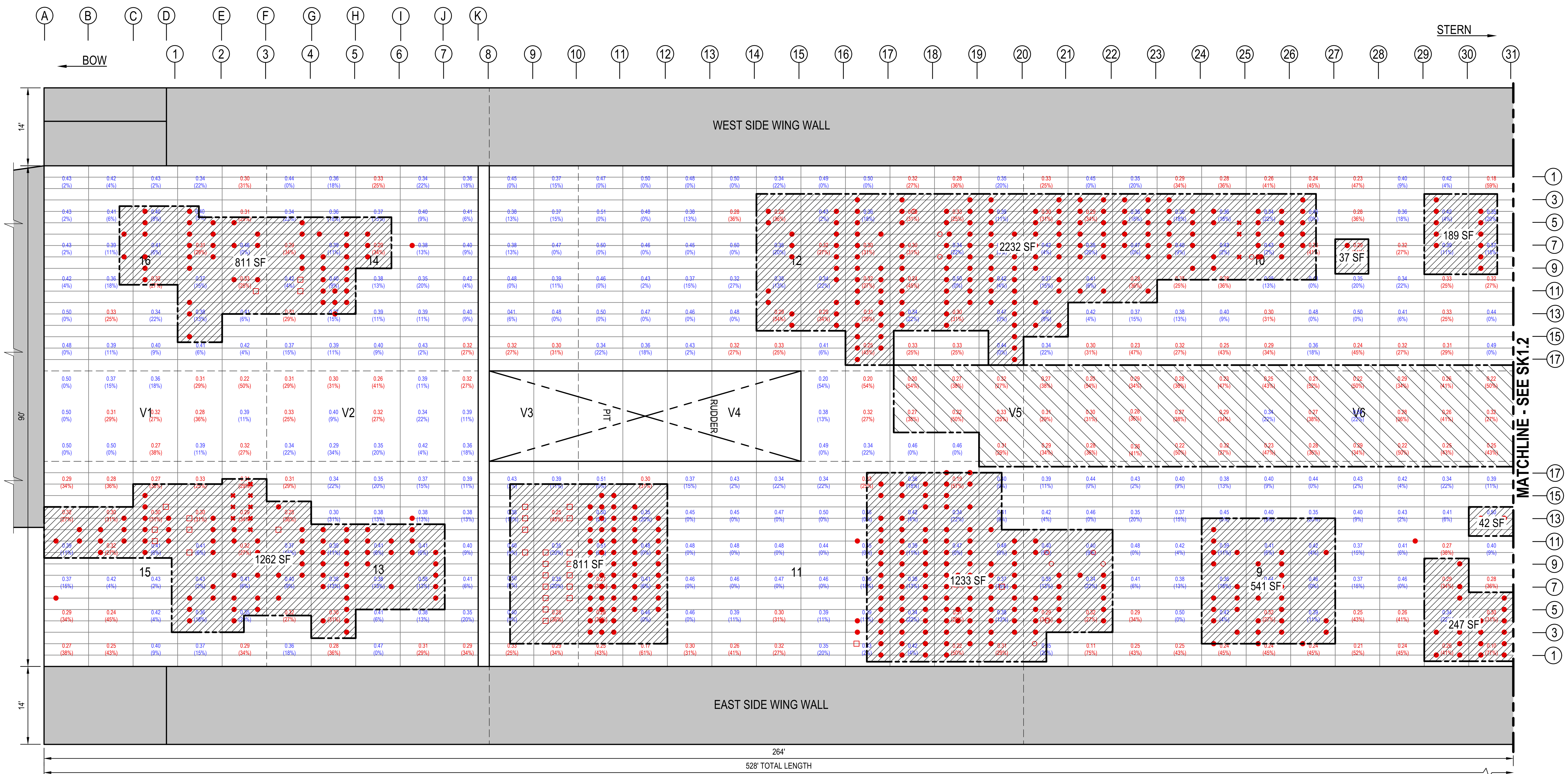
TYPICAL PONTOON FRAME SECTION

CONTRACT NO. GT-02
DRAWING NO. –
SHEET NO. SK1.4 –

Filename: N:\US\San Francisco\Projects\111\11136689 GT-JV SFP Pier 70 Dry Dock Eval\06-CAD\Sheets\11136689 SK1.4.dwg
Plotted By: Pat Scheetz
Plot Date: 2 June 2017 - 3:21 PM

Appendix C

Drawings – Repair Concepts



EUREKA DECK SHORT TERM REPAIR PLAN (1 OF 2)

SCALE: 3/32"=1'-0"

PLAN NORTH

0 8' 16' 24'

LEGEND

37 SF — APPROXIMATE EXTENTS OF REPAIR AREA AND SQUARE FOOTAGE. SEE DETAIL 1/SK3.0.

APPROXIMATE EXTENTS OF NEW 1" COVER PLATE.

NOTES

1. VESSEL LIFTING CAPACITY MAY BE APPROXIMATELY 7,000 LONG TONS IF RECOMMENDED SHORT TERM REPAIRS ARE IMPLEMENTED.
2. REPAIR QUANTITIES ASSUME 55% OF REPAIR AREAS WILL REQUIRE 1/2" DOUBLER PLATE.

PRELIMINARY - NOT FOR CONSTRUCTION

Filename: N:\US\San Francisco\Projects\111\11136689 GT-JV SFP Pier 70 Dry Dock Eval\06-CAD\Sheets\11136689 SK2.1 THRU 2.2.dwg

Plotted By: Pat Scheetz

Plot Date: 2 June 2017 - 3:32 PM

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JP	3/28/17
DRAWN:	DATE:
PS	6/2/17
CHECKED:	DATE:
CL	3/28/17

APPROVED BY
SAN FRANCISCO PORT COMMISSION
DATE: ________
CHIEF HARBOR ENGINEER

SCALE: AS SHOWN

REV. NO. -

PIER 70 DRYDOCK EUREKA CERTIFICATION
TECHNICAL REVIEW AND INSPECTION

EUREKA DECK
SHORT TERM REPAIR PLAN
(1 OF 2)

CONTRACT NO. GT-02

DRAWING NO. -

SHEET NO. SK2.1 -

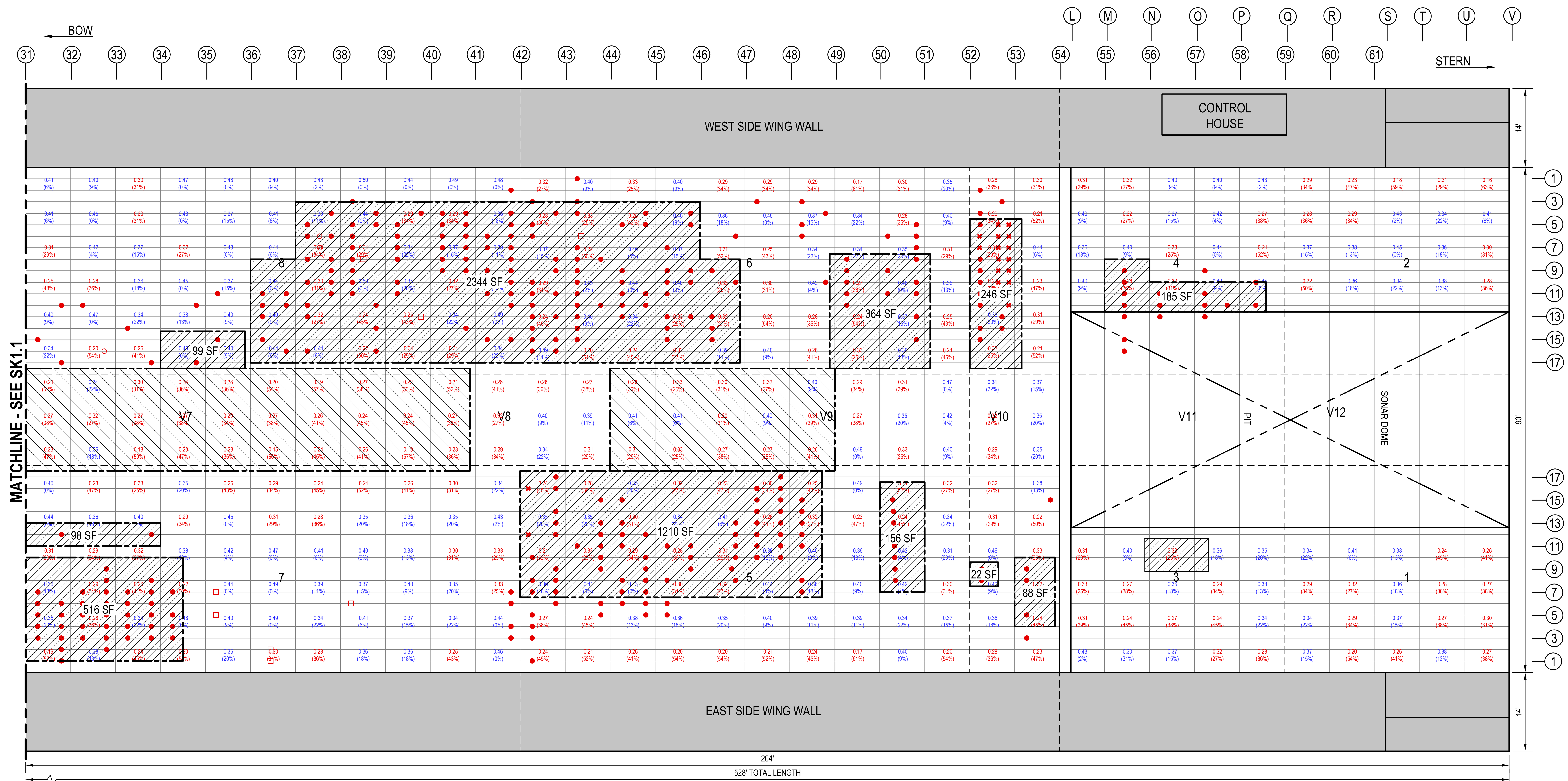
LEGEND

37 SF — APPROXIMATE EXTENTS OF REPAIR AREA AND SQUARE FOOTAGE. SEE DETAIL 1/SK3.0.

APPROXIMATE EXTENTS OF NEW 1" COVER PLATE.

NOTES

1. VESSEL LIFTING CAPACITY MAY BE APPROXIMATELY 7,000 LONG TONS IF RECOMMENDED SHORT TERM REPAIRS ARE IMPLEMENTED.
2. REPAIR QUANTITIES ASSUME 55% OF REPAIR AREAS WILL REQUIRE 1/2" DOUBLER PLATE.



PLAN NORTH

0 8' 16' 24'

EUREKA DECK SHORT REPAIR PLAN (2 OF 2)

SCALE: 3/32"=1'-0"

PRELIMINARY - NOT FOR CONSTRUCTION

NO.	DATE	DESCRIPTION	BY	APP.

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DRAWN: PS DATE: 6/2/17
CHECKED: CL DATE: 3/28/17

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DATE: ________
CHIEF HARBOR ENGINEER

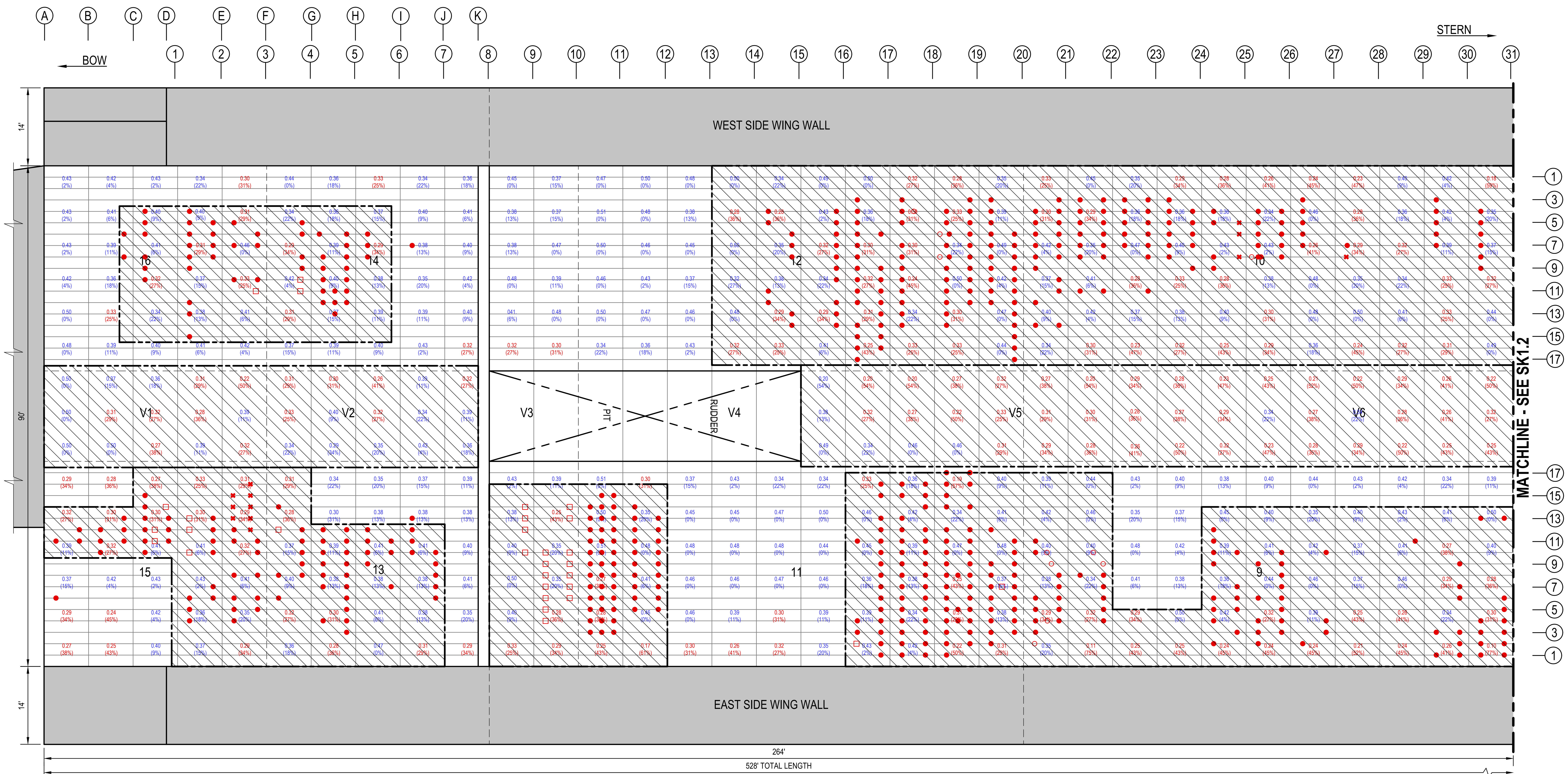
SCALE: AS SHOWN
REV. NO. -

PIER 70 DRYDOCK EUREKA CERTIFICATION
TECHNICAL REVIEW AND INSPECTION

EUREKA DECK
SHORT TERM REPAIR PLAN
(2 OF 2)

CONTRACT NO. GT-02
DRAWING NO. -
SHEET NO. SK2.2
-

Filename: N:\US\San Francisco\Projects\111\11136689 GT-JV SFP Pier 70 Dry Dock Eval\06-CAD\Sheets\11136689 SK2.1 THRU 2.2.dwg
Plotted By: Pat Scheetz
Plot Date: 2 June 2017 - 3:32 PM



EUREKA DECK LONG TERM REPAIR PLAN (1 OF 2)

SCALE: 3/32"=1'-0"

0 8' 16' 24'

LEGEND

EXTENTS OF DECK REPLACEMENT REPAIR AREA AND SQUARE FOOTAGE. SEE DETAIL 2/SK3.0.

NOTES

1. VESSEL LIFTING CAPACITY MAY BE 12,000 TO 14,000 LONG TONS IF RECOMMENDED LONG TERM REPAIRS ARE IMPLEMENTED.

PRELIMINARY - NOT FOR CONSTRUCTION

NO.	DATE	DESCRIPTION	BY	APP.

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PIER 70 DRYDOCK EUREKA CERTIFICATION
TECHNICAL REVIEW AND INSPECTION

EUREKA DECK
LONG TERM REPAIR PLAN
(1 OF 2)

CONTRACT NO. GT-02
DRAWING NO. -
SHEET NO. SK2.3 -

Filename: N:\US\San Francisco\Projects\111\11136689 GT-JV SFP Pier 70 Dry Dock Eval\06-CAD\Sheets\11136689 SK2.3 THRU 2.4.dwg
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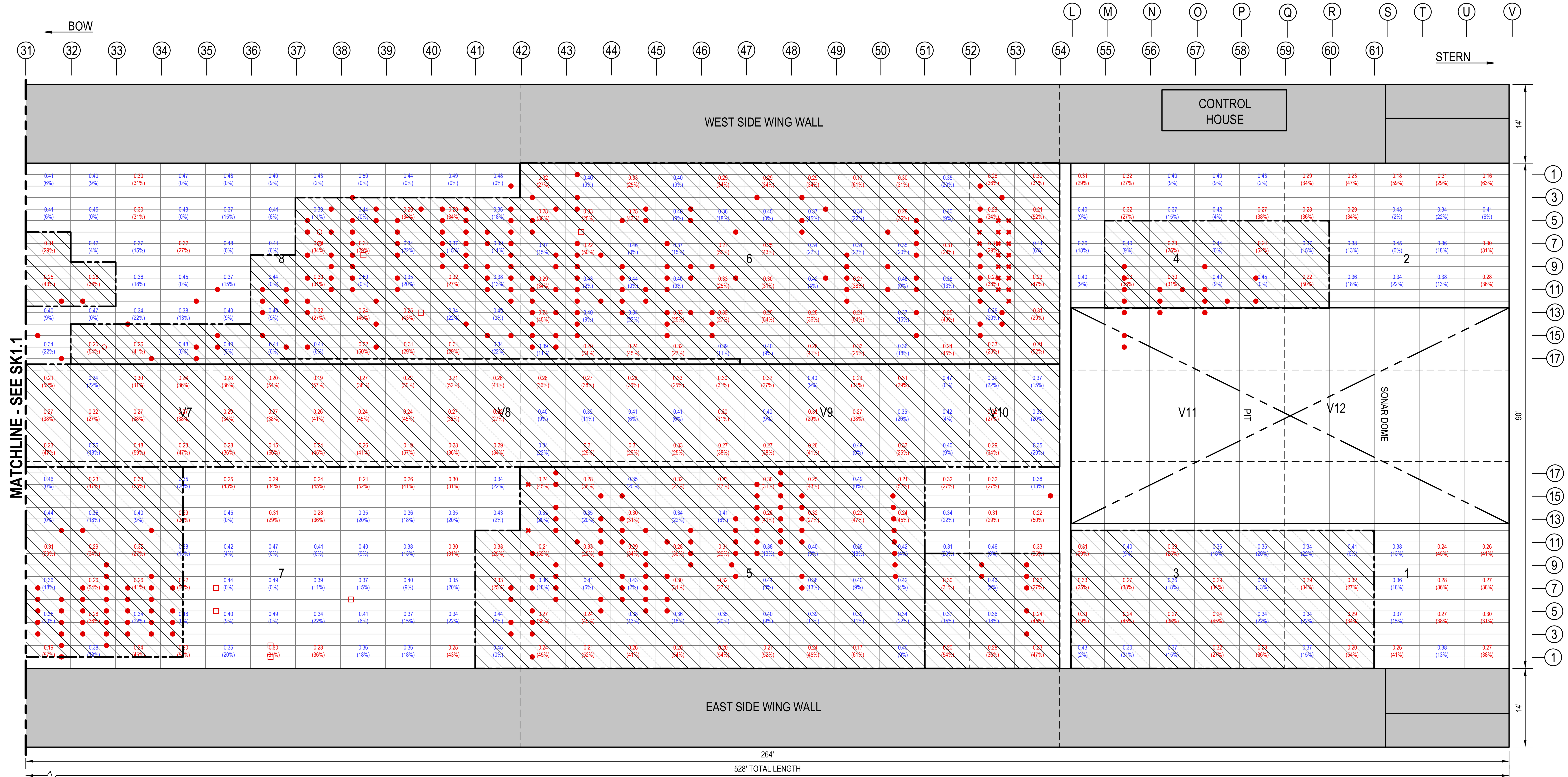


LEGEND

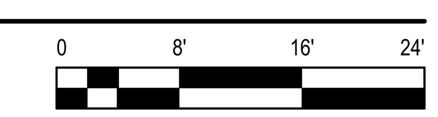
EXTENTS OF DECK REPLACEMENT REPAIR AREA AND SQUARE FOOTAGE. SEE DETAIL 2/SK3.0.

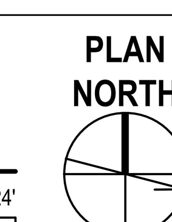
NOTES

1. VESSEL LIFTING CAPACITY MAY BE 12,000 TO 14,000 LONG TONS IF RECOMMENDED LONG TERM REPAIRS ARE IMPLEMENTED.

EUREKA DECK LONG TERM REPAIR PLAN (2 OF 2)

SCALE: 3/32"=1'-0"





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NO.	DATE	DESCRIPTION	BY	APP.

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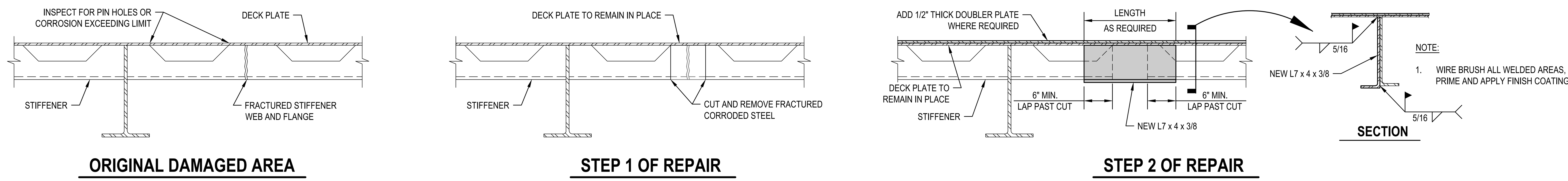
EUREKA DECK LONG TERM REPAIR PLAN (2 OF 2)

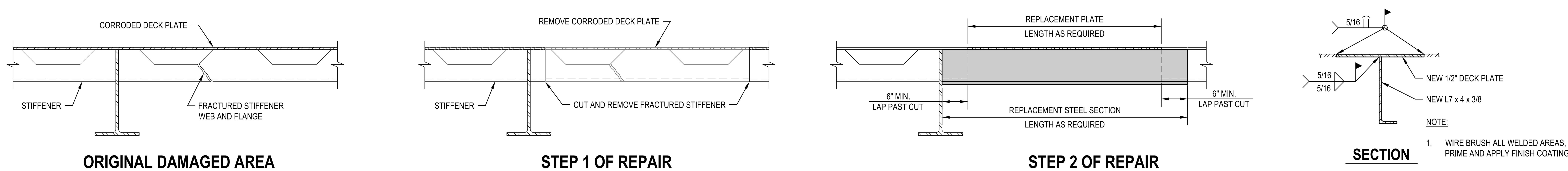
CONTRACT NO. GT-02
DRAWING NO. -
SHEET NO. SK2.4 -

Filename: N:\US\San Francisco\Projects\111\11136689 GT-JV SFP Pier 70 Dry Dock Eval\06-CAD\Sheets\11136689 SK2.3 THRU 2.4.dwg
Plotted By: Pat Schwartz
Plot Date: 2 June 2017 - 3:33 PM



1 STIFFENER WEB AND FLANGE REPAIR DETAIL (SHORT TERM)

NOT TO SCALE



2 PLATE AND STIFFENER REPAIR DETAIL (LONG TERM)

NOT TO SCALE

PRELIMINARY - NOT FOR CONSTRUCTION

Filename: N:\US\San Francisco\Projects\111\11136689 GT-JV SFP Pier 70 Dry Dock Eval\06-CAD\Sheets\11136689 SK3.0.dwg

Plotted By: Pat Scheetz

Plot Date: 2 June 2017 - 3:22 PM

NO.	DATE	DESCRIPTION	BY	APP.

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DATE:
CHIEF HARBOR ENGINEER

SCALE: AS SHOWN
REV. NO. -

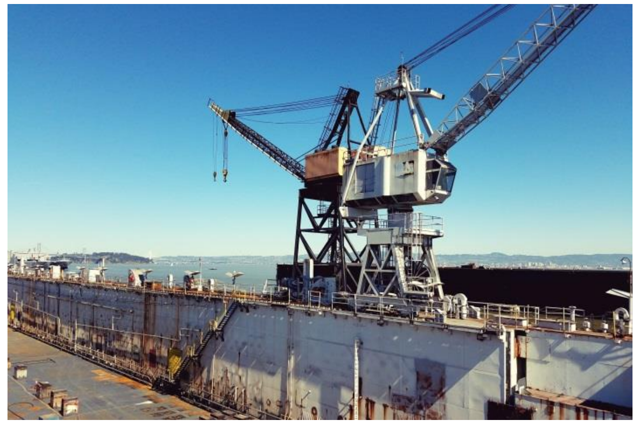
PIER 70 DRYDOCK EUREKA CERTIFICATION TECHNICAL REVIEW AND INSPECTION

CONCEPTUAL REPAIR DETAILS

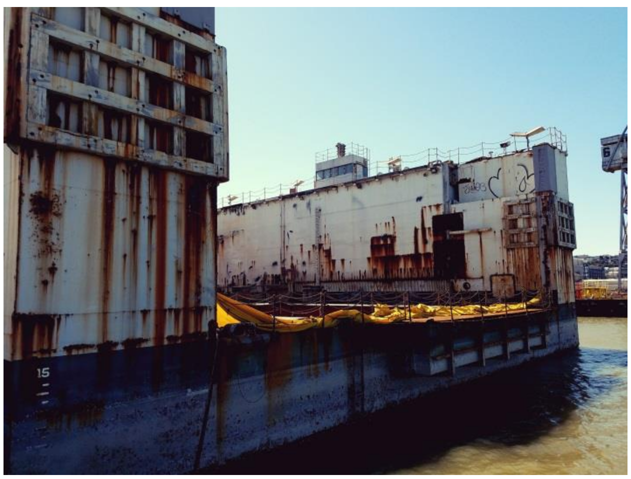
CONTRACT NO. GT-02
DRAWING NO. -
SHEET NO. SK3.0 -

Appendix D
Photos

1. North View of along the length of Dry Dock EUREKA



2. East wing wall



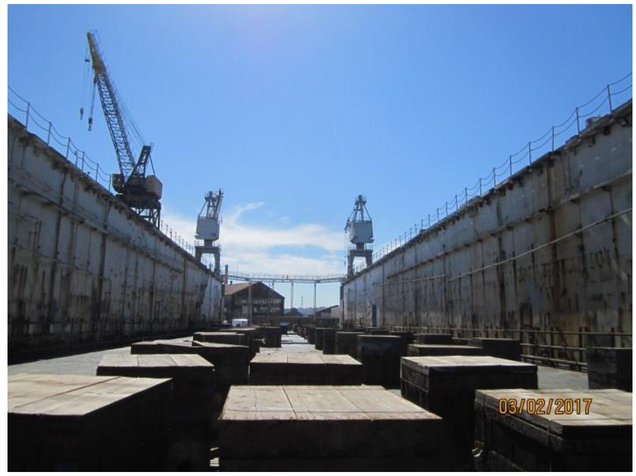
3. North end, exterior view

4. Ramp at south end

5. Close up of pontoon deck corrosion

6. Wide view of pontoon deck corrosion

7. Propeller pit at north end of EUREKA



8. South view of support blocks and interior faces of wing walls

9. Typical pipe and steel corrosion at wing wall

10. Typical support block

11. Sacrificial anode in Tank 9

12. Braced frames at Tank 9

13. Roof stiffeners at Tank 6A

14. Roof stiffeners at Tank 6A

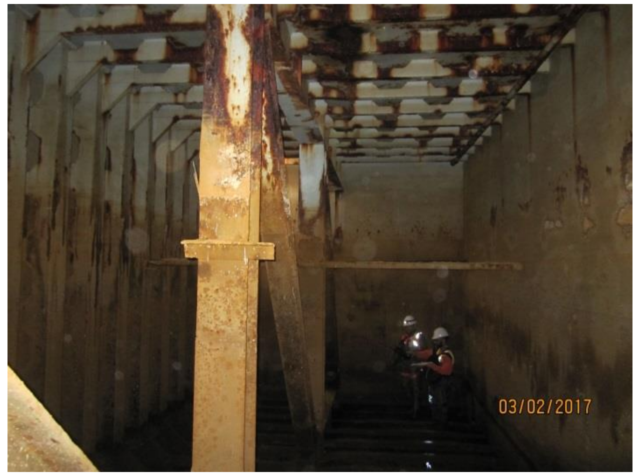
15. Roof stiffeners at Tank 6

16. Roof stiffeners and braced frame at Tank 20A

17. Roof stiffeners at Tank 5

18. Roof stiffeners and braced frame at Tank 5

19. Ladder up wing wall at Tank 6



20. Roof stiffeners and braced frame at Tank 6

21. Wall stiffeners at Tank 6

22. Typical marine growth on hull

23. Removal of marine growth for inspection

24. Typical hull deterioration after removal of marine growth

Appendix E

Underwater Inspection Report

GHD-TECI Joint Venture
Port of San Francisco
Dry Dock EUREKA Underwater Condition Assessment

FINAL REPORT

San Francisco, CA

March 2017

Safeco Plaza, 1001 Fourth Avenue, Suite 4305
Seattle, Washington 98154
206.682.2140 • www.collinsengr.com

COLLINS
ENGINEERS INC.

April 21, 2017
Collins Job No. 45-10289

Mr. Craig Lewis
Facilities Service Line Leader
GHD, Inc.
655 Montgomery Street, Suite 1010
San Francisco, CA 94111

RE: Port of San Francisco – Dry Dock EUREKA Underwater Condition Assessment

Dear Mr. Lewis,

Collins Engineers, Inc. (Collins) is pleased to submit this FINAL document: Dry Dock EUREKA Underwater Condition Assessment FINAL Report. This document is in accordance with the scope of services contained in the Agreement for Professional Services with GHD, Inc., dated March 1, 2017.

This report includes: condition assessment for the underwater hull components of Dry Dock EUREKA, project drawings, the previous inspection report, ultrasonic thickness gauge measurement results, typical photographs, definitions and interpolated tide tables.

Thank you for the opportunity to participate in the execution of this important project.

Very truly yours,

COLLINS ENGINEERS, INC.

Daniel G. Stromberg, P.E.
Engineer of Record

LICENSED PROFESSIONAL ENGINEER
DANIEL GERARD STROMBERG
75133
Exp. 12/31/17
CIVIL
STATE OF CALIFORNIA

I hereby certify that this engineering document was prepared by me or under my direct supervision and that I am duly Licensed Professional Engineer under the laws of the State of California.

Daniel G. Stromberg, P.E. #75133

My license renewal date is 12/31/2017

Pages or sheets covered by this seal: Entire Report

Safeco Plaza • 1001 4th Avenue • Suite 4305 • Seattle, WA 98154 • Phone 206.682.2140 • Fax 206.682.2146 • www.collinsengr.com

UNDERWATER CONDITION ASSESSMENT

FOR

DRY DOCK EUREKA

AT THE

PORT OF SAN FRANCISCO

IN

SAN FRANCISCO, CALIFORNIA

DATES OF INSPECTION: MARCH 5 – MARCH 10, 2017

PREPARED FOR:

GHD – Telamon Engineering Consultants, Inc., Joint Venture

655 MONTGOMERY STREET, SUITE 1010

SAN FRANCISCO, CA 94111

PREPARED BY:

COLLINS ENGINEERS, INC.

1001 4TH AVENUE, SUITE 4305

SEATTLE, WA 98154

(206) 682-2140

www.collinsengr.com

COLLINS JOB NO. 45-10289.00

Page

TABLES

APPENDICES

EXECUTIVE SUMMARY

An Underwater Condition Assessment of Dry Dock EUREKA was conducted from March 5th to March 10th, 2017 at the Port of San Francisco to assess the condition of the Dry Dock EUREKA hull.

Overall, the Dry Dock EUREKA hull was in FAIR condition with minor deterioration that consisted of section loss as ascertained by ultrasonic thickness gauge measurement. The inspection was performed in accordance with the ASCE Underwater Inspection Guidelines, definitions located in Appendix E.

1.0 INTRODUCTION

Currently, the dry dock is moored to a stationary pier at the Puglia Shipyard at the Port of San Francisco. The dry dock is oriented with the apron and access ramp at the south and the port side moored to the adjacent pier. A map with an approximate location of the limits of inspection is shown below in Figure 1.0-1.

Figure 1.0-1 Facility Vicinity Map

Source: Google Earth

1.1 PROJECT PERSONNEL

The underwater inspection was performed by a four-person team consisting of one professional engineer (P.E.)-diver and three supporting engineer-divers. The primary points of contact for the project are presented in Table 1.1-1 Project Representatives.

Table 1.1-1 Project Representatives

Entity	Name	Contact Information
Port of San Francisco	Matthew Bell, P.E., S.E. Civil Engineer Engineering Division	Pier 1, The Embarcadero San Francisco, CA 94111 matthew.n.bell@sfport.com (415) 274-0457
GHD - TECI	Craig Lewis, P.E., S.E. Senior Project Manager	655 Montgomery Street, Suite 1010 San Francisco, CA 94111 craig.lewis@ghd.com (415) 296-3605
Puglia Marine SF Shipyard	Justin Gleaton Dock Master	Pier 70 – 499 20th Street San Francisco, CA 94107 JGleaton@PugliaMarine.com (415) 829-0395
Collins Engineers, Inc.	Daniel Stromberg, P.E. Senor Project Manger	1001 Fourth Ave, Suite 4305 Seattle, WA 98154 dstromberg@collinsengr.com (312) 236-4182
Collins Engineers, Inc.	Adam Cox Assistant Project Manager	1001 Fourth Ave, Suite 4305 Seattle, WA 98154 acox@collinsengr.com (206) 455-9737

Source: Collins Engineers, Inc.

1.2 INSPECTION PROCEDURES

The underwater inspection consisted of Level I, II and III level investigation, as defined in Appendix E. At the time of the inspection the dry dock ballast tanks were emptied of water such that the primary hull chine was at the water surface. Level II cleanings to gather Level III ultrasonic thickness (UT) gauge readings were taken along “belt lines” as shown in Appendix A, Sheet S-01. Belt lines 1 to 5 were chosen based on the locations used to gather UT readings by DRS Marine for their December 2016 inspection as shown in Appendix B. Belt line 6 was added for this inspection to further investigate the hull condition. A fixed line was placed along each belt line to guide the engineer-diver while taking UT readings and to ensure that UT readings could be gathered along the same line during future inspections. Level I visual/tactile inspection for the entire submerged portion of the hull was performed by using a tether line linking the engineer-diver to the guide line to facilitate sweeping of the hull for 50 feet in both directions away from the guide line and oriented parallel to the long axis of the hull. Engineer-divers were deployed from the D/V James Eads which was moored to the starboard (west) side of the dry dock at each belt line.

2.0 UNDERWATER CONDITION ASSESSMENT

2.1 DRY DOCK EUREKA HULL

The Hull of Dry Dock EUREKA was found to be in FAIR condition. The average distance between UT readings and the maximum and minimum UT reading values for each belt line was as shown in the table below:

Table 2.1-1 UT Gauge Readings

Belt Line	Average Distance Between UT Readings (ft-in)	Max UT Reading (in)	Min UT Reading (in)
1	5′-2″	0.415	0.315
2	3′-8″	0.430	0.325
3	3′-6″	0.420	0.345
4	4′-6″	0.430	0.305
5	4′-0″	0.435	0.320
6	4′-4″	0.435	0.385

It is important to note that maximum UT reading values exceeding 0.437 inches (design hull plate thickness) were excluded from the table above. These greater than design thickness values are attributed to weldments on the interior of the hull being picked up by the UT gauge and are excluded as they are not indicative of the current hull plate condition. Complete UT gauge readings are given in Appendix C. In general, there was little to no observable evidence of corrosion on the exterior submerged portion of the dry dock hull. Marine growth present on the hull consisted of various types of hard and soft marine flora and fauna including muscles. Marine growth fully covered the hull within a perimeter zone that extended from the hull edge in towards the keel for a distance of 20 feet around the full perimeter of the hull. Between this perimeter zone and nearer to the keel line marine growth was sparser and covered the hull in small clumps that were randomly distributed. Plate welds and the hull coating system appeared to be intact and functioning as intended. Upon cleaning, hull coating presented with a reddish color indicating the presence of anti-fouling properties. Sacrificial anodes were randomly encountered during the course of the inspection but were not explicitly part of the inspection scope. Observed anode conditions in combination with the overall presentation of exterior hull condition indicates that, although the anodes are being consumed and show loss of section, they are functioning as intended. Photographs of typical conditions as described above are given in Appendix D. Definition of condition rating stipulations is provided in Appendix E.

2.2 MUDLINE DEPTH BELOW THE KEEL

During the course of hull inspection, mudline depths were gathered beneath the keel for each belt line by using the pneumo-fathometer system integrated into the engineer-diver’s umbilical. The time and date that depths were taken were also recorded for subsequent comparison to local tide tables and calculation of the mudline elevation as compared to a mean-lower-low-water (MLLW) datum. Interpolated tide tables are provided in Appendix F. Mudline elevations below the keel are as shown in the table below:

Table 2.2-1 Keel Mudline Elevations

Belt Line	Date/Time	Keel Depth (ft)	M/L Depth (ft)	M/L Elev. (ft)
1	3/7/17 @ 1300hrs	6	24	23
2	3/7/17 @ 1532hrs	6	26	25
3	3/8/17 @ 1206hrs	6	27	24
4	3/8/17 @ 1430hrs	6	27	26
5	3/9/17 @ 1102hrs	6	33	28
6	3/6/17 @ 1022hrs	6	30	27

Note: M/L Elevations calculated using tide station 9414334 Protero Point, CA, MLLW datum and rounding to the nearest foot.

3.0 REPAIR RECOMENDATIONS

It is recommended that sacrificial anodes that have been fully or significantly consumed to a degree of 75% loss of section or more be replaced throughout the hull. As section loss of hull plating was indicated via UT gauge readings and as there was little or no outward evidence of underwater hull plate corrosion, it is recommended that the interior of the hull plating be cleaned and recoated pursuant to analysis of the results of the interior hull inspection performed by others.

Appendix A – Inspection Drawings

PORT OF SAN FRANCISCO - DRY DOCK EUREKA

UNDERWATER CONDITION ASSESSMENT REPORT

SAN FRANCISCO, CALIFORNIA

CLIENT:

GHD - TELAMON ENGINEERING CONSULTANTS, INC.
JOINT VENTURE
CRAIG LEWIS
655 MONTGOMERY ST, SUITE 1010
SAN FRANCISCO, CA 94111
415-283-4970
CRAIG.LEWIS@GHD.COM

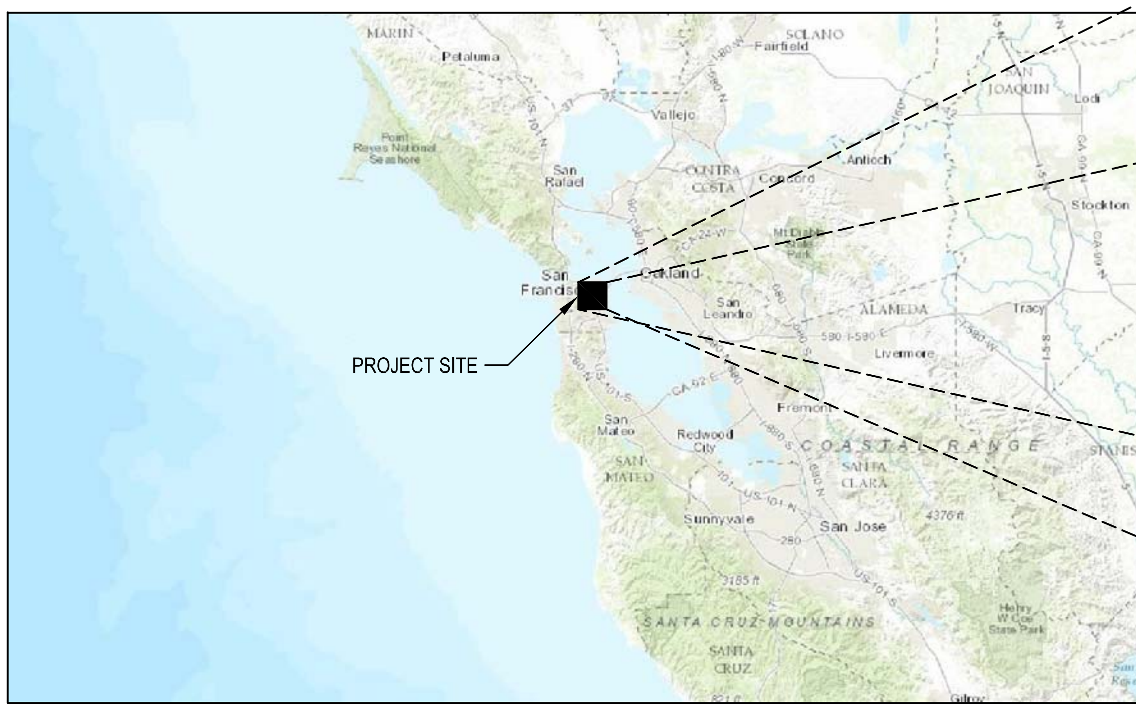
OWNER:

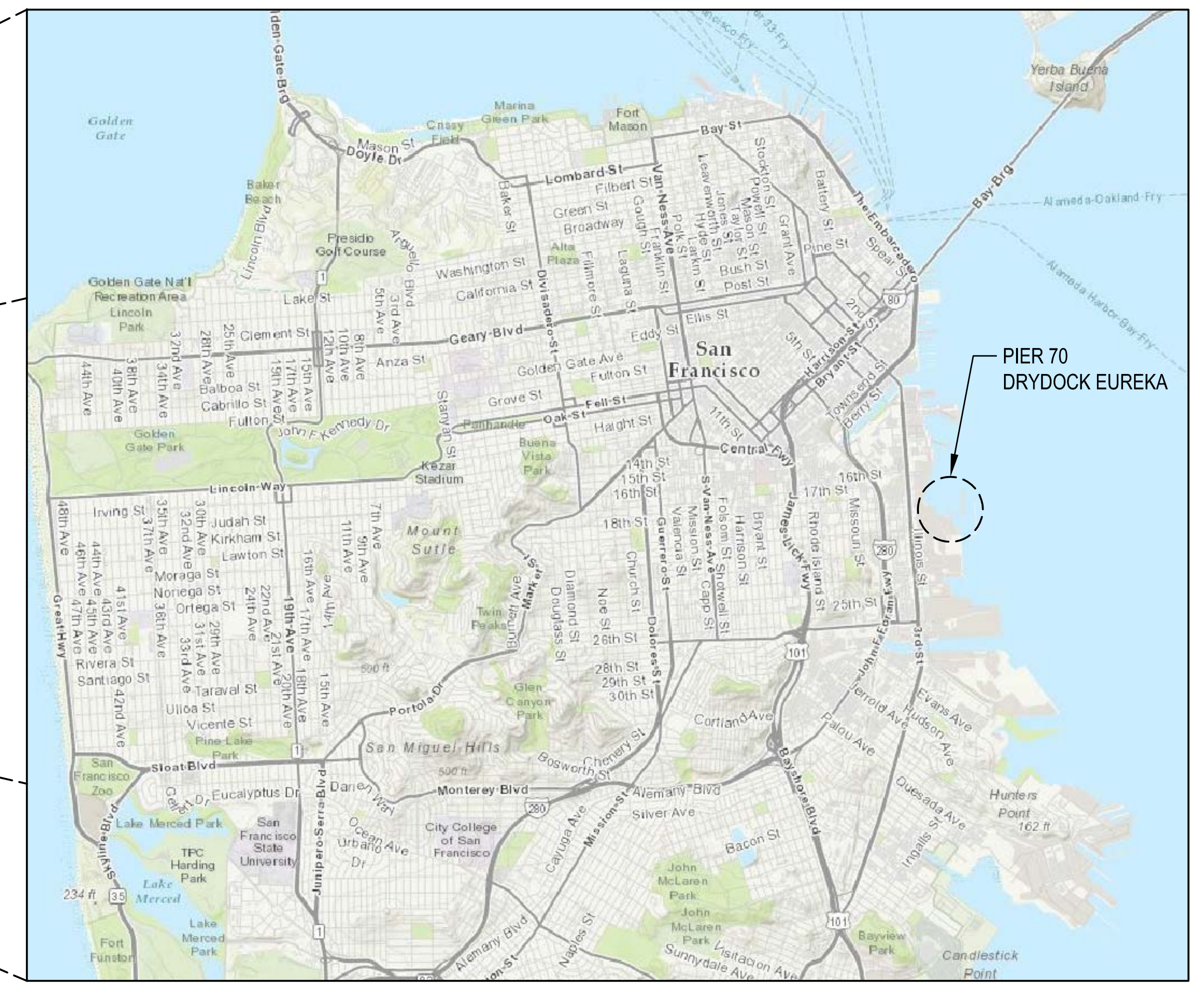
PORT OF SAN FRANCISCO
MATTHEW BELL
PIER 1, THE EMBARCADERO
SAN FRANCISCO, CA 94111
415-274-0400
MATTHEW.N.BELL@SFPORT.COM

ENGINEER OF RECORD:

COLLINS ENGINEERS, INC
MATTHEW DONAHUE
1001 4TH AVE, STE. 4305
SEATTLE, WA 98154
206-455-9741
MDONAHUE@COLLINSENGR.COM

INDEX OF DRAWINGS





1 VICINITY MAP

SCALE: NOT TO SCALE

2 LOCATION MAP

SCALE: NOT TO SCALE

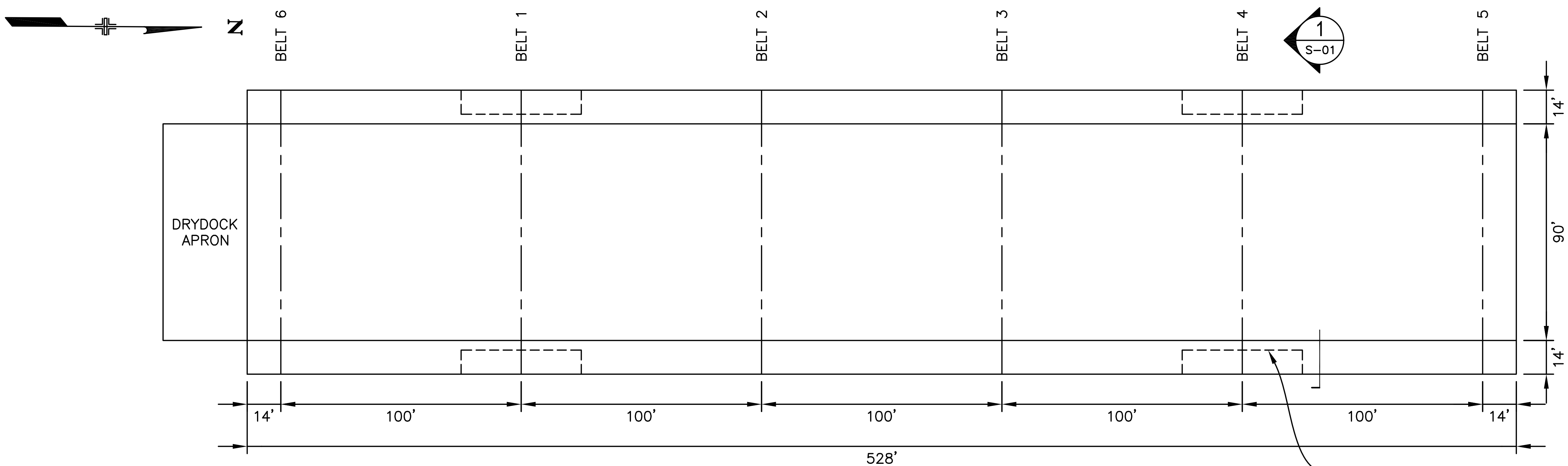
COLLINS ENGINEERS
1001 4th Ave. Suite 4305
Seattle, WA 98154
Phone: 206-682-2140

PORT OF SAN FRANCISCO
PIER 1
THE EMBARCADERO
SAN FRANCISCO, CA 94111

DRY DOCK EUREKA
SHEET INDEX
San Francisco, CA

CEI PROJECT	45–10289
INSPECTED BY:	MJD/AJC/JTF/JJS
DRAWN BY:	JJS
CHECKED BY:	DGS
DATE:	03/06/2017
SHEET NO:	C-01

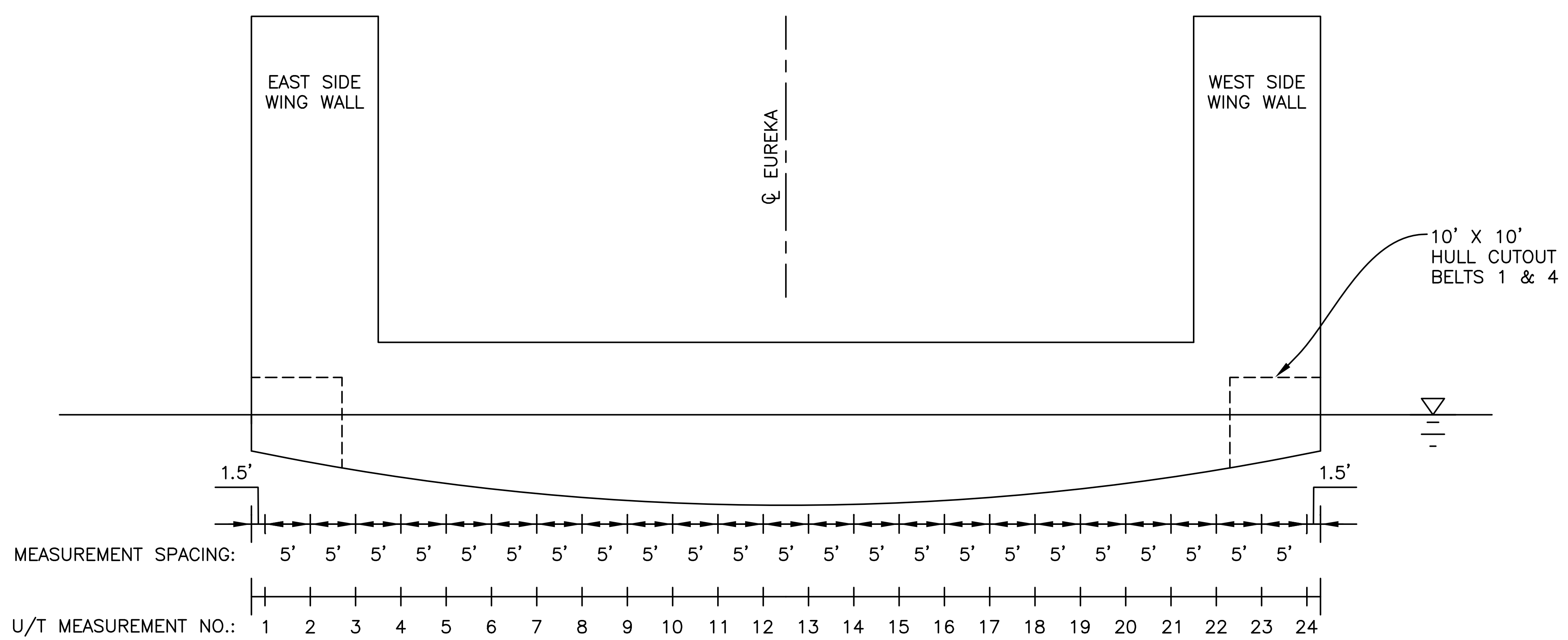
W:\PROJECTS\10289 GHD POSF DRY DOCK 1 UWI\05-ENGINEERING\02-CADD\BASE PLAN.DWG 04/21/2017 01:12:00 PM



10' X 10'
HULL CUTOUT AT
BELTS 1 & 4

A EUREKA OVERALL PLAN
SCALE: 1:600

KEEL MUDLINE ELEVATIONS				
BELT LINE	DATE/TIME	KEEL DEPTH (FT)	M/L DEPTH (FT)	M/L ELEV. (FT)
1	3/7/17 1300HRS	6	24	23
2	3/7/17 1532HRS	6	26	25
3	3/8/17 1206HRS	6	27	24
4	3/8/17 1430HRS	6	27	26
5	3/9/17 1102HRS	6	33	28
6	3/6/17 1022HRS	6	30	27



1 EUREKA TYPICAL BELT SECTION
SCALE: 1:200 LOOKING SOUTH

COLLINS ENGINEERS
1001 4th Ave. Suite 4305
Seattle, WA 98154
Phone: 206-682-2140

PORT OF SAN FRANCISCO
PIER 1
THE EMBARCADERO
SAN FRANCISCO, CA 94111

DRY DOCK EUREKA
OVERALL DRYDOCK PLAN & SECTION
San Francisco, CA

CEI PROJECT 45-10289
INSPECTED BY: MJD/AJC/JTF/JJS
DRAWN BY: JJS
CHECKED BY: DGS
DATE: 03/06/2017
SHEET NO: S-01

W:\PROJECTS\10289 GHD POSF DRY DOCK 1 UWI\05-ENGINEERING\02-CADD\BASE PLAN.DWG 04/21/2017 01:13:44 PM

Appendix B – DRS Marine December 2016 Inspection

DRS MARINE INC.

COMMERCIAL DIVERS
DAMS, POWERHOUSES
U/W PILE REPAIRS
U/W BURNING & WELDING
ROVS

525 CHESTNUT STREET
VALLEJO, CA 94590
BUS: 707-648-3483
FAX: 707-648-2006
WWW.DRSMARINE.COM

COMPLETE DIVING SERVICES

EUREKA DRY DOCK
ULTRASONIC THICKNESS INSPECTION
PREPARED FOR

BAE SYSTEMS
SAN FRANCISCO

December, 2016

DRS MARINE INC.
COMPLETE DIVING SERVICES
drsmarine@aol.com

525 Chestnut Street
Vallejo, CA 94590
PH 707/648-3483
FX 707/648-2006

December 30, 2016

BAE SYSTEMS

ATTN: Justin Gleaton

RE: Dry dock 2 ULTRA SONIC Thickness Gauging

Project site: EUREKA Dry Dock
Date of work: 12/27/16 - 12/29/16
Inspection Site: Pier 80 San Francisco Ca.

INTRODUCTION

DRS marine was contracted to conduct an ultra sonic thickness testing on EUREKA Dry Dock. An inspection and cleaning of the intake/discharge screens will also be completed and details provided to BAE along with pictures in a written report. Underwater readings will be conducted by a 3 man dive team. A man lift will be provided by BAE to allow DRS Marine to reach the areas needed to take readings above the waterline along the inside and outside of the wing walls.

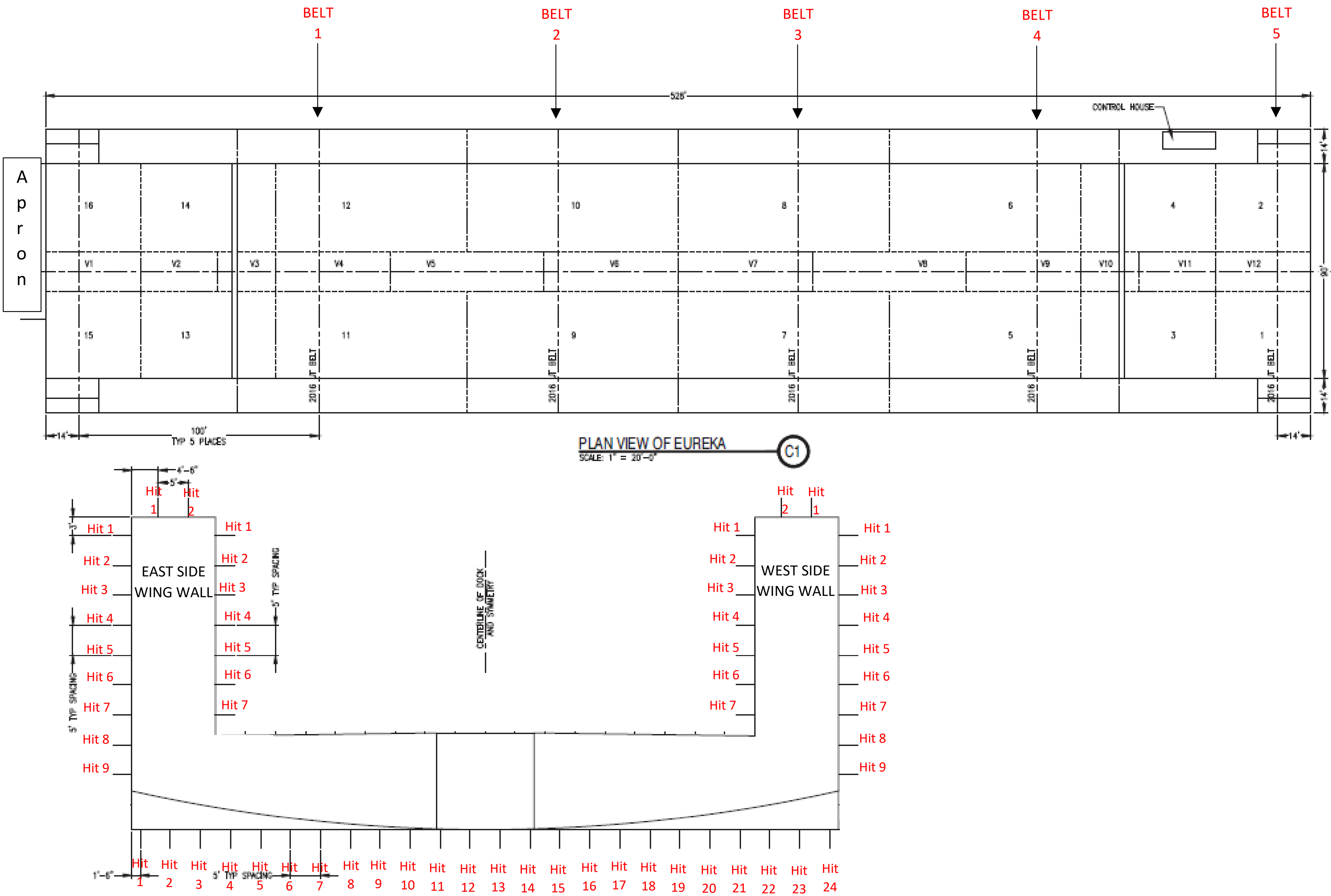
UT GRID PATTERN

The testing would be done along five belts around the dry dock. See ***Drawing A*** on next page. The test hits are to be taken every 5 feet along each belt. Testing will also be conducted along the Apron at designated locations that are to be provided by BAE.

METHOD

For readings that were needed to be taken underwater, DRS marine used a three man dive crew with surface supplied air diving equipment and a low-pressure diving compressor. The dive crew used a CYGNUS 3 Ultrasonic thickness gauge that was checked for calibration every morning and at mid-day.

EUREKA DRYDOCK



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1.0 TESTING ALONG THE 5 BELTS

East Wingwall Top Deck

Hit 1 is 4' 5" from outside edge of wall

LOCATION		ORIGINAL THICKNESS	PRESENT THICKNESS	CHANGE	CHANGE PERCENTAGE
BELT 1	1	0.437	0.407	0.030	0.07
	2	0.437	0.394	0.043	0.10
BELT 2	1	0.437	0.380	0.057	0.13
	2	0.437	0.375	0.062	0.14
BELT 3	1	0.437	0.364	0.073	0.17
	2	0.437	0.446	-0.009	-0.02
BELT 4	1	0.437	0.387	0.050	0.11
	2	0.437	0.371	0.066	0.15
BELT 5	1	0.437	0.446	-0.009	-0.02
	2	0.437	0.450	-0.013	-0.03

East Outside Wingwall

Hit 1 is 3' down from top of wing wall

LOCATION		ORIGINAL THICKNESS	PRESENT THICKNESS	CHANGE	CHANGE PERCENTAGE
BELT 1	1	0.375	0.392	-0.017	-0.05
	2	0.375	0.396	-0.021	-0.06
	3	0.375	0.360	0.015	0.04
	4	0.375	0.328	0.047	0.13
	5	0.375	0.302	0.073	0.19
	6	0.375	0.306	0.069	0.18
	7	0.375	0.344	0.031	0.08
	8	0.437	0.500	-0.063	-0.14
	9	0.437	0.502	-0.065	-0.15
BELT 2	1	0.375	0.396	-0.021	-0.06
	2	0.375	0.382	-0.007	-0.02
	3	0.375	0.360	0.015	0.04
	4	0.375	0.366	0.009	0.02
	5	0.375	0.358	0.017	0.05
	6	0.375	0.352	0.023	0.06
	7	0.375	0.456	-0.081	-0.22
	8	0.437	0.498	-0.061	-0.14
	9	0.437	0.501	-0.064	-0.15
BELT 3	1	0.375	0.372	0.003	0.01
	2	0.375	0.366	0.009	0.02
	3	0.375	0.366	0.009	0.02
	4	0.375	0.370	0.005	0.01
	5	0.375	0.354	0.021	0.06
	6	0.375	0.348	0.027	0.07
	7	0.375	0.444	-0.069	-0.18
	8	0.437	0.452	-0.015	-0.03
	9	0.437	0.468	-0.031	-0.07

East Outside Wingwall ...*Continued*

Hit 1 is 3' down from top of wing wall

LOCATION		ORIGINAL THICKNESS	PRESENT THICKNESS	CHANGE	CHANGE PERCENTAGE
BELT 4	1	0.375	0.394	-0.019	-0.05
	2	0.375	0.352	0.023	0.06
	3	0.375	0.370	0.005	0.01
	4	0.375	0.380	-0.005	-0.01
	5	0.375	0.356	0.019	0.05
	6	0.375	0.360	0.015	0.04
	7	0.375	0.464	-0.089	-0.24
	8	0.437	0.498	-0.061	-0.14
	9	0.437	0.444	-0.007	-0.02
BELT 5	1	0.375	0.402	-0.027	-0.07
	2	0.375	0.364	0.011	0.03
	3	0.375	0.344	0.031	0.08
	4	0.375	0.366	0.009	0.02
	5	0.375	0.370	0.005	0.01
	6	0.375	0.380	-0.005	-0.01
	7	0.375	0.362	0.013	0.03
	8	0.437	0.446	-0.009	-0.02
	9	0.437	0.424	0.013	0.03

Bottom of dry dock

Hit 1 is 1' 6" from the east side

LOCATION		ORIGINAL THICKNESS	PRESENT THICKNESS	CHANGE	CHANGE PERCENTAGE
BELT 1	1	0.437	0.428	0.009	0.02
	2	0.437	0.416	0.021	0.05
	3	0.437	0.416	0.021	0.05
	4	0.437	0.382	0.055	0.13
	5	0.437	0.348	0.089	0.20
	6	0.437	0.400	0.037	0.08
	7	0.437	0.396	0.041	0.09
	8	0.437	0.380	0.057	0.13
	9	0.437	0.370	0.067	0.15
	10	0.437	0.364	0.073	0.17
	11	0.437	0.366	0.071	0.16
	12	0.437	0.394	0.043	0.10
	13	0.437	0.330	0.107	0.24
	14	0.437	0.354	0.083	0.19
	15	0.437	0.318	0.119	0.27
	16	0.437	0.482	-0.045	-0.10
	17	0.437	0.486	-0.049	-0.11
	18	0.437	0.470	-0.033	-0.08
	19	0.437	0.448	-0.011	-0.03
	20	0.437	0.502	-0.065	-0.15
	21	0.437	0.412	0.025	0.06
	22	0.437	0.414	0.023	0.05
	23	0.437	0.438	-0.001	0.00
	24	0.437	0.426	0.011	0.03

Bottom of dry dock…….continued Hit 1 is 1' 6" from the east side

LOCATION		ORIGINAL THICKNESS	PRESENT THICKNESS	CHANGE	CHANGE PERCENTAGE
BELT 2	1	0.437	0.422	0.015	0.03
	2	0.437	0.420	0.017	0.04
	3	0.437	0.412	0.025	0.06
	4	0.437	0.402	0.035	0.08
	5	0.437	0.416	0.021	0.05
	6	0.437	0.412	0.025	0.06
	7	0.437	0.418	0.019	0.04
	8	0.437	0.328	0.109	0.25
	9	0.437	0.358	0.079	0.18
	10	0.437	0.338	0.099	0.23
	11	0.437	0.404	0.033	0.08
	12	0.437	0.424	0.013	0.03
	13	0.437	0.398	0.039	0.09
	14	0.437	0.394	0.043	0.10
	15	0.437	0.380	0.057	0.13
	16	0.437	0.436	0.001	0.00
	17	0.437	0.380	0.057	0.13
	18	0.437	0.330	0.107	0.24
	19	0.437	0.426	0.011	0.03
	20	0.437	0.386	0.051	0.12
	21	0.437	0.496	-0.059	-0.14
	22	0.437	0.498	-0.061	-0.14
	23	0.437	0.388	0.049	0.11
	24	0.437	0.348	0.089	0.20
BELT 3	1	0.437	0.438	-0.001	0.00
	2	0.437	0.402	0.035	0.08
	3	0.437	0.412	0.025	0.06
	4	0.437	0.336	0.101	0.23
	5	0.437	0.384	0.053	0.12
	6	0.437	0.374	0.063	0.14
	7	0.437	0.374	0.063	0.14
	8	0.437	0.372	0.065	0.15
	9	0.437	0.396	0.041	0.09
	10	0.437	0.426	0.011	0.03
	11	0.437	0.386	0.051	0.12
	12	0.437	0.420	0.017	0.04
	13	0.437	0.382	0.055	0.13
	14	0.437	0.342	0.095	0.22
	15	0.437	0.410	0.027	0.06
	16	0.437	0.382	0.055	0.13
	17	0.437	0.410	0.027	0.06
	18	0.437	0.418	0.019	0.04
	19	0.437	0.408	0.029	0.07
	20	0.437	0.414	0.023	0.05
	21	0.437	0.480	-0.043	-0.10
	22	0.437	0.480	-0.043	-0.10
	23	0.437	0.482	-0.045	-0.10
	24	0.437	0.416	0.021	0.05

Bottom of dry dock…….continued Hit 1 is 1' 6" from the east side

LOCATION		ORIGINAL THICKNESS	PRESENT THICKNESS	CHANGE	CHANGE PERCENTAGE
BELT 4	1	0.437	0.498	-0.061	-0.14
	2	0.437	0.478	-0.041	-0.09
	3	0.437	0.466	-0.029	-0.07
	4	0.437	0.386	0.051	0.12
	5	0.437	0.336	0.101	0.23
	6	0.437	0.374	0.063	0.14
	7	0.437	0.436	0.001	0.00
	8	0.437	0.398	0.039	0.09
	9	0.437	0.396	0.041	0.09
	10	0.437	0.366	0.071	0.16
	11	0.437	0.388	0.049	0.11
	12	0.437	0.440	-0.003	-0.01
	13	0.437	0.396	0.041	0.09
	14	0.437	0.302	0.135	0.31
	15	0.437	0.328	0.109	0.25
	16	0.437	0.346	0.091	0.21
	17	0.437	0.422	0.015	0.03
	18	0.437	0.502	-0.065	-0.15
	19	0.437	0.398	0.039	0.09
	20	0.437	0.354	0.083	0.19
	21	0.437	0.392	0.045	0.10
	22	0.437	0.490	-0.053	-0.12
	23	0.437	0.492	-0.055	-0.13
	24	0.437	0.404	0.033	0.08
BELT 5	1	0.437	0.314	0.123	0.28
	2	0.437	0.370	0.067	0.15
	3	0.437	0.374	0.063	0.14
	4	0.437	0.370	0.067	0.15
	5	0.437	0.312	0.125	0.29
	6	0.437	0.340	0.097	0.22
	7	0.437	0.382	0.055	0.13
	8	0.437	0.412	0.025	0.06
	9	0.437	0.326	0.111	0.25
	10	0.437	0.384	0.053	0.12
	11	0.437	0.328	0.109	0.25
	12	0.437	0.302	0.135	0.31
	13	0.437	0.326	0.111	0.25
	14	0.437	0.412	0.025	0.06
	15	0.437	0.352	0.085	0.19
	16	0.437	0.310	0.127	0.29
	17	0.437	0.368	0.069	0.16
	18	0.437	0.330	0.107	0.24
	19	0.437	0.390	0.047	0.11
	20	0.437	0.372	0.065	0.15
	21	0.437	0.436	0.001	0.00
	22	0.437	0.442	-0.005	-0.01
	23	0.437	0.442	-0.005	-0.01
	24	0.437	0.448	-0.011	-0.03

West Wingwall Top Deck

Hit 1 is 4' 5" from outside edge of wall

LOCATION		ORIGINAL THICKNESS	PRESENT THICKNESS	CHANGE	CHANGE PERCENTAGE
BELT 1	1	0.437	0.504	-0.067	-0.15
	2	0.437	0.235	0.202	0.46
BELT 2	1	0.437	0.488	-0.051	-0.12
	2	0.437	0.343	0.094	0.22
BELT 3	1	0.437	0.366	0.071	0.16
	2	0.437	0.448	-0.011	-0.03
BELT 4	1	0.437	0.478	-0.041	-0.09
	2	0.437	0.434	0.003	0.01
BELT 5	1	0.437	0.455	-0.018	-0.04
	2	0.437	0.438	-0.001	0.00

West Outside Wingwall

Hit 1 is 3' down from top of wing wall

LOCATION		ORIGINAL THICKNESS	PRESENT THICKNESS	CHANGE	CHANGE PERCENTAGE
BELT 1	1	0.375	0.385	-0.010	-0.03
	2	0.375	0.385	-0.010	-0.03
	3	0.375	0.345	0.030	0.08
	4	0.375	0.340	0.035	0.09
	5	0.375	0.305	0.070	0.19
	6	0.375	0.495	-0.120	-0.32
	7	0.375	0.505	-0.130	-0.35
	8	0.437	0.505	-0.068	-0.16
	9	0.437	0.466	-0.029	-0.07
BELT 2	1	0.375	0.380	-0.005	-0.01
	2	0.375	0.375	0.000	0.00
	3	0.375	0.335	0.040	0.11
	4	0.375	0.320	0.055	0.15
	5	0.375	0.285	0.090	0.24
	6	0.375	0.350	0.025	0.07
	7	0.375	0.428	-0.053	-0.14
	8	0.437	0.568	-0.131	-0.30
	9	0.437	0.530	-0.093	-0.21
BELT 3	1	0.375	0.375	0.000	0.00
	2	0.375	0.365	0.010	0.03
	3	0.375	0.370	0.005	0.01
	4	0.375	0.375	0.000	0.00
	5	0.375	0.315	0.060	0.16
	6	0.375	0.330	0.045	0.12
	7	0.375	0.543	-0.168	-0.45
	8	0.437	0.576	-0.139	-0.32
	9	0.437	0.520	-0.083	-0.19

West Outside Wingwall …*Continued*

Hit 1 is 3' down from top of wing wall

LOCATION		ORIGINAL THICKNESS	PRESENT THICKNESS	CHANGE	CHANGE PERCENTAGE
BELT 4	1	0.375	0.380	-0.005	-0.01
	2	0.375	0.395	-0.020	-0.05
	3	0.375	0.375	0.000	0.00
	4	0.375	0.350	0.025	0.07
	5	0.375	0.335	0.040	0.11
	6	0.375	0.315	0.060	0.16
	7	0.375	0.555	-0.180	-0.48
	8	0.437	0.533	-0.096	-0.22
	9	0.437	0.483	-0.046	-0.11
BELT 5	1	0.375	0.390	-0.015	-0.04
	2	0.375	0.360	0.015	0.04
	3	0.375	0.370	0.005	0.01
	4	0.375	0.390	-0.015	-0.04
	5	0.375	0.370	0.005	0.01
	6	0.375	0.360	0.015	0.04
	7	0.375	0.597	-0.222	-0.59
	8	0.437	0.576	-0.139	-0.32
	9	0.437	0.584	-0.147	-0.34

West Inside Wingwall

Hit 1 is 3' down from top of wing wall

LOCATION		ORIGINAL THICKNESS	PRESENT THICKNESS	CHANGE	CHANGE PERCENTAGE
BELT 1	1	0.375	0.440	-0.065	-0.17
	2	0.375	0.434	-0.059	-0.16
	3	0.375	0.393	-0.018	-0.05
	4	0.375	0.424	-0.049	-0.13
	5	0.375	0.410	-0.035	-0.09
	6	0.375	0.421	-0.046	-0.12
	7	0.375	0.410	-0.035	-0.09
BELT 2	1	0.375	0.452	-0.077	-0.21
	2	0.375	0.457	-0.082	-0.22
	3	0.375	0.403	-0.028	-0.07
	4	0.375	0.480	-0.105	-0.28
	5	0.375	0.449	-0.074	-0.20
	6	0.375	0.425	-0.050	-0.13
	7	0.375	0.420	-0.045	-0.12
BELT 3	1	0.375	0.406	-0.031	-0.08
	2	0.375	0.420	-0.045	-0.12
	3	0.375	0.377	-0.002	-0.01
	4	0.375	0.442	-0.067	-0.18
	5	0.375	0.406	-0.031	-0.08
	6	0.375	0.414	-0.039	-0.10
	7	0.375	0.407	-0.032	-0.09

West Inside Wingwall ...*Continued*

Hit 1 is 3' down from top of wing wall

LOCATION		ORIGINAL THICKNESS	PRESENT THICKNESS	CHANGE	CHANGE PERCENTAGE
BELT 4	1	0.375	0.400	-0.025	-0.07
	2	0.375	0.434	-0.059	-0.16
	3	0.375	0.433	-0.058	-0.15
	4	0.375	0.426	-0.051	-0.14
	5	0.375	0.383	-0.008	-0.02
	6	0.375	0.372	0.003	0.01
	7	0.375	0.415	-0.040	-0.11
BELT 5	1	0.375	0.433	-0.058	-0.15
	2	0.375	0.461	-0.086	-0.23
	3	0.375	0.436	-0.061	-0.16
	4	0.375	0.430	-0.055	-0.15
	5	0.375	0.445	-0.070	-0.19
	6	0.375	0.438	-0.063	-0.17
	7	0.375	0.420	-0.045	-0.12

East Inside Wingwall

Hit 1 is 3' down from top of wing wall

LOCATION		ORIGINAL THICKNESS	PRESENT THICKNESS	CHANGE	CHANGE PERCENTAGE
BELT 1	1	0.375	0.485	-0.110	-0.29
	2	0.375	0.446	-0.071	-0.19
	3	0.375	0.363	0.012	0.03
	4	0.375	0.420	-0.045	-0.12
	5	0.375	0.385	-0.010	-0.03
	6	0.375	0.368	0.007	0.02
	7	0.375	0.454	-0.079	-0.21
BELT 2	1	0.375	0.450	-0.075	-0.20
	2	0.375	0.444	-0.069	-0.18
	3	0.375	0.361	0.014	0.04
	4	0.375	0.461	-0.086	-0.23
	5	0.375	0.313	0.062	0.17
	6	0.375	0.441	-0.066	-0.18
	7	0.375	0.422	-0.047	-0.13
BELT 3	1	0.375	0.462	-0.087	-0.23
	2	0.375	0.430	-0.055	-0.15
	3	0.375	0.327	0.048	0.13
	4	0.375	0.461	-0.086	-0.23
	5	0.375	0.432	-0.057	-0.15
	6	0.375	0.427	-0.052	-0.14
	7	0.375	0.348	0.027	0.07
BELT 4	1	0.375	0.464	-0.089	-0.24
	2	0.375	0.434	-0.059	-0.16
	3	0.375	0.448	-0.073	-0.19
	4	0.375	0.455	-0.080	-0.21
	5	0.375	0.420	-0.045	-0.12
	6	0.375	0.445	-0.070	-0.19
	7	0.375	0.454	-0.079	-0.21
BELT 5	1	0.375	0.422	-0.047	-0.13
	2	0.375	0.444	-0.069	-0.18
	3	0.375	0.455	-0.080	-0.21
	4	0.375	0.482	-0.107	-0.29
	5	0.375	0.451	-0.076	-0.20
	6	0.375	0.445	-0.070	-0.19
	7	0.375	0.420	-0.045	-0.12

2.0 TESTING ON THE APRON

All testing locations for thickness were provided by BAE. Original thickness was not provided.

APRON DECK

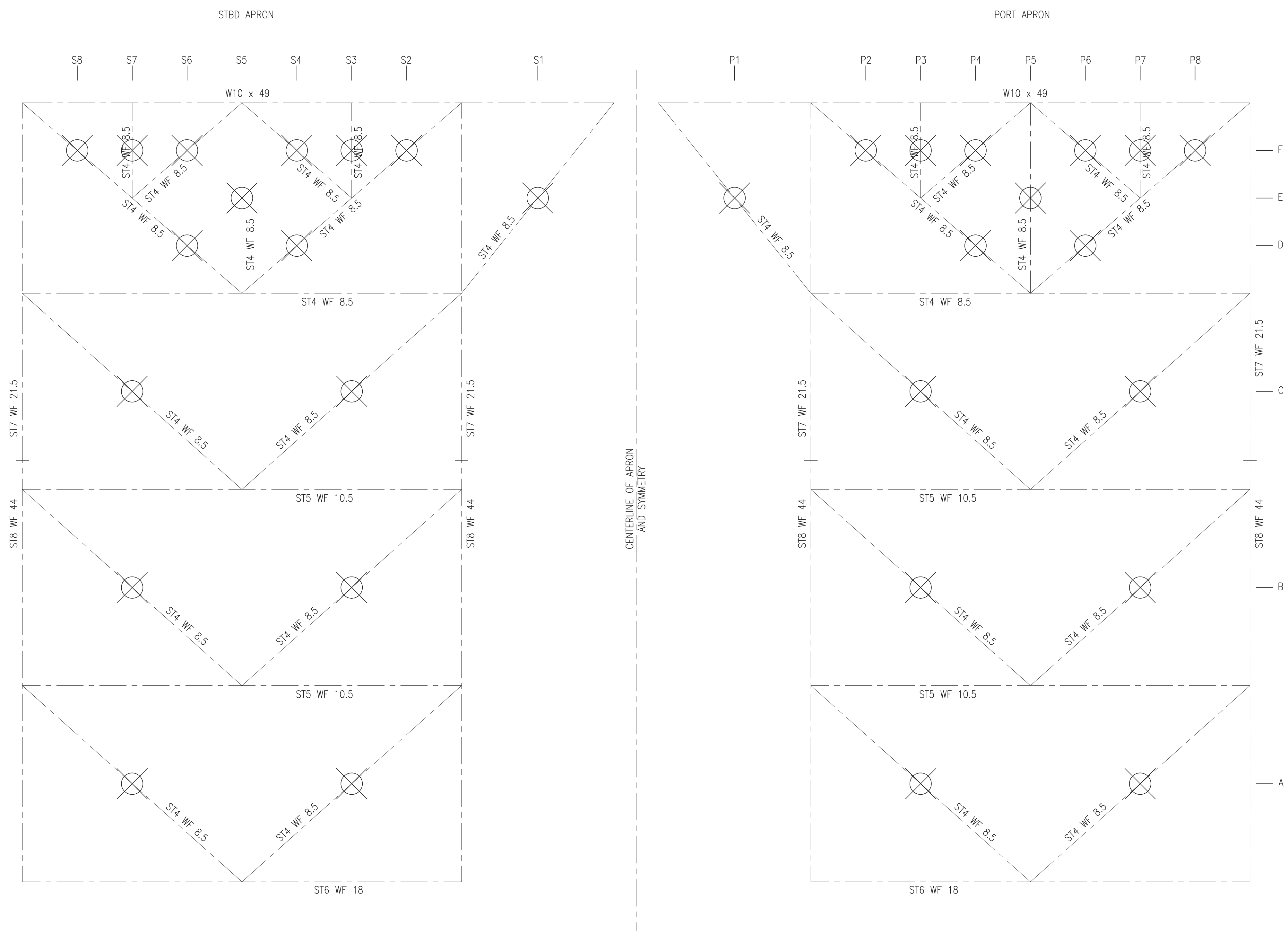
				UT
S	3	A	Web	0.542
S	3	B	Flange	0.485
S	3	C	Web	0.531
S	3	D	Flange	0.517
S	2	A	Web	0.497
S	2	B	Flange	0.217
S	2	C	Web	0.502
S	2	D	Flange	0.551
S	1	A	Web	0.505
S	1	B	Flange	0.568
S	1	C	Web	0.596
S	1	D	Flange	0.587
C	L	A	Web	0.385
C	L	B	Flange	0.389
C	L	C	Web	0.289
C	L	D	Flange	0.336

SEE A1 on Sheet A-005

				UT
P	1	A	Web	0.55
P	1	B	Flange	0.545
P	1	C	Web	0.592
P	1	D	Flange	0.581
P	2	A	Web	0.553
P	2	B	Flange	0.502
P	2	C	Web	0.494
P	2	D	Flange	0.49
P	3	A	Web	0.529
P	3	B	Flange	0.543
P	3	C	Web	0.552
P	3	D	Flange	0.427

SEE A1 on Sheet A-005

FILE NAME: L:\CLIENTS\BAE\BAE San Francisco\3978-D Comercial Inspection of Eureka FDD\Dwgs\D-3978-D Current Heger Design Drawings\A-005.dwg LAYOUT NAME: 6 A-005 PLOTTED: Tuesday, November 15, 2016 - 3:57pm USER: Mike



⌖ — INDICATES THE LOCATION OF TWO UT MEASUREMENTS TAKEN ON STRUCTURAL MEMBERS ONE TAKEN ON THE FLANGE AND ONE TAKEN ON THE WEB.

SECTION
SCALE: 3/8"=1'-0"
A-003 (A1)

3/8" = 1'-0" 0 1 2 4 6 FT

HEGER DRY DOCK, Inc.
DRY DOCK ENGINEERS
DESIGN, INSPECTION AND CERTIFICATION
531 CONCORD STREET
HOLLISTON, MA 01746
(508) 429-1800

SYM	DESCRIPTION	DATE	APPR

DES: | DRW: JJB | CHK: MDN
CHIEF ENG.: WALEED SAYED
DATE: 11/16/2016

CLIENT NAME AND ADDRESS:
BAE SYSTEMS
SAN FRANCISCO, CA.

PROJECT TITLE:
COMMERCIAL INSPECTION OF EUREKA FDD (EX AFDM 14)

DRAWING TITLE:
ORIGINAL EUREKA APRON STRUCTURE 3 OF 3

SCALE: AS NOTED
PROJECT NO.: 3978-D
CONSTR. CONTR. NO.:
SHEET 6 OF 7
A-005

3.0 TESTING LONG TRUSS (locations provided by BAE

STBD - OUTOARD - MAIN TRUSS

	UT
A 1 Web	0.412
A 1 Flange	0.462
A 2 Web	0.36
A 2 Flange	0.517
A 3 Web	0.575
A 3 Flange	0.876
B 1 Web	0.356
B 1 Flange	0.496
B 2 Web	0.403
B 2 Flange	0.589
B 3 Web	0.547
B 3 Flange	0.859
C 1 Web	0.359
C 1 Flange	0.485
C 2 Web	0.363
C 2 Flange	0.471
C 3 Web	0.377
C 3 Flange	0.58
D 1 Web	0.344
D 1 Flange	0.477
D 2 Web	0.345
D 2 Flange	0.576

SEE A5 on Sheet A-003

STBD - INBOARD - MAIN TRUSS

	UT
A 1 Web	0.4
A 1 Flange	0.5
A 2 Web	0.4
A 2 Flange	0.5
A 3 Web	0.6
A 3 Flange	0.4
B 1 Web	0.3
B 1 Flange	0.3
B 2 Web	0.3
B 2 Flange	0.4
B 3 Web	0.6
B 3 Flange	0.9
C 1 Web	0.3
C 1 Flange	0.4
C 2 Web	0.3
C 2 Flange	0.4
C 3 Web	0.3
C 3 Flange	0.6
D 1 Web	0.4
D 1 Flange	0.4
D 2 Web	0.3
D 2 Flange	0.6

SEE A5 on Sheet A-003

STBD - INBOARD - W10x21

	UT
A Web	0.285
Flange	0.359
B Web	0.308
Flange	0.36
C Web	0.378
Flange	0.298
D Web	0.305
D Flange	0.325

SEE B1 on Sheet A-003

STBD - FWD - W10x49

	UT
S2 Web	0.311
Flange	0.205
S1 Web	0.316
Flange	0.387

SEE B1 on Sheet A-003

PORT - INBOARD - W10x21

		UT
A	Web	0.317
	Flange	0.377
B	Web	0.32
	Flange	0.377
C	Web	0.316
	Flange	0.401
D	Web	0.317
D	Flange	0.297

SEE B1 on Sheet A-003

PORT - FWD - W10x49

		UT
P1	Web	0.335
	Flange	0.163
P2	Web	0.333
	Flange	0.347
P2	Web	
	Flange	

SEE B1 on Sheet A-003

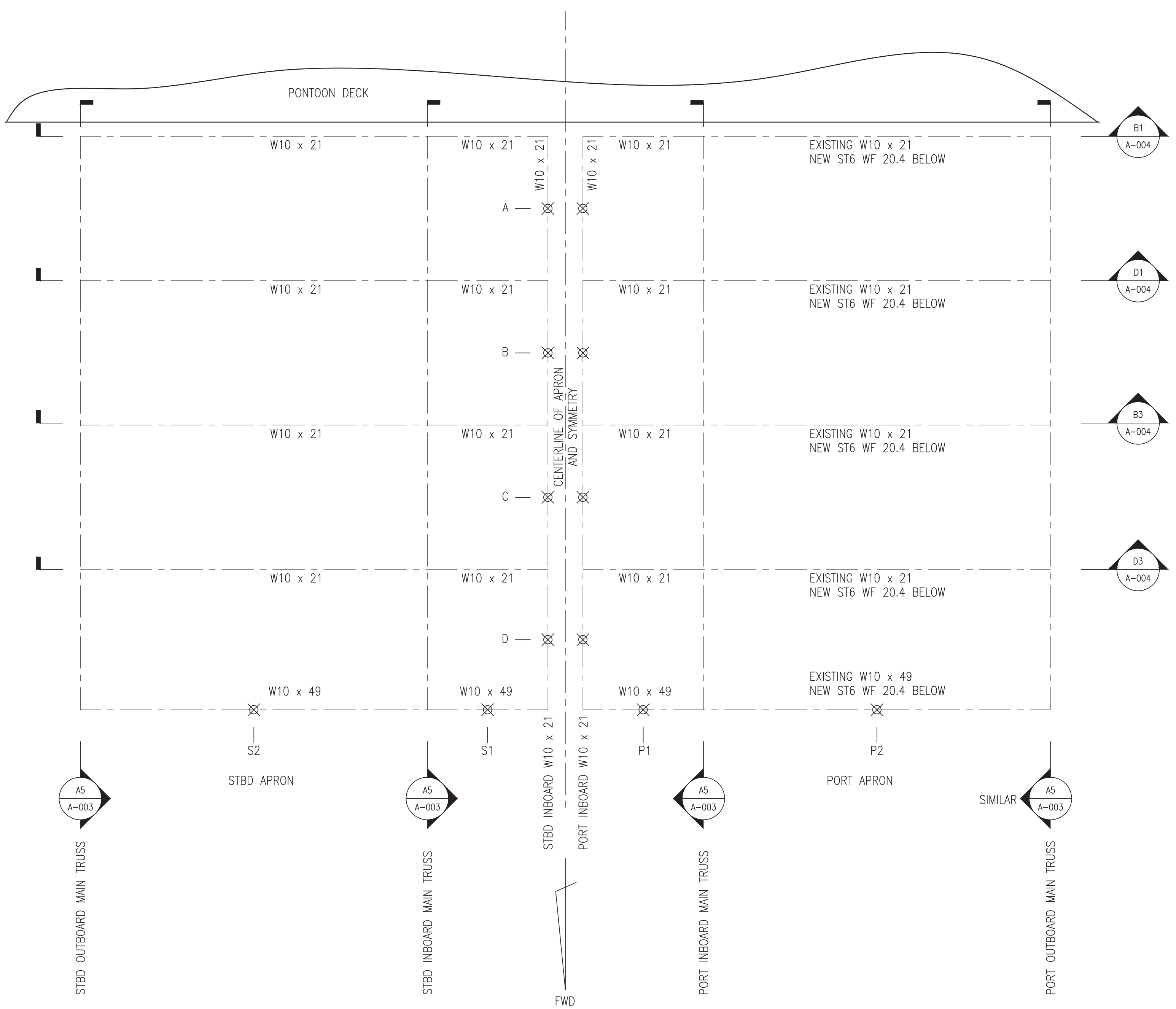
PORT - INBOARD - MAIN TRUSS

			UT
A	1	Web	0.387
A	1	Flange	0.461
A	2	Web	0.281
A	2	Flange	0.479
A	3	Web	0.623
A	3	Flange	0.875
B	1	Web	0.325
B	1	Flange	0.283
B	2	Web	0.279
B	2	Flange	0.466
B	3	Web	0.563
B	3	Flange	0.89
C	1	Web	0.351
C	1	Flange	0.323
C	2	Web	0.344
C	2	Flange	0.463
C	3	Web	0.378
C	3	Flange	0.582
D	1	Web	0.334
D	1	Flange	0.296
D	2	Web	0.375
D	2	Flange	0.553

PORT - OUTBOARD - MAIN TRUSS

			UT
A	1	Web	0.388
A	1	Flange	0.447
A	2	Web	0.357
A	2	Flange	0.506
A	3	Web	0.604
A	3	Flange	0.852
B	1	Web	0.339
B	1	Flange	0.25
B	2	Web	0.294
B	2	Flange	0.464
B	3	Web	0.56
B	3	Flange	0.881
C	1	Web	0.291
C	1	Flange	0.307
C	2	Web	0.296
C	2	Flange	0.465
C	3	Web	0.368
C	3	Flange	0.617
D	1	Web	0.346
D	1	Flange	0.377
D	2	Web	0.371
D	2	Flange	0.595

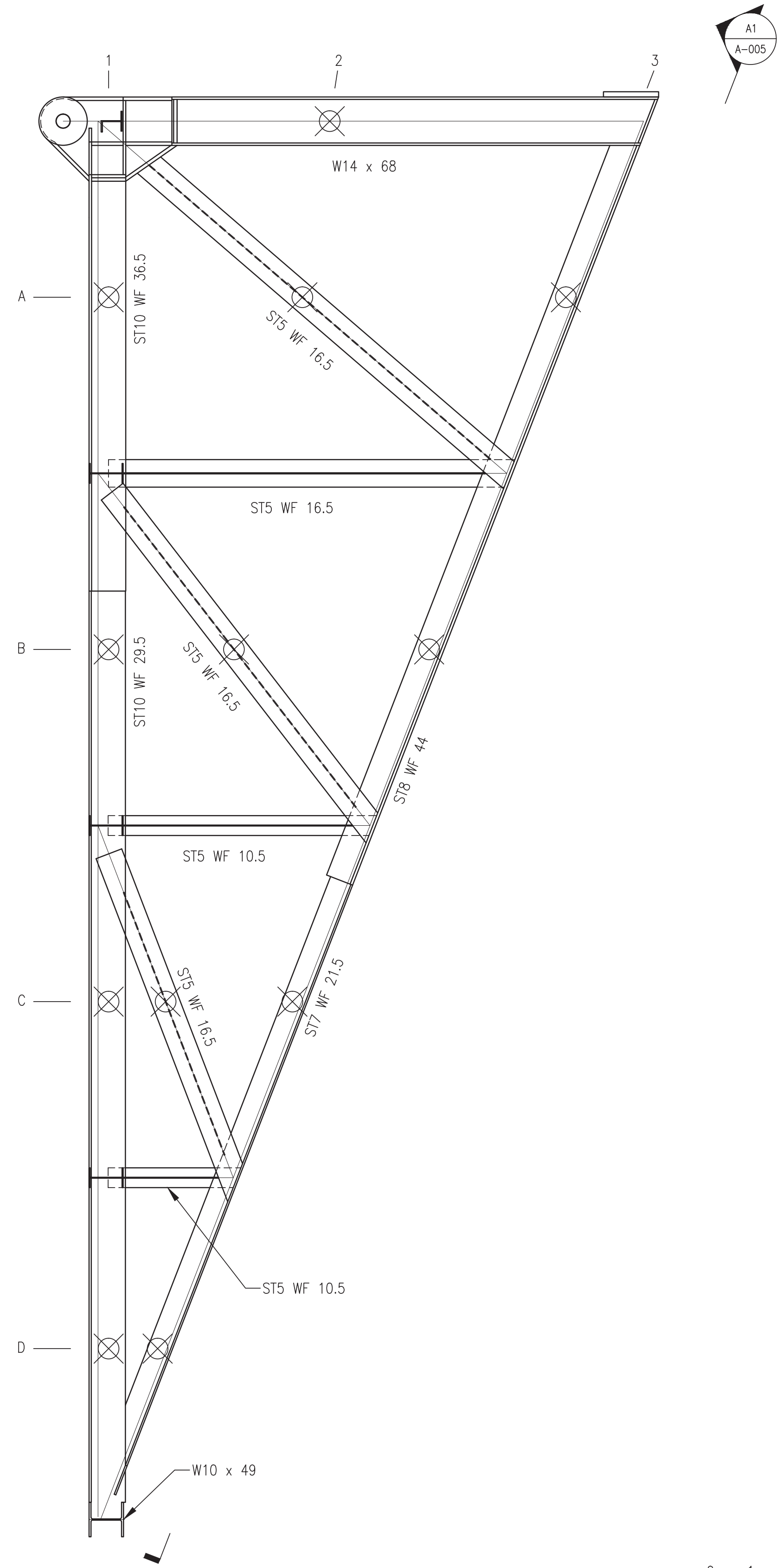
SEE A5 on Sheet A-003



PLAN VIEW OF EUREKA APRON - ORIGINAL STRUCTURE (B1)

SCALE: 1/4"=1'-0"

⌖ — INDICATES THE LOCATION OF TWO UT MEASUREMENTS TAKEN ON STRUCTURAL MEMBERS ONE TAKEN ON THE FLANGE AND ONE TAKEN ON THE WEB.



SECTION - MAIN TRUSS (A5)

SCALE: 1/2"=1'-0" A-003

1/2" = 1'-0" 0 1 2 4 FT

1/4" = 1'-0" 0 1 2 4 8 FT

HEGER DRY DOCK, Inc.
DRY DOCK ENGINEERS
DESIGN, INSPECTION AND CERTIFICATION
531 CONCORD STREET
HOLLISTON, MA 01746
(508) 429-1800

SYM	DESCRIPTION	DATE	APPR

DES | DRW JJB | CHK MDN
CHIEF ENG. WALEED SAYED
DATE: 11/16/2016
SEAL

CLIENT NAME AND ADDRESS: **BAE SYSTEMS** SAN FRANCISCO, CA.

PROJECT TITLE: COMMERCIAL INSPECTION OF EUREKA FDD (EX AFDM 14)

DRAWING TITLE: ORIGINAL EUREKA APRON STRUCTURE 2 OF4

SCALE: AS NOTED
PROJECT NO.: 3978-D
CONSTR. CONTR. NO.
SHEET 4 OF 7
A-003

1st Transverse Truss

				UT
S	6	C	Web	0.483
S	6	C	Flange	0.742
S	5	A	Web	0.314
S	5	A	Flange	0.304
S	5	C	Web	0.314
S	5	C	Flange	0.58
S	5	D	Web	0.386
S	5	D	Flange	0.423
S	4	C	Web	0.338
S	4	C	Flange	0.526
S	3	A	Web	0.311
S	3	A	Flange	0.325
S	3	C	Web	0.362
S	3	C	Flange	0.526
S	3	D	Web	0.364
S	3	D	Flange	0.401
S	2	C	Web	0.486
S	2	C	Flange	0.723
S	1	A	Web	0.319
S	1	A	Flange	0.261
S	1	C	Web	0.31
S	1	C	Flange	0.471

SEE B1 on Sheet A-004

				UT
P	1	A	Web	0.334
P	1	A	Flange	0.255
P	1	C	Web	0.393
P	1	C	Flange	0.637
P	2	C	Web	0.505
P	2	C	Flange	0.806
P	3	A	Web	0.325
P	3	A	Flange	0.231
P	3	B	Web	0.247
P	3	B	Flange	0.54
P	3	C	Web	0.391
P	3	C	Flange	0.583
P	3	D	Web	0.337
P	3	D	Flange	0.414
P	4	C	Web	0.379
P	4	C	Flange	0.566
P	5	A	Web	0.306
P	5	A	Flange	0.388
P	5	B	Web	0.32
P	5	B	Flange	0.526
P	5	C	Web	0.42
P	5	C	Flange	0.693
P	5	D	Web	0.354
P	5	D	Flange	0.436
P	6	C	Web	0.507
P	6	C	Flange	0.797

SEE B1 on Sheet A-004

2nd Transverse Truss

				UT
S	6	C	Web	0.285
S	6	C	Flange	0.52
S	5	A	Web	0.318
S	5	A	Flange	0.138
S	5	C	Web	0.209
S	5	C	Flange	0.353
S	5	D	Web	0.376
S	5	D	Flange	0.404
S	4	C	Web	0.233
S	4	C	Flange	0.366
S	3	A	Web	0.305
S	3	A	Flange	0.263
S	3	C	Web	0.29
S	3	C	Flange	0.375
S	3	D	Web	0.365
S	3	D	Flange	0.402
S	2	C	Web	0.377
S	2	C	Flange	0.604
S	1	A	Web	0.33
S	1	A	Flange	0.359
S	1	C	Web	0.262
S	1	C	Flange	0.321

SEE D1 on Sheet A-004

				UT
P	1	A	Web	0.315
P	1	A	Flange	0.319
P	1	C	Web	0.304
P	1	C	Flange	0.457
P	2	C	Web	0.356
P	2	C	Flange	0.504
P	3	A	Web	0.321
P	3	A	Flange	0.408
P	3	B	Web	0.133
P	3	B	Flange	0.55
P	3	C	Web	0.204
P	3	C	Flange	0.37
P	3	D	Web	0.335
P	3	D	Flange	0.391
P	4	C	Web	0.301
P	4	C	Flange	0.369
P	5	A	Web	0.33
P	5	A	Flange	0.358
P	5	B	Web	0.37
P	5	B	Flange	0.51
P	5	C	Web	0.328
P	5	C	Flange	0.328
P	5	D	Web	0.354
P	5	D	Flange	0.421
P	6	C	Web	0.339
P	6	C	Flange	0.585

SEE D1 on Sheet A-004

3rd Transverse Truss

				UT
S	6	C	Web	0.353
S	6	C	Flange	0.613
S	5	A	Web	0.317
S	5	A	Flange	0.237
S	5	C	Web	0.28
S	5	C	Flange	0.381
S	5	D	Web	0.278
S	5	D	Flange	0.325
S	4	C	Web	0.27
S	4	C	Flange	0.439
S	3	A	Web	0.314
S	3	A	Flange	0.162
S	3	C	Web	0.295
S	3	C	Flange	0.352
S	3	D	Web	0.294
S	3	D	Flange	0.358
S	2	C	Web	0.313
S	2	C	Flange	0.46
S	1	A	Web	0.306
S	1	A	Flange	0.221
S	1	C	Web	0.276
S	1	C	Flange	0.379

SEE B3 on Sheet A-004

				UT
P	1	A	Web	0.334
P	1	A	Flange	0.152
P	1	C	Web	0.302
P	1	C	Flange	0.394
P	2	C	Web	0.363
P	2	C	Flange	0.469
P	3	A	Web	0.341
P	3	A	Flange	0.207
P	3	B	Web	0.385
P	3	B	Flange	0.52
P	3	C	Web	0.355
P	3	C	Flange	0.381
P	3	D	Web	0.245
P	3	D	Flange	0.38
P	4	C	Web	0.331
P	4	C	Flange	0.414
P	5	A	Web	0.355
P	5	A	Flange	0.311
P	5	B	Web	0.339
P	5	B	Flange	0.461
P	5	C	Web	0.23
P	5	C	Flange	0.37
P	5	D	Web	0.252
P	5	D	Flange	0.378
P	6	C	Web	0.359
P	6	C	Flange	0.49

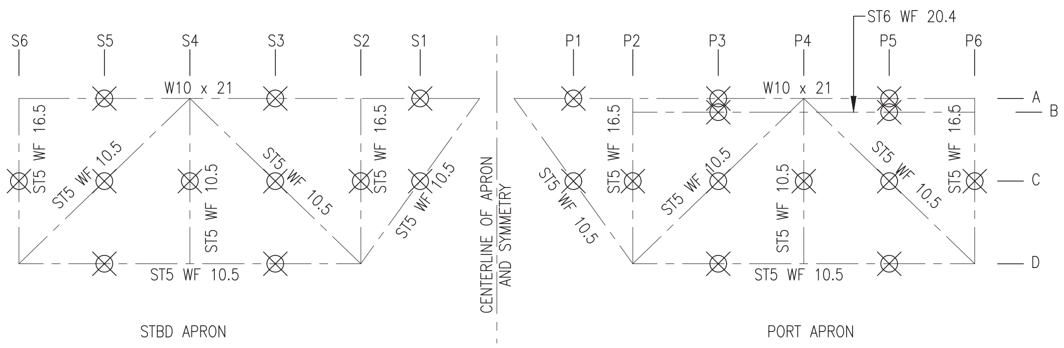
SEE B3 on Sheet A-004

4th Transverse Truss

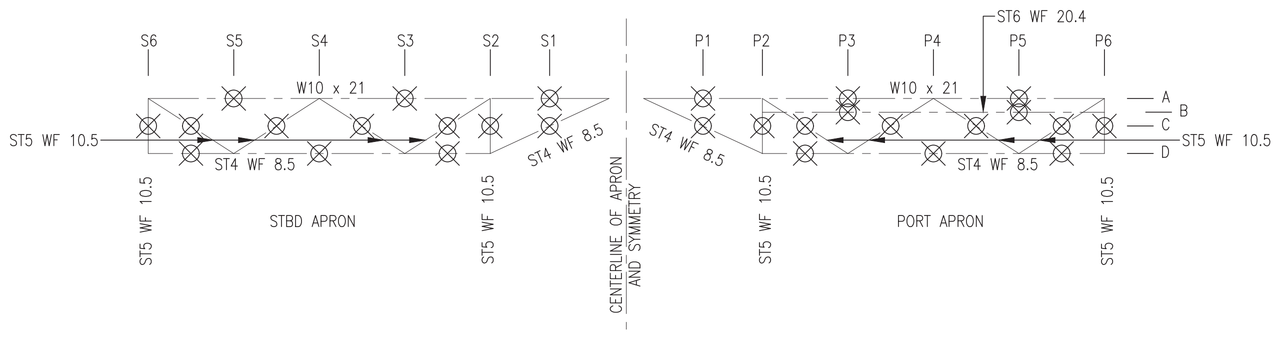
				UT
S	6	C	Web	0.33
S	6	C	Flange	0.297
S	5.5	C	Web	0.29
S	5.5	C	Flange	0.335
S	5.5	D	Web	0.282
S	5.5	D	Flange	0.328
S	5	A	Web	0.327
S	5	A	Flange	0.342
S	4.5	C	Web	0.286
S	4.5	C	Flange	0.326
S	4	D	Web	0.342
S	4	D	Flange	0.297
S	3.5	C	Web	0.264
S	3.5	C	Flange	0.354
S	3	A	Web	0.311
S	3	A	Flange	0.385
S	2.5	C	Web	0.293
S	2.5	C	Flange	0.333
S	2.5	D	Web	0.323
S	2.5	D	Flange	0.355
S	2	C	Web	0.356
S	2	C	Flange	0.525
S	1	A	Web	0.301
S	1	A	Flange	0.235
S	1	C	Web	0.298
S	1	C	Flange	0.351

				UT
P	1	A	Web	0.338
P	1	A	Flange	0.356
P	1	C	Web	0.23
P	1	C	Flange	0.335
P	2	C	Web	0.342
P	2	C	Flange	0.584
P	2.5	C	Web	0.302
P	2.5	C	Flange	0.337
P	2.5	D	Web	0.254
P	2.5	D	Flange	0.36
P	3	A	Web	0.336
P	3	A	Flange	0.305
P	3	B	Web	0.148
P	3	B	Flange	0.551
P	3.5	C	Web	0.259
P	3.5	C	Flange	0.338
P	4	D	Web	0.286
P	4	D	Flange	0.367
P	4.5	C	Web	0.27
P	4.5	C	Flange	0.369
P	5	A	Web	0.367
P	5	A	Flange	0.37
P	5	B	Web	0.153
P	5	B	Flange	0.487
P	5.5	C	Web	0.273
P	5.5	C	Flange	0.342
P	5.5	D	Web	0.29
P	5.5	D	Flange	0.364
P	6	C	Web	0.346
P	6	C	Flange	0.588

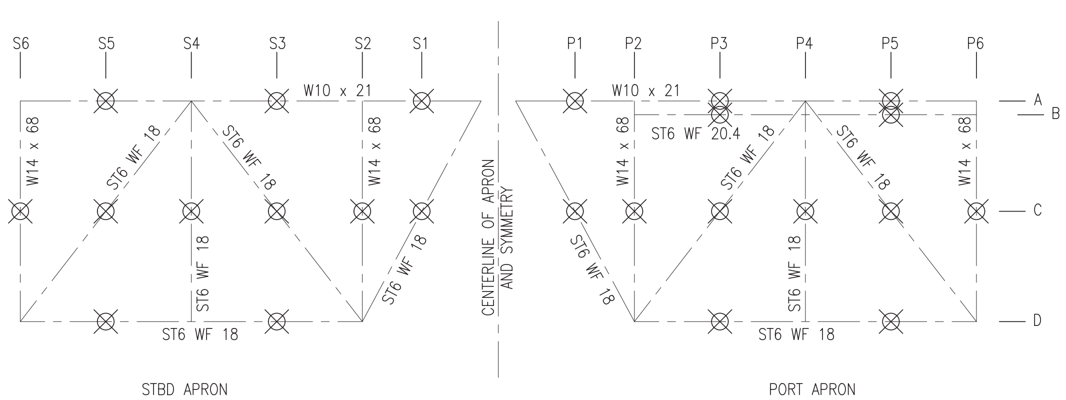
SEE B3 on Sheet A-004



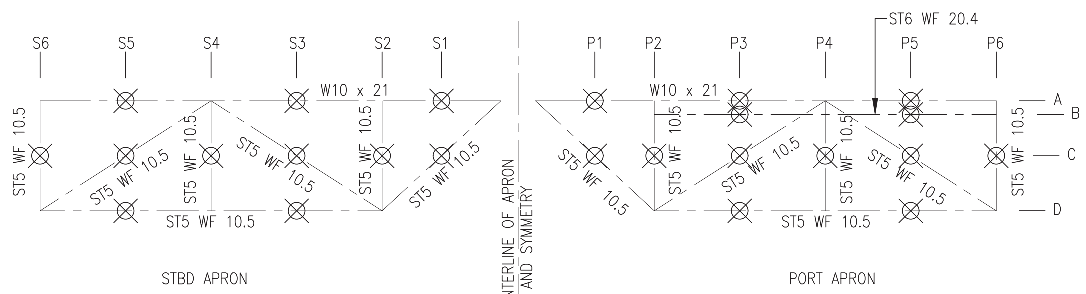
SECTION (D1)
SCALE: 3/16"=1'-0" A-003



SECTION (D3)
SCALE: 3/16"=1'-0" A-003



SECTION (B1)
SCALE: 3/16"=1'-0" A-003



SECTION (B3)
SCALE: 3/16"=1'-0" A-003

⌖ — INDICATES THE LOCATION OF TWO UT MEASUREMENTS TAKEN ON STRUCTURAL MEMBERS ONE TAKEN ON THE FLANGE AND ONE TAKEN ON THE WEB.

3/16" = 1'-0" 0 2 4 8 12 FT

SYM	DESCRIPTION	DATE	APPR

HEGER DRY DOCK, Inc.
DRY DOCK ENGINEERS
DESIGN, INSPECTION AND CERTIFICATION
531 CONCORD STREET
HOLLISTON, MA 01746
(508) 429-1800

DES: | DRW: JJB | CHK: MDN
CHIEF ENG.: WALEED SAYED
DATE: 11/16/2016

CLIENT NAME AND ADDRESS:
BAE SYSTEMS
SAN FRANCISCO, CA.

PROJECT TITLE:
COMMERCIAL INSPECTION OF EUREKA FDD (EX AFDM 14)

DRAWING TITLE:
ORIGINAL EUREKA APRON STRUCTURE 2 OF 3

SCALE: AS NOTED
PROJECT NO.: 3978-D
CONSTR. CONTR. NO.:
SHEET 5 OF 7
A-004

BOTTOM CHORD

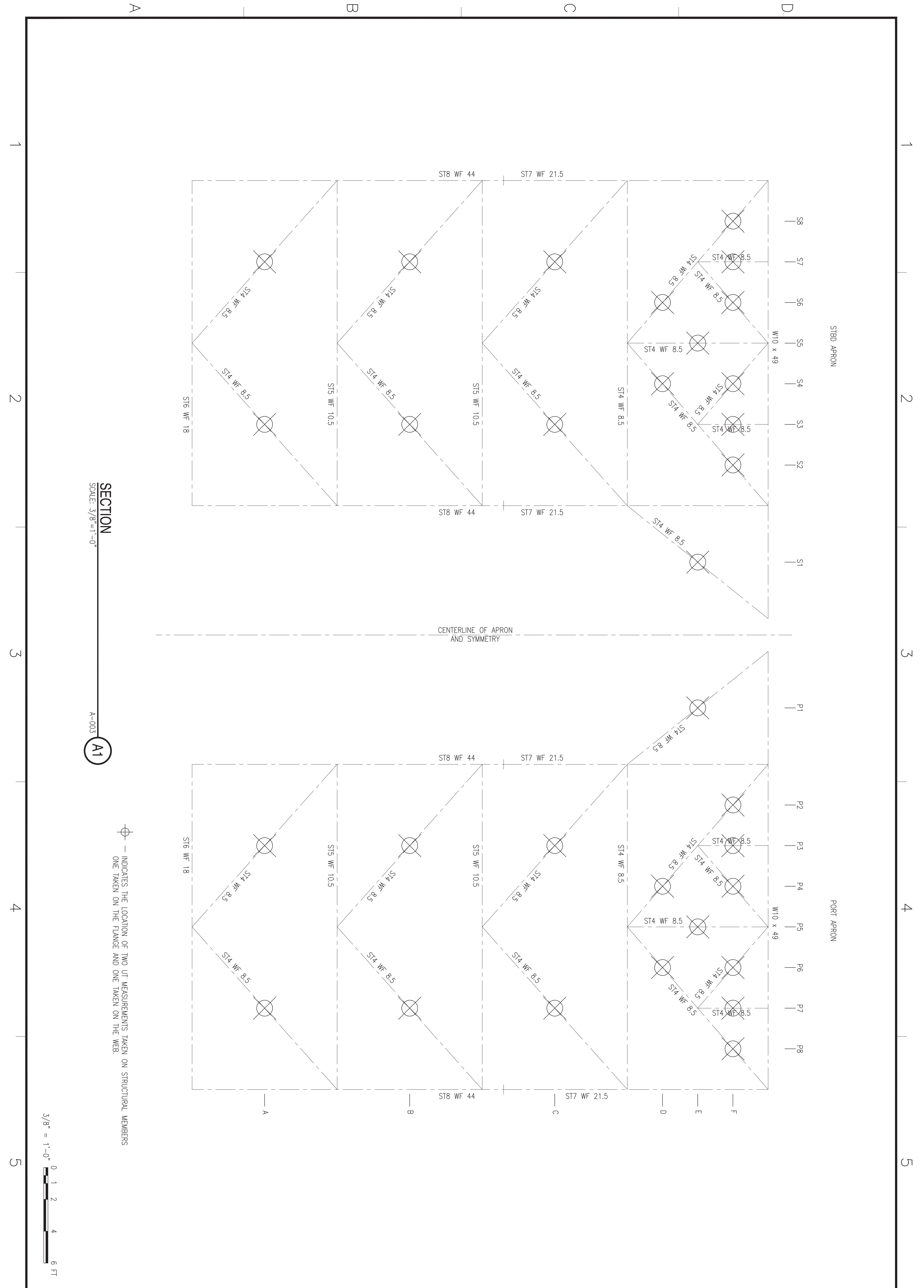
				UT
S	8	F	Web	0.316
S	8	F	Flange	0.27
S	7	F	Web	0.342
S	7	F	Flange	0.293
S	7	C	Web	0.361
S	7	C	Flange	0.307
S	7	B	Web	0.363
S	7	B	Flange	0.318
S	7	A	Web	0.319
S	7	A	Flange	0.37
S	6	F	Web	0.307
S	6	F	Flange	0.275
S	6	D	Web	0.285
S	6	D	Flange	0.271
S	5	E	Web	0.313
S	5	E	Flange	0.294
S	4	F	Web	0.266
S	4	F	Flange	0.243
S	3	F	Web	0.332
S	3	F	Flange	0.278
S	3	C	Web	0.298
S	3	C	Flange	0.296
S	3	B	Web	0.387
S	3	B	Flange	0.311
S	2	A	Web	0.351
S	2	A	Flange	0.382
S	1	E	Web	0.307
S	1	E	Flange	0.286
S	2	F	Web	0.311
S	2	F	Flange	0.284
S	4	D	Web	0.313
S	4	D	Flange	0.265

SEE A1 on Sheet A-005

				UT
P	8	F	Web	0.302
P	8	F	Flange	0.356
P	7	F	Web	0.278
P	7	F	Flange	0.29
P	7	C	Web	0.327
P	7	C	Flange	0.36
P	7	B	Web	0.326
P	7	B	Flange	0.289
P	7	A	Web	0.314
P	7	A	Flange	0.382
P	6	F	Web	0.318
P	6	F	Flange	0.226
P	6	D	Web	0.313
P	6	D	Flange	0.372
P	5	E	Web	0.288
P	5	E	Flange	0.304
P	4	F	Web	0.273
P	4	F	Flange	0.301
P	3	D	Web	0.313
P	3	D	Flange	0.384
P	3	F	Web	0.282
P	3	F	Flange	0.258
P	3	C	Web	0.316
P	3	C	Flange	0.305
P	3	B	Web	0.355
P	3	B	Flange	0.315
P	1	E	Web	0.327
P	1	E	Flange	0.359
P	2	F	Web	0.287
P	2	F	Flange	0.229
P	4	D	Web	0.312
P	4	D	Flange	0.306

SEE A1 on Sheet A-005

FILE NAME: L:\CLIENTS\BAE\BAE San Francisco\3978-D Comercial Inspection of Eureka FDD\Dwgs\0-3978-D Current Heger Design Drawings\A-005.dwg LAYOUT NAME: 6 A-005 PLOTTED: Tuesday, November 15, 2016 - 3:57pm USER: Mike



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CLIENT NAME AND ADDRESS:

BAE SYSTEMS

SAN FRANCISCO, CA.

PROJECT TITLE:

COMMERCIAL INSPECTION OF EUREKA FDD (EX AFDM 14)

DRAWING TITLE:

ORIGINAL EUREKA APRON STRUCTURE 3 OF 3

SCALE:	AS NOTED
PROJECT NO.	3978-D
CONSTR. CONTR. NO.	
SHEET	6 OF 7
	A-005
DES	
DRW	JJB
CHK	MDN
CHIEF ENG.	WALEED SAYED
DATE:	11/16/2016
SEAL	

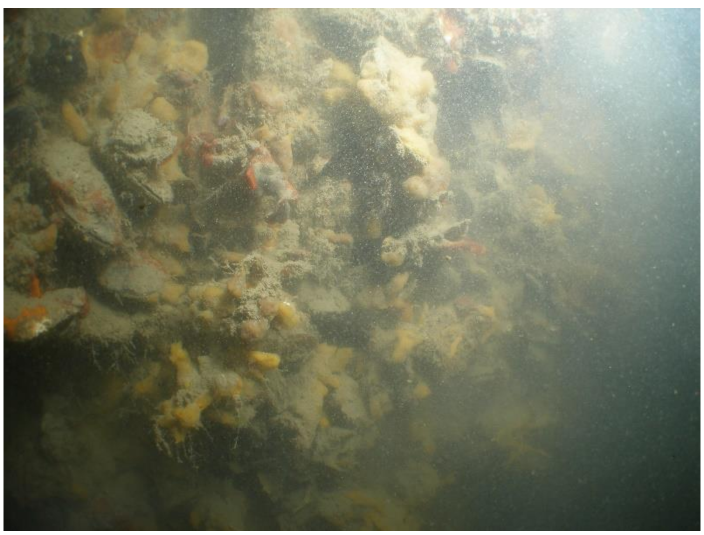
HEGER DRY DOCK, Inc.
DRY DOCK ENGINEERS
DESIGN, INSPECTION AND CERTIFICATION
531 CONCORD STREET
HOLLISTON, MA 01746
(508) 429-1800

SYM	DESCRIPTION	DATE	APPR

6.0 CLEANING OF INTAKE & DISCHARGE SCREENS

METHOD
A dive crew consisting of 3 men, with surface supplied air diving equipment and using a low-pressure diving compressor will send a diver in the water with surface to diver communications to pressure wash the intake/discharge screens on the Eureka dry dock with a 5000 PSI pressure washer to remove the soft and hard growth from the screens. The diver will inspect and report his findings on the screens.

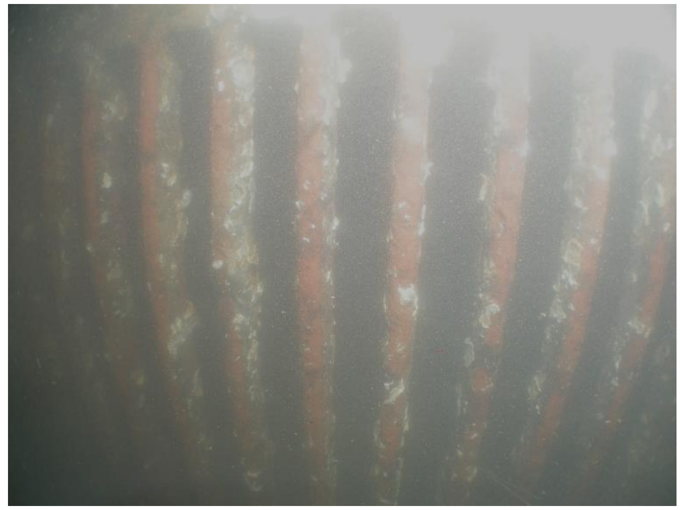
DIVERS FINDINGS
The dive crew cleaned the screens. The screens had mostly hard growth and were clogged up to 90%. All the screens were pressure washed and the marine growth was removed.



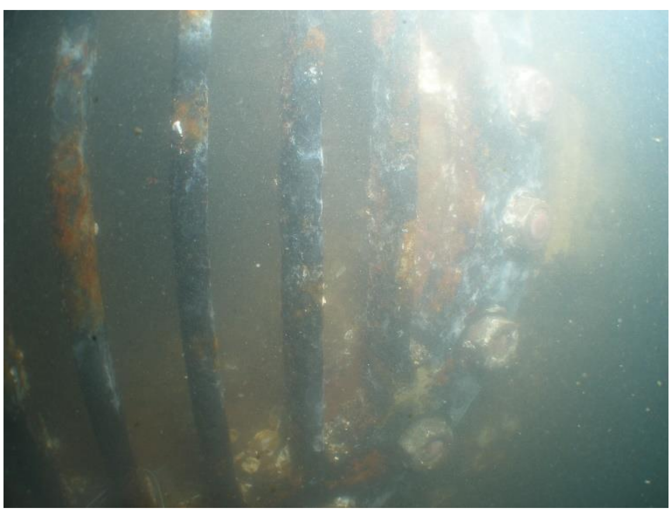
Typical condition of a screen (90% clogged with marine growth)

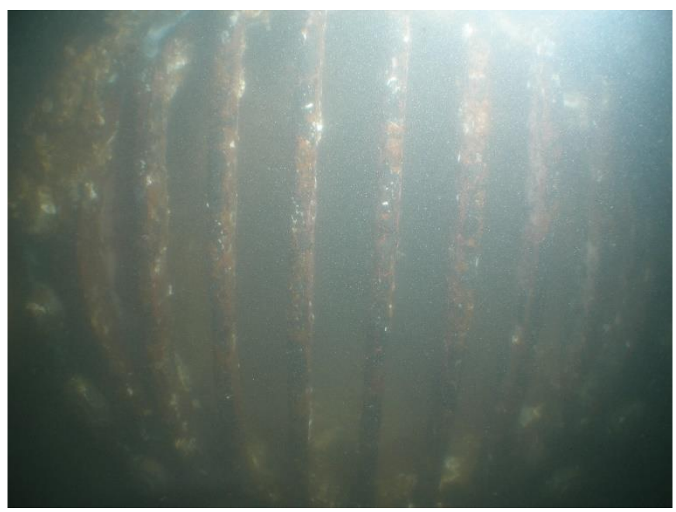
Diver checked each screen again after cleaning and found one screen that has a bent bar which is identified in ***Drawing B***. All other screens are securely fastened to dry dock and in good condition. Below are pictures of a few screens which are typical of all screens after cleaning.

Two intake screen pictures below are “typical” of all intake screens

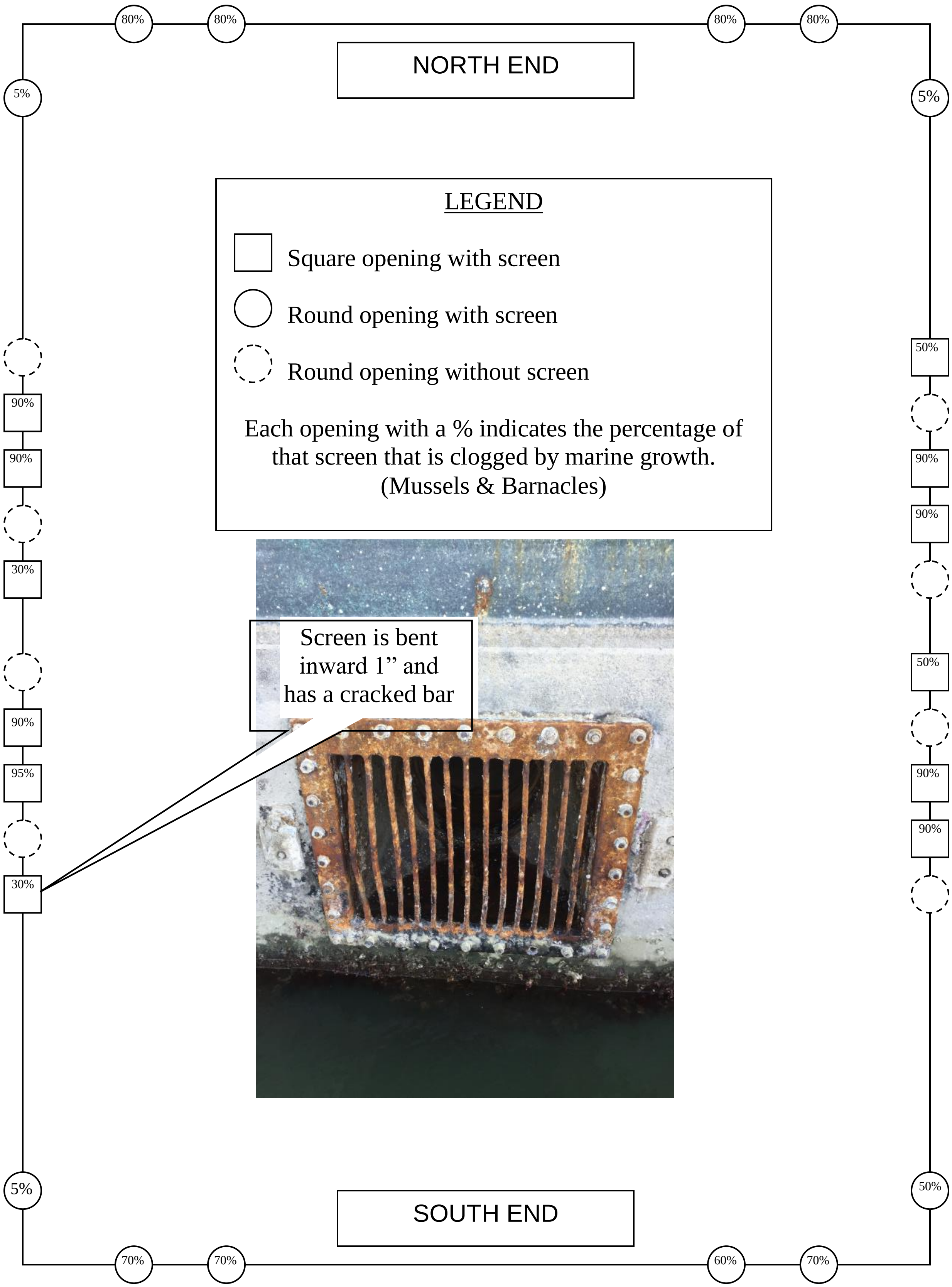


Two discharge screen pictures below are “typical” of all discharge screens





DRAWING B % of marine growth on each screen



END OF REPORT

Appendix C – Ultrasonic Thickness Measurements

Dry Dock EUREKA UT Gauge Readings
Collins Engineers, Inc.

Belt	Location	Original Thickness	March 2017 Thickness
1	Hull Cutout		
	1	0.437	0.370
	2	0.437	0.510
	3	0.437	0.440
	4	0.437	0.440
	5	0.437	0.365
	6	0.437	0.315
	7	0.437	0.500
	8	0.437	0.495
	9	0.437	0.370
	10	0.437	0.770
	11	0.437	0.765
	12	0.437	0.770
	13	0.437	0.370
	14	0.437	0.375
	15	0.437	0.385
	16	0.437	0.365
	17	0.437	0.390
	18	0.437	0.370
	19	0.437	0.415
	20	0.437	0.365
	21	0.437	0.355
	22	0.437	0.440
	23	0.437	0.410
	Hull Cutout		

Average Distance Between Measurements =	5'-2"
Max < 0.437 in. =	0.415
Min =	0.315

Notes:
1. Hit 1 is on East Side of hull
2. Hits 1 and 23 are 1 foot in towards keel from inside face of hull cut out
3. Above water UT gauge reading taken on ceiling of hull cut out 1 foot in from west pontoon face = 0.390 in.

Belt	Location	Original Thickness	March 2017 Thickness
2	1	0.437	0.405
	2	0.437	0.325
	3	0.437	0.380
	4	0.437	0.480
	5	0.437	0.490
	6	0.437	0.365
	7	0.437	0.365
	8	0.437	0.325
	9	0.437	0.400
	10	0.437	0.415
	11	0.437	0.360
	12	0.437	0.420
	13	0.437	0.410
	14	0.437	0.415
	15	0.437	0.430
	16	0.437	0.375
	17	0.437	0.365
	18	0.437	0.385
	19	0.437	0.385
	20	0.437	0.385
	21	0.437	0.395
	22	0.437	0.400
	23	0.437	0.395
	24	0.437	0.415
	25	0.437	0.415
	26	0.437	0.405
	27	0.437	0.400
	28	0.437	0.365
	29	0.437	0.375
	30	0.437	0.380
	31	0.437	0.415
	32	0.437	0.405

Average Distance Between Measurements =	3'-8"
Max < 0.437 in. =	0.430
Min =	0.325

Notes:

1 Hit 1 is on East Side of hull

2 Hits 1 and 32 are 1 foot in from outer hull corner towards the hull kee

Dry Dock EUREKA UT Gauge Readings
Collins Engineers, Inc.

Belt	Location	Original Thickness	March 2017 Thickness
3	1	0.437	0.465
	2	0.437	0.470
	3	0.437	0.390
	4	0.437	0.365
	5	0.437	0.395
	6	0.437	0.382
	7	0.437	0.410
	8	0.437	0.405
	9	0.437	0.470
	10	0.437	0.375
	11	0.437	0.390
	12	0.437	0.395
	13	0.437	0.395
	14	0.437	0.395
	15	0.437	0.405
	16	0.437	0.450
	17	0.437	0.490
	18	0.437	0.445
	19	0.437	0.420
	20	0.437	0.380
	21	0.437	0.385
	22	0.437	0.375
	23	0.437	0.350
	24	0.437	0.375
	25	0.437	0.405
	26	0.437	0.350
	27	0.437	0.385
	28	0.437	0.355
	29	0.437	0.345
	30	0.437	0.450
	31	0.437	0.505
	32	0.437	0.390
	33	0.437	0.390
	34	0.437	0.350

Average Distance Between Measurements =	3'-6"
Max < 0.437 in. =	0.420
Min =	0.345

Notes:

1 Hit 1 is on East Side of hull

2 Hits 1 and 34 are 1 foot in from outer hull corner towards the hull kee

Dry Dock EUREKA UT Gauge Readings
Collins Engineers, Inc.

Belt	Location	Original Thickness	March 2017 Thickness
4	Hull Cutout		
	1	0.437	0.385
	2	0.437	0.395
	3	0.437	0.430
	4	0.437	0.380
	5	0.437	0.305
	6	0.437	0.370
	7	0.437	0.370
	8	0.437	0.495
	9	0.437	0.500
	10	0.437	0.385
	11	0.437	0.435
	12	0.437	0.355
	13	0.437	0.380
	14	0.437	0.365
	15	0.437	0.415
	16	0.437	0.410
	17	0.437	0.425
	18	0.437	0.420
	19	0.437	0.430
	20	0.437	0.420
	21	0.437	0.310
	22	0.437	0.385
	Hull Cutout		

Average Distance Between Measurements =	4'-6"
Max < 0.437 in. =	0.430
Min =	0.305

Notes:

1. Hit 1 is on East Side of hull
2. Hits 1 and 22 are 1 foot in towards keel from inside face of hull cut out
3. Above water UT gauge reading taken on ceiling of hull cut out 1 foot in from west pontoon face = 0.455 in.

Dry Dock EUREKA UT Gauge Readings
Collins Engineers, Inc.

Belt	Location	Original Thickness	March 2017 Thickness
5	1	0.437	0.435
	2	0.437	0.445
	3	0.437	0.435
	4	0.437	0.440
	5	0.437	0.445
	6	0.437	0.430
	7	0.437	0.435
	8	0.437	0.395
	9	0.437	0.410
	10	0.437	0.415
	11	0.437	0.430
	12	0.437	0.390
	13	0.437	0.385
	14	0.437	0.425
	15	0.437	0.410
	16	0.437	0.425
	17	0.437	0.405
	18	0.437	0.395
	19	0.437	0.400
	20	0.437	0.420
	21	0.437	0.425
	22	0.437	0.395
	23	0.437	0.345
	24	0.437	0.345
	25	0.437	0.385
	26	0.437	0.325
	27	0.437	0.325
	28	0.437	0.320
	29	0.437	0.330

Average Distance Between Measurements =	4'-0"
Max < 0.437 in. =	0.435
Min =	0.320

Notes:

1 Hit 1 is on East Side of hull
2 Hits 1 and 29 are 1 foot in from outer hull corner towards the hull keel

Dry Dock EUREKA UT Gauge Readings
Collins Engineers, Inc.

Belt	Location	Original Thickness	March 2017 Thickness
6	1	0.437	0.425
	2	0.437	0.445
	3	0.437	0.425
	4	0.437	0.395
	5	0.437	0.950
	6	0.437	0.400
	7	0.437	0.385
	8	0.437	0.445
	9	0.437	0.450
	10	0.437	0.425
	11	0.437	0.420
	12	0.437	0.415
	13	0.437	0.405
	14	0.437	0.435
	15	0.437	0.430
	16	0.437	0.425
	17	0.437	0.430
	18	0.437	0.425
	19	0.437	0.425
	20	0.437	0.420
	21	0.437	0.430
	22	0.437	0.445
	23	0.437	0.435
	24	0.437	0.435
	25	0.437	0.430
	26	0.437	0.425
	27	0.437	0.425

Average Distance Between Measurements = 4'-4"

Max < 0.437 in. = 0.435

Min = 0.385

Notes:

1 Hit 1 is on East Side of hull

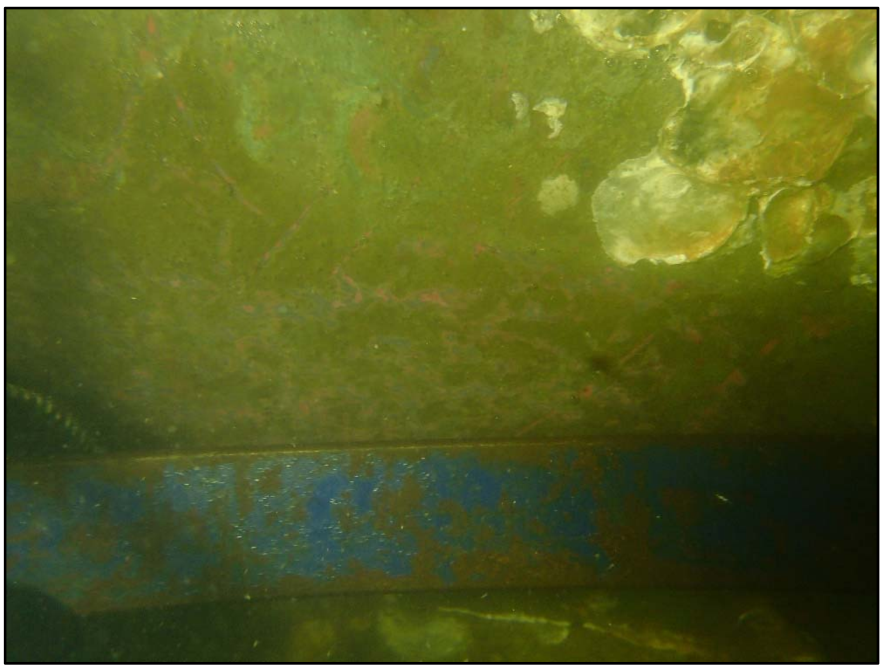
2 Hits 1 and 27 are 1 foot in from outer hull corner towards the hull keel

Appendix D – Photographs

Photograph 1 : Overall view of Dry Dock EUREKA, looking southeast.

Photograph 2 : Overall view of Dry Dock EUREKA, looking northeast.

Photograph 3 : Underwater view of typical marine growth located along outer hull perimeter.



Photograph 4 : Underwater view of typical marine growth towards hull keel.

Photograph 5 : Underwater view of typical hull coating presentation with red coloring.

Photograph 6 : Underwater view of typical sacraficial annode condition.

Appendix E – Definitions

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

Source: ASCE Manuals and Reports on Engineering Practice No. 101, Underwater Investigations Standard Practice Manual, 2001; Table 2-4.

Inspection Level	Scope of Work Overview	Detectable Defects in Steel
Level I	Visual or tactile inspection of underwater components without removal of marine growth	Extensive corrosion and holes Severe mechanical damage
Level II	Partial marine growth removal of a statistically representative sample – typically 10% of all components.	Moderate mechanical damage Corrosion pitting and loss of section
Level III	Nondestructive testing (NDT) or partially destructive testing (PDT) of a statistically sample – typically 5% of all components. May consist of PDT of wood and remaining thickness measurements of steel components.	Thickness of material Electrical potentials for cathodic protection

Source: ASCE Manual, Underwater Investigations Standard Practice Manual, 2001.

Appendix F – Interpolated Tide Tables

Dry Dock Eureka
Monday 3/6/2017 Tide Gauge Station 9414334 Potrero Point, CA

Time	Mins Difference	MLLW (ft)	
6:05	-	6.26	High
6:15	10	6.12	
6:30	15	5.90	
6:45	15	5.69	
7:00	15	5.47	
7:15	15	5.26	
7:30	15	5.05	
7:45	15	4.83	
8:00	15	4.62	
8:15	15	4.40	
8:30	15	4.19	
8:45	15	3.97	
9:00	15	3.76	
9:15	15	3.55	
9:30	15	3.33	
9:45	15	3.12	
10:00	15	2.90	
10:15	15	2.69	
10:30	15	2.47	
10:45	15	2.26	
11:00	15	2.04	
11:15	15	1.83	
11:30	15	1.62	
11:45	15	1.40	
12:00	15	1.19	
12:15	15	0.97	
12:30	15	0.76	
12:45	15	0.54	
13:00	15	0.33	
13:15	15	0.12	
13:21	6	0.03	Low
13:30	9	0.13	
13:45	15	0.31	
14:00	15	0.48	
14:15	15	0.65	
14:30	15	0.83	
14:45	15	1.00	
15:00	15	1.17	
15:15	15	1.35	
15:30	15	1.52	
15:45	15	1.69	
16:00	15	1.86	
16:15	15	2.04	
16:30	15	2.21	
16:45	15	2.38	
17:00	15	2.56	
17:15	15	2.73	
17:30	15	2.90	
17:45	15	3.08	
18:00	15	3.25	
18:15	15	3.42	
18:30	15	3.59	
18:45	15	3.77	
19:00	15	3.94	
19:15	15	4.11	
19:30	15	4.29	
19:45	15	4.46	
20:00	15	4.63	
20:15	15	4.81	
20:24	9	4.91	High

Difference between the MLLW high and low is: 6.23 ft

Difference between the MLLW high/low time is: 7:16 or 436 mins

Slope per min: 0.014289 ft/min

Difference between the high and low is: 4.88 ft

Difference between the MLLW high/low time is: 7:03 or 423 mins

Slope per min: 0.011537 ft/min

Dry Dock Eureka
Tuesday 3/7/2017 Tide Gauge Station 9414334 Potrero Point, CA

Time	Mins Difference	MLLW (ft)						
7:14	-	6.31	High					
7:15	1	6.29						
7:30	15	6.07		Difference between the high and low is:	6.53 ft			
7:45	15	5.84						
8:00	15	5.61		Difference between the MLLW high/low time is:	7:12	or	432	mins
8:15	15	5.39						
8:30	15	5.16		Slope per min:	0.015116 ft/min			
8:45	15	4.93						
9:00	15	4.71						
9:15	15	4.48						
9:30	15	4.25						
9:45	15	4.03						
10:00	15	3.80						
10:15	15	3.57						
10:30	15	3.35						
10:45	15	3.12						
11:00	15	2.89						
11:15	15	2.67						
11:30	15	2.44						
11:45	15	2.21						
12:00	15	1.99						
12:15	15	1.76						
12:30	15	1.53						
12:45	15	1.31						
13:00	15	1.08						
13:15	15	0.85						
13:30	15	0.63						
13:45	15	0.40						
14:00	15	0.17						
14:15	15	-0.05						
14:26	11	-0.22	Low					
14:30	4	-0.17						
14:45	15	0.03						
15:00	15	0.23		Difference between the high and low is:	5.46 ft			
15:15	15	0.42						
15:30	15	0.62		Difference between the MLLW high/low time is:	6:57	or	417	mins
15:45	15	0.81						
16:00	15	1.01		Slope per min:	0.013094 ft/min			
16:15	15	1.21						
16:30	15	1.40						
16:45	15	1.60						
17:00	15	1.80						
17:15	15	1.99						
17:30	15	2.19						
17:45	15	2.39						
18:00	15	2.58						
18:15	15	2.78						
18:30	15	2.97						
18:45	15	3.17						
19:00	15	3.37						
19:15	15	3.56						
19:30	15	3.76						
19:45	15	3.96						
20:00	15	4.15						
20:15	15	4.35						
20:30	15	4.55						
20:45	15	4.74						
21:00	15	4.94						
21:15	15	5.14						
21:23	8	5.24	High					

Dry Dock Eureka
Wednesday 3/8/2017 Tide Gauge Station 9414334 Potrero Point, CA

Time	Mins Difference	MLLW (ft)				
8:19	-	6.39	High			
8:30	11	6.21				
8:45	15	5.97	Difference between the high and low is:	6.79 ft		
9:00	15	5.73				
9:15	15	5.49	Difference between the MLLW high/low time is:	7:02	or	422 mins
9:30	15	5.25				
9:45	15	5.01	Slope per min:	0.01609 ft/min		
10:00	15	4.76				
10:15	15	4.52				
10:30	15	4.28				
10:45	15	4.04				
11:00	15	3.80				
11:15	15	3.56				
11:30	15	3.32				
11:45	15	3.08				
12:00	15	2.83				
12:15	15	2.59				
12:30	15	2.35				
12:45	15	2.11				
13:00	15	1.87				
13:15	15	1.63				
13:30	15	1.39				
13:45	15	1.14				
14:00	15	0.90				
14:15	15	0.66				
14:30	15	0.42				
14:45	15	0.18				
15:00	15	-0.06				
15:15	15	-0.30				
15:21	6	-0.40	Low			
15:30	9	-0.27				
15:45	15	-0.05				
16:00	15	0.16	Difference between the high and low is:	5.92 ft		
16:15	15	0.38				
16:30	15	0.60	Difference between the MLLW high/low time is:	6:50	or	410 mins
16:45	15	0.81				
17:00	15	1.03	Slope per min:	0.014439 ft/min		
17:15	15	1.25				
17:30	15	1.46				
17:45	15	1.68				
18:00	15	1.90				
18:15	15	2.11				
18:30	15	2.33				
18:45	15	2.55				
19:00	15	2.76				
19:15	15	2.98				
19:30	15	3.20				
19:45	15	3.41				
20:00	15	3.63				
20:15	15	3.85				
20:30	15	4.06				
20:45	15	4.28				
21:00	15	4.49				
21:15	15	4.71				
21:30	15	4.93				
21:45	15	5.14				
22:00	15	5.36				
22:11	11	5.52	High			

Dry Dock Eureka
Thursday 3/9/2017 Tide Gauge Station 9414334 Potrero Point, CA

Time	Mins Difference	MLLW (ft)	
9:18	-	6.46	High
9:30	12	6.26	
9:45	15	6.00	
10:00	15	5.75	
10:15	15	5.50	
10:30	15	5.24	
10:45	15	4.99	
11:00	15	4.73	
11:15	15	4.48	
11:30	15	4.23	
11:45	15	3.97	
12:00	15	3.72	
12:15	15	3.46	
12:30	15	3.21	
12:45	15	2.96	
13:00	15	2.70	
13:15	15	2.45	
13:30	15	2.19	
13:45	15	1.94	
14:00	15	1.69	
14:15	15	1.43	
14:30	15	1.18	
14:45	15	0.92	
15:00	15	0.67	
15:15	15	0.42	
15:30	15	0.16	
15:45	15	-0.09	
16:00	15	-0.34	
16:08	8	-0.48	Low
16:15	7	-0.37	
16:30	15	-0.14	
16:45	15	0.09	
17:00	15	0.32	
17:15	15	0.55	
17:30	15	0.78	
17:45	15	1.01	
18:00	15	1.24	
18:15	15	1.48	
18:30	15	1.71	
18:45	15	1.94	
19:00	15	2.17	
19:15	15	2.40	
19:30	15	2.63	
19:45	15	2.86	
20:00	15	3.09	
20:15	15	3.32	
20:30	15	3.55	
20:45	15	3.78	
21:00	15	4.02	
21:15	15	4.25	
21:30	15	4.48	
21:45	15	4.71	
22:00	15	4.94	
22:15	15	5.17	
22:30	15	5.40	
22:45	15	5.63	
22:52	7	5.74	High

Difference between the high and low is: 6.94 ft

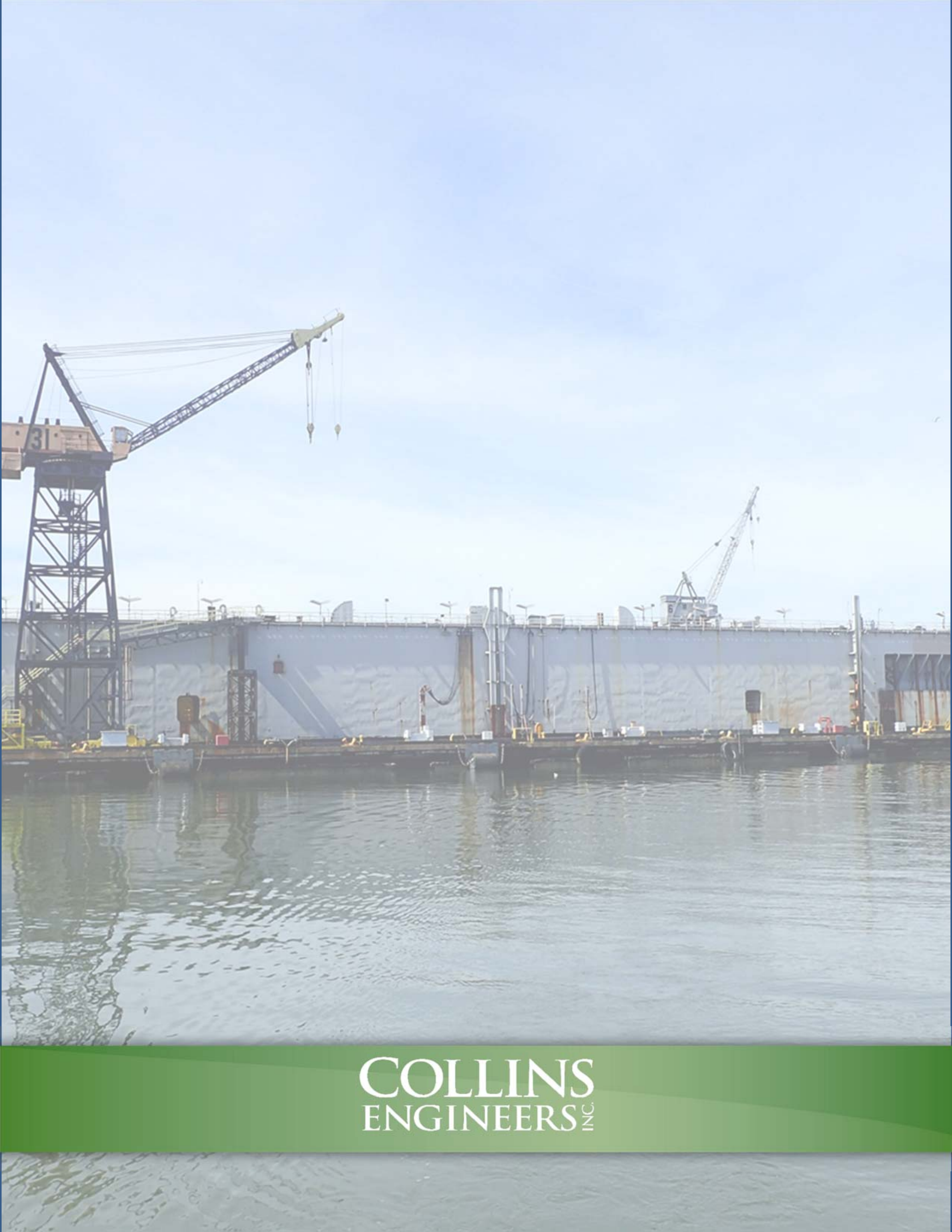
Difference between the MLLW high/low time is: 6:50 or 410 mins

Slope per min: 0.016927 ft/min

Difference between the high and low is: 6.22 ft

Difference between the MLLW high/low time is: 6:44 or 404 mins

Slope per min: 0.015396 ft/min



COLLINS
ENGINEERS INC.

Appendix F

Interior Compartment Inspection Notes

3/21 11:30 AM

Tank 6A Wall 49 (S. Wall)

42" from E wall, 59" height

Horizontal = 0.53"
Vertical = 0.63"
Transverse = 0.58"

① 12 mil Coating

12 mil Coating	.340	–	.352
	.338	–	.357
14 mil	.324	5 mil	.370
9 mil	.362	5 mil	.346

② Tank 6A East Wall

10 ft. from North Wall
66" height

7 mil	~~.380~~ .392	7 mil	.392
7 mil	.392	8 mil	.390
7 mil	.391	10 mil	.391
7 mil	.391	7 mil	.390

③ Tank 6A North Wall

234" from E Wall
51" height

–	.464	13 mil	.465
–	.482	8 mil	.479
8 mil	.467	–	.482
–	.478	10 mil	.459

④ Tank 6A West Wall

59" from N Wall
53" height

13 mil	.391	15 mil	.381
5 mil	.402	5 mil	.396
19 mil	.397	–	.395
–	.397	13 mil	.378

Tank 6A Inside Wing Wall Compartment
Lower First West Wall

26" from N Wall
47" height

9 mil	.440	–	.442
6 mil	.443	–	.440
8 mil	.432	–	.449
–	.449	12 mil	.410

FT=Flange Thickness

6A?

Transverse

Coating intact

FT = 0.58"

Vertical

Coating intact

FT=0.63"

Horizontal Beam

Flange thickness = 0.53"

5A

Transverse

FT=0.57"

Vertical

FT=~~0.57~~ 0.64"

Horizontal Beam

FT= 0.51"

Tank 5A 3/2/17 1 PM

East Wall

38" from N Wall

55" height

–	.407	8ml	.388
8ml	.394	13ml	.380
–	.468	8ml	.395
9mil	.393	8ml	.389 8

112" from E. Wall

58" heigh

North Wall

–	.528	5ml	.530
–	.492	5ml	.540
6ml	.504	8ml	.478
–	.503	9ml	.524

112" from E Wall

58" heigh

~~West~~ South Wall

17ml	.418	19ml	.411	18mls	.420
11ml	.414	10ml	.430	16mls	.416
18ml	.415	14ml	.416		

105" from N Wall

72" height

~~South~~ West Wall

16ml,	.401	20ml	.381
17ml,	.386	6ml	.403
7ml	.405	~~20~~10ml,	.382
5ml	.407	15ml	.395

March 3, 2017
6:50 AM

Tank 20 A

Vertical Beam = 0.53"
Transverse Beam = 0.57"

South Wall

5ml	0.387	–	0.388	6	392
13	0.370	6	386	5	385
–	0.391	16	377		

91" from W. Wall
7' heigh

East Wall

10ml	0.396	9	416
10	393	10	395
10	415	11	398
–	415	10	395

74" from S Wall
57" heigh

North Wall

13	491	9	505	10	510
11	491	10	497	–	517
11	495	–	513		

87" from W wall
75" height.

West Wall

17	384	9	394	9	393
12	382	9	394	13	385
10	398	13	384		

6' from N. wall
43" height

Tank ~~8~~ 6 7:30 AM

Trasvers = 0.69"
Vertical = 0.64"

East Wall

(17nl) 0.368 (8) 395 (15) 382 (-) 391
(8) 389 (14) 392 (13) 403 (-) 383

66" height
~40' S.Wall

West Wall

(6) 385 (22) 362 (6) 375 (-) 387
(5) 382 (20) 375 (8) 398 (14) 370

40' from S. Wall
51" height

North Wall

(-) 378 (6) 346 (-) 363 (12) 355
(9) 336 (-) 386 (14) 338 (12) 368

38" from Wall
67" height

SOUTH WALL NOT ACCESSIBLE DUE TO FILL PIPE

TANK ~~7~~ 5 8:05 AM Transvers = 0.67" Vertical = 0.69" Hor. = 0.52"

East Wall

(15) 396 (19) ~~3~~406 (11) 399 (12) 406
(12) 407 (11) 396 (14) 404 (12) 403

94" height
99" ~~height~~ from S. Wall

~~SOUTH WALL NOT ACCESSIBLE~~

North Wall

(8) 422 (13) 406 (17) 424 (-) 425
(8) 408 (-) 422 (-) 420 (9) 423

38" from E. Wall
63" height

West Wall

(27) 398 (18) 394 (14) 397 (17) 394
(22) 365 (18) 380 (16) 389 (16) 394

79" from S. Wall
10' height

SOUTH WALL

(16) 354 (10) 387 (22) 369 (16) 370
(14) 373 (17) 360 (20) 364 (13) 366

10' height
6' from W Wall

Tank 22

~~Treasures~~ Vertical: 0.61"
Transverse: 0.68"
Horizontal:

3/3/17
9:45am

West wall

74" N. Wall

59" Height

(8) 409	(9) 425	(8) 408	(7) 408
(5) 421	(0) 420	(8) 408	(7) 408

South wall

81" Height

28" W. Wall

(-) 405	(11) 385	(-) 404	(13) 385
(8) 402	(-) 407	(-) 407	(11) 386

East Wall

84" Height

73" S. Wall

(8) 386	(13) 372	(9) 386	(12) 372
(13) 373	(12) 373	(13) 373	(14) 382

North Wall

83" Height

25" E. Wall

(11) 499	(11) 501	(11) 479	(10) 499
(11) 502	(11) 504	(11) 500	(11) 496

9:55AM

Tank 8

West Wall — Height: 55" S.Wall: 34"

Vertical: 0.52" Trans: 0.65" Horizontal: 0.52"

(18) 388 (11) 386 (6) 398 (8) 386
(9) 386 (11) 386 (10) 386 (8) 386

South Wall — Height: 56" W. Wall: 51"

(13) 390 (5) 401 (12) 385 (11) 390
(7) 404 (-) 399 (14) 388 (10) 385

ENCLOSURE 1

Pontoon Deck UT Data

North Wall — Height: 60" W. Wall: 62"

(19) 388 (10) 403 (10) 411 (0) 406
(0) 422 (9) 399 (11) 406 (0) 416

East Wall — Height: 69" S; wall: 79"

(0) 405 (0) 413 (0) 411 (8) 404
(8) 395 (0) 413 (13) 388 (8) 407

10:59AM

Tank 7

East Wall — Height: 64" S. Wall: 84"

Vertical: 0.52" Trans: 0.67" Horizontal: 0.41"

(0) 365 (13) 344 (13) 340 (0) 369
(0) 368 (0) 363 (0) 361 (0) 367

South Wall — Height: 54" E. Wall: 50"

(16) 365 (11) 385 (12) 374 (6) 388
(10) 379 (12) 373 (7) 389 (0) 385

North Wall — Height: 61" E. Wall: 83"

(0) 401 (0) 400 (0) 403 (0) 401
(0) 402 (11) 400 (0) 400 (6) 402

West Wall — Height: 68" S. Wall: 112"

(8) 396 (0) 395 (10) 383 (7) 394
(0) 396 (6) 396 (6) 397 (13) 393

ENCLOSURE 2

Pontoon Deck Stiffener Fracture Map

~~West~~ South Wall | Height: 58" | Vertical: 0.63" | 11:37am
W. wall: 107" | Trans: 0.73 | Tank 9
Horizontal: 0.53"

(13) 408 (12) 403 (12) 409 (0) 419
(11) 409 (6) 418 (11) 403 (18) 390

East Wall | Height = 54"
N.wall = 123"

(14) 388 (13) 382 (14) 389 (14) 388
(15) 387 (14) 387 (13) 388 (12) 388

North Wall | Height: 39"
E. wall: 40"

(11) 370 (0) 381 (0) 384 (0) 390
(0) 386 (10) 368 (0) 380 (10) 369

~~South~~ West wall | Height: 61"
N. wall: 48"

(0) 408 (0) 404 (8) 405 (0) 412
(0) 419 (0) 410 (0) 409 (0) 419

Tank 10 | 12:07pm

North Wall | Height: 59" | Vertical: 0.61"
W. wall: 63" | Trans: 0.67"
Horizontal: 0.45"

(10) 371 (10) 372 (11) 387 (8) 385
(9) 372 (7) 385 (8) 385 (7) 386

West Wall | Height: 60"
N. wall: 61"

(7) 358 (8) 344 (0) 379 (0) 358
(12) 357 (5) 340 (8) 343 (0) 367

South wall | Height: 62"
W. wall: 90"

(9) 383 (14) 382 (0) 394 (13) 387
(12) 383 (0) 397 (12) 383 (0) 397

East wall | Height: 42"
S. wall: 99"

(15) 376 (0) 391 (3) 366 (12) 377
(16) 379 (20) 377 (5) 384 (12) 378

Tank 23

Vertical: 0.56"
Trans: 0.69"
Horizontal: 0.70"

12:40pm

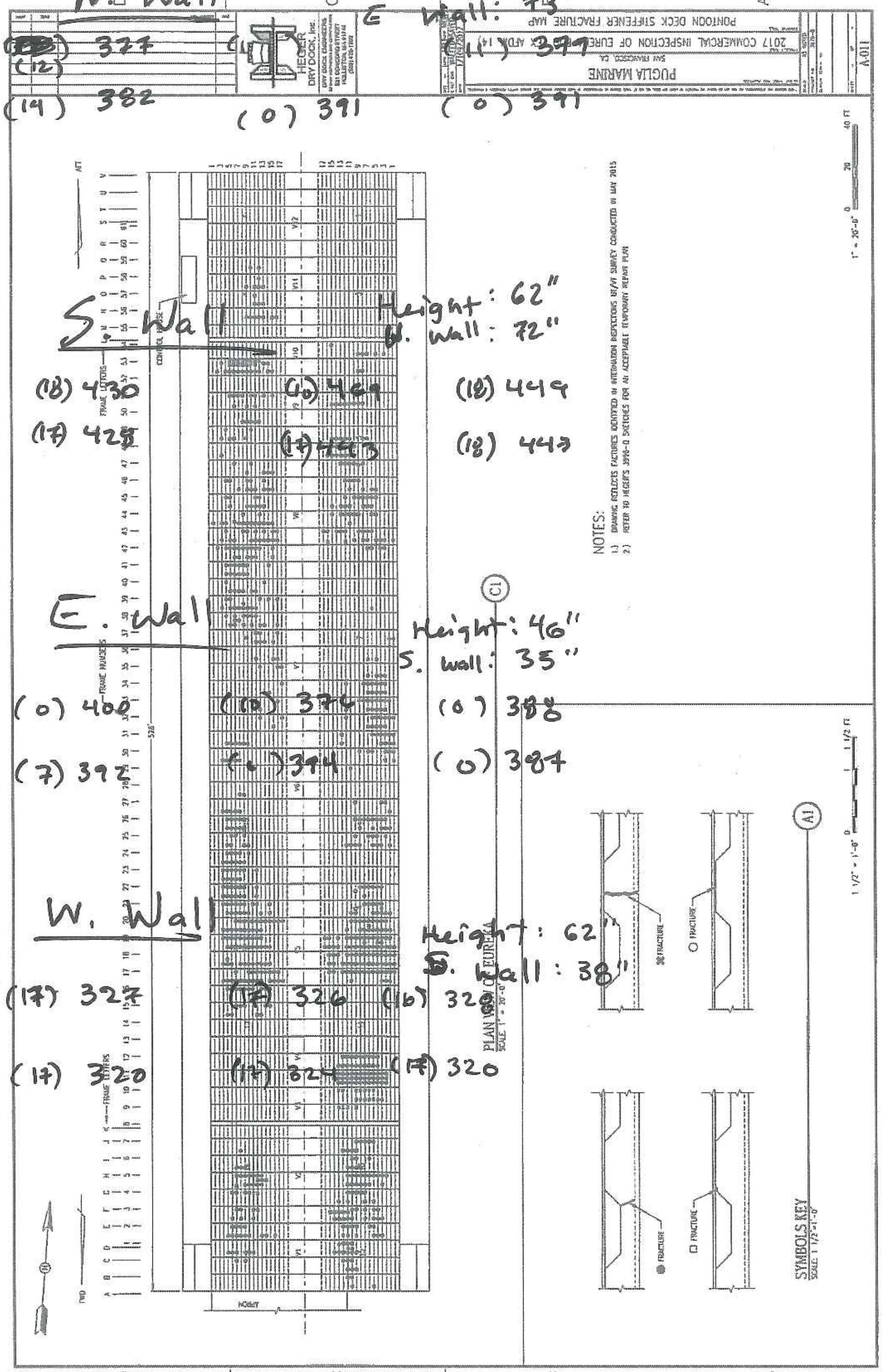
N. Wall
Height: 64"
E. Wall: 73"

(8) 377
(0) 391

(12) 377
(12)
(14) 382

(0) 391

(11) 377
(0) 391



S. Wall
Height: 62"
W. Wall: 72"

(18) 438
(12) 468

(18) 430
(17) 428

(0) 469
(17) 443

(18) 449
(18) 443

E. Wall
Height: 46"
S. Wall: 35"

(5) 397
(10) 395

(0) 400
(7) 392

(10) 376
(6) 394

(0) 388
(0) 384

W. Wall
Height: 62"
S. Wall: 38"

(18) 327
(19) 320

(17) 327
(17) 320

(17) 326
(17) 324

(16) 328
(17) 320

No anodes observed. Noticeable surface corrosion observed

Appendix G

Deck Inspection Notes

INTERNATIONAL INSPECTION, INC.

NORTH

BHD V	0.16 (63%)	0.41 (6%)	0.30 (31%)	0.28 (36%)		0.26 (41%)	0.27 (38%)	0.30 (31%)	0.27 (38%)
	0.31 (29%)	0.34 (22%)	0.36 (18%)	0.38 (13%)		0.24 (45%)	0.28 (36%)	0.27 (38%)	0.38 (13%)
	0.18 (59%)	0.43 (2%)	0.45 (0%)	0.34 (22%)	RUDDER	0.38 (13%)	0.36 (18%)	0.37 (15%)	0.26 (41%)
	0.23 (47%)	0.29 (34%)	0.38 (13%)	0.36 (18%)		0.41 (6%)	0.32 (27%)	0.29 (34%)	0.20 (54%)
	0.29 (34%)	0.28 (36%)	0.37 (15%)	0.22 (50%)		0.34 (22%)	0.29 (34%)	0.34 (22%)	0.37 (15%)
BHD 59	0.43 (2%)	0.27 (38%)	0.21 (52%)	0.45 (0%)		0.35 (20%)	0.38 (13%)	0.34 (22%)	0.28 (36%)
	0.40 (9%)	0.42 (4%)	0.44 (0%)	0.40 (9%)		0.36 (18%)	0.29 (34%)	0.24 (45%)	0.32 (27%)
	0.40 (9%)	0.37 (15%)	0.33 (25%)	0.30 (31%)	PIT	0.33 (25%)	0.36 (18%)	0.27 (38%)	0.37 (15%)
	0.32 (27%)	0.32 (27%)	0.40 (9%)	0.28 (36%)		0.40 (9%)	0.27 (38%)	0.24 (45%)	0.30 (31%)
	0.31 (29%)	0.40 (9%)	0.36 (18%)	0.40 (9%)		0.31 (29%)	0.33 (25%)	0.31 (29%)	0.43 (2%)

BHD 54	0.30 (31%)	0.21 (52%)	0.41 (6%)	0.23 (47%)	0.31 (29%)	0.21 (52%)	0.37 (15%)	0.35 (20%)	0.35 (20%)	0.38 (13%)	0.22 (50%)	0.33 (25%)	0.32 (27%)	0.24 (45%)	0.23 (47%)
	0.28 (36%)	0.29 (34%)	0.31 (29%)	0.27 (38%)	0.35 (20%)	0.33 (25%)	0.34 (22%)	0.32 (27%)	0.29 (34%)	0.32 (27%)	0.31 (29%)	0.46 (0%)	0.40 (9%)	0.36 (18%)	0.28 (36%)
	0.35 (20%)	0.40 (9%)	0.31 (29%)	0.38 (13%)	0.25 (43%)	0.24 (45%)	0.47 (0%)	0.42 (4%)	0.40 (9%)	0.32 (27%)	0.34 (22%)	0.31 (29%)	0.30 (31%)	0.37 (15%)	0.20 (54%)
	0.30 (31%)	0.28 (36%)	0.35 (20%)	0.46 (0%)	0.37 (15%)	0.36 (18%)	0.31 (29%)	0.35 (20%)	0.33 (25%)	0.21 (52%)	0.24 (45%)	0.42 (4%)	0.42 (4%)	0.34 (22%)	0.40 (9%)
	0.17 (61%)	0.34 (22%)	0.34 (22%)	0.27 (38%)	0.24 (45%)	0.33 (25%)	0.29 (34%)	0.27 (38%)	0.49 (0%)	0.49 (0%)	0.23 (47%)	0.36 (18%)	0.40 (9%)	0.39 (11%)	0.17 (61%)
	0.29 (34%)	0.37 (15%)	0.34 (22%)	0.42 (4%)	0.28 (36%)	0.26 (41%)	0.40 (9%)	0.31 (29%)	0.26 (41%)	0.25 (43%)	0.32 (27%)	0.40 (9%)	0.38 (13%)	0.39 (11%)	0.24 (45%)
	0.29 (34%)	0.45 (0%)	0.25 (43%)	0.30 (31%)	0.20 (54%)	0.40 (9%)	0.32 (27%)	0.40 (9%)	0.27 (38%)	0.30 (31%)	0.26 (41%)	0.38 (13%)	0.44 (0%)	0.40 (9%)	0.21 (52%)
	0.29 (34%)	0.36 (18%)	0.21 (52%)	0.33 (25%)	0.32 (27%)	0.39 (11%)	0.30 (31%)	0.30 (31%)	0.27 (38%)	0.23 (47%)	0.41 (6%)	0.31 (29%)	0.32 (27%)	0.35 (20%)	0.20 (54%)
	0.40 (9%)	0.40 (9%)	0.37 (15%)	0.40 (9%)	0.33 (25%)	0.32 (27%)	0.33 (25%)	0.41 (6%)	0.33 (25%)	0.32 (27%)	0.34 (22%)	0.28 (36%)	0.30 (31%)	0.36 (18%)	0.20 (54%)
	0.33 (25%)	0.25 (43%)	0.46 (0%)	0.44 (0%)	0.34 (22%)	0.24 (45%)	0.28 (36%)	0.41 (6%)	0.31 (29%)	0.35 (20%)	0.30 (31%)	0.29 (34%)	0.43 (2%)	0.38 (13%)	0.26 (41%)
	0.40 (9%)	0.33 (25%)	0.22 (50%)	0.43 (2%)	0.40 (9%)	0.20 (54%)	0.27 (38%)	0.39 (11%)	0.31 (29%)	0.28 (36%)	0.35 (20%)	0.33 (25%)	0.41 (6%)	0.24 (45%)	0.21 (52%)
	0.32 (27%)	0.28 (36%)	0.37 (15%)	0.29 (34%)	0.24 (45%)	0.39 (11%)	0.28 (36%)	0.40 (9%)	0.34 (22%)	0.24 (45%)	0.35 (20%)	0.21 (52%)	0.36 (18%)	0.27 (38%)	0.24 (45%)
BHD 42	0.48 (0%)	0.36 (18%)	0.39 (11%)	0.38 (13%)	0.49 (0%)	0.34 (22%)	0.26 (41%)	0.32 (27%)	0.29 (34%)	0.34 (22%)	0.43 (2%)	0.33 (25%)	0.33 (25%)	0.44 (0%)	0.45 (0%)
	0.49 (0%)	0.29 (34%)	0.37 (15%)	0.32 (27%)	0.34 (22%)	0.31 (29%)	0.21 (52%)	0.27 (38%)	0.28 (36%)	0.30 (31%)	0.35 (20%)	0.30 (31%)	0.35 (20%)	0.34 (22%)	0.25 (43%)
	0.44 (0%)	0.29 (34%)	0.34 (22%)	0.35 (20%)	0.25 (43%)	0.31 (29%)	0.22 (50%)	0.24 (45%)	0.19 (57%)	0.26 (41%)	0.36 (18%)	0.38 (13%)	0.40 (9%)	0.37 (15%)	0.36 (18%)
	0.50 (0%)	0.44 (0%)	0.31 (29%)	0.50 (0%)	0.24 (45%)	0.22 (50%)	0.27 (38%)	0.24 (45%)	0.26 (41%)	0.21 (52%)	0.35 (20%)	0.40 (9%)	0.37 (15%)	0.41 (6%)	0.36 (18%)
	0.43 (2%)	0.39 (11%)	0.29 (34%)	0.30 (31%)	0.32 (27%)	0.41 (6%)	0.19 (57%)	0.26 (41%)	0.24 (45%)	0.24 (45%)	0.28 (36%)	0.41 (6%)	0.39 (11%)	0.34 (22%)	0.28 (36%)
	0.40 (9%)	0.41 (6%)	0.41 (6%)	0.44 (0%)	0.40 (9%)	0.41 (6%)	0.20 (54%)	0.27 (38%)	0.15 (66%)	0.29 (34%)	0.31 (29%)	0.47 (0%)	0.49 (0%)	0.49 (0%)	0.30 (31%)
	0.48 (0%)	0.37 (15%)	0.48 (0%)	0.37 (15%)	0.40 (9%)	0.40 (9%)	0.28 (36%)	0.29 (34%)	0.28 (36%)	0.25 (43%)	0.45 (0%)	0.42 (4%)	0.44 (0%)	0.40 (9%)	0.35 (20%)
	0.47 (0%)	0.48 (0%)	0.32 (27%)	0.45 (0%)	0.38 (13%)	0.48 (0%)	0.28 (36%)	0.27 (38%)	0.23 (47%)	0.35 (20%)	0.29 (34%)	0.38 (13%)	0.22 (50%)	0.48 (0%)	0.20 (54%)
	0.30 (31%)	0.30 (31%)	0.37 (15%)	0.36 (18%)	0.34 (22%)	0.26 (41%)	0.30 (31%)	0.27 (38%)	0.18 (59%)	0.33 (25%)	0.40 (9%)	0.32 (27%)	0.26 (41%)	0.34 (22%)	0.24 (45%)
	0.40 (9%)	0.45 (0%)	0.42 (4%)	0.28 (36%)	0.47 (0%)	0.20 (54%)	0.34 (22%)	0.32 (27%)	0.36 (18%)	0.23 (47%)	0.36 (18%)	0.29 (34%)	0.20 (54%)	0.28 (36%)	0.38 (13%)
BHD 31	0.41 (6%)	0.41 (6%)	0.31 (29%)	0.25 (43%)	0.40 (9%)	0.34 (22%)	0.21 (52%)	0.27 (38%)	0.23 (47%)	0.46 (0%)	0.44 (0%)	0.31 (29%)	0.36 (18%)	0.35 (20%)	0.19 (57%)

NOTE:
DRY DOCK DECK .4375"PLT.
RED = EXCESSIVE WASTAGE 25% OR GREATER.
[box] = READINGS TAKEN IWO DOUBLER FROM UNDERSIDE OF DECK.

GKD, U/T READINGS
3/8/2017

VESSEL: EUREKA DRY DOCK

DESCRIPTION: MAIN DECK PLATING - NORTH SECTION
PLAN VIEW

DRAWN BY: M. SMITH | JOB # A1268 | DWG # MnDk 1 v1.1 | DATE: MAY 2015

GHD Inc

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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date

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