Marine Facilities Study – Port Orchard Marina for Port of Bremerton

Kitsap County, WA

June 2016

COLLINS ENGINEERS INC.
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COLLINS ENGINEERS INC.

June 27, 2016
Collins Job No. 45-09191

Mr. Steven Sparks
Director, Facilities and Planning
Port of Bremerton
8850 SW State Highway 3
Bremerton, WA 98312

RE: Marine Facilities Study – Port Orchard Marina

Dear Mr. Sparks,

Collins Engineers, Inc. (Collins) is pleased to submit this FINAL document: Marine Facilities Study – Port Orchard Marina report. This document is in accordance with the scope of services contained in the Subcontract Agreement with the Port of Bremerton, dated August 10, 2015.

This report includes: condition assessments and appendices that contain opinions of probable construction costs for the Port Orchard Marina's A-Dock and Breakwaters.

Please review this document and provide comments to Collins for incorporation and preparation of the final report.

Very truly yours,

COLLINS ENGINEERS, INC.

6/27/16

Wallace M. Mosher, P.E.
Engineer of Record

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 Washington.

Wallace M. Mosher, P.E. #47933

My license renewal date is 11/14/2017

Pages or sheets covered by this seal: Entire Report

MARINE FACILITIES STUDY

FOR

A-DOCK AND BREAKWATERS

AT

THE PORT ORCHARD MARINA

IN

KITSAP COUNTY, WASHINGTON

PREPARED FOR:

PORT OF BREMERTON

8850 SW STATE HIGHWAY 3

BREMERTON, WA 98312

PHONE: (360) 674-2381

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PREPARED BY:

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COLLINS JOB NO. 45-09191.00

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TABLES

FIGURES

APPENDICES

EXECUTIVE SUMMARY

Collins Engineers, Inc. (Collins) performed an above water existing condition evaluation of the A-Dock and breakwaters at Port Orchard Marina, Bremerton, Washington in August, 2015. This investigation included the above water inspection of the guide piles, float modules, selected utilities, and related appurtenances. In a separate project, Echelon Engineering, Inc. (Echelon) performed an underwater inspection of a portion of the facility in 2014. Piles at the A-Dock, West Breakwater, and East Breakwater were not included in the scope of their inspection, however the mooring systems at the North and East Breakwaters were included and subsequent report information and recommendations are provided in this report by reference. A location plan of the marina is provided in Figure 1 and the inspected structures are shown in Figure 2.

Engineering Assessment Ratings (Good, Satisfactory, Fair, Poor, Serious, Critical) and Condition Index Ratings (0 to 100) are based on engineering judgment and correlation with assessment definitions as determined by industry standards. The Operational Capability Ratings (C1 to C4) signify the operational capabilities of the facilities. A full description of these ratings is provided in the Introduction and in Tables 1-2 and 1-3. A condition summary of each structure is provided in Table 1, and a summary of estimated immediate, near term and long term repair costs is provided in Table 2. Immediate repairs should be completed within the next 2 years to correct defects to elements that pose a risk to personnel/public or if unrepaired, that may result in damage to more critical structural elements. Near term repairs should be completed within the next 2-5 years to correct defects to elements that may be at risk of failing, possibly before the next inspection cycle, and long term repairs should be completed within the next 5-15 years to correct defects to elements that have minimal deterioration but will require repairs as the deterioration increases. A graphical representation of the findings is provided in Figure 3, a projected 5 year Condition Plan is provided in Figure 4, a 10 year Condition Plan is provided in Figure 5, and typical A-Dock and breakwater float sections are provided in Figure 6. These Condition Plans reflect the Engineering Assessment, Condition Index and Operational Capability ratings for each of the inspected structures based on an overall assessment.

The following provides a summary of findings for each structure evaluated:

A-DOCK SUMMARY

The A-Dock is in Fair condition overall, with a Condition Index Rating of 60 and an Operational Capabilities Rating of C1. Significant structural findings include moderate abrasion on the timber guide piles, approximately 10 sf of concrete spalls and delamination, missing rub blocks on the guide pile assemblies, and minor knife edging on the transition plate.

The Electrical System servicing the A-Dock is in Satisfactory condition overall. Significant findings include missing circuit breaker covers, corroded transformer breakers, and haphazardly draped cables.

The Fire Protection System servicing the A-Dock is in Fair Condition overall. Significant findings include corroded standpipe fittings and improperly supported standpipe connections.

EAST BREAKWATER SUMMARY

The East Breakwater is in Fair Condition Overall, with a Condition Index rating of 65, and an Operational Capabilities Rating of C1. Significant structural findings include approximately 30 sf of concrete spalls and delamination in the concrete float modules, transverse cracking up to 1/16" wide throughout the approach float modules, moderate corrosion and missing rub blocks on the guide pile assemblies, moderate corrosion on the float connections, 130 lf of loose or deteriorated timber curbs, and 8 loose cleats.

The Electrical System servicing the East Breakwater is in Fair condition overall. Significant findings include rusted support brackets, rusted condulets, and broken splice boxes.

The Fire Protection System servicing the East Breakwater is in Fair Condition overall. Significant findings include missing insulation around the cold water piping, missing hose caps, and improperly supported standpipe connections.

NORTH BREAKWATER SUMMARY

The North Breakwater is in Fair Condition Overall, with a Condition Index rating of 60, and an Operational Capabilities Rating of C1. Significant structural findings include approximately 70 sf of concrete spalls and delamination in the concrete float modules, moderate corrosion on the float connections, knife edging on the wearing ends of the transition plates, 200 lf of loose or deteriorated timber curbs, 14 loose cleats, and 2 broken cleats. Information from the Echelon report indicates the mooring system is in Good overall condition, with one failed bridle chain, one timber anchor pile with significant marine borer damage, and minor nylon mooring rope chafing.

The Electrical System servicing the North Breakwater is in Fair condition overall. Significant findings include rusted condulets, rusted powercenter panels, broken panel boards and splice boxes, rusted conduits and supports, failed conduit fittings, and a damaged beacon pole.

The North Breakwater does not currently have a Fire Protection System.

WEST BREAKWATER SUMMARY

The West Breakwater is in Satisfactory Condition Overall, with a Condition Index rating of 75, and an Operational Capabilities Rating of C1. Significant structural findings include two float modules on the service float with delaminated concrete, rust staining, and cracking throughout, minor coating loss and corrosion on the cleats, minor to moderate corrosion on the guide pile assemblies, and one guide pile assembly with a failed connection. Information from the Echelon report indicates the mooring system is in Good overall condition.

The Electrical System servicing the West Breakwater is in Fair condition overall. Significant findings include missing circuit breaker covers, rusted circuit breakers, rusted transformer breaker enclosures, and haphazardly draped power cables.

The Fire Protection System servicing the West Breakwater is in Fair Condition overall. Significant findings include missing insulation around the cold water piping, missing hose caps, and corroded standpipe valves.

TABLE 1
CONDITION SUMMARY FOR PORT ORCHARD MARINA

Structure	Engineering Assessment Rating	Condition Index	Operational Capability Rating	Operational Restrictions		
				Deck Loading	Vessel Mooring	Vessel Berthing
A-Dock	Fair	60	C1	No	No	No
East Breakwater	Fair	65	C1	No	No	No
North Breakwater	Fair	60	C1	No	No	No
West Breakwater	Satisfactory	75	C1	No	No	No

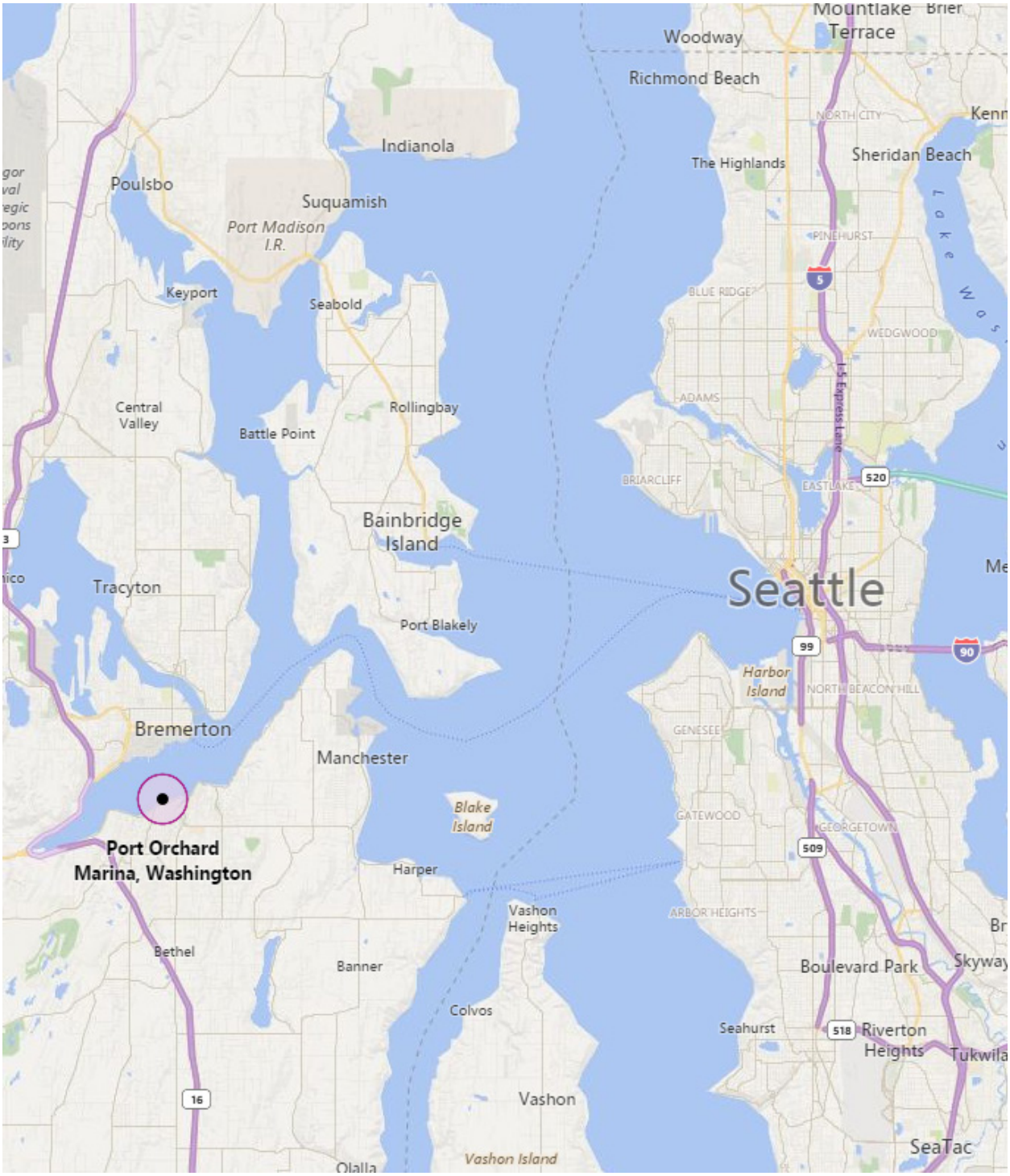
See Tables 1-2 and 1-3 for a description of condition and operational capability ratings.

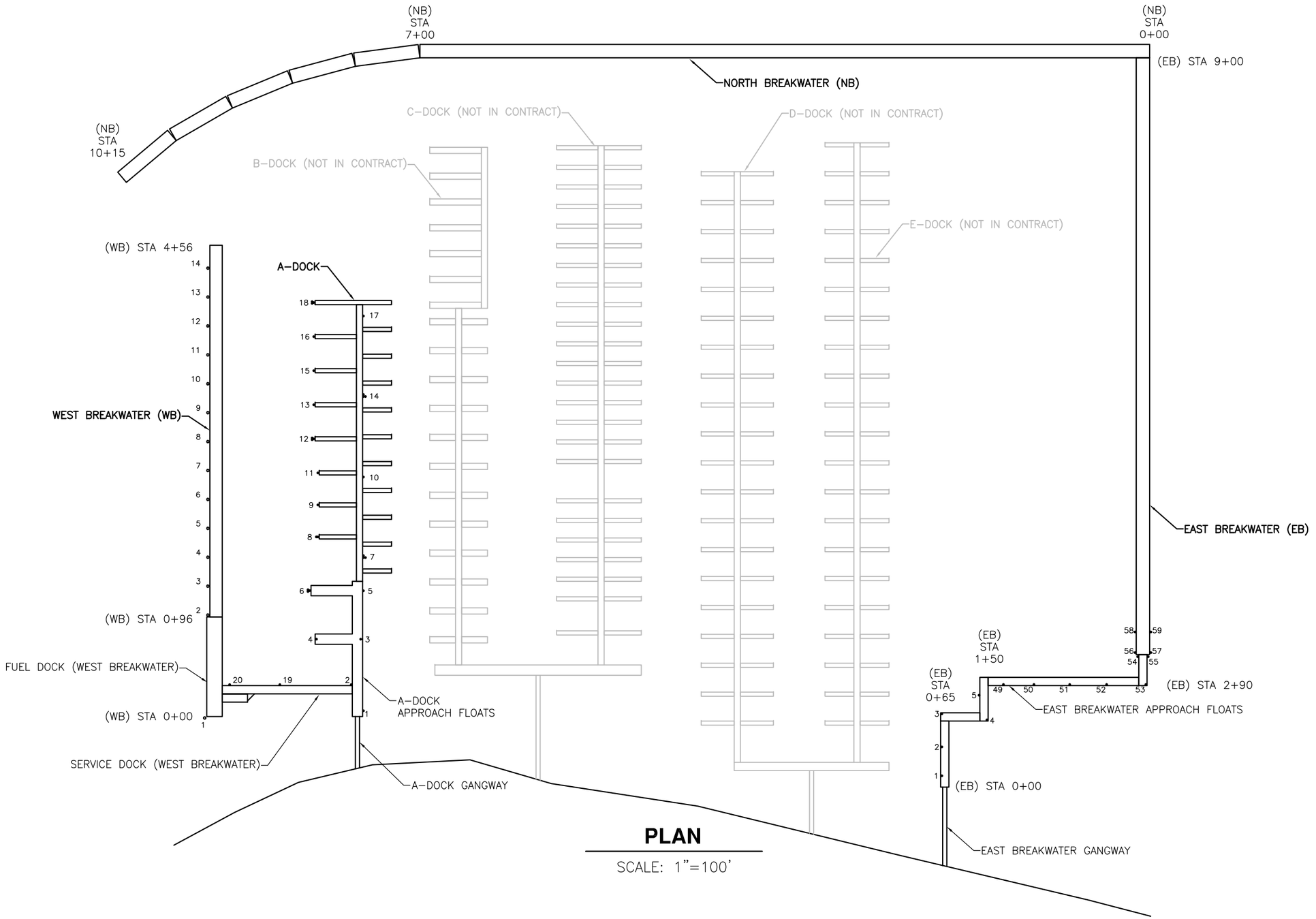
TABLE 2
ESTIMATED BUDGETARY COST SUMMARY

Structure	Immediate (2016)	Near Term (2017)	Long Term (after 2020)	Totals	Replacement
A-Dock	$22,000	$111,400	$178,800	$312,200	$2,800,000
East Breakwater	$49,200	$156,200	$177,100	$382,500	$3,700,000
North Breakwater	$75,600	$256,000	$171,900	$503,500	$4,300,000
West Breakwater	$62,000	$190,500	$76,500	$329,000	$3,200,000
Subtotal	$208,800	$714,100	$604,300	$1,527,200	$14,000,000
50% POB	($104,400)				
50% Contractor	→	$104,400			
Total	$104,400	$818,500	$604,300	$1,527,200	$14,000,000
Say	**$104,000**	**$819,000**	**$570,000**	**$1,530,000**	**$14,000,000**

(1) See Section 1 of this report for a description of priority definitions.
(2) Immediate, Near Term and Long Term Construction cost estimates include:
15% Contingency
6% Engineering
8% Engineering/Permitting (Complete Replacement only)
10% Mobilization
25% Contractor Overhead and Profit
(3) Assume annual estimated maintenance costs of up 3% of the replacement value of the asset, to be compounded over the expected useful service life of the existing structure. These estimates are not included in this table.

FIGURE 1
LOCATION PLAN





PLAN

SCALE: 1"=100'

LEGEND

1 ● PILE WITH DESIGNATION No.

GRAPHIC SCALE (FEET)	DATE		
0 100' 200'	OCTOBER 2015	COLLINS ENGINEERS, INC. 1001 4TH AVENUE, SUITE 3330 SEATTLE, WA 98154 COLLINS ENGINEERS Collins Project No: 45–09191.00	PORT OF BREMERTON FACILITIES AND PLANNING DEPARTMENT BREMERTON, W.A.

PORT ORCHARD MARINA BREMERTON, WA

SITE PLAN

FIG. NO. 2

TITL_CADA.DWG

(NB) STA 7+00

(NB) STA 0+00

(EB) STA 9+00

NORTH BREAKWATER (NB)
OPERATIONAL CAPABILITY: C1

(NB) STA 10+15

C–DOCK (NOT IN CONTRACT)

D–DOCK (NOT IN CONTRACT)

B–DOCK (NOT IN CONTRACT)

E–DOCK (NOT IN CONTRACT)

A–DOCK
OPERATIONAL CAPABILITY: C1

(WB) STA 4+56

WEST BREAKWATER (WB)
OPERATIONAL CAPABILITY: C1

EAST BREAKWATER (EB)
OPERATIONAL CAPABILITY: C1

(WB) STA 0+96

FUEL DOCK (WEST BREAKWATER)

(WB) STA 0+00

SERVICE DOCK (WEST BREAKWATER)

A–DOCK APPROACH FLOATS

A–DOCK GANGWAY

(EB) STA 1+50

(EB) STA 0+65

(EB) STA 2+90

EAST BREAKWATER APPROACH FLOATS

(EB) STA 0+00

EAST BREAKWATER GANGWAY

CONDITION LEGEND

- STRUCTURE IN GOOD CONDITION WITH A CONDITION INDEX ≥ 90
- STRUCTURE IN SATISFACTORY CONDITION WITH A CONDITION INDEX OF 75
- STRUCTURE IN FAIR CONDITION WITH A CONDITION INDEX OF 60
- STRUCTURE IN POOR CONDITION WITH A CONDITION INDEX OF 45
- STRUCTURE IN SERIOUS CONDITION WITH A CONDITION INDEX OF 30
- STRUCTURE IN CRITICAL CONDITION WITH A CONDITION INDEX ≤ 15

PLAN

SCALE: 1"=100'

N

OPERATIONAL CAPABILITIES LEGEND

C1	STRUCTURE OPERATIONAL
C2	STRUCTURE MOSTLY OPERATIONAL
C3	STRUCTURE PARTIALLY OPERATIONAL
C4	STRUCTURE NOT OPERATIONAL

GRAPHIC SCALE (FEET)

0 100' 200'

DATE

OCTOBER 2015

COLLINS ENGINEERS, INC.
1001 4TH AVENUE, SUITE 3330
SEATTLE, WA 98154
COLLINS ENGINEERS
Collins Project No:
45–09191.00

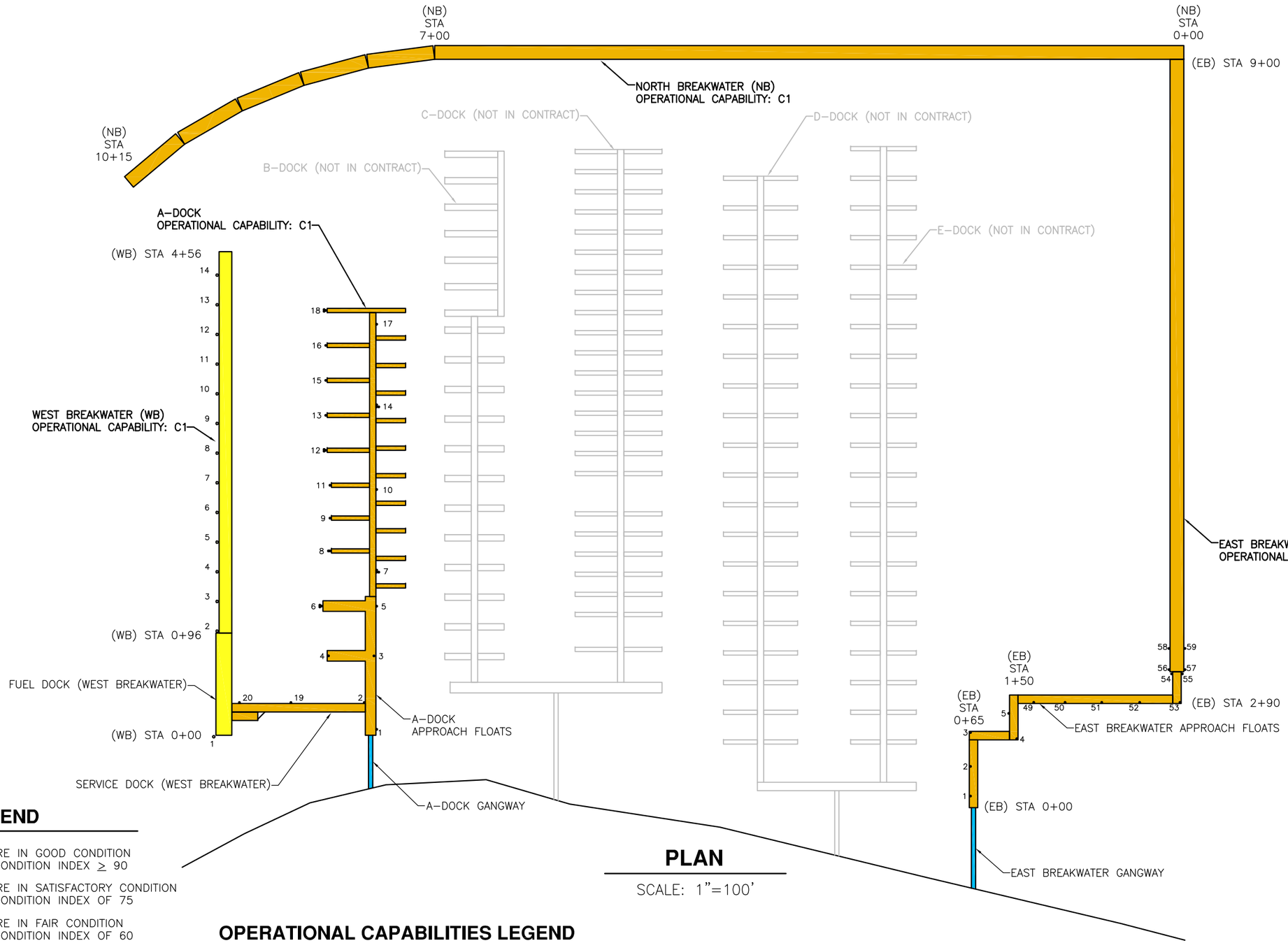
PORT OF BREMERTON
FACILITIES AND PLANNING DEPARTMENT
BREMERTON, W.A.

PORT ORCHARD MARINA BREMERTON, WA

CONDITION PLAN 2015

FIG. NO. 3

TITL_CADA.DWG



PLAN

SCALE: 1"=100'

CONDITION LEGEND

- STRUCTURE IN GOOD CONDITION WITH A CONDITION INDEX ≥ 90
- STRUCTURE IN SATISFACTORY CONDITION WITH A CONDITION INDEX OF 75
- STRUCTURE IN FAIR CONDITION WITH A CONDITION INDEX OF 60
- STRUCTURE IN POOR CONDITION WITH A CONDITION INDEX OF 45
- STRUCTURE IN SERIOUS CONDITION WITH A CONDITION INDEX OF 30
- STRUCTURE IN CRITICAL CONDITION WITH A CONDITION INDEX ≤ 15

OPERATIONAL CAPABILITIES LEGEND

C1	STRUCTURE OPERATIONAL
C2	STRUCTURE MOSTLY OPERATIONAL
C3	STRUCTURE PARTIALLY OPERATIONAL
C4	STRUCTURE NOT OPERATIONAL

GRAPHIC SCALE (FEET)

0 100' 200'

DATE

OCTOBER 2015

COLLINS ENGINEERS, INC.
1001 4TH AVENUE, SUITE 3330
SEATTLE, WA 98154
COLLINS ENGINEERS
Collins Project No: 45–09191.00

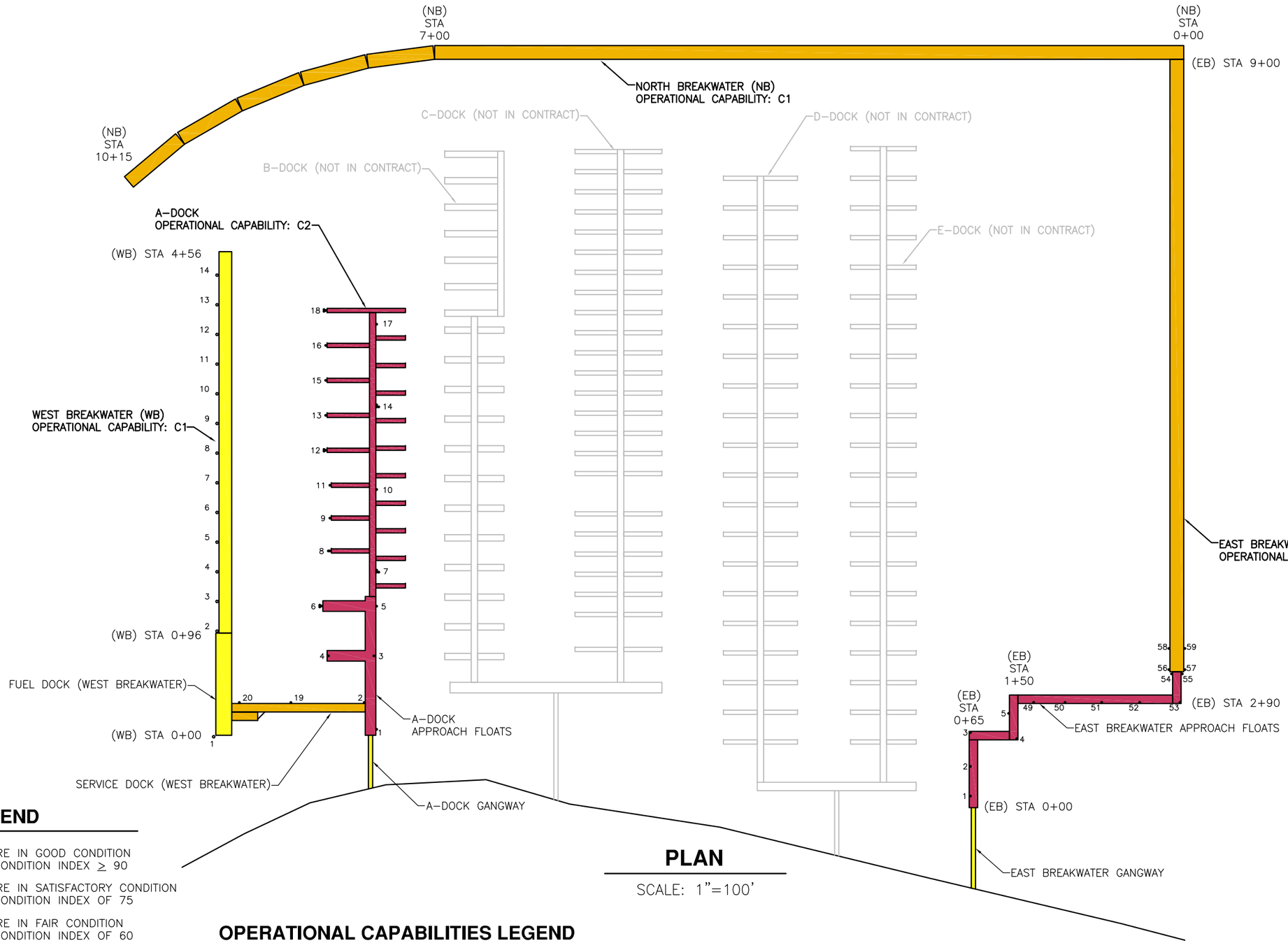
PORT OF BREMERTON
FACILITIES AND PLANNING DEPARTMENT
BREMERTON, W.A.

PORT ORCHARD MARINA BREMERTON, WA

CONDITION PLAN 5 YEAR PROJECTION

FIG. NO. 4

TITL_CADA.DWG



PLAN

SCALE: 1"=100'

CONDITION LEGEND

- STRUCTURE IN GOOD CONDITION WITH A CONDITION INDEX ≥ 90
- STRUCTURE IN SATISFACTORY CONDITION WITH A CONDITION INDEX OF 75
- STRUCTURE IN FAIR CONDITION WITH A CONDITION INDEX OF 60
- STRUCTURE IN POOR CONDITION WITH A CONDITION INDEX OF 45
- STRUCTURE IN SERIOUS CONDITION WITH A CONDITION INDEX OF 30
- STRUCTURE IN CRITICAL CONDITION WITH A CONDITION INDEX ≤ 15

OPERATIONAL CAPABILITIES LEGEND

C1	STRUCTURE OPERATIONAL
C2	STRUCTURE MOSTLY OPERATIONAL
C3	STRUCTURE PARTIALLY OPERATIONAL
C4	STRUCTURE NOT OPERATIONAL

GRAPHIC SCALE (FEET)

0 100' 200'

DATE

OCTOBER 2015

COLLINS ENGINEERS, INC.
1001 4TH AVENUE, SUITE 3330
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COLLINS ENGINEERS
Collins Project No: 45–09191.00

PORT OF BREMERTON
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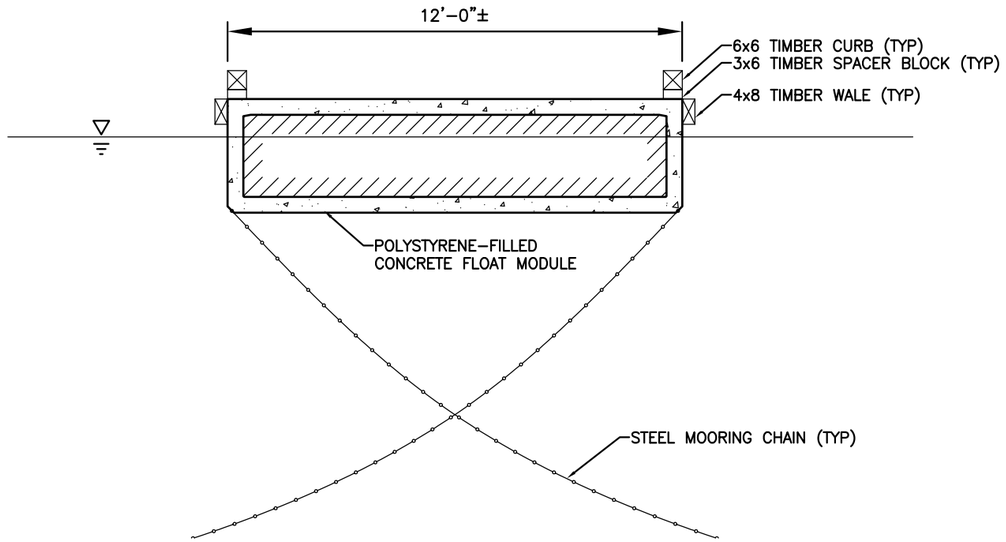
BREMERTON, W.A.

PORT ORCHARD MARINA BREMERTON, WA

CONDITION PLAN 10 YEAR PROJECTION

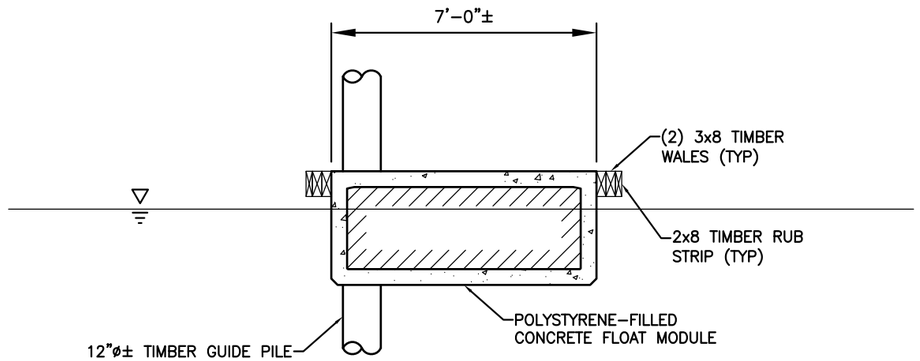
FIG. NO. 5

TITL_CADA.DWG



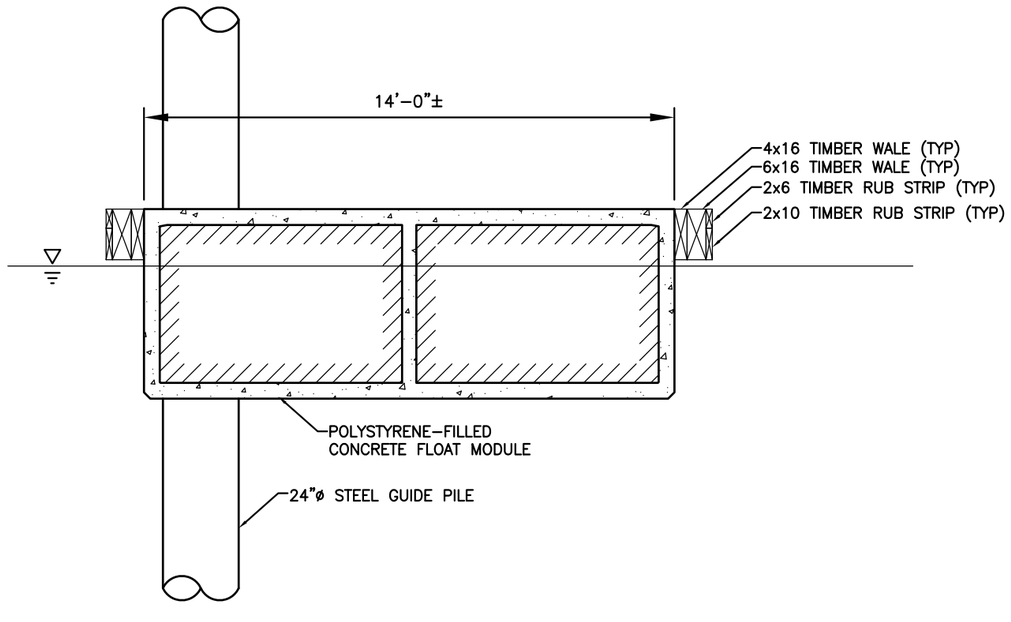
EAST AND NORTH BREAKWATER FLOATS - TYPICAL SECTION

SCALE: 1/4"=1'



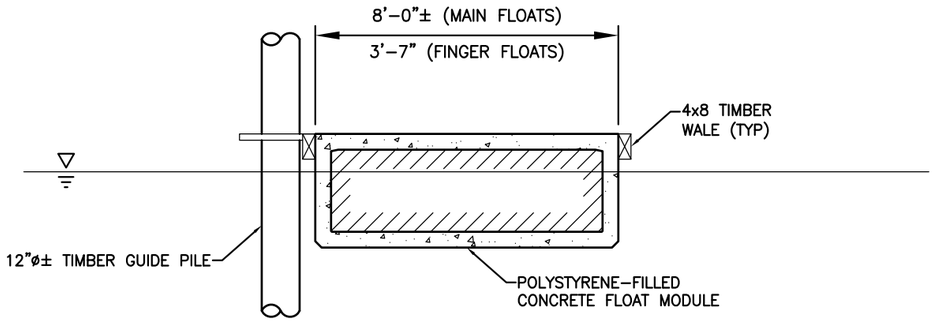
EAST BREAKWATER APPROACH FLOATS - TYPICAL SECTION

SCALE: 1/4"=1'



WEST BREAKWATER FLOATS - TYPICAL SECTION

SCALE: 1/4"=1'



A-DOCK FLOATS - TYPICAL SECTION

SCALE: 1/4"=1'

GRAPHIC SCALE (FEET)	DATE	COLLINS ENGINEERS, INC. 1001 4TH AVENUE, SUITE 3330 SEATTLE, WA 98154 COLLINS ENGINEERS Collins Project No: 45–09191.00	PORT OF BREMERTON FACILITIES AND PLANNING DEPARTMENT BREMERTON, W.A.
0 2' 4' 8'	OCTOBER 2015		PORT ORCHARD MARINA BREMERTON, WA — TYPICAL FLOAT SECTIONS 2015 — FIG. NO. 6

TITL_CADA.DWG

1.0 INTRODUCTION

This report presents a condition assessment of the waterfront structures inspected at the Port Orchard Marina in Bremerton, Washington and was prepared as part of waterfront inspection services for the facility. The report includes findings from the above water inspection and assessment, underwater inspection and assessment, general repair recommendations, repair concept alternatives, and estimated repair costs for the A-Dock and breakwaters. All of these services[1], including this report, were provided by Collins, Elcon Associates (Elcon, electrical subconsultant) and Mazzetti (mechanical subconsultant) under the responsible charge of Wallace M. Mosher, P.E. in accordance with the Scope of Work.

This contract provided the engineering services necessary to perform a Routine Waterfront Facility Inspection and to assess the apparent general condition of the inspected structures at Port Orchard Marina in August, 2015. The following structures were inspected in accordance with the Scope of Work:

TABLE 1-1
PORT ORCHARD MARINA INSPECTED STRUCTURES

Structure	Year Built / Modified	Facility Size (LxW, ft)	Water Depth* (ft)
A-Dock	Unk	400x75	8.0
East Breakwater	Unk	900x12	7.5
North Breakwater	Unk	1015x12	22.5
West Breakwater	1992/Unk	456x14	22.0

*Minimum Water depth along the berthing face(s) is referenced to mean lower low water.

The Routine Level Inspection included above water inspection of the guide piles, float modules, selected utilities, and related appurtenances. Below water components, and above deck structures including all buildings and related appurtenances were excluded from the inspection unless otherwise noted.

The purpose of the inspection is to gather sufficient data to make a general structural assessment of the inspected structures' overall conditions, operational capability, and to provide estimated repair costs for budgetary purposes. The repair recommendations provided in this report are preliminary and intended for general budgeting and planning purposes.

Each element inspected is identified with a unique number in accordance with the Uniformat II system (ASTM Standard E1557-97, as updated by NAVFAC for waterfront structures) as follows:

H10 Waterfront Structures
H1010 Substructure
H1020 Superstructure
H1030 Deck
H1040 Mooring and Berthing System
H1050 Appurtenances

H50 Waterfront Utilities
H5010 Civil/Mechanical Utilities
H5020 Electrical Utilities
H5030 Waterfront Fire Protection

The overall condition of elements was evaluated considering their current physical condition, operating capability, age of the structure, and relative age of the elements. In general, the rate of deterioration and required repairs increases with respect to the age of the structure; therefore, the age of the structure and elements have a significant impact on anticipating deterioration and related repairs, directly effecting the condition rating. Consequently, an older element with similar current physical

[1] The underwater inspection and assessment was performed by Echelon and incorporated into this report by reference.

conditions of a new element, will typically be assigned a lower condition rating. This approach should help the Port to prioritize future funding for expected repairs. Condition evaluation and forecasting anticipated repairs with respect to life-cycle degradation is based on past experience, industry standards, and engineering judgment, and is summarized specifically for the Port Orchard Marina structures in Table A-1, Appendix A. Structural conditions were categorized in accordance with Tables A-2, A-3 and A-4 and each inspected component was rated in accordance with Table 1-2; the Engineering Assessment Ratings are from the "Underwater Investigations Standard Practice" (ASCE), and the Engineered Management System Condition Index Ratings are from standards established by the U.S. Army Construction Engineering Research Laboratory. The two standards have been combined for military waterfront studies and adopted for use elsewhere, as they provide a reasonably consistent approach for the assessment of a wide variety of waterfront structures. The rating values assigned as a result of the inspections are based on engineering judgment and correlation with assessment definitions as determined by industry standards. The Operational Capability Ratings (C1 to C4) were determined in accordance with Table 1-3; they signify the operational capabilities of the facilities and reflect the overall rating factors assigned.

TABLE 1-2
ENGINEERING ASSESSMENT AND CONDITION INDEX RATINGS

Engineering Assessment Rating	Engineering Management System Condition Index (CI)I Rating	Description
"Good"	90	No problems or only minor problems noted. Structural elements may show some very minor deterioration, but no overstressing observed.
"Satisfactory"	75	Minor to moderate defects and deterioration observed, but no overstressing observed.
"Fair"	60	All primary structural elements are sound; but minor to moderate defects and deterioration observed. Localized areas of moderate to advance deterioration may be present but do not significantly reduce the load bearing capacity of the structure.
"Poor"	45	Advanced deterioration or overstressing observed on widespread portions of the structure.
"Serious"	30	Advanced deterioration, overstressing or breakage may have significantly affected the load bearing capacity of primary structural components. Local failures are possible.
"Critical"	15	Very advanced deterioration, overstressing, or breakage has resulted in localized failure(s) of primary structural components. More widespread failures are likely to occur.

TABLE 1-3
WATERFRONT FACILITY OPERATIONAL CAPABILITY RATINGS

Operational Capability Rating		Description
C1	FACILITY OPERATIONAL	No limitations on design structural live load and mooring/berthing operations. Structure is well maintained and in good condition. Depth at facility is adequate to eliminate fouling or shoaling.
C2	FACILITY MOSTLY OPERATIONAL	Design live load capacity is unaffected at present time. Some damage or deterioration of structural members exist which might result in downgrading of the live load capacity in the next three years, or restrict mooring/berthing operations. Use of the facility is somewhat limited by tidal cycles and/or draft of loaded ships.
C3	FACILITY PARTIALLY OPERATIONAL	Design live load capacity is limited at present time. Damage or deterioration of structural members or mooring/fender systems is present resulting in restrictions to mooring/berthing operations. Use of the facility is often limited by tidal cycles and/or draft of loaded ships.
C4	FACILITY NOT OPERATIONAL	Damage or deterioration of structural members or mooring/fender systems is present to an extent that the structure is not able to safely support the intended operations. Major structural repair are required before restoration of original live load capacity. Use of the facility is always limited by tidal cycles and/or draft of loaded ship.

Repair recommendations are based on extents of deterioration, risk to personnel/public and assets, and damage/deterioration exposure to more critical elements. These repair and maintenance recommendations are intended to develop the expected useful service life of the structure and safely maintain operational capabilities. Each repair recommendation has been prioritized into Immediate, Near Term, and Long Term repairs, defined as follows.

Immediate

Repairs should be completed within the next 2 years. Element has failed or is at risk of imminent failure, and/or no longer functions as intended. If left unrepaired, there is increased risk of personnel/public injury or damage to assets, more extensive deterioration is very likely to occur, and/or unrepaired element may result in damage to more critical structural elements.

Near Term

Repairs should be completed within the next 2-5 years. The element has significant deterioration that will advance and the element may be at risk of failing and/or loss of function within the next few years, likely prior to the next inspection cycle. The condition of the element currently does not pose risk to personnel/public, assets, or more critical elements and therefore does not require immediate attention; however, it is anticipated that the rate of deterioration and associated risk increases with age. Near Term repair recommendations also include projected repairs and maintenance related items that are anticipated to be required considering the current condition and age of elements. These repair quantities are approximated using extrapolated defect data and engineering judgment considering past experience and industry standards.

Long Term

Repairs should be completed within the next 5-15 years. The element has minimal deterioration and/or has slowly progressing deterioration that is not expected to affect the safety or operation of the structure in the near term. Therefore, these elements do not require repairs in the near term, but eventual repairs are expected as the deterioration increases. Long Term repair recommendations also include projected repairs and maintenance related items that are anticipated to be required considering the current condition and age of elements, including maintenance items to be completed on a routine basis, and long-term maintenance items based on element life expectancy in accordance with industry standards. These repair quantities are approximated using extrapolated defect data and engineering judgment considering past experience and industry standards. Long Term repairs also include the cost of structure replacement as the structure reaches the end of its useful service life.

Cost estimates are in current dollars, and an assumed inflation rate was used to generate dock and breakwater replacement costs. Overall, costs include contingency, engineering/permitting, mobilization, and contractor overhead and profit. For the structural repairs, material costs were determined from RSMeans and manufacturers web sites as appropriate, and from historical costs for similar materials and similar projects. For the purposes of this report, concrete repair costs were determined specifically from contractor input (CONTECH, Inc.) Labor costs were generally determined by adjusting a typical RSMeans labor rate and/or production times for waterfront work based on consideration of access, work windows/tides, insurance, difficulty, etc., which results in significantly higher labor costs than provided by RSMeans. Where the information is available, historic bid costs were compared with the engineers estimate and if on par, then it was assumed the labor rates/material costs were generally consistent with the work. Replacement costs for the breakwaters and the A-Dock were based on typical costs generated from previous planning studies, which were vetted through a QA/QC process, and were also based on similar recent public projects constructed in the Northeast. In general, the city index for the Seattle area is approximately 20% higher than the city index where the projects were constructed, however public projects are typically more expensive than private projects, so there was no additional adjustment other than for inflation, which is typically considered to bring historical costs/estimates up to date.

In general, structural repairs include concrete resurfacing, concrete sealing, and guide pile assembly replacement. For concrete resurfacing, recommended materials include SikaRepair 222 (Sika Corporation) or other approved equivalent. Limited material quantities generally rule using Department of Transportation standard concrete mixes, as they are impractical to order, deliver and install, and proprietary bag mixes developed specifically for concrete repairs are routinely used on waterfront structures.

For concrete sealing, recommended materials include Prosoco Saltguard WB (PROSOCO) or other approved equivalent, capable of filling narrow cracks up to 1/16" wide. These sealers are typically applied once aged concrete has initiated significant cracks and require re-application on a regular basis.

For pile guide assembly's, there is a significant variety of aftermarket products available, and a minimum recommendation for this facility is that the replacement assemblies contact the pile on four sides with either rollers, or timber/plastic rub blocks.

For the East and North mooring system anodes, Echelon recommended that the Port continue its periodic inspection and maintenance program. The anodes currently used to protect the mooring chains and bridle chains (chains) consist of small diameter anodes hung from the chains. Based on the current available information, the chains may be up 30 years old with minimal corrosion, which indicates that the Ports maintenance program, as referenced in the Echelon report, has been effective. From a budgetary standpoint, Collins opinion of probable costs for anode maintenance assumes replacing approximately 20 anodes pursuant to each underwater inspection cycle, at a cost of $6,000. This cost includes a $5,000 day rate for a contractor dive crew and anode costs of approximately

$50 each. It is assumed that up to 20 anodes can be installed in one day. Anode consumption is highly dependent upon the quality of the chain/anode connection, size and type of anode, number of anodes, distance between adjacent anodes, and environmental conditions. If chain corrosion were a significant issue or if the Port wanted to fine tune anode replacement strategies, anode manufacturers can work with the Port to assess current conditions and make recommendations accordingly. These costs can typically be included in the expected annual maintenance costs of up to 3% of the replacement value (see Table 2 – Executive Summary).

For the mooring system chains and rope (mooring lines), the expected service life will meet the expected service life of the breakwaters, if the Port continues its current maintenance program. In the event that a mooring line does fail, Collins opinion of a probable replacement cost is up to $10/ft for material costs (chain/rope/anodes/miscellaneous connections) which is an average of approximately $1,500 per mooring line. The Port can assume $5,000 per day for a dive contractor and, depending upon accessibility to the mooring pile, installation of up to four mooring lines per day.

2.0 INSPECTED STRUCTURES

2.1 A-DOCK CONDITION INDEX – 60

Based on available archive plans, the original A-Dock was constructed in 1970. Considering the original construction drawings and conditions observed, it appears the structure has been replaced, however, the year of replacement is unknown. The A-Dock consists of one 10'x130' approach float, one 270'x5' main float, twenty one (21) 4' wide finger floats, varying from 28' to 44' long. Two 10' wide auxiliary finger floats are provided off the west side of the approach float. The structure provides mooring for approximately 45 vessels.

The main float is constructed of 8'x5' concrete float modules and the fingers are constructed of 10'x4' concrete float modules. The float modules are framed by 8"x4" timber wales along both sides of the float modules, secured with steel tie-rods, with galvanized steel cleats located long the top of the timber wales for mooring points. The floating docks are secured to 14" timber guide piles, located at the ends of the finger floats and intermittently along the main float, with 10" diameter timber batter piles located at various locations to accommodate additional lateral loads.

The A-Dock is in Fair condition, with a CI of 60 and an Operational Capability Rating of C1 (See Photo 2.1-1 and 2.1-2 for overalls). There are no operational restrictions required for this structure. Each asset was assessed and assigned a numerical Condition Index (CI), ranging from 1 (failed) to 100 (good).

2.1.1 OBSERVED CONDITIONS AND ASSESSMENTS

H1010.01 – PILE FOUNDATIONS **CONDITION INDEX – 60**

H1010.01.01 – GUIDE PILES **CI – 60**

The timber guide piles typically have minor to moderate abrasion with 10% to 20% section loss, with discrete locations having moderate abrasion with up to 30% section loss (See Photo S2.1-3).

H1050.02 – BROWS AND GANGWAYS **CONDITION INDEX – 90**

H1050.02.01 – GANGWAY **CI – 90**

No significant deficiencies were observed in the aluminum access gangway.

H1050.02.05 – GANGWAY ROLLER **CI – 90**

The gangway rollers have minor wear typical of their operation. No significant section loss or deficiencies were observed.

H1050.04 – FLOATS **CONDITION INDEX – 60**

H1050.04.01 – FLOAT MODULES **CI – 60**

The concrete float modules typically have minor surface scaling up to 1/16" deep, with random edge spalling and abrasion marks up to 1" deep. Three areas of deck delamination were observed up to 2.5'Lx2.5'Wx1/2"D, with associated spalling, rust staining, and random cracking exhibiting efflorescence (See Photo S2.1-4). Two closed corrosion spalls up to 4'Lx3"W were observed, and one 4"Lx10"Wx1/4"D open corrosion spall with exposed and corroded reinforcing steel was observed (See Photos S2.1-5 and S2.1-6). The concrete trench cover panels typically have significant cracks and edge spalling up to 4'Lx2"W (See Photo S2.1-7).

Freeboard measurements ranged from 10" to 11" across the main floats, and 14" to 15" across the approach floats. Floating docks are typically designed for freeboards from 12" to 18". Measurements indicate there may be minor loss of buoyance due to the age of the structure; however, there are no indications of localized float failures or major loss of buoyancy.

H1050.04.02 – WALES **CI – 75**

The timber wales typically have minor weathering and light checking, with isolated areas of minor fungal decay. When sounded with a hammer, the timber was typically solid with no apparent hollow sounding areas and only limited discrete locations of superficial soft timber were observed.

H1050.04.02 –TIE-ROD ASSEMBLIES **CI – 75**

The steel tie-rod assemblies typically have minor to moderate corrosion on the exposed ends; however, no significant section loss was noted. The tie-rods appeared secure with no indication of loose or broken sections.

H1050.04.04 – CLEATS **CI – 90**

The galvanized steel mooring cleats exhibited minor isolated surface corrosion on exposed ends of the anchor bolts. The cleats were typically secure with no indication of loose or failed connection hardware.

H1050.04.05 – FENDERS **CI – N/A**

The floating dock modules are not fitted with fendering systems.

H1050.04.06 – GUIDE PILE ASSEMBLIES **CI – 60**

The guide piles assemblies generally have minor surface corrosion with light scaling; however, no significant section loss was observed. Timber rub blocks are missing from approximately 25% of the external (hoop) guide pile assemblies, and the internal guide pile assemblies located on the access float have worn rub blocks with up to 50% section loss (See Photo S2.1-8).

H1050.04.07 – TRANSITION PLATES **CI – 60**

The steel transition plate from the access float to the main float has isolated coating loss and light surface corrosion, with minor section loss observed on the sliding end of the plate (Photo S2.1-9). The hinge connection has minor corrosion and the pin is bent; however, the plate appears to be stable at this time. The steel wear plate has surface corrosion throughout with no significant section loss.

H5020.01 – ELECTRICAL POWER DISTRIBUTION **CONDITION INDEX – 75**

H5020.01.03 – ELECTRICAL CONDUITS AND CABLES **CI – 75**

The PVC conduits serving the dock appeared in fair condition.

H5020.01.04 – ELECTRICAL SHORE-TIE RECEPTACLES **CI – 60**

Rust was observed on the non-stainless steel powercenters (See Photos E2.1-1 to E2.1-3). The powercenter serving the T-head slips A01 and A02 is within the horseshoe serving slips A04 and A06 and cables were draped across surface of dock, subjecting the cables to possible mechanical damage and posing a tripping hazard. Per NEC 400.8, flexible cords are not permitted where subject to physical abuse.

The powercenter at slips A40 and A41 was missing covers for the circuit breakers (See Photo E2.1-4). Per NEC 11.028 and WAC 296-46B-555, circuit breakers in an outdoor environment need to be within a NEMA 3X or 4X enclosure.

H5020.01.04 – OTHER ELECTRICAL COMPONENTS **CI – 75**

A dock is served from two 120/240 volt panels. Each panel is fed from a corresponding 50 kVA 480-120/240 transformer (See Photos E2.1-5 and E2.1-6). Minor rust was observed on the enclosed circuit breakers for each transformer. The fiberglass enclosures of the 120/240 volt panels appeared in good condition.

NEC 555.9 requires all electrical connections to be 12 inches above the float. At the time of installation, the current electrical system met code and as such has grandfather status. If any electrical upgrades take place, the electrical system would need to meet current code and all existing

electrical connections below 12 inches, such as at the base of most powercenters, would need to be removed or raised above 12 inches.

NEC 555.3 requires the main overcurrent device that feeds the marina to be ground-fault protected. At the time of installation, the current electrical system met code and as such has grandfather status. If any electrical upgrades take place, the electrical system would need to meet current code and all existing and/or new feeders would need ground-fault protection.
Lighting, communications and fire alarm are not in contract scope for assessment and were not inspected.

H5030.01 – FIRE PROTECTION WATER DISTRIBUTION SYSTEM **CONDITION INDEX – 65**

The existing A-Dock is served by a manual dry standpipe system and is primarily in fair condition. The fire protection system was reviewed for general condition, and not for compliance with current Code. We assume the fire protection system is periodically tested as required by NFPA 14. Where Code violations were obvious, they are noted below.

H5030.01.01 – PIPES AND FITTINGS **CI – 75**

Fusion-welded High Density Polyethylene (HDPE) piping is installed for most of the fire protection piping system, with unsupported piping resting in the water near the dock. Black HDPE potable water piping (with blue stripe) was used for this installation, and appears to be in good condition. Flexible hoses at the ramp also appear to be in good condition.

H5030.01.08 – STANDPIPE CONNECTIONS **CI – 60**

Galvanized standpipes (5 total) are in satisfactory condition, but are corroded at threaded fittings and wherever galvanizing does not exist on the piping. The manual standpipe fire department connection is located near the top of the ramp (See Photo F2.1-1 and F2.1-2). HDPE piping extends from the water level to above the dock and connects to galvanized piping and fittings with bronze standpipe valves and hose connections. Some of the standpipes are not well supported (HDPE piping extends above the pipe support to the standpipe valve), but appear to be rigid enough to make fire hose connections (See Photos F2.1-4 and F2.1-5). There is a potential risk that a fire on the dock could melt exposed plastic piping at one of the standpipes and disable the standpipe system. The first standpipe hose connection is less than the required 3' – 5' above the dock (See Photo F2.1-6).

2.1.2 RECOMMENDATIONS

Repairs are recommended to the elements listed below. If an element is not listed, then no significant defects are present that warrant repairs. Floating docks typically have a useful service life of 20 to 30 years that may be extended with routine maintenance, repairs and upgrading. The age of the A-Dock is unknown, however, it is estimated to have 10-15 or more years of remaining service life, provided it is maintained and inspected on a regular basis. The structure should be re-inspected in 2020 (see Table A-5, Appendix A).

Recommended Structural Repairs:

Immediate Repairs (0-2 yr)

- Replace missing guide pile assembly rub blocks to minimize abrasion on the piles and guide pile assemblies.
- Resurface concrete float modules, consisting of removal of unsound concrete, cleaning existing reinforcing steel, and placing concrete patch materials.
- Replace cracked and spalled concrete trench covers and investigate using aluminum grid decking as done on other portions of the float system.

Near Term Repairs (2-5 yr)

- Resurface concrete float modules

- Replace the transition plate providing access between the access float and main float.
- Replace piles with greater than 50% section loss. Steel replacement piles may be considered for long term use, to be incorporated with a new future floating dock system.
- For piles that are replaced, the existing external (hoop) guide pile assemblies should be removed and replaced with recommended guide pile assemblies.
- It can be anticipated that routine maintenance items will be required consisting of tightening loose cleats and replacing guide pile rub blocks. Because of the age and general condition of the float modules, more extensive maintenance items may be required in the near-team consisting of replacing sections of timber wales, replacing tie-rods, completing additional localized concrete spall repairs, and replacing corroded cleats.

Long Term Repairs (5-15 yr)

- Replace all timber guide piles exhibiting significant section loss. The associated guide pile assemblies should be removed and replaced with recommended guide pile assemblies.
- Because of the age and general condition of the float modules, it can be anticipated that routine maintenance items may be required as described in the near term repairs, at an increased frequency due to the age of the structure. Additionally, it can be expected that long-term maintenance items will be required consisting of replacing widespread sections of timber wales, replacing tie-rods, and replacing individual float modules.
- The complete floating dock system should be programmed for replacement in the next 15-20 years.

Recommended Electrical Repairs:

Immediate Repairs (0-2 yr)

- Replace missing circuit breaker covers
- Replace rusted circuit breakers

Near Term Repairs (2-5 yr)

- Relocate powercenter from A04/A06 to T-head A01/A02 or provide some way for power cords to reach berths without subjecting cords to possible physical damage
- Provide GFCI protection for all power on dock
- Remove or relocate all electrical connections less than 12 inches above the deck

Long Term Repairs (5-15 yr)

- Replace enclosed circuit breakers at each transformers
- Replace transformers

Recommended Fire Protection Repairs:

Immediate Repairs (0-2 yr)

- Replace HDPE piping to standpipes above the dock level with galvanized piping from the valve to just above the water line. This will minimize potential piping damage during a fire, where plastic piping would easily melt, and potentially disable the standpipe system. It will also provide a rigid point for making fire hose connections at the standpipes, as well as allow all of the standpipe valves to be mounted at the same elevation.
- In addition to required NFPA 14 testing of the system, we also recommend the Port of Bremerton have the local Fire Department review the standpipe locations and assure fire hoses can easily be connected to the standpipes.

Near Term Repairs (2-5 yr)

- Clean and paint rusted surfaces at galvanized piping components where not indicated to be replaced with new standpipes.
- Support the HDPE piping at the elbow-to-flexible pipe transitions below the ramp to minimize stress at the 90-degree fittings. A bracket could be attached to the existing pipe supports and provide reinforcement for the elbows.

2.1.3 RECOMMENDED REPAIR COSTS

The estimated budgetary cost for these repairs is $312,200 (see Appendix B - Cost Estimate).

TABLE 2.1-1
A-DOCK - ESTIMATED BUDGETARY COST SUMMARY

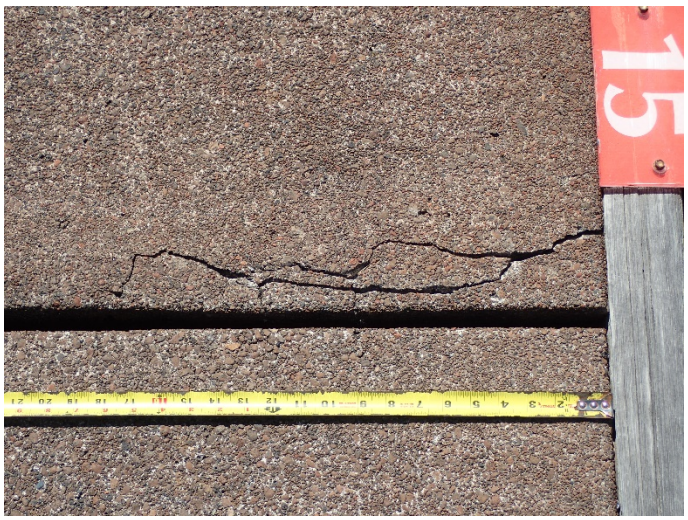
PRIORITY	RECOMMENDATIONS	ESTIMATED CONSTRUCTION COSTS
Immediate	• Replace missing guide pile assembly rub blocks • Resurface concrete float modules • Replace cracked and spalled concrete trench covers and investigate using aluminum grid decking • Replace missing circuit breaker covers • Replace rusted circuit breakers • Replace HDPE piping to standpipes	$22,000
Near Term	• Resurface concrete float modules • Replace the transition plate • Replace piles with greater than 50% section loss and associated guide pile assemblies • Relocate powercenter from A04/A06 to T-head A01/A02 • Provide GFCI protection for all power on dock • Remove or relocate all electrical connections less than 12 inches above the deck • Clean and paint rusted surfaces at galvanized piping components • Support the HDPE piping at the elbow-to-flexible pipe	$111,400
Long Term	• Replace all timber guide piles exhibiting significant section loss. The associated guide pile assemblies should be removed and replaced with recommended guide pile assemblies. • Replace enclosed circuit breakers at each transformers • Replace transformers	$178,800
	Total	**$312,200**

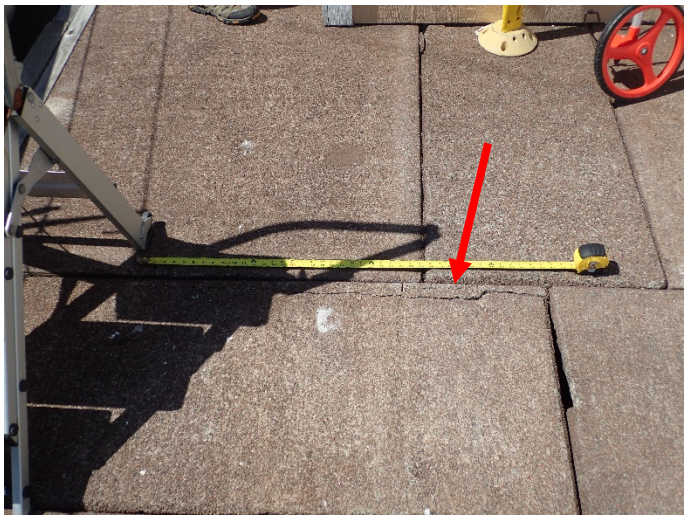
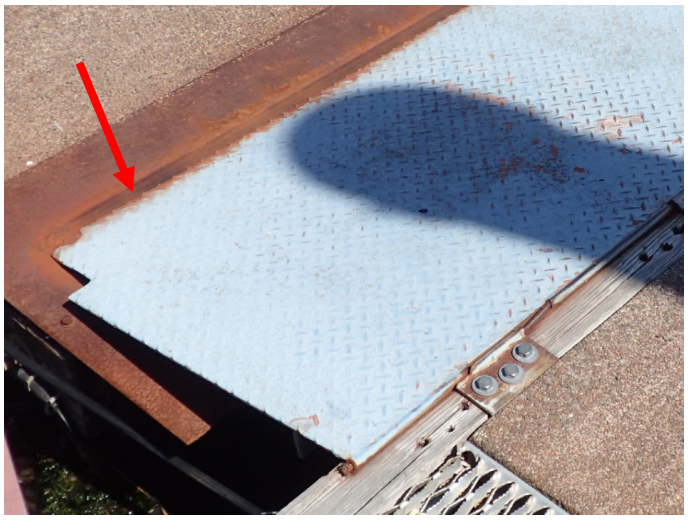
Estimated Construction Costs include:
15% Contingency
6% Engineering
10% Mobilization
25% Contractor Overhead and Profit

2.1.4 PHOTOGRAPHS

Structural Photographs

	Photo S2.1-1: Overall of A-Dock (Looking Southeast)
	Photo S2.1-2: Overall of A-Dock (Looking North)
	Photo S2.1-3: Moderate abrasion and section loss in timber guide pile

	Photo S2.1-4: Cracking, rust staining, and surface spalling in concrete float module
	Photo S2.1-5: Delamination in concrete float module
	Photo S2.1-6: Spall with exposed reinforcing steel in float module, note abraded concrete surface.

	Photo S2.1-7: Typical edge spalling in trench cover
	Photo S2.1-8: Typical worn pile guide assembly rub block
	Photo S2.1-9: Transition plate (note knife edging at wearing end)

Electrical Photographs

	Photo E2.1-1: Typical A dock powercenter
	Photo E2.1-2: Typical A dock powercenter
	Photo E2.1-3: Typical A dock powercenter and light pole

	Photo E2.1-4: Stainless steel powercenter with missing circuit breaker covers
	Photo E2.1-5: Transformers TRA2 and TRA3 with enclosed circuit breaker covers open
	Photo E2.1-6: Panelboard A3 (A2 similar)

Fire protection Photographs

	Photo F2.1-1: Manual standpipe system fire department connection
	Photo F2.1-2: Manual standpipe system fire department connection
	Photo F2.1-3: System transition at floating dock

	Photo F2.1-4: Existing standpipe (note extension above support bracket)
	Photo F2.1-5: Existing standpipe (note extension above support bracket)
	Photo F2.1-6: Standpipe connection less than required 3′-5′ above deck

2.2 EAST BREAKWATER CONDITION INDEX – 65

Based on available archive plans, the original East Breakwater was constructed in 1970, and relocated in 1985. Considering the original construction drawings and conditions observed, it appears the structure has been replaced, however, the year of replacement is unknown. The East Breakwater consists of a series of approach floats, approximately 300' long, connected to a 600' floating breakwater.

The approach floats are constructed of 7' wide concrete float modules, varying in length, typically framed by double 3x8 timber wales, and fitted with 2x8 timber rub strips. The approach floats are secured by twelve 14" timber guide piles, spaced intermittently along the approach floats. The breakwater is constructed of 63'x12' concrete float modules, framed by 4x8 timber wales. Timber curbs are provided on either side of the breakwater floats, constructed of 10' long 6x6 timbers. The breakwater floats are secured by four 14" timber guide piles at the south end of the breakwater, with the remainder of the breakwater secured by mooring chains and anchor piles.

The East Breakwater is in Fair condition, with a CI of 65 and an Operational Capability Rating of C1 (See Photos S2.2-1 to S2.2-3 for overalls). There are no operational restrictions required for this structure. Each asset was assessed and assigned a numerical Condition Index (CI), ranging from 1 (failed) to 100 (good).

2.2.1 OBSERVED CONDITIONS AND ASSESSMENTS

H1010.01 – PILE FOUNDATIONS **CONDITION INDEX – 90**

H1010.01.01 – GUIDE PILES **CI – 90**

The timber guide piles securing the approach floats have minor abrasion with up to 5% section loss. The breakwater floats are secured by four guide piles at the south end; however, the remainder of the breakwater float is secured by mooring chains and anchors located below the waterline which was not included in the scope of this inspection.

H1010.10 – OTHER SUBSTRUCTURE COMPONENTS **CONDITION INDEX – 90**

H1010.10.01 – MOORING LINES **CI – 90**

Information from Echelon indicates the mooring lines are in overall good condition, with limited inspection of buried components. Anodes attached to the chains exhibit up to 90% consumption, indicating they are operating.

H1010.10.02 – MOORING ANCHORAGES **CI – 90**

Information from Echelon indicates the mooring anchorages are in overall good condition, with limited inspection of buried components.

H1050.02 – BROWS AND GANGWAYS **CONDITION INDEX – 90**

H1050.02.01 – GANGWAY **CI – 90**

No significant deficiencies were observed in the aluminum access gangway (See Photo S2.2-4).

H1050.02.05 – GANGWAY ROLLER **CI – 90**

The gangway rollers have minor wear typical of their operation. No significant section loss or deficiencies were observed.

H1050.04 – FLOATS **CONDITION INDEX – 60**

H1050.04.01 – FLOAT MODULES **CI – 60**

The float modules on the approach floats have minor to moderate abrasion up to 1/8" deep, with intermittent longitudinal and transverse cracks up to 1/16" wide, and random rust staining throughout. The rust staining generally indicates corroding concrete reinforcement (See Photo S2.2-5). The breakwater floats have minor wear and isolated random hairline cracks (See Photo

S2.2-6). The approach floats and breakwater have approximately 30 SF (6 locations) of delaminated concrete on the top of the float modules. Localized spall repairs have been previously completed. Minor delamination was observed around the edges of the spall repairs; however, the repairs were generally appeared sound and bonded to the existing concrete.

Freeboard measurements ranged from 12" at the south end of the structure, to 8" at the north end of the structure. Floating docks and breakwaters are typically designed with freeboards from 12" to 18". Measurements indicate there may be minor loss of buoyancy, with moderate loss at the north end of the floats.

H1050.04.02 – WALES **CI – 75**

The timber wales typically have minor weathering and light checking, with isolated locations of minor fungal decay. When sounded with a hammer, the timber was typically solid with no apparent hollow sounding areas and only limited discrete locations of superficial soft timber were observed.

H1050.04.03 – TIE-ROD ASSEMBLIES **CI – 75**

The tie-rod assemblies typically have minor to moderate corrosion on the exposed ends; however, no significant section loss was noted. The tie-rods appeared secure with no indication of loose or broken sections.

H1050.04.04 – CLEATS **CI – 75**

The galvanized steel mooring cleats have isolated areas of minor surface corrosion on exposed ends of the anchor bolts (See Photo S2.2-7). Loose connection hardware was identified on 8 cleats.

H1050.04.05 – FENDERS **CI – 75**

The timber rub strips on the access float have minor weathering and light checking, with isolated locations of minor fungal decay. A 4' section of the rub strip, located at the northeast end of the access floats, at the transition between the access floats and the breakwater, has moderate to major fungal decay with approximately 50% section loss (See Photo S2.2-8).

H1050.04.06 – GUIDE PILE ASSEMBLIES **CI – 60**

The access float's external guide piles assemblies generally have minor surface corrosion, with moderate corrosion and scaling typically located around the hoop connections (See Photo S2.2-9). The timber rub blocks are missing from four external (hoop) guide pile assemblies at the north end of the access floats.

H1050.04.07 – TRANSITION PLATES **CI – 60**

The transition plates extending across the gaps between the breakwater floats have minor to moderate knife edging at the contact end of the plates, and the anchor bolts are typically severely corroded, missing, or have been replaced with undersized anchors (See Photo S2.2-10). The transition plate from the access float to the breakwater float has minor paint loss; however the plate appears to be aluminum and has no surface rust or surface corrosion.

H1050.04.07 – CONNECTION HARDWARE **CI – 60**

The connection hardware between the breakwater float modules has moderate corrosion with moderate scaling and approximately 25% section loss on the connection plates and hardware (See Photo S2.2-11).

H1050.04.09 – TIMBER CURBS **CI – 60**

The timber curbs mounted on the wales have minor weathering and light checking, with isolated locations of minor fungal decay. Three sections (30 LF) of the curbs have major fungal decay with up to 75% section loss, and ten timber curbs (100 LF) are loose (See Photo S2.2-12).

H5020.01 – ELECTRICAL POWER DISTRIBUTION **CONDITION INDEX – 60**

H5020.01.03 – ELECTRICAL CONDUITS AND CABLES **CI – 60**

The East Breakwater is served by one surface mounted conduit mounted to the inner timber curb. Most portions of this conduit along with the transitional fittings to flexible conduit at each expansion joint had minor to major amounts of surface rust.

Visible portions of the G cable under the gangway appeared to be in good shape.

H5020.01.04 – ELECTRICAL SHORE-TIE RECEPTACLES **CI – 60**

The plastic portions of the Midwest powercenters are in fair condition, however the angled brackets securing the powercenters to the deck as well as the condulets attached to each powercenter are all showing moderate signs of rust (See Photos E2.2-1 to E2.2-3).

H5020.01.05 – OTHER ELECTRICAL COMPONENTS **CI – 60**

The East Breakwater is served by three 37.5 KVA 480-120/240 volt transformers and 120/240 volt panels (See Photo E2.2-4). Each transformer has rusting bottoms (See Photo E2.2-5). The panelboards appeared to be in good shape.

NEC 555.9 requires all electrical connections to be 12 inches above the float. At the time of installation, the current electrical system met code and as such has grandfather status. If any electrical upgrades take place, the electrical system would need to meet current code and all existing electrical connections below 12 inches, such as within each splice box, would need to be removed or raised above 12 inches.

NEC 555.3 requires the main overcurrent device that feeds the marina to be ground-fault protected. At the time of installation, the current electrical system met code and as such has grandfather status. If any electrical upgrades take place, the electrical system would need to meet current code and all existing and/or new feeders would need ground-fault protection.

H5030.01 – FIRE PROTECTION WATER DISTRIBUTION SYSTEM **CONDITION INDEX – 60**

The existing East Breakwater is served by a manual wet standpipe system and overall is in poor condition. The fire protection system was reviewed for general condition, and not for full compliance with current Codes. We assume the fire protection system is periodically tested as required by NFPA 14. Where Code violations were obvious, they are noted below.

H5030.01.01 – PIPES AND FITTINGS **CI – 75**

Fusion-welded High Density Polyethylene (HDPE) piping is installed for most of the fire protection piping system, with unsupported piping resting in the water near the dock. Black HDPE potable water piping (with blue stripe) was used for this installation, and appears to be in good condition.

H5030.01.08 – STANDPIPE CONNECTIONS **CI – 50**

The manual standpipe fire department connection is located in a wooden box at the bottom of the ramp (See Photo F2.2-1 and F2.2-2). This station is labeled "Fire Department Injection Standpipe". The protective caps (Code required) are missing at the fire department connections, there is significant corrosion on the connection threads (suspect that making a hose connection could be difficult to make given the condition of the threaded connections), and it appears the right hose connection may be difficult to access due to the wooden box construction. This assembly is considered to be in poor condition.

There is also a cold water piping connection, with isolation valve just below the fire department connection (not allowed by Code), to the standpipe system within this box. The cold water piping insulation is in poor condition, making the water piping more susceptible to freezing. No check valves were visible, and should be reviewed with the Fire Department, for compliance with NFPA 14. We expect the fire department will require elimination of the isolation valve and replacing it with a check valve between the fire department connection and the domestic cold water piping.

With the addition of the check valve we anticipate a larger door opening may be required to accommodate the entire assembly.

The single galvanized standpipe at the East Breakwater is in poor condition, and shows significant signs of corrosion at the piping and threaded fittings. The standpipe is also not well supported, with a short bracket and single U-bolt holding the assembly (See Photo F2.2-3)

2.2.2 RECOMMENDATIONS

Repairs are recommended to the elements listed below. If an element is not listed, then no significant defects are present that warrant repairs.

Floating docks and breakwaters typically have a useful service life of 20 to 30 years that may be extended with routine maintenance, repairs and upgrading. It is unknown how old the East Breakwater is; however, based on the conditions observed it is estimated that the structure has 10-15 years or more of remaining service life, provided it is maintained and inspected on a regular basis. The structure should be re-inspected in 2020.

Recommended Structural Repairs:

Immediate Repairs (0-2 yr)

- Resurface concrete float modules, consisting of removal of unsound concrete, cleaning existing reinforcing steel, and placing concrete patch materials.
- Tighten all loose cleats.
- Replace missing pile guide rub blocks to minimize abrasion on the piles and guide pile assemblies.
- Seal top of approach dock float modules with recommended concrete sealer.
- Replace corroded, missing, and undersized transition plate anchors, and replace associated transition plates.
- Replace timber rub strips and curbs with significant fungal decay.

Near Term Repairs (2-5 yr)

- Resurface concrete float modules, consisting of removal of unsound concrete, cleaning existing reinforcing steel, and placing concrete patch materials.
- Replace corroded connection hardware between breakwater float modules with galvanized connection plates and hardware.
- It can be anticipated that routine maintenance items will be required consisting of replacing sections of timber curbs, tightening loose cleats, and replacing guide pile rub blocks. Because of the condition of the approach float modules, more extensive maintenance repairs may be required consisting of replacing discrete sections of timber wales, tie-rods, and rub strips, and completing additional spall repairs.

Long Term Repairs (5-15 yr)

- Replace hoop guide pile assemblies with recommended guide pile assemblies.
- Because of the age and general condition of the float modules, it can be anticipated that routine maintenance items may be required as described in the near term repairs, at an increased frequency due to the age of the structure. Additionally, it can be expected that long-term maintenance items will be required consisting of replacing widespread sections of timber wales and timber curbs, replacing tie-rods, replacing timber piles, and replacing discrete float modules.
- The complete floating breakwater dock system should be programmed for replacement in the next 15-20 years.

Recommended Electrical Repairs:

Immediate Repairs (0-2 yr)

- Replace rusted angled brackets
- Replace rusted condulets
- Repair or replace broken boxes

Near Term Repairs (2-5 yr)

- Provide GFCI protection for all power on dock.
- Remove or relocate all electrical connections less than 12 inches above the deck.

Long Term Repairs (5-15 yr)

- Replace transformers

Recommended Fire Protection Repairs:

Immediate Repairs (0-2 yr)

- Replace the fire department injection standpipe with a new hose connection assembly, replace the isolation valve with a check valve (if required by the Fire Department), and provide 2-inch closed cell foam insulation and jacket on the cold water piping. A larger door opening in the wooden enclosure for the fire department connection, valves, and piping may be required.
- Replace the East Breakwater standpipe assembly, and provide a tall galvanized bracket to support the standpipe, similar to what was used at A-Dock. Secure the bracket to the top and side of the wooden dock.

Near Term Repairs (2-5 yr)

- Remove rust and paint corroded galvanized fitting under the ramp

Long Term Repairs (5-15 yr)

- Consider extending a manual dry standpipe system along the East Breakwater to serve the East and North Breakwater docks. (Note: the North Breakwater portion of the cost estimate included in Section 2.3).

2.2.3 RECOMMENDED REPAIR COSTS

The estimated budgetary cost for these repairs is $382,500 (see Appendix B - Cost Estimate).

TABLE 2.2-1
EAST BREAKWATER - ESTIMATED BUDGETARY COST SUMMARY

PRIORITY	RECOMMENDATIONS	ESTIMATED CONSTRUCTION COSTS
Immediate	• Resurface concrete float modules • Tighten all loose cleats. • Replace missing pile guide rub blocks • Seal top of approach dock float modules • Replace corroded, missing, and undersized transition plate anchors, and replace associated transition plates • Replace timber rub strips and curbs • Replace rusted angled brackets • Replace rusted condulets • Repair or replace broken boxes • Replace the fire department injection standpipe with a new hose connection assembly, replace the isolation valve with a check valve (if required by the Fire Department), and provide 2-inch closed cell foam insulation and jacket on the cold water piping • Replace the East Breakwater standpipe assembly, and provide a tall galvanized bracket to support the standpipe	$49,200
Near Term	• Resurface concrete float modules • Replace corroded connection hardware between breakwater float modules • Provide GFCI protection for all power on dock. • Remove or relocate all electrical connections less than 12 inches above the deck. • Remove rust and paint corroded galvanized fitting under the ramp	$156,200
Long Term	• Replace hoop guide pile assemblies • Replace transformers • Consider extending a manual dry standpipe system along the East Breakwater to serve the East and North Breakwater docks	$177,100
	Total	**$382,500**

Estimated Construction Costs include:
15% Contingency
6% Engineering
10% Mobilization
25% Contractor Overhead and Profit

2.2.4 PHOTOGRAPHS

Structural Photographs

	Photo S2.2-1: Overall of East Breakwater (Looking Northeast)
	Photo S2.2-2: Overall of Approach Floats (Looking West)
	Photo S2.2-3: Overall of Breakwater Float (Looking North)

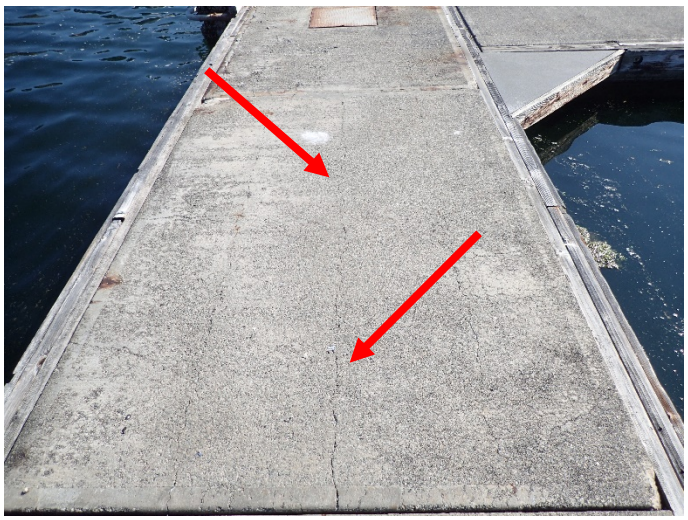
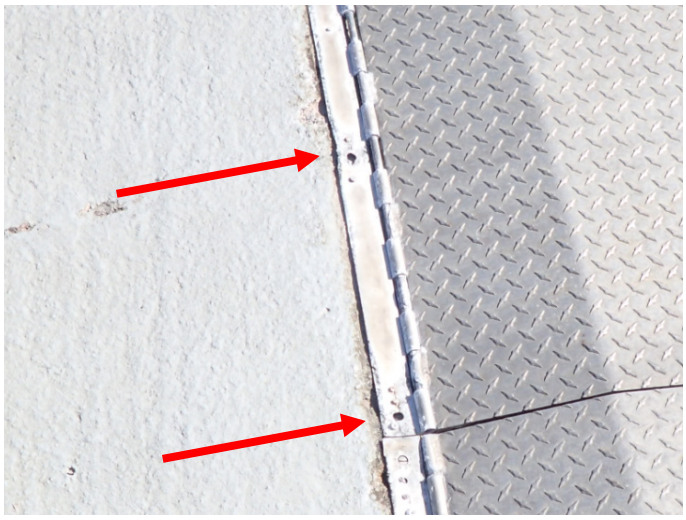
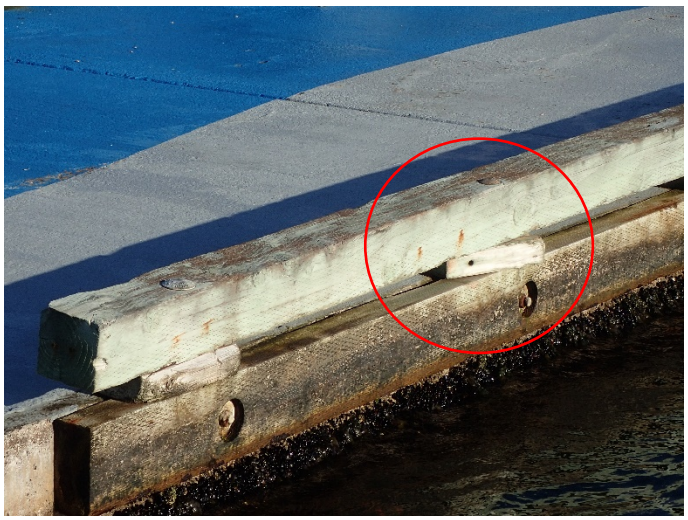
	Photo S2.2-4: Overall of Gangway (Looking South)
	Photo S2.2-5: Typical Condition of Concrete Approach Float Modules (Note Cracking)
	Photo S2.2-6: Typical Condition of Concrete Breakwater Float Modules (Looking Southwest)

	Photo S2.2-7: Typical Galvanized Steel Cleat Condition
	Photo S2.2-8: Fungal Decay in Timber Rub Strip at Northeast End of Approach Floats
	Photo S2.2-9: Corrosion on Steel Pile Guide Assembly

	Photo S2.2-10: Missing Transition Plate Anchors
	Photo S2.2-11: Typical Corrosion of Steel Connection Hardware
	Photo S2.2-12: Typical Loose Timber Curb and Spacer Blocks

Electrical Photographs

	Photo E2.2-1: Typical powercenter, splice box and light pole
	Photo E2.2-2: Powercenter pedestal with rusted angle brackets, rusted bolts, loose connection fitting and rusted condulet
	Photo E2.2-3: Broken splice box, rusted fitting, rusted bolt

	Photo E2.2-4: Typical transformer, splice box, panelboard, light pole and powercenter
	Photo E2.2-5: Transformer with rusted bottom

Fire Protection Photographs

	Photo F2.2-1: Manual dry standpipe fire department connection
	Photo F2.2-2: Manual dry standpipe fire department connection
	Photo F2.2-3: Standpipe connection at start of East Breakwater floats extending well above bracket with insufficient support

2.3 NORTH BREAKWATER CONDITION INDEX – 60

Based on available archive plans, the original North Breakwater was constructed in 1970, and relocated in 1985. Considering the original construction drawings and conditions observed, it appears the structure has been replaced, however, the year of replacement is unknown. The North Breakwater consists of 700' of a straight breakwater section extending west of the East Breakwater, and a 315' curved section extending from the west end of the straight breakwater section.

The breakwater is constructed of 63'x12' concrete float modules, framed by 4x8 timber wales. Timber curbs are provided on either side of the breakwater floats, constructed of 10' long 6x6 timbers. The breakwater is secured by mooring chains and anchor piles.

The North Breakwater is in Fair condition, with a CI of 60 and an Operational Capability Rating of C1 (See Photos S2.3-1 to S2.3-3 for overalls). There are no operational restrictions required for this structure. Each asset was assessed and assigned a numerical Condition Index (CI), ranging from 1 (failed) to 100 (good).

2.3.1 OBSERVED CONDITIONS AND ASSESSMENTS

H1010 – SUBSTRUCTURE **CONDITION INDEX – 90**

H1010.10 – OTHER APPURTENANCES **CI – 90**

H1010.10.01 – MOORING LINES **CI – 80**

Information from Echelon indicates the mooring lines are in overall good condition, with limited inspection of buried components (lines, anchorages). Bridle chain 35 has failed at the attachment point to the float, and the nylon rope portion of Mooring 65 exhibits minor abrasion. Anodes attached to the chains exhibit up to 90% consumption, indicating they are operating.

H1010.10.02 – MOORING ANCHORAGES **CI – 90**

Information from Echelon indicates the timber anchor pile at Mooring 45 has significant marine borer damage approximately 1 foot above the mooring system connection, otherwise there was no apparent damage.

H1050.04 – FLOATS **CI – 60**

H1050.04.01 – FLOAT MODULES **CI – 60**

The float modules on the have minor wear and isolated random hairline cracks. The approach floats and breakwater have approximately 70 SF (9 locations) of delaminated concrete on the top of the float modules (See Photo S2.3-4). Localized concrete spall repairs have been completed previously completed. Minor delamination was observed around the edges of the spall repairs; however, the repairs generally appeared sound and bonded to the existing concrete (See Photo S2.3-5). At the west end of the breakwater, there is a 3.5'Lx5"Wx2"D open corrosion spall with exposed and corroding reinforcing steel (See Photo S2.3-6).

Freeboard measurements ranged from 10" to 12" across most of the floats, with as little as 8" at the east end where the structure connects to the East Breakwater. Floating docks and breakwaters are typically designed with freeboards from 12" to 18". Measurements indicate there may be minor loss of buoyancy, with moderate loss at the east end of the structure.

H1050.04.02 – WALES **CI – 75**

The timber wales typically have minor weathering and light checking, with isolated locations of minor fungal decay. When sounded with a hammer, the timber was typically solid with no apparent hollow sounding areas and only limited discrete locations of superficial soft timber were observed.

H1050.04.03 – TIE-ROD ASSEMBLIES **CI – 75**

The tie-rod assemblies typically have minor to moderate corrosion on the exposed ends; however, no significant section loss was noted. The tie-rods appeared secure with no indication of loose or broken sections.

H1050.04.04 – CLEATS **CI – 60**

The galvanized steel mooring cleats have isolated areas of minor isolated surface corrosion on exposed ends of the anchor bolts. Loose connection hardware was identified on 14 cleats. Two of the plastic cleats are broken (See Photo S2.3-7).

H1050.04.07 – TRANSITION PLATES **CI – 60**

The transition plates extending across the gaps between the breakwater floats have minor to moderate knife edging at the wearing end of the plates, with more significant knife edging at the transition plates at the west end of the breakwater (See Photo S2.3-8). The transition plate anchor bolts are typically severely corroded, missing, or have been replaced with undersized anchors (See Photo S2.3-9).

H1050.04.07 – CONNECTION HARDWARE **CI – 60**

The connection hardware between the breakwater float modules has moderate to major corrosion with heavy scaling and approximately 25% section loss of the connection plates and hardware (See Photo S2.3-10).

H1050.04.09 – TIMBER CURBS **CI – 60**

The timber curbs mounted on the wales have minor weathering and light checking, with isolated locations of minor fungal decay. Four sections (40 LF) of the curbs have major fungal decay with up to 75% section loss, sixteen timber curbs (160 LF) are loose, and one curb has bent anchor bolts (See Photo S2.3-11).

H5020.01 – ELECTRICAL POWER DISTRIBUTION **CONDITION INDEX – 50**

H1050.01 – ELECTRICAL POWER DISTRIBUTION **CI – 50**

H5020.01.03 – ELECTRICAL CONDUITS AND CABLES **CI – 45**

The North Breakwater is served by one surface mounted conduit mounted to the inner timber curb. Portions of this conduit along the tribal portion have fallen from the rusted conduit hangers. These portions are now resting on the deck are now rusted. The portions along the tribal float still attached to the curb are still subject to damage from mooring lines, as no cleats exist on this portion of curb (See Photos E2.3-1 to E2.3-5)

H5020.01.04 – ELECTRICAL SHORE-TIE RECEPTACLES **CI – 45**

The plastic portions of the Midwest powercenters are in fair condition, however the pedestals and angled brackets securing the pedestals to the deck as well as the condulets attached to each powercenter are all showing moderate to severe signs of rust (See Photos E2.3-6 and E2.3-7). One condulet access cover has rusted completely through (See Photo E2.3-9).

All powercenters are currently installed on the southern (inside) portion of the breakwater. Power cords were observed at multiple locations draped across the breakwater to boats berthed to the north (outside), subjecting the cables to possible mechanical damage and posing a tripping hazard (See Photo E2.3-10). Per NEC 400.8, flexible cords are not permitted where subject to physical abuse.

H5020.01.05 – OTHER ELECTRICAL COMPONENTS **CI – 60**

The North Breakwater is served by three 50 KVA 480-120/240 volt transformers and 120/240 volt panels (See Photo E2.3-11). Each transformer had rusting bottoms (See Photo E2.3-12). The panelboards had missing portions of vents (See Photo E2.3-13).

The light pole at the end of the tribal float has a rusted base.

NEC 555.9 requires all electrical connections to be 12 inches above the float. At the time of installation, the current electrical system met code and as such has grandfather status. If any electrical upgrades take place, the electrical system would need to meet current code and all existing electrical connections below 12 inches, such as within each splice box, would need to be removed or raised above 12 inches.

NEC 555.3 requires the main overcurrent device that feeds the marina to be ground-fault protected. At the time of installation, the current electrical system met code and as such has grandfather status. If any electrical upgrades take place, the electrical system would need to meet current code and all existing and/or new feeders would need ground-fault protection.

H5030.01 – FIRE PROTECTION WATER DISTRIBUTION SYSTEM **CONDITION INDEX – N/A**

There is no fire protection piping system serving the North Breakwater. Fire extinguishers are located along the dock. It is unclear whether NFPA 303 requires additional standpipes due to the length of the dock; however, review of potential Code requirements, or meeting with the local AHJ, is outside the current scope of the project.

2.3.2 RECOMMENDATIONS

Repairs are recommended to the elements listed below. If an element is not listed, then no significant defects are present that warrant repairs.

Floating docks and breakwaters typically have a useful service life of 20 to 30 years that may be extended with routine maintenance, repairs and upgrading. It is unknown how old the North Breakwater is; however, based on the conditions observed it is estimated that the structure has 10-15 years or more of remaining service life, provided it is maintained and inspected on a regular basis. The structure should be re-inspected in 2020.

Recommended Structural Repairs:

Immediate Repairs (0-2 yr)

- Resurface concrete float modules, consisting of removal of unsound concrete, cleaning existing reinforcing steel, and placing concrete patch materials.
- Replace failed cleats and tighten all loose cleats.
- Replace deteriorated, missing, and undersized transition plate anchors, and replace transition plates with severe knife edging.
- Replace curbs with major fungal decay.
- Replace Bridle Chain 35

Near Term Repairs (2-5 yr)

- Resurface concrete float modules, consisting of removal of unsound concrete, cleaning existing reinforcing steel, and placing concrete patch materials.
- Replace deteriorated connection hardware between breakwater float modules with galvanized connection plates and hardware.
- It can be anticipated that routine maintenance items will be required consisting of replacing discrete section of timber curbs and tightening loose cleats.

Long Term Repairs (5-15 yr)

- Because of the age and general condition of the float modules, it can be anticipated that routine maintenance items may be required as described in the near term repairs, at an increased frequency due to the age of the structure. Additionally, it can be expected that long-

term maintenance items will be required consisting of replacing widespread sections of timber wales and tie rods, replacing sections of timber curb, and replacing discrete float modules.
- The complete floating breakwater dock system should be programmed for replacement in the next 15-20 years.

Recommended Electrical Repairs:

Immediate Repairs (0-2 yr)

- Replace rusted angled brackets
- Replace rusted condulets
- Replace rusted powercenter pedestals
- Repair broken panelboards and splice boxes
- Replace rusted conduit and conduit hangers
- Replace broken conduit fittings
- Replace beacon pole
- Provide cleats at tribal float to eliminate securing boats to curb and damaging conduit

Near Term Repairs (2-5 yr)

- Provide power at the north side of the float or provide a way for cords to cross float free from physical damage
- Provide GFCI protection for all power on dock.
- Remove or relocate all electrical connections less than 12 inches above the deck.

Long Term Repairs (5-15 yr)

- Replace transformers

Recommended Fire Protection Repairs:

Immediate Repairs (0-2 yr)

- None; no fire protection system is present on the North Breakwater

Near Term Repairs (2-5 yr)

- None; no fire protection system is present on the North Breakwater

Long Term Repairs (5-15 yr)

- Consider adding a manual dry standpipe system along North Breakwater docks.

2.3.3 RECOMMENDED REPAIR COSTS

The estimated budgetary cost for these repairs is $503,500 (see Appendix B - Cost Estimate).

TABLE 2.3-1
NORTH BREAKWATER - ESTIMATED BUDGETARY COST SUMMARY

PRIORITY	RECOMMENDATIONS	ESTIMATED CONSTRUCTION COSTS
Immediate	• Resurface concrete float modules • Replace Bridle Chain 35 • Replace failed cleats and tighten all loose cleats. • Replace transition plate anchors, and transition plates • Replace curbs • Replace rusted angled brackets • Replace rusted condulets • Replace rusted powercenter pedestals • Repair broken panelboards and splice boxes • Replace rusted conduit and conduit hangers • Replace broken conduit fittings • Replace beacon pole • Provide cleats at tribal float	$75,600
Near Term	• Resurface concrete float modules • Replace deteriorated connection hardware between breakwater float modules • Replace discrete section of timber curbs and tightening loose cleats. • Provide power at the north side of the float or provide a way for cords to cross float free from physical damage • Provide GFCI protection for all power on dock. • Remove or relocate all electrical connections less than 12 inches above the deck.	$256,000
Long Term	• Replace transformers • Consider adding a manual dry standpipe system along North Breakwater docks.	$171,900
	Total	**$503,500**

Estimated Construction Costs include:
15% Contingency
6% Engineering
10% Mobilization
25% Contractor Overhead and Profit

2.3.4 PHOTOGRAPHS

Structural Photographs

	Photo S2.3-1: Overall of North Breakwater (West End, Looking Southwest
	Photo S2.3-2: Overall of North Breakwater (East End, Looking West)
	Photo S2.3-3: Overall of North Breakwater (West End, Looking East)

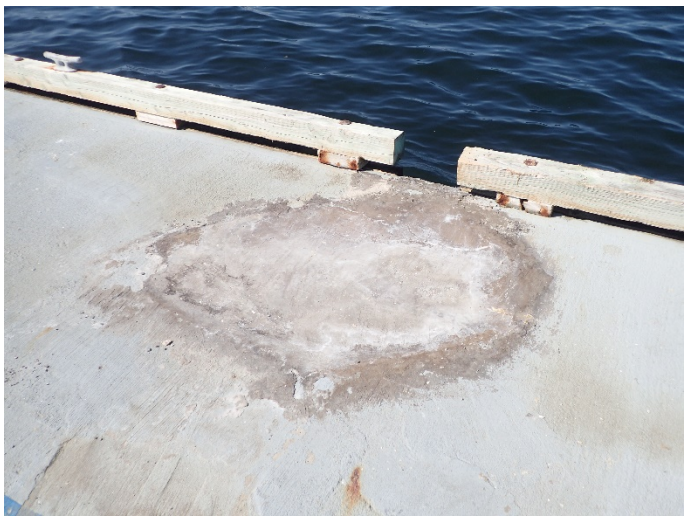
	Photo S2.3-4: Delaminated Concrete in Top of Deck Surface
	Photo S2.3-5: Previous Repair in Top of Deck (Minor Edge Delamination)
	Photo S2.3-6: Open Corrosion Spall with Exposed Reinforcing

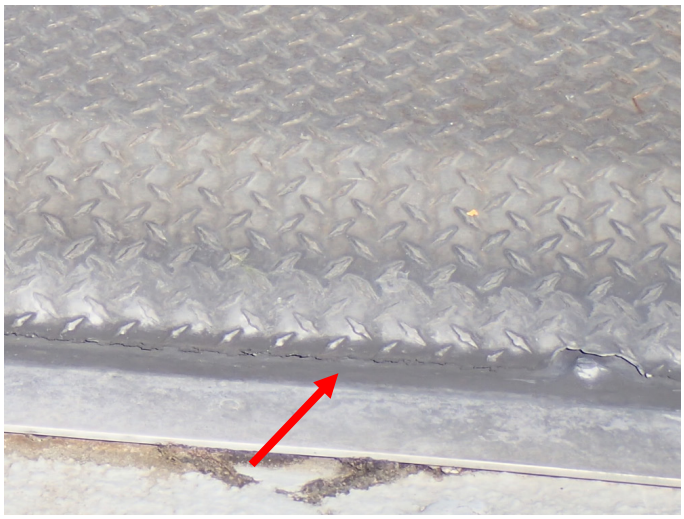
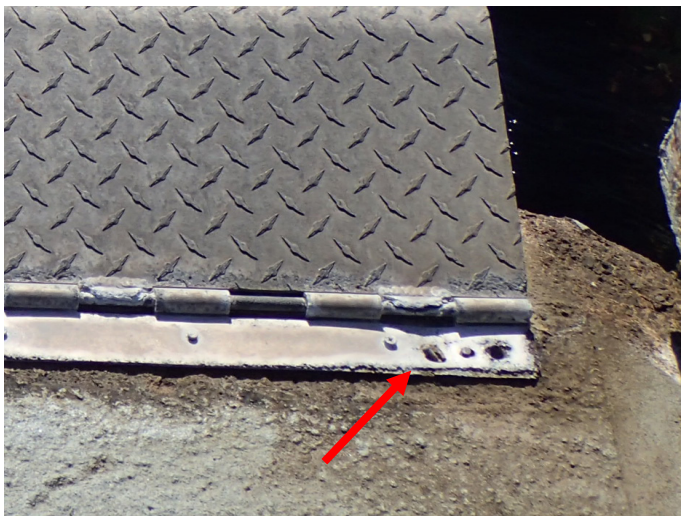
	Photo S2.3-7: Broken Cleat
	Photo S2.3-8: Knife-edging in Wearing End of Transition Plate
	Photo S2.3-9: Missing Transition Plate Anchors

	Photo S2.3-10: Typical Corrosion of Steel Connection Hardware
	Photo S2.3-11: Displaced Timber Curb With Bent Anchor Bolts

Electrical Photographs

	Photo E2.3-1: Detached conduit fitting
	Photo E2.3-2: Ship tied to curb and conduit, subjecting conduit to possible mechanical damage
	Photo E2.3-3: Damaged splice box

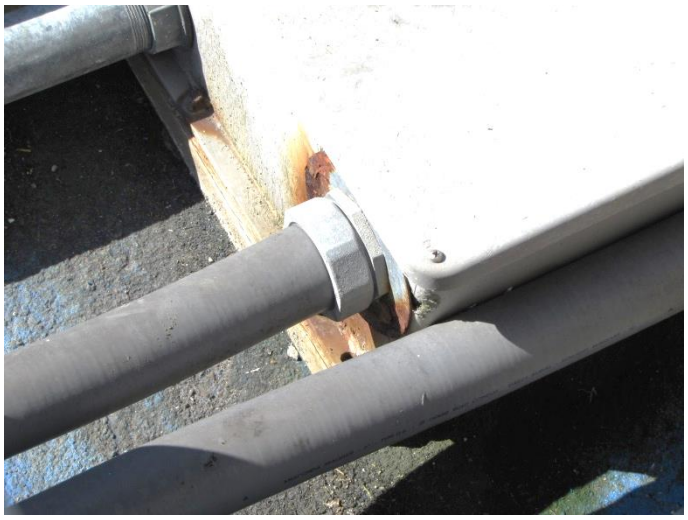
	Photo E2.3-4: Previously repaired portion of damaged splice box with new rust
	Photo E2.3-5: Rusted beacon pole footing, conduit not mounted to curb
	Photo E2.3-6: Powercenter with rusted pedestal, condulet and angle brackets

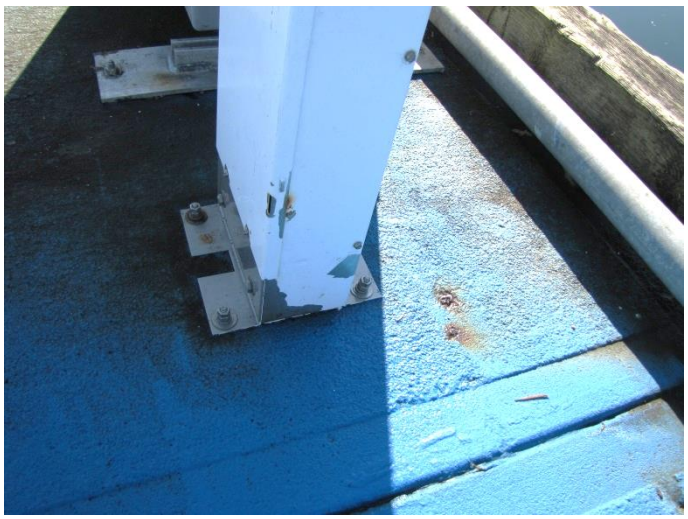
	Photo E2.3-7: Rusted powercenter pedestal, angle bracket
	Photo E2.3-8: Powercenter with new angle brackets
	Photo E2.3-9: Rusted condulet

	Photo E2.3-10: Typical powercenter, splice box and light pole with power cord draped across breakwater.
	Photo E2.3-11: Typical transformer, splice box, light pole, panel and powercenter.
	Photo E2.3-12: Rusted transformer bottom

	Photo E2.3-13: Broken vent in panelboard

2.4 WEST BREAKWATER CONDITION INDEX – 75

The West Breakwater is a 456' long structure, consisting of a 96'x14' fuel dock at the southern end of the structure and a 360x14' floating breakwater at the northern end of the structure. For the purposes of this report, the West Breakwater will also include the service dock between the fuel dock and A-Dock, which is a 127'x8' wide floating dock, with a 25'x8' extension at the southwest corner of the dock.

Based on available archive information, the West Breakwater was originally constructed in the early 1970s, with the service dock and fuel dock replaced in 1992, and the floating breakwater replaced at an unknown vintage.

The service dock is constructed of two rows of 2'-7" wide concrete float modules, with a utility trench located between the float modules. The floats are framed with double 3x8 timber wales on the either sides of the dock, fitted with 2x8 timber rub strips. The service dock is moored by 14" timber guide piles. The fuel dock is constructed of 14' wide concrete modules, framed with a 4x12 timber wales, and fitted with 2x12 timber rub strips and a 3" plastic rub rail on the east side of the dock. The floating breakwater is constructed of 14' wide concrete modules, framed with a 4x16 inner timber wale and a 6x16 outer timber wale, and fitted with 2x6 timber upper timber rub strips and 2x10 lower rub strips on both sides of the float. The fuel dock and breakwater floats are secured to twelve 24" coated steel guide piles.

The West Breakwater is in Satisfactory condition, with a CI of 75 and an Operational Capability Rating of C1 (See Photos S2.4-1 to S2.4-3 for overalls). There are no operational restrictions required for this structure. Each asset was assessed and assigned a numerical Condition Index (CI), ranging from 1 (failed) to 100 (good).

2.4.1 OBSERVED CONDITIONS AND ASSESSMENTS

H1010.01 – PILE FOUNDATIONS **CONDITION INDEX – 90**

H1010.01.01 – GUIDE PILES **CI – 90**

The coating on the steel guide piles securing the west breakwater floats and fuel dock floats is generally intact, with minor loss and limited surface corrosion showing through (See Photo S2.4-4). The timber guide piles securing the service dock have minor abrasion with less than 5% section loss.

H1050.02 – BROWS AND GANGWAYS **CONDITION INDEX – 90**

H1050.02.01 – GANGWAY **CI – 90**

No significant deficiencies were observed in the aluminum gangway between the service float and fuel float (See Photo S2.4-5).

H1050.02.05 – GANGWAY ROLLER **CI – 90**

The gangway rollers have minor wear typical of their operation. No significant section loss or deficiencies were observed.

H1050.04 – FLOATS **CONDITION INDEX – 75**

H1050.04.01 – FLOAT MODULES **CI – 75**

The float modules on the south service float have minor surface abrasion, and random hairline cracks with isolated transverse cracks up to 1/16" wide (See Photo S2.4-6). Two float modules near the midpoint of the service float have delaminated concrete (approximately 60 SF), and rust staining over the entire top surface, with multiple transverse cracks up to 1/16" wide, extending the full width of the modules (See Photo S2.4-7).

The fuel float and breakwater float have minor surface abrasion, with no significant deterioration observed (See Photo S2.4-8).

Freeboard measurements ranged from 19" to 21" across east side of the structure, and 15" to 17" across the west side of the structure. Floating docks and breakwaters are typically designed with freeboards from 12" to 18". The float listing east to west may be due to the weight of the guide pile assemblies and reduced floatation materials (foam) due to their construction inside the float. There is no indication of any significant loss of buoyancy at this time.

H1050.04.02 – WALES **CI – 80**

The timber wales typically have minor weathering. When sounded with a hammer, the timber was solid with no indication of significant fungal decay.

H1050.04.03 – TIE-ROD ASSEMBLIES **CI – 75**

The tie-rod assemblies typically have minor surface corrosion on the exposed ends; however, no significant section loss was noted. The tie-rods appeared secure with no indication of loose or broken sections.

H1050.04.04 – CLEATS **CI – 75**

The painted steel cleats on the fuel float have moderate coating loss with minor corrosion on the underlying steel (See Photo S2.4-9). The steel cleats located on the breakwater floats have moderate corrosion with scaling on the base plates and minor section loss (See Photo S2.4-10).

H1050.04.05 – FENDERS **CI – 60**

The timber rub strips on the access float have minor weathering. When sounded with a hammer, the timber was solid with no indication of significant fungal decay.

The timber rub strips on the fuel float and breakwater float has minor weathering, with isolated locations of minor fungal decay and checking. A 14' section of the rub strip, located at the north end of the breakwater, and a 10' section located on the west face approximately 20' from the north end of the breakwater, have failed due to vessel impact (See Photos S2.4-11 and S2.4-12). Additionally, a 3' section near the mid-point of the west side of the breakwater float has failed. No significant deterioration was observed on the rubber fenders on the fuel float and service float.

H1050.04.06 – GUIDE PILE ASSEMBLIES **CI – 60**

The breakwater and fuel float guide pile assemblies generally have minor to moderate surface corrosion, with light scaling (See Photo S2.4-13). The guide pile assembly at the south end of the fuel float has moderate corrosion, and one of the supports at the end of the guide pile assembly is failed (See Photo S2.4-14).

H1050.04.07 – TRANSITION PLATES **CI – 90**

The transition plate from the fuel float to the breakwater float has minor paint loss with minor corrosion on the hinges.

H5020.01 – ELECTRICAL POWER DISTRIBUTION **CONDITION INDEX – 65**

H5020.01.03 – ELECTRICAL CONDUITS AND CABLES **CI – 75**

Aside from some rust covered portions of conduits at each transformer, the visible portions of the conduits and cables appeared in good shape.

H5020.01.04 – ELECTRICAL SHORE-TIE RECEPTACLES **CI – 60**

The West Breakwater has a mixture of powercenters. The powercenters on the east side are newer and in reasonable shape (See Photo E2.4-1). The powercenters on the west side of the float are older and in need of repair, as two are missing circuit breaker covers (See Photos E2.4-2 and E2.4-3). Due to the limited supply of powercenters, cords have been draped across the deck to serve berths on the opposite side, subjecting the cables to possible mechanical damage

and posing a tripping hazard. Per NEC 400.8, flexible cords are not permitted where subject to physical abuse.

H5020.01.04 – OTHER ELECTRICAL COMPONENTS **CI – 45**

The West Breakwater is served by two 37.5 KVA 480-120/240 volt transformers. Each transformer has rust on large portions of its enclosure (See Photos E2.4-4 and E2.4-5). Each transformer has a primary and secondary enclosed circuit breaker enclosure has rust on large portions of each, with missing deadfronts and entire bottoms rusted away (See Photos E2.4-6 to E2.4-9).

NEC 555.3 requires the main overcurrent device that feeds the marina to be ground-fault protected. At the time of installation, the current electrical system met code and as such has grandfather status. If any electrical upgrades take place, the electrical system would need to meet current code and all existing and/or new feeders would need ground-fault protection.

H5030.01 – FIRE PROTECTION AND SUPPRESSION **CONDITION INDEX – 55**

H5030.01.00 – FIRE PROTECTION WATER DISTRIBUTION SYSTEM **CI – 55**

The existing West Breakwater is served by both a manual dry standpipe system, and manual wet standpipe system, and overall is in fair condition. The fire protection system was reviewed for general condition, and not for full compliance with current Codes. We assume the fire protection systems are periodically tested as required by NFPA 14. Where Code violations were obvious, they are noted below.

Fusion-welded High Density Polyethylene (HDPE) piping is installed for most of the fire protection piping system, with unsupported piping resting in the water near the dock. Black HDPE potable water piping (with blue stripe) was used for this installation, and appears to be in good condition. The manual dry standpipe fire department connection is located at the top of the ramp serving both A-Dock and the West Breakwater, as shown in Photo F2.1-1. The HDPE piping appears to serve the standpipe behind a hose cabinet as shown in Photo F2.5-1, and the 3 cabinets located on the West Breakwater.

The manual wet standpipe hose cabinet near the fueling station is in fair condition; see Photo F2.5-2. The water piping connection at this hose box is insulated for freeze protection, and the insulation is in poor condition. Copper water piping appeared to be in good condition.

There are three Class II hose cabinets (1-1/2" valves) on the West Breakwater that have had hose assemblies removed, and currently house a hose valve and fire extinguisher within each cabinet. The 1-1/2" bronze hose valves are corroded and the hose connection protective caps (Code required) are missing as indicated in Photo F2.5-3. While the cabinet provides some physical protection to prevent debris from getting into the connection, it doesn't prevent corrosion of the threads. NFPA 303 requires Class I standpipes (2-1/2" valves) with valves mounted at between 3' and 5' above the dock for ease of fire department connection.

HDPE piping extends from the water level, through the dock, and connects to galvanized piping and fittings at each cabinet as shown in Photo F2.5-4. We were unable to trace the piping serving these cabinets, but it was assumed the cabinets are all served from the manual dry standpipe system.

H5030.01.01 – PIPES AND FITTINGS **CI – 75**

Fusion-welded High Density Polyethylene (HDPE) piping is installed for most of the fire protection piping system, with unsupported piping resting in the water near the dock. Black HDPE potable water piping (with blue stripe) was used for this installation, and appears to be in good condition.

HDPE piping extends from the water level, through the dock, and connects to galvanized piping and fittings at each cabinet. We were unable to trace the piping serving these cabinets, but it was assumed the cabinets are all served from the manual dry standpipe system.

H5030.01.08 – STANDPIPE CONNECTIONS **CI – 60**

The manual dry standpipe fire department connection is located at the top of the ramp serving both A-Dock and the West Breakwater (See Photo F2.4-1). The HDPE piping appears to serve the standpipe behind a hose cabinet, and the 3 cabinets located on the West Breakwater (See Photo F2.4-2).

The manual wet standpipe hose cabinet near the fueling station is in fair condition (See Photo F2.4-3). The water piping connection at this hose box is insulated for freeze protection, and the insulation is in poor condition. Copper water piping appeared to be in good condition.

H5030.01.09 – OTHER FIRE PROTECTION COMPONENTS **CI – 60**

There are 3 hose cabinets on the West Breakwater that have had hose assemblies removed, and currently house a hose valve and fire extinguisher within each cabinet. The bronze hose valves are corroded and the hose connection protective caps (Code required) are missing (See Photo F2.4-4). While the cabinet provides some physical protection to prevent debris from getting into the connection, it doesn't prevent corrosion of the threads. It is unclear if the low valve position within these cabinets meets the NFPA 14 requirement to have valve connections between 3' and 5' above the dock.

2.4.2 RECOMMENDATIONS

Repairs are recommended to the elements listed below. If an element is not listed, then no significant defects are present that warrant repairs. Floating docks and breakwaters typically have a useful service life on the order of 20 to 30 years that may be extended with routine maintenance, repairs and upgrading. The age of the West Breakwater is unknown, however, it is estimated to have 20-25 or more years of remaining service life, provided it is maintained and inspected on a regular basis. The structure should be re-inspected in 2020.

Recommended Structural Repairs:

Immediate Repairs (0-2 yr)

- Replace failed timber rub strips.
- Repair failed guide pile assembly.
- Seal top of service dock float modules with recommended concrete sealer.

Near Term Repairs (2-5 yr)

- Replace steel cleats with significant corrosion and section loss.
- Replace corroded fuel dock and breakwater guide pile assemblies.
- Replace float modules on service float that exhibit delaminated concrete and rust staining, and replace associated steel tie rods and timber wales.
- It can be anticipated that routine maintenance items will be required consisting of replacing discrete section of rub strips and rub rails, tightening loose cleats, and replacing guide pile rub blocks.

Long Term Repairs (5-15 yr)

- Complete routine recoating of steel piles in the splash zone. Typically steel piles will require coating maintenance on a 10-15 year cycle.
- It can be anticipated that routine maintenance items may be required as described in the near term repairs, with the extent and frequency of the maintenance increasing exponentially with the age of the structure. Additionally, it can be anticipated that other long-term maintenance

items will be required consisting of replacing discrete sections of timber wales, replacing tie-rods, completing localized concrete spall repairs, and replacing transition plates.
- The complete floating breakwater dock system should be programmed for replacement in 25-30 years.

Recommended Electrical Repairs:

Immediate Repairs (0-2 yr)

- Replace enclosed circuit breakers at each transformer
- Replace missing circuit breaker covers
- Replace rusted circuit breakers

Near Term Repairs (2-5 yr)

- Replace transformers
- Provide additional powercenters or provide a way for cords to cross float free from physical damage
- Provide GFCI protection for all power on dock

Long Term Repairs (5-15 yr)

- None

Recommended Fire Protection Repairs:

Immediate Repairs (0-2 yr)

- Replace the hose cabinets with Class I 2-1/2" standpipe valves and connect to existing 3" galvanized piping above the dock level
- Replace cold water piping closed cell foam insulation with elastomeric insulation and jacketing, for freeze protection
- We also recommend the Port of Bremerton have the local Fire Department review the standpipe valve locations and assure fire hoses can easily be connected to the standpipes

Near Term Repairs (2-5 yr)

- Remove rust and paint galvanized fitting threads

Long Term Repairs (5-15 yr)

- None

2.4.3 RECOMMENDED REPAIR COSTS

The estimated budgetary cost for these repairs is $329,000 (see Appendix B - Cost Estimate).

TABLE 2.4-1
WEST BREAKWATER - ESTIMATED BUDGETARY COST SUMMARY

PRIORITY	RECOMMENDATIONS	ESTIMATED CONSTRUCTION COSTS
Immediate	• Replace failed timber rub strips • Repair failed guide pile assembly • Seal top of service dock float modules • Replace enclosed circuit breakers at each transformer • Replace missing circuit breaker covers • Replace rusted circuit breakers • Clean all standpipe valves, and provide hose connections with caps. Confirm valves are fully operational through NFPA 14 testing • Replace cold water piping closed cell foam insulation with elastomeric insulation and jacketing	$62,000
Near Term	• Replace steel cleats • Replace corroded fuel dock and breakwater guide pile assemblies • Replace float modules and associated steel tie rods and timber wales • Replace transformers • Provide additional powercenters • Provide GFCI protection for all power on dock • Remove rust and paint galvanized fitting threads	$190,500
Long Term	• Complete routine recoating of steel piles in the splash zone	$76,500
	Total	**$329,000**

Estimated Construction Costs include:

15% Contingency
6% Engineering
10% Mobilization
25% Contractor Overhead and Profit

2.4.4 PHOTOGRAPHS

Structural Photographs

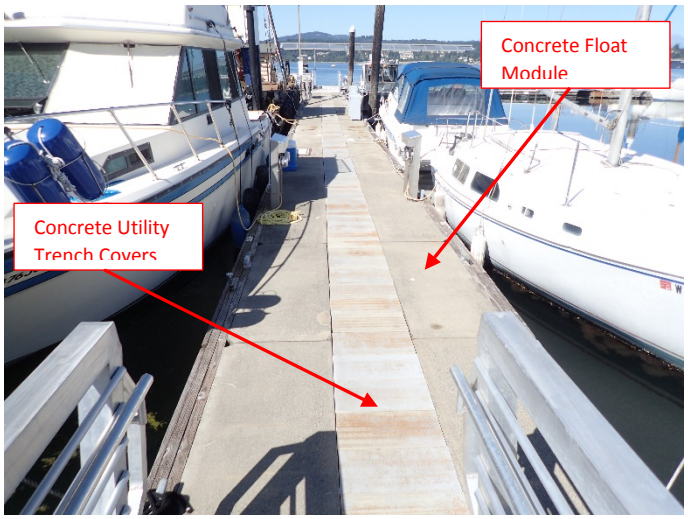
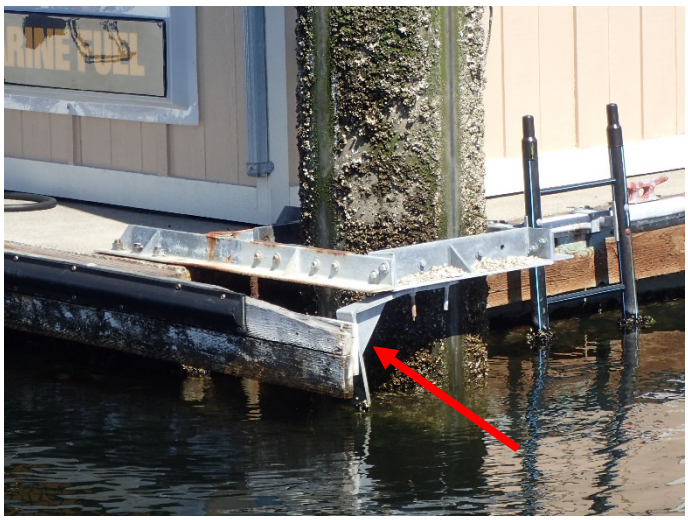
	Photo S2.4-1: Overall of West Breakwater (Looking Northwest)
	Photo S2.4-2: Overall of Fuel Float (Looking Northeast)
	Photo S2.4-3: Overall of Service Float (Looking West)

	Photo S2.4-4: Typical Guide Pile Condition
	Photo S2.4-5: Condition of Transition Gangway
	Photo S2.4-6: Typical Cracking in Service Float Modules

	Photo S2.4-7: Delaminated Concrete and Rust Staining in Float Modules at Mid-Point of Service Float
	Photo S2.4-8: Typical Condition of Fuel and Breakwater Float Modules
	Photo S2.4-9: Typical Coated Cleat Condition

	Photo S2.4-10: Steel Cleat on West Breakwater with Corrosion and Scaling on the Base Plate
	Photo S2.4-11: Failed Timber Rub Strip at North End of West Breakwater
	Photo S2.4-12: Failed Timber Rub Strip 20' from North End of West Breakwater

	Photo S2.4-13: Typical Guide Pile Assembly Condition
	Photo S2.4-14: Failed Guide Pile Assembly Bracket on South End of West Breakwater

Electrical Photographs

	Photo E2.4-1: Typical east end powercenter.
	Photo E2.4-2: West end powercenter with missing covers for circuit breakers and power cord draped across deck.
	Photo E2.4-3: West end powercenter with missing covers on circuit breakers

	Photo E2.4-4: Rusted transformer #2
	Photo E2.4-5: Rusted transformer #2
	Photo E2.4-6: Enclosed 150A circuit breaker at transformer #1.

	Photo E2.4-7: Enclosed 100A circuit breaker at transformer #1.
	Photo E2.4-8: Enclosed 150A circuit breaker at transformer #2. Deadfront is missing and bottom has rusted away.
	Photo E2.4-9: Enclosed 100A circuit breaker at transformer #2. Bottom is starting to rust away.

	Photo E2.4-10: Typical light pole base.

Fire Protection Photographs

	Photo F2.4-1: Manual dry standpipe fire department connection
	Photo F2.4-2: Typical fire hose cabinet
	Photo F2.4-3: Manual wet standpipe near fueling station

	Photo F2.4-4: Typical manual dry standpipe fitting in cabinet

.

APPENDIX A: INDUSTRY DATA AND DEFINITIONS

Table A-1. Port Orchard Marina Concrete Floating Dock Service Life Estimates

Asset	Material	Expected Service Life (years)		Typical Causes of Deterioration	Typical Maintenance		Frequency (years)
		Minimum	Maximum				
Piles	Timber	15	30	Exposure, abrasion, decay, marine animals	LM	Remove accumulated marine growth	As needed
	Steel	15	40	Exposure, abrasion, corrosion	M	Remove accumulated marine growth, recoat	As needed
Float	Concrete	25	40	Top (exposed deck) exposure, abrasion	M	Routine washing, periodic spall repairs, routine sealing (after the initiation of significant cracks)	2
				Sides/bottom exposure, marine growth	LM	Remove marine growth	As needed
	Foam core	25	40	Saturation, marine growth, aggressive environment	NM		
Wales	Timber	20	30	Exposure, abrasion, decay, marine animals	LM	Remove marine growth	As needed
Rub strips(1)	Timber	20	30	Exposure, abrasion, decay, marine animals	LM	Remove marine growth	As needed
Tie-Rods(2)	Steel	10	20	Corrosion	NM		
Cleats	Steel	10	40	Corrosion	M	Routine clean/coat, tighten loose connections	5
Guide Pile Assemblies(1)	Steel/Timber	10	20	Corrosion/abrasion	M	Replace worn rub blocks, tighten loose connections, clean/coat steel components (if practical)	2 to 5
Curbs	Timber	10	20	Exposure, decay	LM	Tighten loose connections	2

NM - no practical maintenance

LM - limited practical maintenance

M - routine maintenance advised

Minimum Expected Service Life assumes poor construction, aggressive environment, limited maintenance

Maximum Expected Service Life assumes good construction, mild environment, regular maintenance

(1) Generally considered to be sacrificial elements requiring periodic maintenance

(2) If ties rods fail due to corrosion, wales are susceptible to premature failure due to increased stress

Table A-2. Timber Condition Categorization

Category	Description
Minor	(5–15%) section or strength loss, sound surface material, minor abrasion damage, no evidence of marine borer damage.
Moderate	(15-45%) section or strength loss, significant loss of outer shell material, evidence of borer damage, significant abrasion damage.
Major	(45-75%) section or strength loss, significant loss of outer shell and interior material, severe marine borer damage, severe abrasion damage.
Severe	Greater than 75% section or strength loss, severe borer damage.

Source: *Design of Marine Facilities for the Berthing, Mooring, and Repair of Vessels*, John W. Gaythwaite, 2004.

Table A-3. Steel Condition Categorization

Category	Description
Minor	(5–15%) steel or strength loss, light surface rust, light pitting.
Moderate	(15-45%) steel or strength loss, rust that is loose and flaking with some pitting. The scaling, or exfoliation, can be removed with some effort with hand tools.
Major	(45-75%) section or strength loss, medium rust, and pitting.
Severe	Greater than 75% steel or strength loss, heavy, stratified rust, or rust scales with extensive pitting. Removal requires exerted effort and may require power-operated tools.

Source: *Design of Marine Facilities for the Berthing, Mooring, and Repair of Vessels*, John W. Gaythwaite, 2004.

Table A-4. Concrete Condition Categorization

Category	Description
Minor	Original, sound hard surface with no exposed reinforcing. Fine cracks, slight rust staining or spalls up to 6-inch diameter and 1 inch deep.
Moderate	Softening of the concrete, limited spalling, exposed reinforcing with corrosion, rust staining, medium cracks, and spalls up to 12-inch diameter and 2 inches deep.
Major	(40% to 50%) concrete section loss, large spalls (greater than 12 inches across, any depth), wide cracks, reinforcing with apparent section loss, widespread surface disintegration.
Severe	Greater than 50% concrete section loss, exposed reinforcing, no remaining structural strength.

Source: *Design of Marine Facilities for the Berthing, Mooring, and Repair of Vessels*, John W. Gaythwaite, 2004.

Table A-5. Recommended Maximum Interval between Underwater Routine Inspections (Years).

		Construction Material					
		Unwrapped Wood or Unprotected Steel (No Coating or Cathodic Protection)		Concrete, Wrapped Wood, Protected Steel, or Composite Materials (FRP, Plastic, etc.)		Channel Bottom or Mudline - Scour (Soundings /Direct Observation)	
Condition Rating from Previous Inspection		Benign Environment	Aggressive Environment	Benign Environment	Aggressive Environment	Benign Environment	Aggressive Environment
6	(Good)	6	4	6	5	6 / 6	2 / 5
5	(Satisfactory)	6	4	6	5	6 / 6	2 / 5
4	(Fair)	5	3	5	4	6 / 6	2 / 5
3	(Poor)	4	3	5	4	6 / 6	2 / 5
2	(Serious)	2	1	2	2	2 / 2	2 / 2
1	(Critical)	0.5	0.5	0.5	0.5	1 / 1	0.5 / 1

Source: *Underwater Investigations – Standard Practice Manual*, American Society of Civil Engineers, 2001.

APPENDIX B: COST ESTIMATES

A-Dock

NAVFAC 11013/7 (1-78)	CONSTRUCTION COST ESTIMATE						SHEET 1 OF 1 DATE PREPARED October 2015	
ACTIVITY AND LOCATION Port of Bremerton Bremerton, WA			CONSTRUCTION CONTRACT NO. N/A				IDENTIFICATION NUMBER N/A	
PROJECT TITLE Breakwater and Floating Dock Evaluation and Repair Alternatives Report			ESTIMATED BY Collins Engineers, Inc. Seattle, WA				CATEGORY CODE NUMBER	
			STATUS OF DESIGN _X_ PED ___ 60% ___ 100% ___ FINAL ___ OTHER				JOB ORDER NUMBER	
ITEM DESCRIPTION	QUANTITY		MATERIAL COST		LABOR COST		ENGINEERING ESTIMATE	
	NUMBER	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
Immediate Repairs								
Replace Guide Pile Rub Blocks	6	EA	$25	$150	$50	$300	$75	$450
Replace Trench Covers with Aluminum Grating	10	EA	$450	$4,500	$150	$1,500	$600	$6,000
Replace missing circuit breaker covers	2	EA	$50	$100	$100	$200	$150	$300
Replace rusted circuit breakers	2	EA	$50	$100	$100	$200	$150	$300
Repair FP standpipes	1	LS	$2,100	$2,100	$3,400	$3,400	$5,500	$5,500
Near Term Repairs								
Replace Transition Plate	1	EA	$500	$500	$300	$300	$800	$800
Replace Piles	4	EA	$1,500	$6,000	$2,000	$8,000	$3,500	$14,000
Replace Guide Pile Assemblies	4	EA	$250	$1,000	$1,000	$4,000	$1,250	$5,000
Relocate power center	1	LS	$2,000	$2,000	$3,000	$3,000	$5,000	$5,000
Provide GFCI protection for dock	1	LS	$5,000	$5,000	$5,000	$5,000	$10,000	$10,000
Replace all elec. connections less than 12" above deck	1	LS	$15,000	$15,000	$15,000	$15,000	$30,000	$30,000
Repair FP Piping	1	LS	$1,300	$1,300	$2,100	$2,100	$3,400	$3,400
Long Term Repairs								
Replace Piles	12	EA	$1,800	$21,600	$2,400	$28,800	$4,200	$50,400
Replace Guide Pile Assemblies	12	EA	$300	$3,600	$1,200	$14,400	$1,500	$18,000
Replace enclosed circuit breakers	4	EA	$2,000	$8,000	$2,000	$8,000	$4,000	$16,000
Replace transformers	2	EA	$8,000	$16,000	$7,000	$14,000	$15,000	$30,000
							SUB TOTAL	$195,150
							Contingency (15%)	$29,273
							Mob/Demob (10%)	$19,515
							Engineering (6%)	$11,709
							Overhead/Profit (25%)	$48,788
							SUB TOTAL (ROUNDED)	$305,000
Immediate Contech Surfacing repairs include 1 panel x 8' x 5'							CONTECH	$2,400
Near Term Contech Surfacing repairs include 2 panel x 8' x 5'							CONTECH	$4,800
							TOTAL	**$312,200**

Notes:

1. These cost estimates were developed based upon conversations with contractors specializing in work of this nature, prior experience with projects of a similar nature, and Means Heavy Construction Cost Data.

A-Dock

NAVFAC 11013/7 (1-78)	CONSTRUCTION COST ESTIMATE	SHEET 1 OF 1 DATE PREPARED October 2015
ACTIVITY AND LOCATION Port of Bremerton Bremerton, WA	CONSTRUCTION CONTRACT NO. N/A	IDENTIFICATION NUMBER N/A
PROJECT TITLE Breakwater and Floating Dock Evaluation and Repair Alternatives Report	ESTIMATED BY Collins Engineers, Inc. Seattle, WA	CATEGORY CODE NUMBER
	STATUS OF DESIGN _X_ PED ___ 60% ___ 100% ___ FINAL ___ OTHER	JOB ORDER NUMBER

ITEM DESCRIPTION	QUANTITY PER CYCLE		MATERIAL COST		LABOR COST		ENGINEERING ESTIMATE	
	NUMBER	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
A-Dock Breakwater Replacement Cost (@ YR 15)								
Marina Replacement Cost	7,000	SF	$160	$1,120,000	$110	$770,000	$270	$1,890,000
CAPITAL COST SUBTOTAL								$1,890,000
Overhead/Profit (25%)								$473,000
Engineering/Permitting/Contingency (15%)								$355,000
CAPITALCOST TOTAL (ROUNDED)								$2,800,000

Notes:

1. These cost estimates were developed based upon conversations with contractors specializing in work of this nature, prior experience with projects of a similar nature, and Means Heavy Construction Cost Data.

East Breakwater

NAVFAC 11013/7 (1-78)	CONSTRUCTION COST ESTIMATE						SHEET 1 OF 1 DATE PREPARED Ocober, 2015	
ACTIVITY AND LOCATION Port of Bremerton Bremerton, WA			CONSTRUCTION CONTRACT NO. N/A				IDENTIFICATION NUMBER N/A	
PROJECT TITLE Breakwater and Floating Dock Evaluation and Repair Alternatives Report			ESTIMATED BY Collins Engineers, Inc. Seattle, WA				CATEGORY CODE NUMBER	
			STATUS OF DESIGN _X_ PED ___ 60% ___ 100% ___ FINAL ___ OTHER				JOB ORDER NUMBER	
ITEM DESCRIPTION	QUANTITY		MATERIAL COST		LABOR COST		ENGINEERING ESTIMATE	
	NUMBER	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
Immediate Repairs								
Seal Approach Floats	2,000	SF	$1	2,000	$3	6,000	$4	$8,000
Replace Guide Pile Rub Blocks	4	EA	$25	100	$50	200	$75	$300
Tighten Loose Cleats and Loose Timber Curbs	1	LS	$100	100	$900	900	$1,000	$1,000
Replace Transition Plate Anchors (Each Transition)	9	EA	$25	225	$150	1,350	$175	$1,575
Replace Transition Plates	9	EA	$700	6,300	$200	1,800	$900	$8,100
Replace Rub Strips	10	LF	$5	50	$25	250	$30	$300
Replace Curbs	30	LF	$15	450	$20	600	$35	$1,050
Replace rusted angle brackets	9	EA	$20	180	$100	900	$120	$1,080
Replace rusted condulets	5	EA	$70	350	$200	1,000	$270	$1,350
Repair or replace broken boxes	1	EA	$500	500	$500	500	$1,000	$1,000
Repair FP Standpipes and Insulation	1	LS	$1,700	1,700	$3,300	3,300	$5,000	$5,000
Near Term Repairs								
Replace Float Connections	36	EA	$250	9,000	$1,000	36,000	$1,250	$45,000
Provide GFCI protection for dock	1	LS	$5,000	$5,000	$5,000	$5,000	$10,000	$10,000
Replace all elec. connections less than 12" above deck	1	LS	$20,000	$20,000	$20,000	$20,000	$40,000	$40,000
Repair FP piping corrosion	1	LS	$100	$20,000	$400	$20,000	$500	$500
Long Term Repairs								
Replace pile guide assemblies	7	EA	$300	2,100	$1,200	8,400	$1,500	$10,500
Replace transformers	2	EA	$7,000	14,000	$7,000	14,000	$14,000	$28,000
Add manual dry standpipe system	1	LS	$30,000	30,000	$45,000	45,000	$75,000	$75,000
							SUB TOTAL	$237,755
							Contingency (15%)	$35,663
							Mob/Demob (10%)	$23,776
							Engineering (6%)	$14,265
							Overhead/Profit (25%)	$59,439
							SUB TOTAL (ROUNDED)	$371,000
Immediate Contech Surfacing repairs 12' wide x 6'							CONTECH	$4,320
Near Term Contech Surfacing repairs 12' wide x 10'							CONTECH	$7,200
							TOTAL	**$382,600**

Notes:

1. These cost estimates were developed based upon conversations with contractors specializing in work of this nature, prior experience with projects of a similar nature, and Means Heavy Construction Cost Data.
2. Float is 12-ft wide, assumed full width x 6-ft for repairs

East Breakwater

NAVFAC 11013/7 (1-78)	CONSTRUCTION COST ESTIMATE						SHEET 1 OF 1 DATE PREPARED October, 2015	
ACTIVITY AND LOCATION Port of Bremerton Bremerton, WA			CONSTRUCTION CONTRACT NO. N/A				IDENTIFICATION NUMBER N/A	
PROJECT TITLE Breakwater and Floating Dock Evaluation and Repair Alternatives Report			ESTIMATED BY Collins Engineers, Inc. Seattle, WA				CATEGORY CODE NUMBER	
			STATUS OF DESIGN _X_ PED ___ 60% ___ 100% ___ FINAL ___ OTHER				JOB ORDER NUMBER	
ITEM DESCRIPTION	QUANTITY PER CYCLE		MATERIAL COST		LABOR COST		ENGINEERING ESTIMATE	
	NUMBER	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
East Breakwater Replacement Cost (@ YR 15)								
Breakwater Replacement Cost	9,400	SF	$160	$1,504,000	$110	$1,034,000	$270	$2,538,000
							CAPITAL COST SUBTOTAL	$2,538,000
							Overhead/Profit (25%)	$635,000
							Engineering/Permitting/Contingency (15%)	$476,000
							CAPITALCOST TOTAL (ROUNDED)	$3,700,000

Notes:

1. These cost estimates were developed based upon conversations with contractors specializing in work of this nature, prior experience with projects of a similar nature, and Means Heavy Construction Cost Data.

North Breakwater

NAVFAC 11013/7 (1-78)	CONSTRUCTION COST ESTIMATE	SHEET 1 OF 1 DATE PREPARED 8/28/2015
ACTIVITY AND LOCATION Port of Bremerton Bremerton, WA	CONSTRUCTION CONTRACT NO. N/A	IDENTIFICATION NUMBER N/A
PROJECT TITLE Breakwater and Floating Dock Evaluation and Repair Alternatives Report	ESTIMATED BY Collins Engineers, Inc. Seattle, WA	CATEGORY CODE NUMBER
	STATUS OF DESIGN X PED ___ 60% ___ 100% ___ FINAL ___ OTHER	JOB ORDER NUMBER

ITEM DESCRIPTION	QUANTITY		MATERIAL COST		LABOR COST		ENGINEERING ESTIMATE	
	NUMBER	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
Immediate Repairs								
Replace Bridle Chain 35	1	EA	$250	$250	$2,000	$2,000	$2,250	$2,250
Replace Failed Cleats	2	EA	$25	$50	$250	$500	$275	$550
Install cleats on tribal portion	10	EA	$25	$250	$250	$2,500	$275	$2,750
Tighten Loose Cleats and Loose Timber Curbs	1	LS	$150	$150	$1,200	$1,200	$1,350	$1,350
Replace Transition Plate Anchors (Each Transition)	15	EA	$25	$375	$150	$2,250	$175	$2,625
Replace Transition Plates	15	EA	$700	$10,500	$200	$3,000	$900	$13,500
Replace Curbs	40	LF	$15	$600	$20	$800	$35	$1,400
Replace rusted angle brackets	10	EA	$20	$200	$100	$1,000	$120	$1,200
Replace rusted condulets	6	EA	$70	$420	$200	$1,200	$270	$1,620
Replace rusted powercenter pedestals	4	EA	$1,000	$4,000	$1,000	$4,000	$2,000	$8,000
Repair broken panelboards and splice boxes	3	EA	$250	$750	$250	$750	$500	$1,500
Replace rusted conduit and conduit hangers	1	LS	$500	$500	$1,000	$1,000	$1,500	$1,500
Replace broken conduit fittings	1	EA	$30	$30	$200	$200	$230	$230
Replace beacon pole	1	EA	$2,000	$2,000	$1,000	$1,000	$3,000	$3,000
Near Term Repairs								
Replace Float Connections	64	EA	$250	$16,000	$1,000	$64,000	$1,250	$80,000
Relocate or add powercenters	1	LS	$5,000	$5,000	$5,000	$5,000	$10,000	$10,000
Provide GFCI protection for dock	1	LS	$5,000	$5,000	$5,000	$5,000	$10,000	$10,000
Replace all elec. connections less than 12" above deck	1	LS	$25,000	$25,000	$25,000	$25,000	$50,000	$50,000
Long Term Repairs								
Replace transformers	3	EA	$8,000	$24,000	$7,000	$21,000	$15,000	$45,000
Add FP Manual Standpipe	1	LS	$25,000	$25,000	$40,000	$55,000	$65,000	$65,000
						SUB TOTAL		$301,475
						Contingency (15%)		$45,221
						Mob/Demob (10%)		$30,148
						Engineering (6%)		$18,089
						Overhead/Profit (25%)		$75,369
						SUB TOTAL (ROUNDED)		$471,000
Immediate Contech Surfacing repairs 12' wide x 15'						CONTECH		$10,800
Near Term Contech Surfacing repairs 12' wide x 30'						CONTECH		$21,600
						TOTAL		**$503,400**

Notes:
1. These cost estimates were developed based upon conversations with contractors specializing in work of this nature, prior experience with projects of a similar nature, and Means Heavy Construction Cost Data.
2. Float is 12-ft wide, assumed full width x 6-ft for CONTECH repairs

North Breakwater

NAVFAC 11013/7 (1-78)	CONSTRUCTION COST ESTIMATE	SHEET 1 OF 1 DATE PREPARED 8/28/2015
ACTIVITY AND LOCATION Port of Bremerton Bremerton, WA	CONSTRUCTION CONTRACT NO. N/A	IDENTIFICATION NUMBER N/A
PROJECT TITLE Breakwater and Floating Dock Evaluation and Repair Alternatives Report	ESTIMATED BY Collins Engineers, Inc. Seattle, WA	CATEGORY CODE NUMBER
	STATUS OF DESIGN _X_ PED ___ 60% ___ 100% ___ FINAL ___ OTHER	JOB ORDER NUMBER

ITEM DESCRIPTION	QUANTITY PER CYCLE		MATERIAL COST		LABOR COST		ENGINEERING ESTIMATE	
	NUMBER	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
North Breakwater Replacement Cost (@ YR 15)								
Breakwater Replacement Cost	12,300	SF	$160	$1,968,000	$110	$1,353,000	$270	$3,321,000
CAPITAL COST SUBTOTAL								$3,321,000
Overhead/Profit (25%)								$831,000
Engineering/Permitting/Contingency (15%)								$125,000
CAPITALCOST TOTAL (ROUNDED)								$4,300,000

Notes:

1. These cost estimates were developed based upon conversations with contractors specializing in work of this nature, prior experience with projects of a similar nature, and Means Heavy Construction Cost Data.

West Breakwater

NAVFAC 11013/7 (1-78)	CONSTRUCTION COST ESTIMATE	SHEET 1 OF 1 DATE PREPARED 8/28/2015
ACTIVITY AND LOCATION Port of Bremerton Bremerton, WA	CONSTRUCTION CONTRACT NO. N/A	IDENTIFICATION NUMBER N/A
PROJECT TITLE Breakwater and Floating Dock Evaluation and Repair Alternatives Report	ESTIMATED BY Collins Engineers, Inc. Seattle, WA	CATEGORY CODE NUMBER
	STATUS OF DESIGN _X_ PED ___ 60% ___ 100% ___ FINAL ___ OTHER	JOB ORDER NUMBER

ITEM DESCRIPTION	QUANTITY		MATERIAL COST		LABOR COST		ENGINEERING ESTIMATE	
	NUMBER	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
Immediate Repairs								
Replace Damaged Rub Strips	30	LF	$5	$150	$50	$1,500	$55	$1,650
Replace Guide Pile Assembly Bracket	1	EA	$250	$250	$1,000	$1,000	$1,250	$1,250
Seal Approach Floats	1,150	SF	$1	$1,150	$3	$3,450	$4	$4,600
Replace missing circuit breaker covers	4	EA	$50	$200	$100	$400	$150	$600
Replace rusted circuit breakers	4	EA	$50	$200	$100	$400	$150	$600
Replace enclosed circuit breakers at transformers	4	EA	$2,000	$8,000	$2,000	$8,000	$4,000	$16,000
Replace Standpipes	1	LS	$6,000	$6,000	$9,000	$9,000	$15,000	$15,000
Near Term Repairs								
Replace Guide Pile Assemblies	14	EA	$500	$7,000	$1,500	$21,000	$2,000	$28,000
Replace Cleats	80	EA	$150	$12,000	$150	$12,000	$300	$24,000
Replace Deteriorated Service Float Modules	2	EA	$4,000	$8,000	$5,500	$11,000	$9,500	$19,000
Replace transformers	2	EA	$7,000	$14,000	$7,000	$14,000	$14,000	$28,000
Relocate or add pow ercenters	1	LS	$5,000	$5,000	$5,000	$5,000	$10,000	$10,000
Provide GFCI protection for dock	1	LS	$5,000	$5,000	$5,000	$5,000	$10,000	$10,000
Repair rusted FP fittings	1	LS	$1,000	$1,000	$2,000	$2,000	$3,000	$3,000
Long Term Repairs								
Recoat Piles	14	EA	$1,000	$14,000	$2,500	$35,000	$3,500	$49,000
							SUB TOTAL	$210,700
							Contingency (15%)	$31,605
							Mob/Demob (10%)	$21,070
							Engineering (6%)	$12,642
							Overhead/Profit (25%)	$52,675
							SUB TOTAL (ROUNDED)	$329,000
Immediate Contech Surfacing repairs - none							CONTECH	
Near Term Contech Surfacing repairs - none							CONTECH	
							TOTAL	**$329,000**

Notes:

1. These cost estimates w ere developed based upon conversations w ith contractors specializing in w ork of this nature, prior experience w ith projects of a similar nature, and Means Heavy Construction Cost Data.

West Breakwater

NAVFAC 11013/7 (1-78)	CONSTRUCTION COST ESTIMATE	SHEET 1 OF 1 DATE PREPARED 8/28/2015
ACTIVITY AND LOCATION Port of Bremerton Bremerton, WA	CONSTRUCTION CONTRACT NO. N/A	IDENTIFICATION NUMBER N/A
PROJECT TITLE Breakwater and Floating Dock Evaluation and Repair Alternatives Report	ESTIMATED BY Collins Engineers, Inc. Seattle, WA	CATEGORY CODE NUMBER
	STATUS OF DESIGN _X_ PED ___ 60% ___ 100% ___ FINAL ___ OTHER	JOB ORDER NUMBER

ITEM DESCRIPTION	QUANTITY PER CYCLE		MATERIAL COST		LABOR COST		ENGINEERING ESTIMATE	
	NUMBER	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
West Breakwater Replacement Cost (@ YR 20)								
Breakwater Replacement Cost	7,500	SF	$180	$1,350,000	$110	$825,000	$290	$2,175,000
CAPITAL COST SUBTOTAL								$2,175,000
Overhead/Profit (25%)								$544,000
Engineering/Permitting/Contingency (15%)								$408,000
CAPITALCOST TOTAL (ROUNDED)								$3,200,000

Notes:

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COLLINS
ENGINEERS INC.