McElhanney

BEST MANAGED COMPANIES

Marine Facility Condition Assessment of the Owen Bay Wharf

August 24th, 2022 | Revision 0

Submitted to: Strathcona Regional District (SRD)
Prepared by McElhanney Ltd.

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1. Introduction

1.1. PROJECT BACKGROUND

McElhanney Ltd. (McElhanney) has been retained by the Strathcona Regional District (SRD) to complete a condition assessment of the public wharf at Owen Bay, located on Sonora Island, BC. Figure 1 shows the site location of the wharf.

The marine facilities are generally in moderate condition with assumed limited maintenance and inspection having been completed over the last 10 years. McElhanney's assessment will be used to determine the need for repairs and/or replacements.

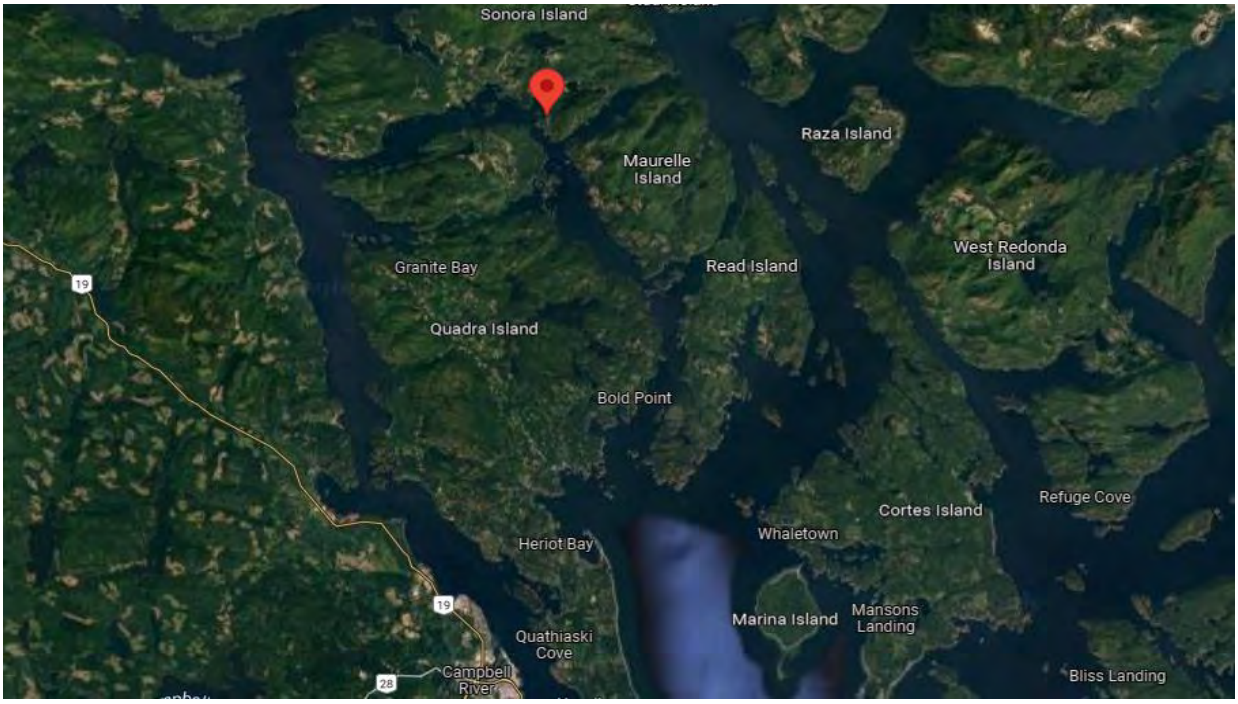

Figure 1 – Site Location

The above water site inspection was completed on September 22nd, 2021, and the underwater inspection was completed January 21st, 2022 by the following McElhanney personnel:

- Hannah Hladkowicz, EIT, Marine Structural Engineer
- Zach Tillapaugh, EIT, Structural Engineer

1.2. REFERENCE DRAWINGS

The following reference drawings and documents are available and have been reviewed by McElhanney:

- Drawings 1-3: Wharf Repairs, Owen Bay B.C., Transport Canada Harbours and Ports – Herold Engineering, March 2011
- Owen Bay Port Divestiture Program Final Report – McElhanney, January 2014
- Owen Bay Location Map

1.3. REFERENCE SYSTEM

The reference system used in the inspection is consistent with Figure 2 below.

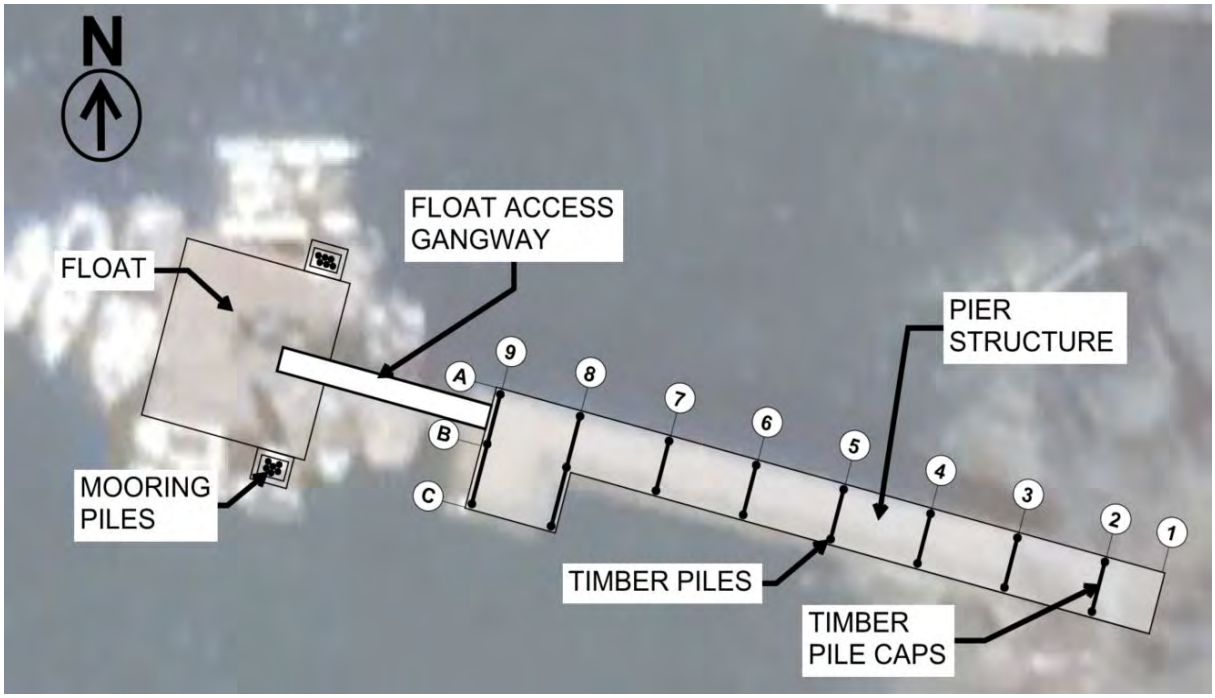

Figure 2 – Inspection Reference System

2. Description of Facilities

The wharf structure is a conventional treated timber wharf, approximately 105 feet long, and consists of the following:

- Conventional painted timber handrails including a top rail, mid-rail, and bull rail curb secured to handrail posts bolted to the edge stringer and bull rail
- Deck planks, typically 2” x 12”
- 6” x 12” stringers, typically at 30” centers
- 10” x 12” pile caps, typically at 15’ centers
- 12” nominally sized creosoted treated piles at 10’ centers along the bent. Bent Nos. 8 and 9 have (3) piles along the bent at the wharf head.
- 40 ft long aluminum truss gangway.
- 27’ x 29’ floating dock consisting of timber framing, topsides and decking, and buoyancy billets.
- (14) treated timber mooring piles, (6) at the south end and (8) at the north end, secured in mooring wells.

Figure 3 provides a reference sketch of the timber wharf structure. Inspection photographs can be found in Appendix A.

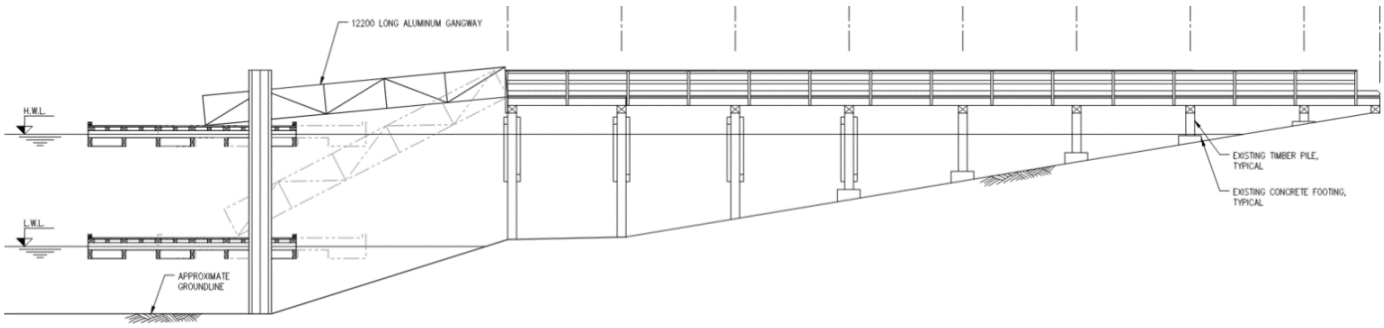

Figure 3 – Wharf Structure Elevation

3. Inspection Methodology and Limitations

An above water inspection of the marine assets was completed using visual inspections. The inspection methodology was completed in accordance with the procedures and recommendations provided in “Procedures for Inspection and Assessment of Fixed Timber Docks”, by RG Sexsmith Ltd. and dated September 1994, 4th Edition. This reference has been widely adopted by the Canadian Coast Guard, Department of Fisheries and Oceans Small Craft Harbours Branch, and Transport Canada in the evaluation and assessment of timber docks, piers, and wharves along the BC Coast.

The inspection methodology used is summarized as follows:

- Visual inspection of the timber elements from the lower intertidal zone to underside of deck was completed during a low tide window.
- An underwater inspection was completed to assess the condition of the piles and float using an underwater ROV mobilized from the floating dock.

The following inspection limitations should be considered when evaluating the results of the inspection findings:

- Both bankia and limnoria marine borers species are actively present on the BC Coast and can damage the timber pilings from the seabed to the intertidal zone. This should be identified during underwater inspections.
- The findings and recommendations are for the use of the SRD only.
- A detailed coring inspection of the timber members was not completed as part of the condition assessment.
- Users of the facility should always report any unusual conditions so that they can be evaluated by a Professional Engineer registered in British Columbia.
- Inspection is limited to what was observed on site, with the possibility that hidden defects and damage may not have been visible.

In accordance with the Ministry of Transportation and Infrastructure, Asset Performance Measures, for each structural element type, the overall condition state is provided based on a site inspection of each structure component.

- Excellent Condition – as-built condition, no observed defects.
- Good Condition – normal wear and deterioration
- Fair Condition – minor loss in condition or minor observed defects.
- Poor Condition – advanced loss in condition or significant defects.
- Very Poor Condition – serious loss in condition or serious defects.

4. Inspection Findings

4.1. WHARF STRUCTURE

4.1.1. Approach

The approach is in generally good condition (Photo 2). There are no signs of settlement in this area, and the slope around the abutment appears stable. No load rating sign has been posted.

Repairs are not considered necessary at this time; however ongoing monitoring of the approach is recommended. Consideration should also be given to posting a load rating sign and extending safety barriers to the approach area.

4.1.2. Topsides and Decking

The topsides are generally in fair to good condition with moderate widespread weathering and fungal decay (Photo 3 and Photo 4). Inspection findings are as follows:

- The timber handrails are well secured and in good condition. They were replaced approx. 10 years ago according to previous reference drawings provided by the SRD.

- The timber deck planks have widespread minor weathering and fungal decay, however, are in fair to good condition. The deck planks appear generally well secured, with some missing/loose nails.

Installation of an anti-slip grating to improve the safety during wet weather conditions is recommended. Consideration can be given to replacing and adding more nails to the decking. Ongoing monitoring of the condition of the topsides is recommended.

4.1.3. Stringers

The treated timber stringers are generally in good condition, with green algae growth (Photo 5). The stringers appear well secured between the decking and the pile caps, and there is no evidence of significant splitting or structural deterioration. The ends of the stringers, where the end grain is present, does not show significant evidence of moisture or fungal decay.

Repairs are not considered necessary at this time; however ongoing monitoring of the stringers is recommended.

4.1.4. Pile Caps

The treated timber pile caps are generally in fair to good condition with minor widespread weathering and green algae growth (Photo 6 and Photo 7). The pile caps appear well secured, and are typically aligned well over the piles, with no obvious evidence of shifting or displacement. Inspection findings are as follows:

- The pile cap at Bent No. 3 is in good condition and was replaced about 10 years ago according to the Wharf Repair drawings.

- The pile cap at Bent No. 4 has minor splitting at the end grain and top of the member on the south end (Photo 8).
- The pile cap at Bent No. 5 has severe splitting at the south end of the member (Photo 9).
- The pile cap at Bent No. 6 shows signs of deterioration at the end grain at the north end, as well as moderate to severe splitting at the south end (Photo 10 and Photo 11).
- The pile cap at Bent No. 8 has minor to moderate splitting at the north end (Photo 12).
- The through bolts from the bull rails directly above the pile caps at bents 8 and 9 connect to the pile caps (Photo 13).

Pile caps at Bent Nos. 8 and 9 should be monitored for potential fungal decay where the through-bolts are. Replacements of the pile caps at Bent Nos. 5 and 6 should be considered. Ongoing monitoring of the remaining pile caps is recommended.

4.1.5. Piles

The timber piles are generally in fair condition, with some minor damage to isolated piles, and widespread minor weathering and green algae growth (Photo 14 and Photo 15**Error! Reference source not found.**). Inspection findings are as follows:

- The existing capping over all piles (excluding piles 3A, 3B, 7A, 7B, 8B, 8C, 9A, 9B, and 9C) is deteriorated or missing, with some biological growth where this occurs (Photo 16).
- The piles are supported on concrete footings which are in fair to good condition. There are minor signs of scouring, and minor signs of undermining at bents 2 and 3.
- Pile No. 4B has a minor split down the length of the pile (Photo 17).
- Pile No. 5A has split at the top of the pile. It has been banded in 2 locations to prevent further spitting (Photo 18).
- Pile No. 6B has split at the top of the pile. It has been banded in 2 locations to prevent further spitting.

The missing and deteriorated capping should be replaced to prevent further damage to the tops of the piles. Pile 4B should be continually monitored and banded to prevent further splitting. Ongoing monitoring of the piles and footings and areas of damage is recommended. It is anticipated that the piles identified with splitting will have established internal fungal decay in the next 5-10 years and may be considered for replacement.

4.1.6. Cross Bracing

The timber cross bracing is generally in good condition (Photo 19 and Photo 20). There is widespread weathering, however the cross braces show no obvious sign of deterioration and are well secured to the piles.

Repairs are not considered necessary at this time; however ongoing monitoring of the cross bracing is recommended.

4.2. FLOATS

4.2.1. Access Gangway

The access gangway is in good condition with no significant corrosion or deterioration noted (Photo 21). According to the reference drawings it was replaced approximately 10 years ago. The inspection findings are as follows:

- The timber gangway slider plate is in fair condition with wearing and fungal decay and is well aligned with the gangway rollers (Photo 22).
- The structural members and welded connections appear to be in good condition.
- The upper hinge connections are well aligned, and the bolt connections are in good condition. The lower bolt on the south end connection has loosened slightly (Photo 23).

Repairs are not considered necessary at this time; however ongoing monitoring of the gangway is recommended.

4.2.2.Float

The float is in poor to fair condition (Photo 24). Inspection findings are as follows:

- The timber deck planks, bull rails and fascia boards have widespread weathering and fungal decay, (Photo 25 and Photo 26).
- The mooring wells are in good condition with repairs assumed to have been completed in the past 10 years. Wear strips have been installed on the inside of the wells.
- The timber mooring piles are in fair to good condition, with widespread minor fungal decay and weathering. There are no significant signs of abrasion from the floats to the pile faces. The connections at the top of the mooring piles are in good condition, and the wire rope lashing is secure (Photo 27 to Photo 31).
- One of the north mooring piles has some minor damage in the lower intertidal zone (Photo 32).
- The flotation elements are uncoated styrofoam billets (Photo 33).
- There is significant floatation loss at the southeast corner of the float; the freeboard is approx. 300mm less than at the northwest corner. The mooring well is cantilevered off this end of the float and is partially submerged in the water (Photo 34 and Photo 35).

The float capacity is a significant concern for the community. At the time of the inspection, the float was at full capacity, and multiple pleasure craft vessels had to be tied up to other vessels to access the float. In addition, other vessels must tie up at the mooring point to the southwest of the facility when spots have not been available. Consideration should be given to expanding the floating dock footprint for increased need. Consideration should be given to replacing the float along with the mooring system rather than continue regular minor maintenance/repairs.

5. Residual Life Estimates

The marine facility is typically in fair condition. For the purpose of this evaluation, the residual life represents the estimated period of time between the inspection date and the time when the component will typically require repair or replacement.

For timber docks in a saltwater/marine environment, the residual life estimate is based on the following:

- Where no established deterioration (marine borer cavities / fungal decay / mechanical abrasion) is noted in creosote treated timber, the remaining residual life is estimated to be 10+ years. As deterioration can progress rapidly in timber members once established, residual life estimates greater than 10 years are typically not given.

- Where deterioration has been established, the remaining residual life is estimated to be 2-7 years, depending on the extent of deterioration and likelihood to progress rapidly.

- Where there is deterioration which has significantly affected the structural capacity of the member the residual life is assumed to be minimal.

Based on McElhanney's understanding of the environment, usage, and familiarity with similar structures, Table 1 provides the estimates of the remaining service life of the wharf elements:

Table 1 – Summary of Recommendations

Location / Structure	Residual Life Estimate
Wharf Structure	
Approach	+10 years
Topsides	5-7 years
Decking	2-4 years
Stringers	8-10 years
Pile Caps	5-7 years
Piles	5-7 years
Floats	
Gangway	8-10 years
Float	2-4 years

6. Facility Recommendations and Cost Estimates

The Owen Bay Wharf facility is generally in fair condition and is expected to continue servicing public access for small craft vessels. Based on the inspection findings, there are several small maintenance items recommended in addition to replacement of the floating dock elements. Table 2 provides recommendations and cost estimates based on McElhanney's understanding that the SRD intends to invest significant maintenance effort in the facility as required.

The cost estimates for the repairs are show in Table 2.

Table 2 – Cost Estimates

Item	Priority	Description	Units	Quantity	Unit Cost	Subtotal
1	High	Install a load rating sign and approach barriers	LS	1	$3,000	**$3,000**
2	High	Miscellaneous pile cap repairs / replacements	Ea.	4	$5,000	**$20,000**
3	High	Replacement of deteriorated capping on piles	Ea.	9	$500	**$4,500**
4	High	New float with increased capacity (approx. quantity, to change with new design)	m^2	100	$1,200	**$120,000**
5	High	New steel mooring piles for the float	Ea.	6	$10,000	**$60,000**
6	Medium	Phased replacement of the timber decking	m^2	112	$250	**$28,000**
7	Medium	Miscellaneous pile repairs/replacements	Ea.	3	$12,000	**$36,000**
					High Priority Subtotal	$207,500
					Contingency (25%)	$51,875.00
					High Priority Total	**$259,375**
					Medium Priority Subtotal	$64,000
					Contingency (25%)	$16,000.00
					Medium Priority Total	**$80,000**
					Total Capital Cost Estimate	**$ 339,375**

In reviewing the cost estimates above, please note the following:

- Estimated is based on available cost estimate material and labour rate data from recent projects between 2019 to 2021 and assumes competitive contractor pricing.
- Estimate is considered accurate to ± 50%. A contingency of 25% has been provided to account for cost items which have not been considered due to the extent of engineering work completed to date.
- McElhanney recommends that a coring inspection be completed within 12 months of significant timber repairs to the stringers, pile caps, or piles to identify locations with internal fungal decay which are not identifiable from a visual inspection.

7. Closure

Please do not hesitate to contact the undersigned with any questions or comments.

Sincerely,
McElhanney Ltd.

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Revision History

Date	Status	Revision	Author
Nov. 29, 2021	Draft Issue	A	HH
Mar. 04, 2022	Draft Issue	B	HH
Aug. 24, 2022	For Use	0	HH

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APPENDIX A – INSPECTION PHOTOS

Photo 1 - General View facing West

Photo 2 - Approach area

Photo 3 - Topsides of the Wharf Structure

Photo 4 - General View of the Handrails

Photo 5 - General view of the Stringers

Photo 6 - General view of the Pile Cap Bents

Photo 7 - Weathering and green algae growth on Pile Caps

Photo 8 - Minor splitting of the Pile cap at Bent 4

Photo 9 - Severe splitting of the Pile cap at Bent 5

Photo 10 - Deterioration of the Pile Cap at Bent 6

Photo 11 - Moderate to Severe splitting of the Pile cap at Bent 6

Photo 12 - Minor to moderate splitting of the Pile cap at Bent 8

Photo 13 - Through bolts in the Pile Cap at Bent 9

Photo 14 - Typical weathering and green algae growth on piles

Photo 15 - Typical condition of undderwater piles

Photo 16 - Typical deteriorated capping on piles

Photo 17 - Minor splitting on Pile 4B

Photo 18 - Pile 5A with typical existing banded repair

Photo 19 - General view of Cross Bracing

Photo 20 - Tyical condition of underwater cross-bracing

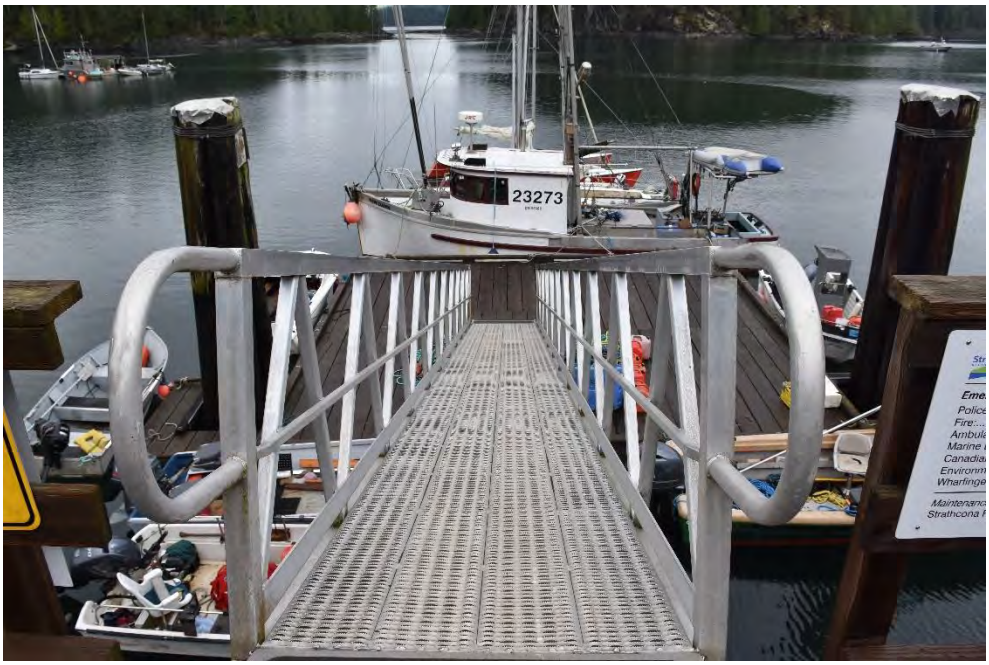

Photo 21 - General View of Aluminum Gangway

Photo 22 - Gangway slider plate and rollers

Photo 23 - Gangway Upper Hinge Connection with loose bolt

Photo 24 - General View of the float

Photo 25 - Typical condition of the timber decking

Photo 26 - Typical condition of the timber bull rails and fascia board

Photo 27 - South Mooring Piles

Photo 28 - North Mooring Piles

Photo 29 - South Mooring Piles

Photo 30 - South Mooring Piles

Photo 31 - North Mooring Piles

Photo 32 - North Mooring Piles

Photo 33 - Condition of exposed uncoated styrofoam billets

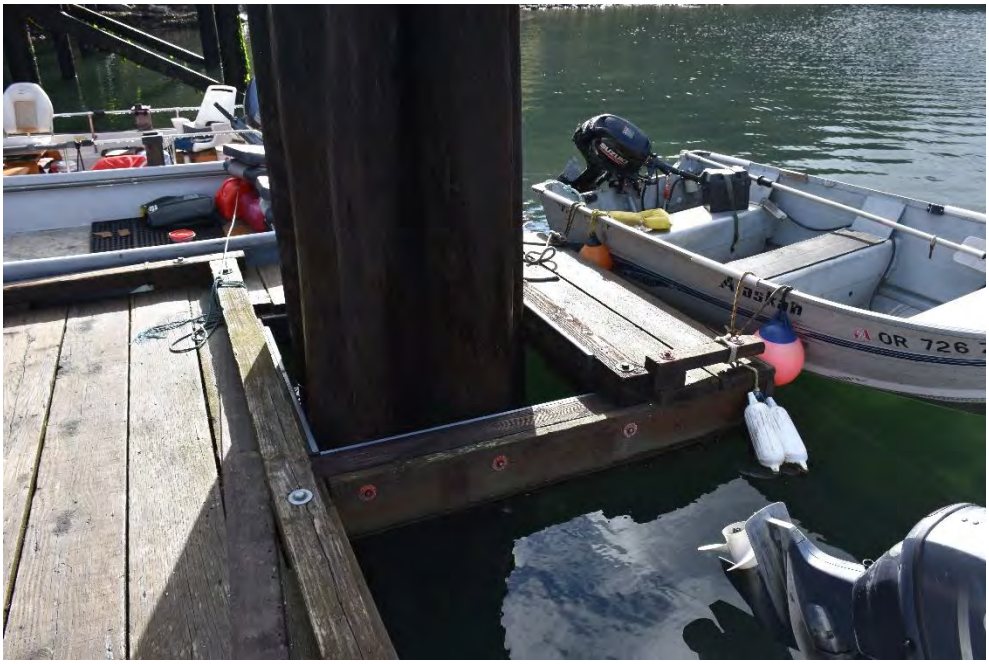

Photo 34 - South Mooring Well with significant flotation loss

Photo 35 - Typical condition under the south end of the float

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