Marine Facility Condition Assessment of the Surge Narrows Wharf

April 11th, 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 located at Surge Narrows located on Read Island, BC. Figure 1 shows the site location of the wharf.

The marine facilities are generally in fair condition. Repairs were completed in 2013, according to the reference drawings, and it has been assumed that limited maintenance and repairs were completed in the years following. McElhanney's assessment will be used to determine the need for repairs and/or replacements.

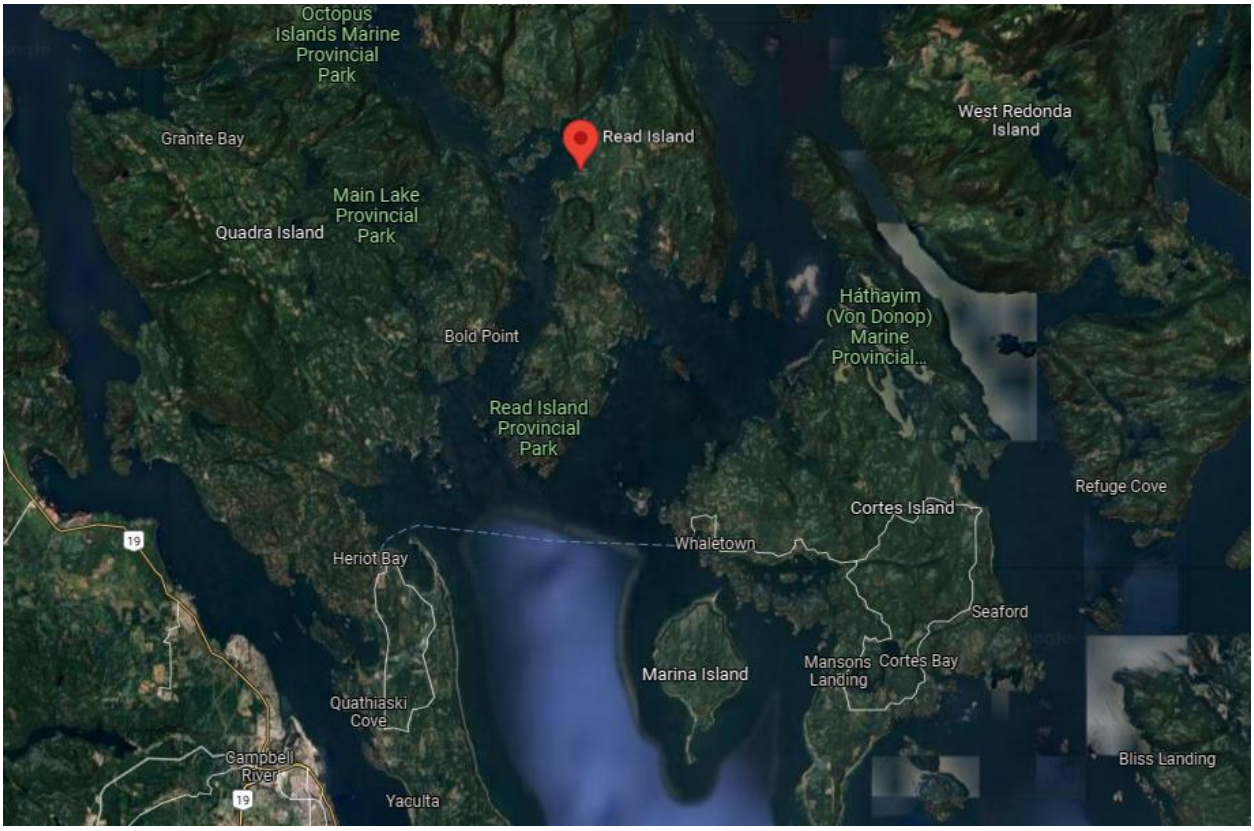

Figure 1 – Site Location

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:

- Sub-Tidal Dock and Piling Review – McElhanney, October 2013
- Surge Narrows Location Map
- Derrick Inspection and Servicing Report – Arrowsmith Engineering Services Ltd., June 2017
- Wharf and Float Repairs, Surge Narrows, BC – Herold Engineering Ltd., March 2013
- Surge Narrows Port Divestiture Program Final Report – McElhanney, January 2014
- Structure Condition Inspection and Report – Herold Engineering, February 2014
- Surge Narrows Wharf License Area

1.3. REFERENCE SYSTEM

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

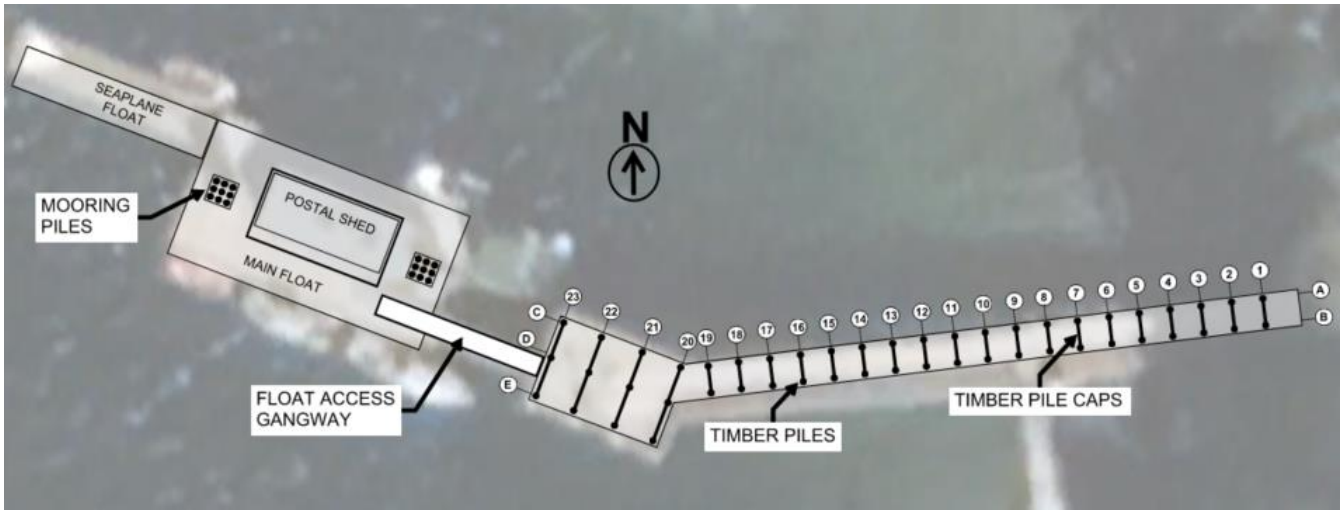

Figure 2 – Inspection Reference System

2. Description of Facilities

The wharf structure is a conventional treated timber wharf, approximately 170 feet long, and consists of the following:

- Painted timber handrails including a top rail, (2) mid-rails, and bull rail curb secured to handrail posts bolted to the edge stringer and bull rail
- Treated timber deck planks, typically 2” x 10”
- 6” x 12” stringers, typically at 12” centers
- Either 10” x 12” or 12” x 12” pile caps, typically at 8’ centers
- 12” nominally sized creosoted treated piles typically at 6’ centers along the bent, however varying in some locations. Bent Nos. 20, 21, 22 and 23 have (3) piles along the bent at the wharf head.
- 40 ft long aluminum truss gangway
- 30’ x 60’ main float consisting of timber framing, topsides and decking, and buoyancy billets.
- 9’ x 45’ seaplane float consisting of timber framing, topsides and decking, and buoyancy billets.
- (18) treated timber mooring piles, (9) at both the west and the east end of the main float, secured in mooring wells.

Inspection photographs can be found in Appendix A.

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 the floats. The inspection was completed using an underwater ROV mobilized from the floats.

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 1). There are no signs of settlement in this area, and the slope around the abutment appears stable. The load rating sign specifies a maximum gross vehicle weight of 5,300kg (Photo 2).

Repairs are not considered necessary at this time; however ongoing monitoring of the approach is recommended. Consideration should be given to extending the safety barriers to the approach area.

4.1.2. Topsides and Decking

The topsides are generally in good condition with minor widespread weathering (Photo 3). Inspection findings are as follows:

- The timber handrails are well secured and in good condition (Photo 4). These were replaced in 2013 according to the repair drawings by Herold Engineering. One section of the handrails on the south end is missing the lower mid-rail (Photo 5).
- The timber deck planks are in good condition with widespread minor weathering (Photo 6). All deck planks appear generally well secured. The decking was also replaced in 2013.
- There is one section along the wharf structure which leads to private property. This area is closed off to the general public (Photo 7).

The lower mid rail of the handrails should be installed where it is missing. Consideration should be given to removing access to the private property. Ongoing monitoring of the condition of the topsides is recommended.

4.1.3. Stringers

The timber stringers are generally in good condition (Photo 8). The stringers appear well secured between the decking and the pile caps, and there are no signs of significant splitting or structural distress.

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 condition, with widespread weathering and green algae growth, and damage to isolated members (Photo 9 to Photo 10). The pile caps appear well secured, and are typically aligned well over the piles, with no signs of shifting. Inspection findings are as follows in Table 1 below:

Table 1 – Pile Cap Inspection Findings

Location	Description of Findings	Photo
Bent No. 1	The pile cap is split on the north end.	Photo 11
Bent No. 2	The pile cap has a minor split at the south end grain.	Photo 12
Bent No. 4	The pile cap is fractured at the base in the center, and the end of one of the through bolts is exposed.	Photo 13
Bent No. 6	The pile cap is above 2 corbels on each pile. The corbels are in fair condition and secured vertically with a steel angle on one side. The top corbel at the north end is showing signs of splitting.	Photo 14 to Photo 15
Bent No. 7	The pile cap is above 2 corbels on the south pile. The corbels are in fair condition and stabilized vertically with a steel angle on one side. The bottom corbel is showing minor signs of splitting at the end grain.	Photo 16 to Photo 17
Bent No. 10	The pile cap is fractured at the base in the center, and the end of one of the through bolts is exposed.	Photo 18
Bent No. 11	The pile cap is splitting at the north end grain.	Photo 19
Bent No. 12	The pile cap is fractured at the base in the center, and the end of one of the through bolts is exposed.	Photo 20
Bent No. 13	The pile cap at is above 2 corbels on the south pile. The corbels are in fair condition and stabilized vertically with a steel angle on one side. The corbel is showing minor signs of splitting at the end grain.	Photo 21
Bent No. 14	The pile cap has some damage at the end grain on the north end.	Photo 22
Bents Nos. 2, 4, 6, 8, 10, 12 and 14	The pile caps do not extend the full length of the deck. The pile caps end approximated one foot before the end stringer on the south end. The end stringers therefore span 2 bents at these locations.	

Replacements of piles caps at Bent Nos. 1, 2, 4, 6, 7, 8, 10, 11, 12, 13 and 14 is strongly recommended. It is recommended that the corbels at bent 6 are laterally braced with sister channels, and all the corbels at Bent Nos. 6, 7, and 13 are braced vertically on both sides of the pile with either strapping or steel angles. Ongoing monitoring of the remaining pile caps is recommended.

4.1.5. Piles

The timber piles are generally in fair condition, with widespread fungal decay. Inspection findings are as follows:

- Pile No. 2B has a minor split at the top of the pile (Photo 23)
- Pile No. 4B has a split at the top of the pile. It has previously been banded to prevent further splitting (Photo 24).
- Pile No. 10B has multiple minor bolt holes in the intertidal zone (Photo 25).
- Pile No. 11B has a severe marine borer cavity in the intertidal zone (Photo 26).
- Pile 19A has a minor split in the intertidal zone (Photo 27).
- Pile 22A has some damage in the intertidal zone (Photo 28).
- The majority of the existing capping over the piles is deteriorated or missing.

The missing and deteriorated capping should be replaced to prevent further damage to the tops of the piles. Ongoing monitoring of the piles and areas of damage is recommended. It is recommended that any holes be plugged with a treated timber dowel if possible. It is anticipated that the piles identified with holes and splitting will have established internal fungal decay in the next 5-10 years and should be considered for replacement.

4.1.6. Fendering System

The timber fender piles are generally in fair condition, with no signs of significant deterioration or mechanical damage (Photo 29 to Photo 30).

McElhanney understands that the fender piles are not longer used for vessel moorage and repairs are not considered necessary at this time. Continued monitoring of the fender piles is recommended.

4.1.7. Cross Bracing

The timber cross bracing is generally in fair to good condition (Photo 31 to Photo 32). Inspection findings are as follows:

- There is widespread weathering, and minor fungal decay to the end grains of the members, however all cross braces appear well secured to the piles.
- There are two locations where timber log debris is trapped under the wharf structure and is resting on the cross-bracing. (Photo 33 to Photo 34).
- It appears a timber member was added as a side brace from the deck to pile 11B, however it is no longer secured to the pile and is hanging from the deck (Photo 35).

It is recommended that the timber log debris and the hanging side brace at pile 11B are removed. Ongoing monitoring of the cross bracing is recommended.

4.1.8. Derrick Loading Crane

The Derrick Loading Crane appears to be in fair condition with signs of corrosion (Photo 36 to Photo 38). The crane appears to still be in use. The hanging tackle is being secured to the timber handrails with a rope.

Consideration should be given to removing the crane if usage cannot be monitored.

4.2. FLOATS

4.2.1. Access Gangway

The access gangway is in good condition with no significant corrosion or deterioration of the welded connections (Photo 39). According to the repairs drawings it was replaced in 2013. The inspection findings are as follows:

- The gangway slider plate is in good condition and is well aligned with the gangway rollers (Photo 40).
- The upper hinge connections are well aligned, and the bolted connections are in good condition (Photo 41).

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

4.2.2. Main Float

The main float is in fair condition (Photo 42). Inspection findings are as follows:

- The timber deck planks were replaced in 2013 and are in good condition with minor weathering (Photo 43 to Photo 45).
- The bull rails and fascia board are in fair to good condition, with minor weathering (Photo 46).
- The floating dock does not appear to have consistent floatation, with flotation loss of 6 inches noted at the middle east side of the float. It appears there are no floatation elements in this area, which is directly surrounding the mooring well (Photo 47 to Photo 49). Additionally, the freeboard at the north end of the dock is about 6inches less than the south end. This could be due to the weight of the postal shed, which is further on the north end of the dock.
- The mooring piles and mooring dolphins have moderate abrasion with the dock structures (Photo 50 to Photo 57).

Consideration should be given to adding and/or replacing some of the flotation elements to improve the consistency of the freeboard of the main dock. Ongoing monitoring of the main float is recommended.

4.2.3. Seaplane Float

The seaplane float is in fair condition (Photo 58). Inspection findings are as follows:

- The timber deck planks, bull rails and fascia boards have widespread weathering and fungal decay (Photo 59 to Photo 60).
- On the north end of the seaplane float, rubber tires have been bolted to the fascia boards as fenders (Photo 60).
- There is some floatation loss at the west side of the seaplane float end, with the freeboard approx. 5 inches less than the east side. Additionally, the seaplane float freeboard is about 5 inches less than the main float, resulting in a step down between the docks which may pose a tripping hazard. A rubber mat has been installed as a transition mat (Photo 61).
- The seaplane float is secured by mooring anchor chains, on concrete anchors.

Consideration should be given to replacing the seaplane float along with the mooring system rather than continue regular minor maintenance/repairs. Consideration should also be given to the addition of a security gate to prevent access to the seaplane float.

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 follow:

- 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 2 provides the estimates of the remaining service life of the wharf elements:

Table 2 - Summary of Recommendations

Location / Structure	Residual Life Estimate
Wharf Structure	
Approach	+10 years
Topsides	8-10 years
Decking	8-10 years
Stringers	8-10 years
Pile Caps	1-2 years
Piles	2-4 years
Fender Piles	5-7 years
Floats	
Gangway	+10 years
Main Float	2-4 years
Seaplane Float	4-6 years

6. Facility Recommendations and Cost Estimates

The Surge Narrows 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 multiple maintenance items recommended. Table 2 provides recommendations and cost estimates based on McElhanney's understanding that the SRD intends to invest significant maintenance effort in the facility before 2024.

The cost estimates for the repairs are shown in Table 3.

Table 3 – Cost Estimates

Item	Priority	Description	Units	Quantity	Unit Cost	Subtotal
1	High	Repair and replace the handrails where needed.	m	10	$200	**$2,000**
2	High	Miscellaneous pile cap repairs / replacements	Ea.	11	$5,000	**$55,000**
3	High	Miscellaneous pile repairs/replacements	Ea.	3	$12,000	**$36,000**
4	Medium	Install new flotation billets on Main Float	Ea.	6	$5,000	**$30,000**
5	Medium	Full replacement of Seaplane Float	m^2	37	$1,200	**$44,400**
					High Priority Subtotal	$93,000
					Contingency (25%)	$23,250.0
					High Priority Total	**$116,250**
					Medium Priority Subtotal	$74,400
					Contingency (25%)	$18,600.0
					Medium Priority Total	**$93,000**
					Total Capital Cost Estimate	**$209,250**

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

- The current vessel moorage capacity is sufficient for future use. No expansion or increase in vessel moorage capacity is anticipated.
- 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
April 11, 2023	For Use	0	HH

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APPENDIX A – INSPECTION PHOTOS

Photo 1 - Approach area

Photo 2 - Load rating sign

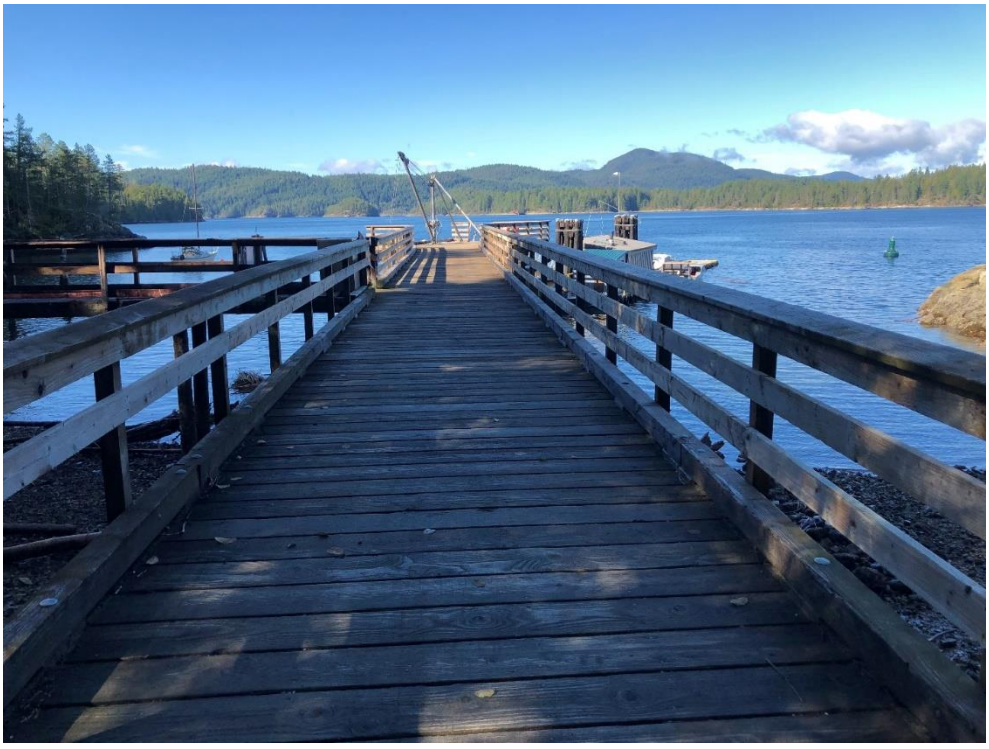

Photo 3 - Wharf Structure Topsides

Photo 4 - Wharf Structure Handrails

Photo 5 - Missing lower mid-rail

Photo 6 - Wharf Structure Decking

Photo 7 - Access to private property

Photo 8 - Typical View of Timber Stringers

Photo 9 - General View facing south of the timber pile caps

Photo 10 - Weathering and green algae growth on pile caps

Photo 11 - Split at the north end of the pile cap at Bent 1

Photo 12 - Minor splitting of the pile cap at Bent 2

Photo 13 - Pile cap at Bent 4

Photo 14 - Pile cap at Bent 6 and corbels

Photo 15 - Split in corbel at Bent 6

Photo 16 - Pile cap at Bent 7 and corbels

Photo 17 - Split in corbel at Bent 7

Photo 18 - Pile cap at Bent 10

Photo 19 - Pile cap at Bent 11

Photo 20 - Pile cap at Bent 12

Photo 21 - Pile cap at Bent 13 with corbels

Photo 22 - Pile cap at Bent 14

Photo 23 - Pile 2B

Photo 24 - Pile 4B

Photo 25 - Pile 10B

Photo 26 - Pile 11B

Photo 27 - Pile 19A

Photo 28 - Pile 22A

Photo 29 - North end fender piles

Photo 30 - North end fender piles and log debris

Photo 31 - General condition of the Cross Bracing

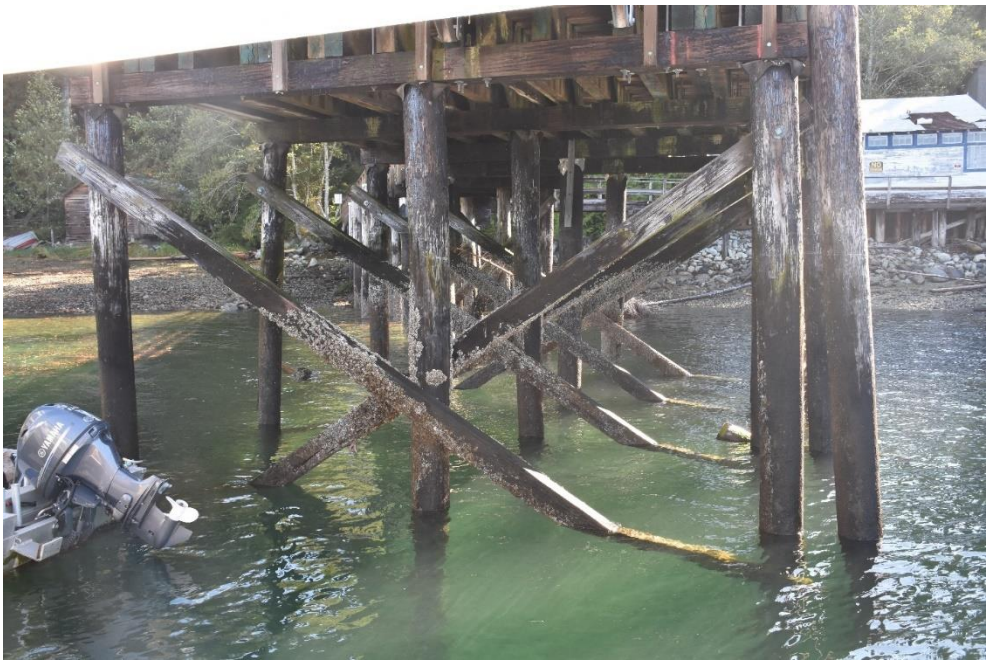

Photo 32 - General view of Cross Bracing

Photo 33 - Log resting on the Cross Bracing

Photo 34 - Log resting on the Cross Bracing

Photo 35 - Hanging side brace at pile 11B

Photo 36 - Derrick Loading Crane

Photo 37 - Derrick Loading Crane

Photo 38 - Derrick Loading Crane

Photo 39 - General View of Aluminum Gangway

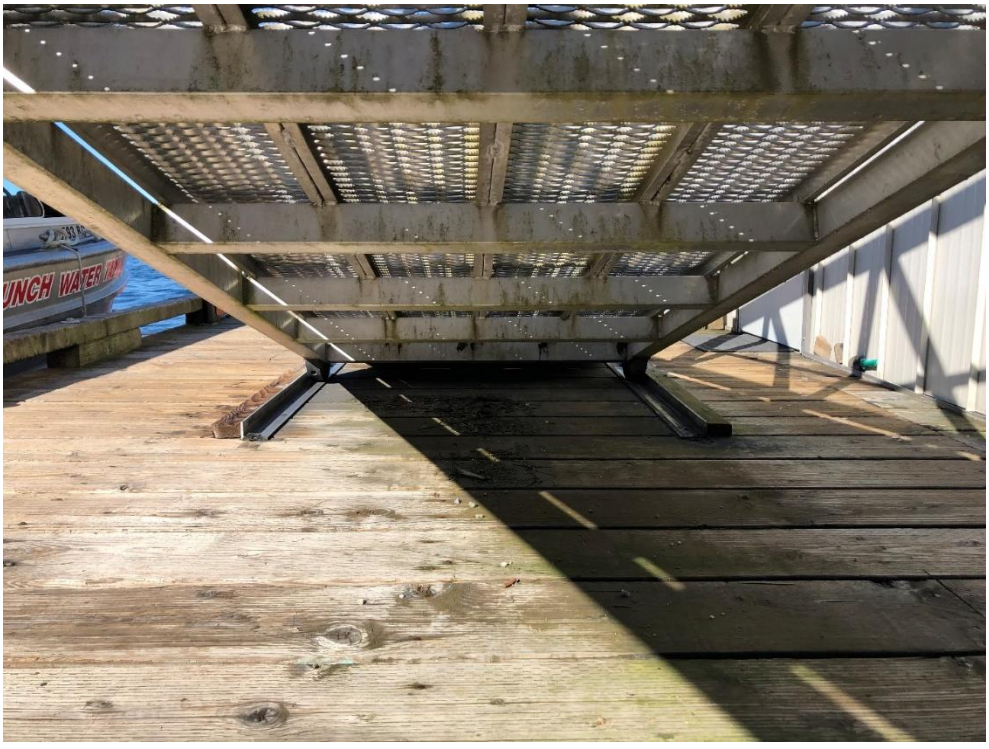

Photo 40 - Gangway slider plate and rollers

Photo 41 - Gangway Upper Hinge Connection

Photo 42 - General View of the Main Float

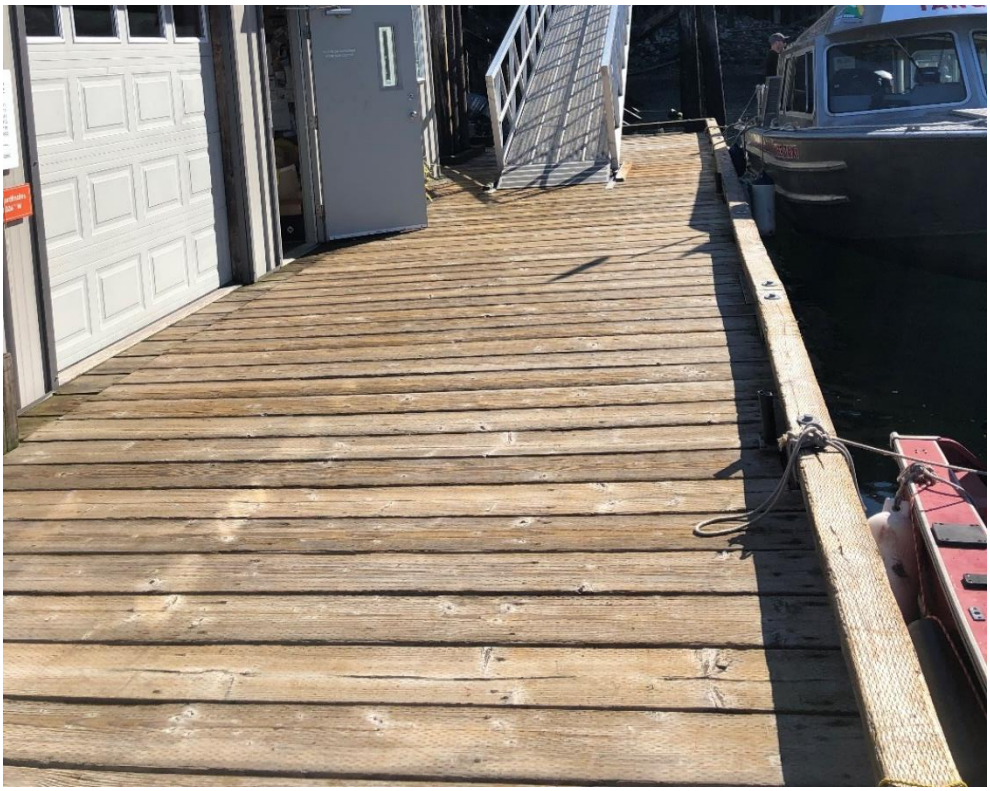

Photo 43 - Typical condition of the Main Float deck

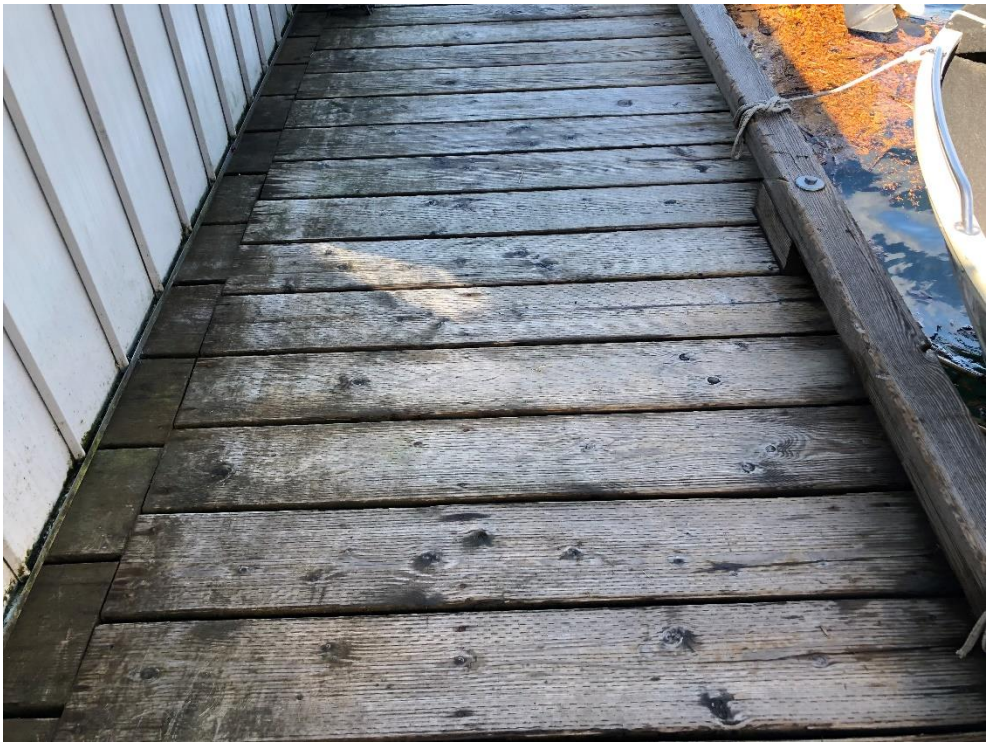

Photo 44 - Typical condition of the Main Float deck

Photo 45 - Typical condition of the deck beneath the postal shed

Photo 46 - Typical condition of the timber bull rails and fascia board on the Main Float

Photo 47 - Flotation loss at centre of the Main Float on the east end

Photo 48 - Main Float on the east end

Photo 49 - Main Float on the east end

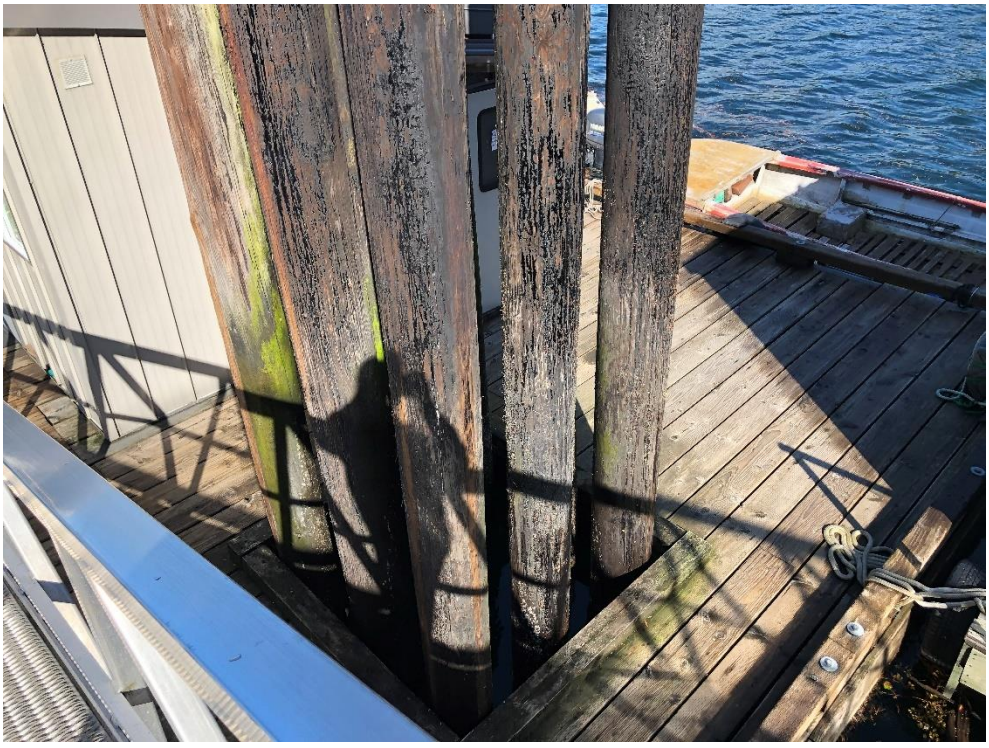

Photo 50 - East end Mooring Piles

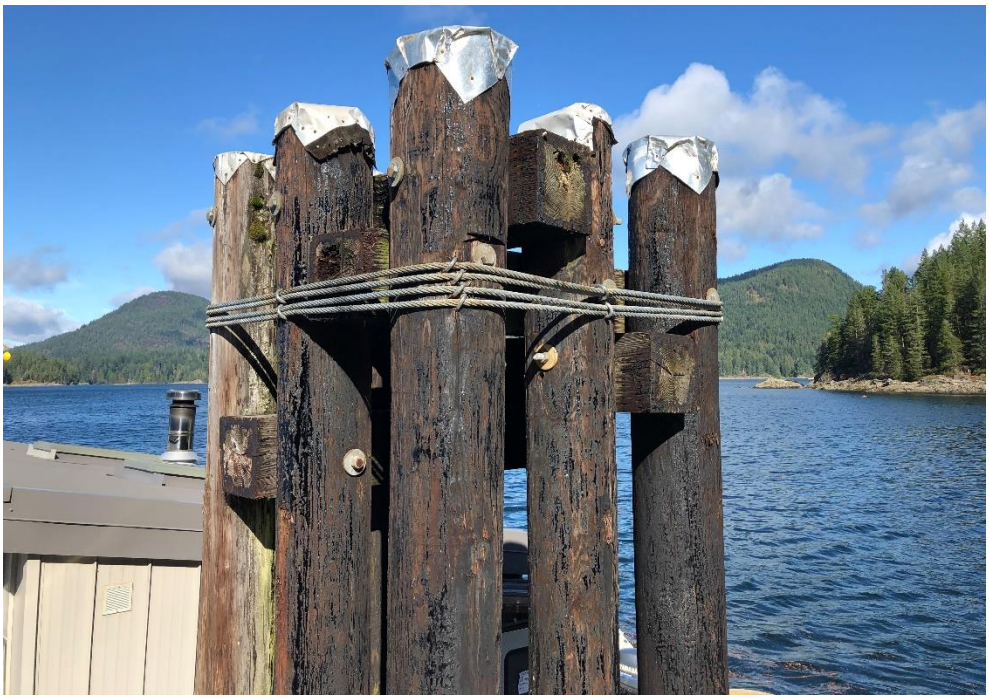

Photo 51 - East end Mooring Piles

Photo 52 - East end Mooring Piles

Photo 53 - West end Mooring Piles

Photo 54 - West end Mooring Piles

Photo 55 - West end Mooring Piles – up to 10% CSL

Photo 56 - West end Mooring Piles

Photo 57 - West end Mooring Piles

Photo 58 - General view of the Seaplane Float

Photo 59 - Typical condition of the Seaplane Float deck

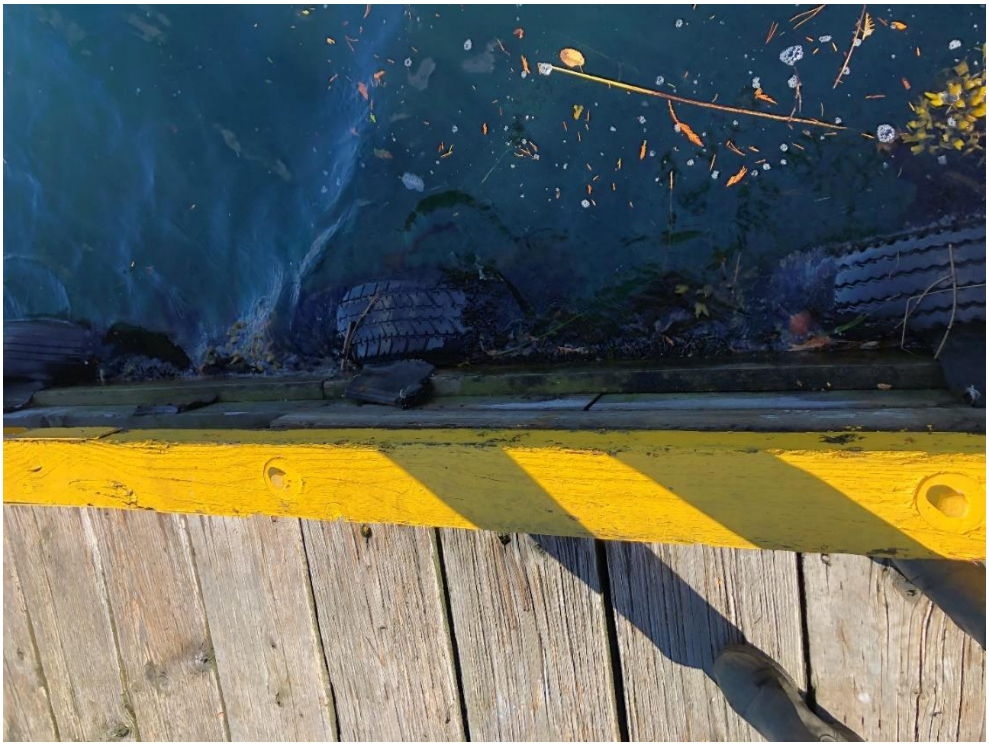

Photo 60 - Typical condition of the timber bull rails, fascia board and rubber tire fendering on the Seaplane Float

Photo 61 - Transition from the Main Float to the Seaplane Float

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