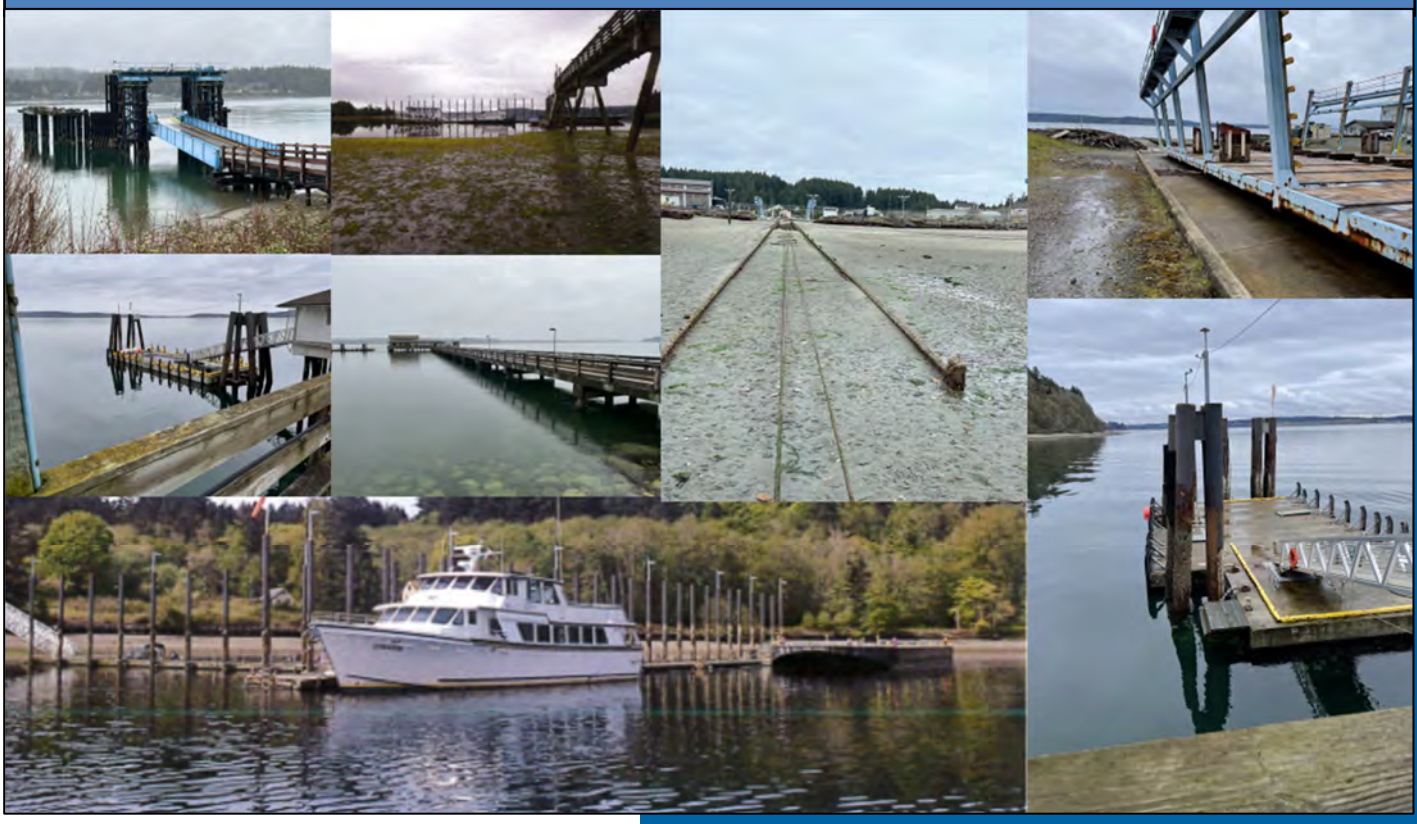
McNeil Island
Repair and Replacement Options
10182200022



Prepared by KPFF Consulting Engineers

Draft Repair and Replacement Options

June 30, 2022

kpff 60 YEARS

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

KPFF met with the Washington State Department of Corrections (DOC) on McNeil Island to observe the deficiencies of concern identified in Washington State Department of Transportation (WSDOT) Inspection Reports and additional concerns observed by the DOC staff working at the facilities. The scope of work is to review of the WSDOT reports, estimate and prioritize repairs of the deficiencies and replacement of the structures.

The Marine Railway Dry dock system is made up of a rail structure that allows for the cradle to travel from a submerged state in the water to a secured, upland working station for drydocked vessel maintenance work. The cradle is pulled into position with a traction-type winch system that utilizes snatch blocks connected to each end of the cradle and one at the water where the wire rope system is anchored. The existing winch system is utilizing wire rope to pull the cradle from the water to the working station.

The Steilacoom trestle is a fixed pier with timber piles which support a wood framed building. The floating ferry dock is accessed through the building. The concrete float is held in place with steel battered pile dolphins. A hinged aluminum gangway provides access between the building and the float.

The island side ferry mooring float is constructed of concrete floats held in place by steel batter pile dolphins. The concrete trestle is supported by steel piles and supports multiple structures. A hinged aluminum gangway provides access between the trestle and floats.

The Barge Dock consists of a timber pile supported timber trestle, a steel girder transfer span, timber pile supported hoist tower, and steel apron. Timber pile wing walls and steel pile dolphins surround the barge slip.

The Still Harbor Dock is used as the backup ferry landing as well as the primary dock for the emergency vessel and other vessels and barges that are out of service. The dock consists of concrete floats arranged in a T which are held in place by steel guide piles. The floats are accessed by a hinged aluminum gangway supported at the end of a concrete trestle. The trestle is supported by concrete piles.

EVALUATION OF EXISTING CONDITIONS AND PRIORITY RATINGS

The following condition rating ranking system is used to determine the severity of the structural deficiencies:

C1. Monitor the condition to ensure damage does not get worse. This element has the potential to turn into a more significant issue in the future if it gets worse.
C2. Requires action, but damage does not pose an immediate threat to the life safety.
C3. Requires immediate action to resolve the issue.

The following priority rating ranking system is used to determine the level of prioritization:

P1. Low priority, resolution to issue is not required now, but should be monitored for the potential to turn into a more significant issue.
P2. Medium priority, resolution to issue should be soon.
P3. High priority, resolution to issue should be immediate.

The total rating is achieved by adding the condition rating to the priority rating.

Marine Railway Dry Dock

Photo 1A: Marine Railway Dry Dock

Most of the fasteners within the system have heavy marine growth and surface corrosion. Surface corrosion is caused by electrochemical reactions that destroy the structure of the material. These occurrences result in fatigue of the metal and reduce the structural capabilities that they once had. The pile cap brackets and pile fasteners are all heavily corroded. These members are a concern because of the decrease in strength of their structure. The rail

base plates south of the bulkhead are all severely corroded with section loss. This severe corrosion is a typical occurrence when metals of different carbon content are in contact in a saltwater environment. The rails are not fully secured laterally by the rail base plates due to the section loss. This is of high concern because the rails are free to move in unsecured locations and could result in failure of the system during operation. The overall rating of the fasteners in the system is a three and requires immediate action.

The rails north of the bulkhead have minor uniform surface corrosion and pitting in sections. The rails south of the bulkhead have heavy surface corrosion, pitting and marine growth. The rail splice bars are heavily corroded and have heavy marine growth. The conditions gradually worsen down the rail system toward the anchor point at the southern end. If the rails get any worse, they may pose a threat to the operational capabilities of the system. The overall rating of the rails is a 3 and will require immediate action.

The timber rail beams, pile caps, and piles are covered in marine growth, green moss algae, they are hollow in sections along the system, and there is evidence of Teredo ship worm activity. The hollowing of the timber rails, pile caps, and piles is a major concern because the structural capacity of the members is severely degraded. Teredo shipworm activity can result in a major loss of volume in timber members. When the shipworm borers itself into timber, it leaves a small opening for respiration. Once shipworm activity has occurred, the only way to eliminate the issue is to suffocate the borers by covering the member with a plastic material. If a timber rail beam, pile, or pile cap were to fail from any of these issues, the system would be out of operation.

The cradle has sections with surface corrosion and delaminating paint. Areas where welded joints are and exposed elements, have heavier surface corrosion. If this is not dealt with, the cradle system will worsen over time and will require significant repairs rather than typical maintenance. The cradle's wheels and axle retainers are heavily corroded. This is a major concern because the wheels are frozen, and the cradle is not able to function as designed without replacement of the necessary mechanical components.

Figures 1, 2A, 2B, and 3 visually represent the total ratings of each element in the marine railway dry dock system. The total rating is achieved by adding the condition state rating to the priority rating. The condition state rating is the ranking system to represent the severity of structural deficiencies. While the priority rating is a ranking system based off the condition and its level of importance. The total rating can be a value between zero and six. A value of six being the worst condition and the highest priority. Depending on the value of the total rating, it could fall under three different categories. These categories are the minimum repairs (light red), intermediate repairs (yellow), and maximum repairs (light blue). The minimum repairs category represents the minimum amount of repairs required to make the system operational for an assumed time of five years before further work is required. The intermediate repairs represent the intermediate number of repairs required to make the system operational for an assumed time of ten years. The intermediate repairs include retrofitting the cradle hoisting system with a chain driven system and replacing a larger number of members than the minimum repairs. The maximum repairs category represents the maximum amount of repairs to make the system safely operable and productive for an assumed length of fifteen years. The maximum repairs include the chain driven retrofit for the hoisting system, replacing a majority of the members in the system, sandblasting and painting the cradle, and the

option of two different design proposals. The assumed length of time before more repairs are required is an estimate and may not be accurate for all member in the system.

To demonstrate how the graphs are to be read, pile cap 15 will be used as an example. Pile cap 15 has a condition rating of C3 and a priority rating of P3. The total rating = condition rating + priority rating, therefore the total rating is 6. With a total rating of 6, pile cap 15 falls into the minimum repairs category.

The repair categories are organized as follows:

Minimum Repairs – Total ratings between 4 and 6.

Intermediate Repairs – Total ratings between 2 and 4.

Maximum Repairs – Total ratings between 0 and 2.

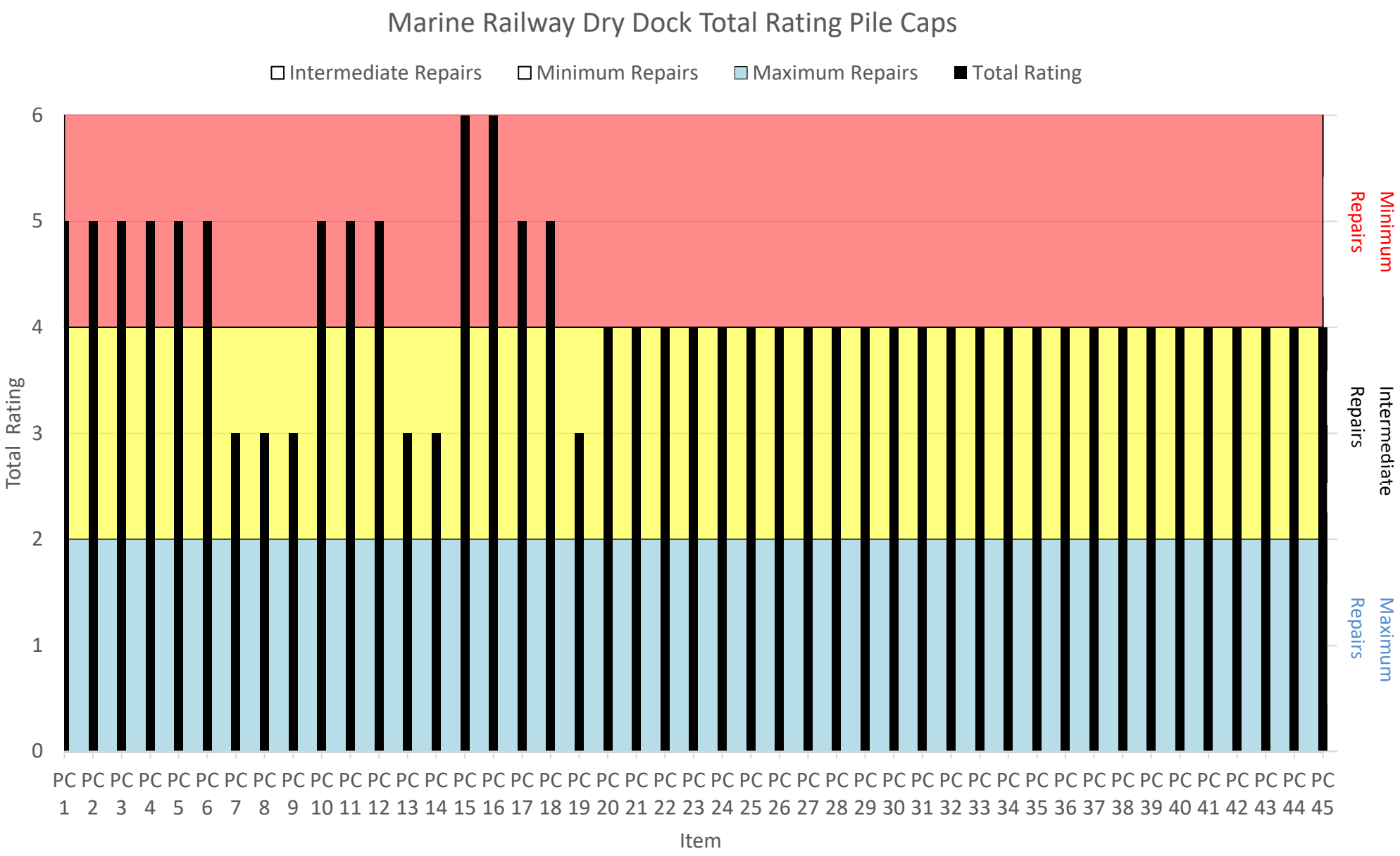


Figure 1. Total ratings with level of repairs for Railway Dry Dock pile caps.

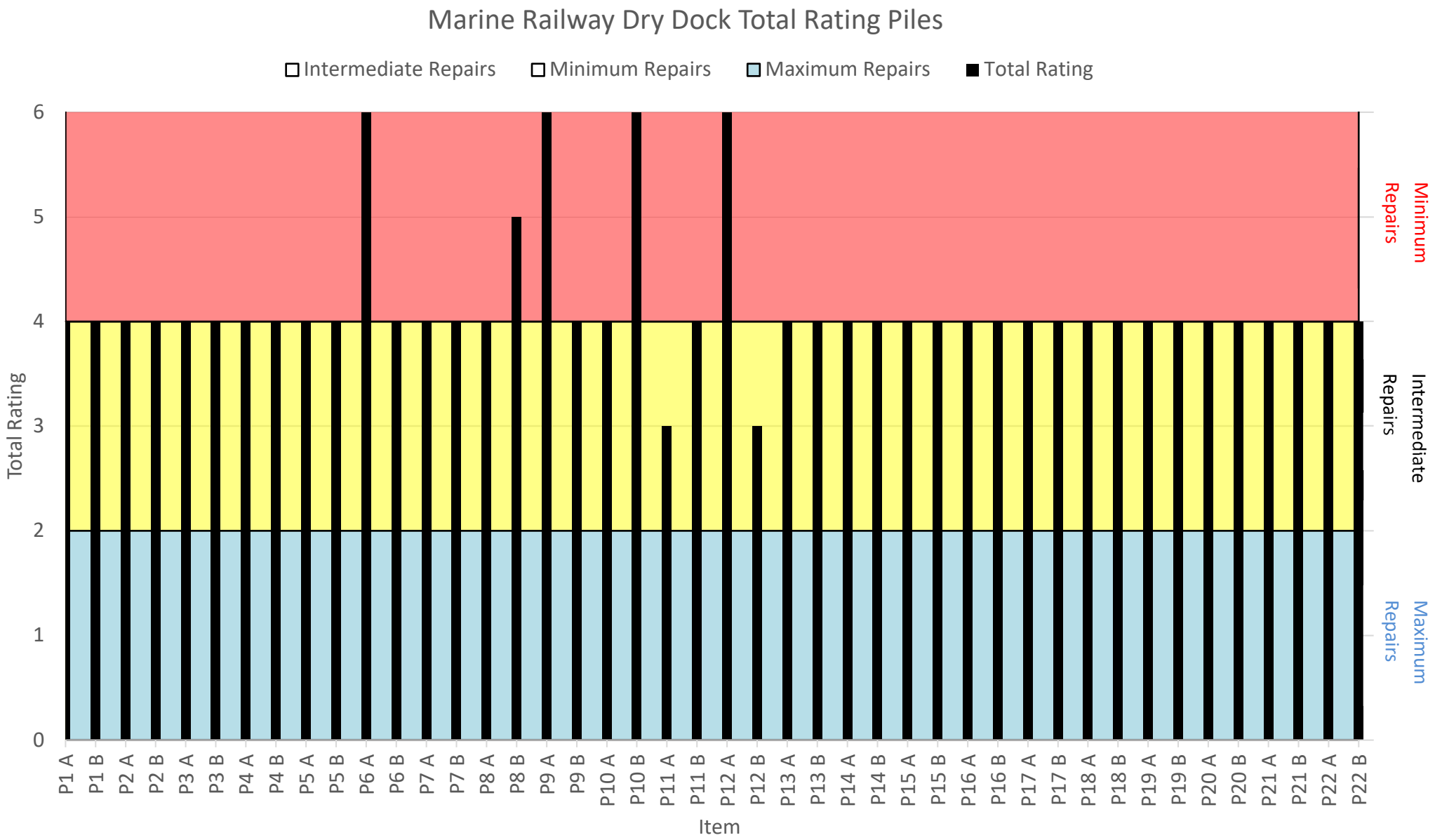


Figure 2A. Total ratings with level of repairs for Railway Dry Dock piles.

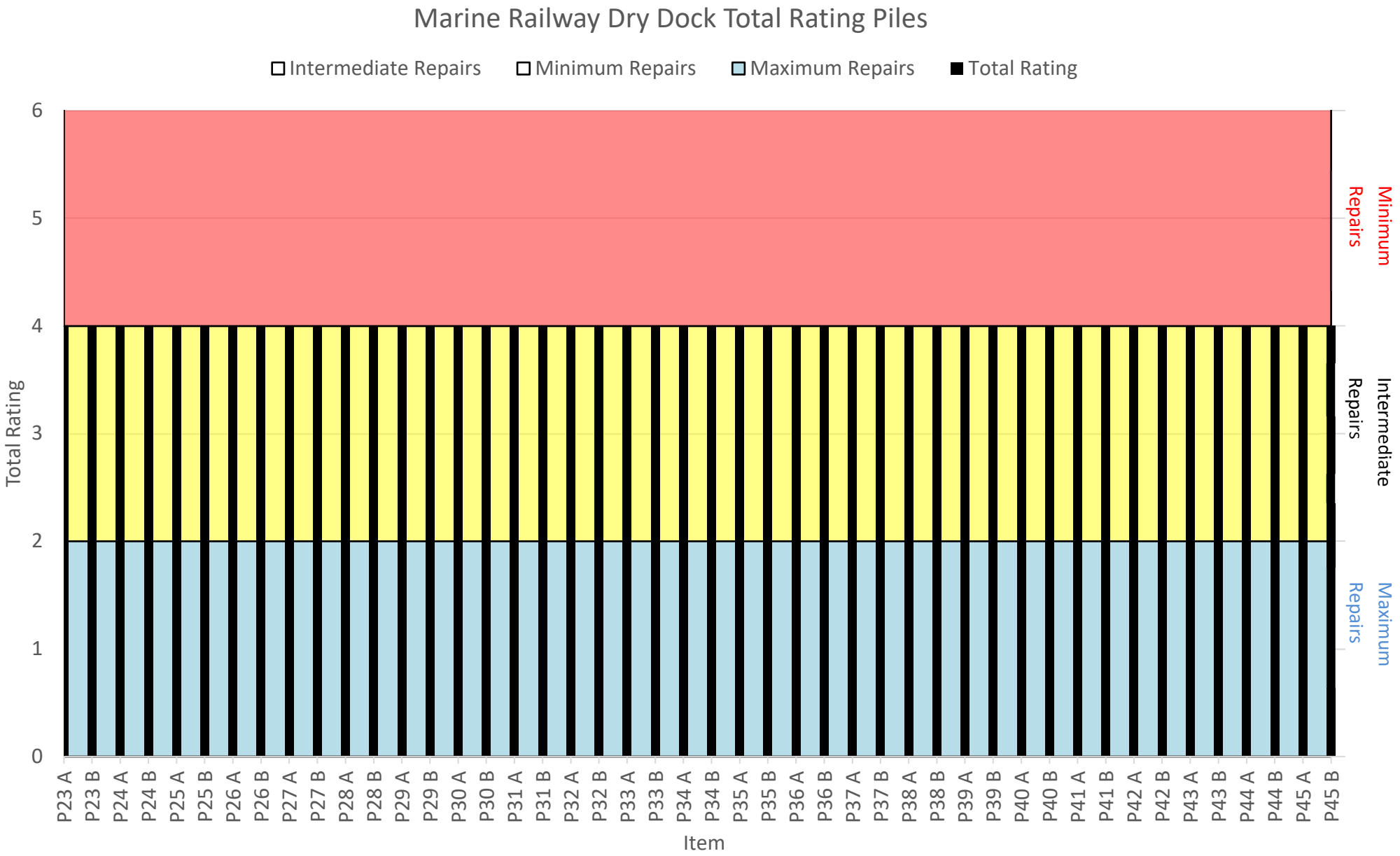


Figure 2B. Total ratings with level of repairs for Railway Dry Dock piles.

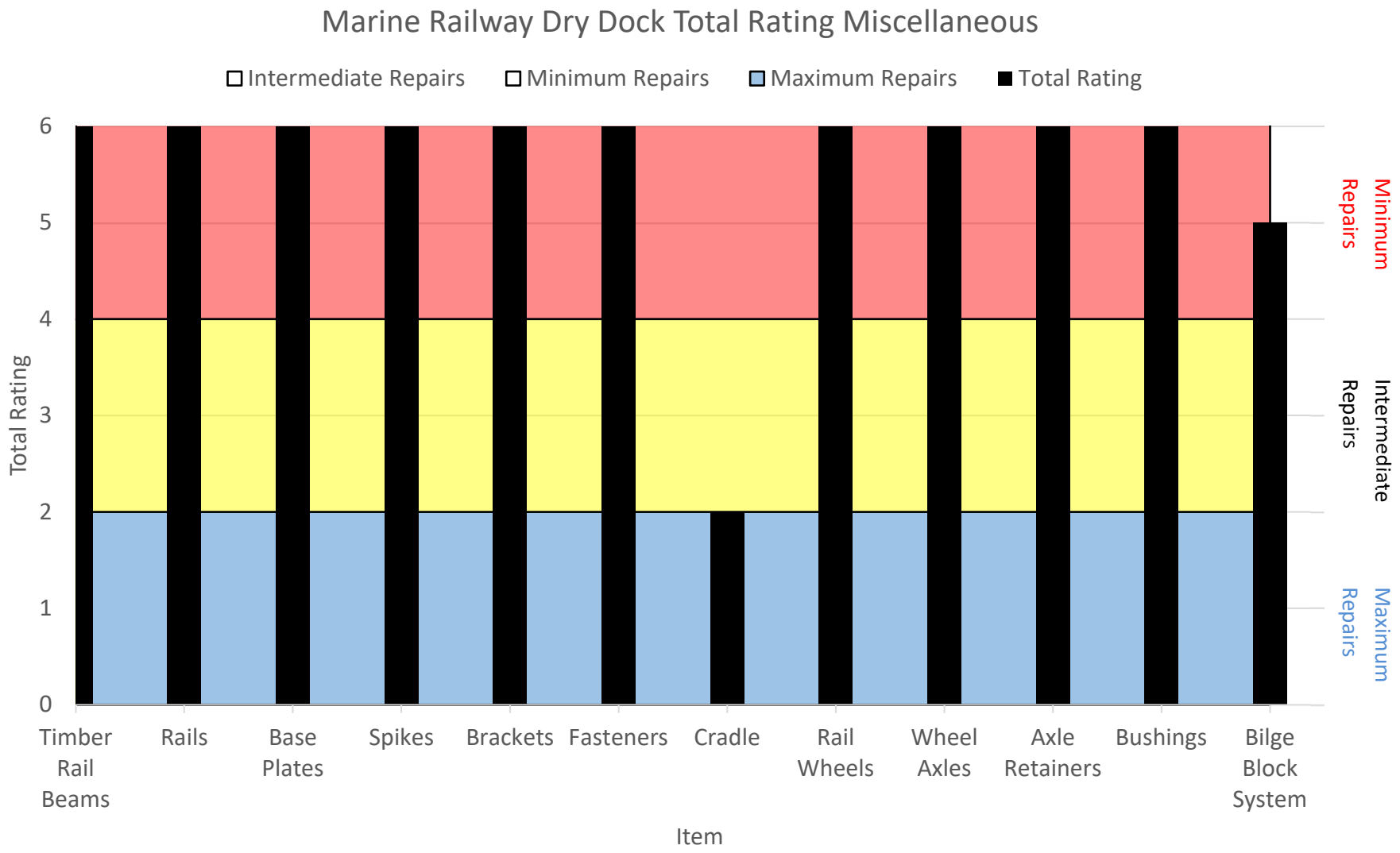


Figure 3. Total ratings with level of repairs for Railway Dry Dock miscellaneous items.

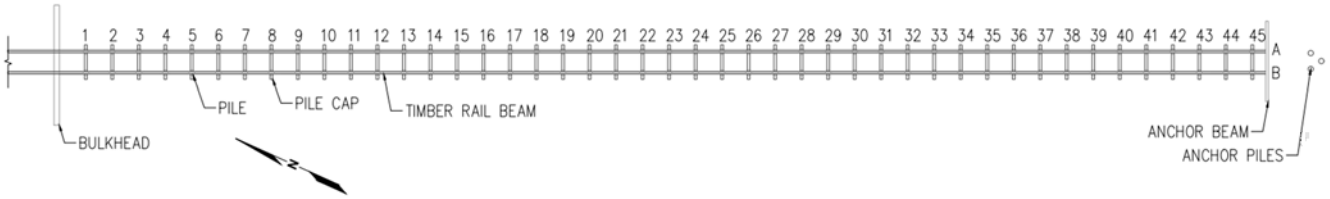


Figure 4. Pile cap plan with numbered pile cap grid lines.

Due to 60% of the timber rail beams, 66.7% of the pile caps, and 86.7% of the piles either being buried in soil or partially buried in soil, the condition rating is an assumed value based off experience with similar structures. The condition of each member has a possibility of being better or worse. Typically, the timber members that are less exposed are in better condition than those that are fully exposed. Therefore, members underneath the soil are less likely to be deteriorated than those that are not. These buried members are assumed to have a condition state rating of two; Requires action, but damage does not pose an immediate threat to the life safety. To achieve an accurate condition rating, the soil around the members would need to be excavated, allowing accessibility to visually assess the conditions.

Table 1. Evaluation of Marine Railway pile caps.

- Assumed rating based off typical conditions.

Marine Railway Dry Dock Pile Caps						
Grid Line	**Condition Rating**	**Priority Rating**	**Condition**	**Impact on the capacity/serviceability**	**Photo**	**Total Rating**
1-4	C2	P3	Buried in soil	Not visible for an assessment due to conditions.	130	5
5	C2	P3	Partially buried in soil	Not visible for an assessment due to conditions.	137	5

6	C2	P3	Partially buried in soil, cracking, heavy marine growth, early stages of soft rot, heavily corroded connection brackets	Full beam not visible for an assessment due to conditions, this member requires action and has a high potential to lose its structural integrity if it gets any worse.	144	5
7	C1	P2	Barnacle growth, green moss algae, wire rope wearing marks, and heavily corroded connection brackets	This member has the potential to lose its structural integrity if it gets any worse.	151, 170	3
8	C1	P2	Heavy barnacle growth, green moss algae, wire rope wearing marks, and heavily corroded connection brackets	This member has the potential to lose its structural integrity if it gets any worse.	172	3
9	C1	P2	Heavy barnacle growth, green moss algae, wire rope wearing marks, and heavily corroded connection brackets	This member has the potential to lose its structural integrity if it gets any worse.	145	3
10	C2	P3	Heavy marine growth, green moss algae, early stages of soft rot, and heavily corroded connection brackets	This member requires action and has a high potential to lose its structural integrity if it gets any worse.	139	5

11	C2	P3	Heavy barnacle growth, green moss algae, wire rope wearing marks, and heavily corroded connection brackets	This member requires action and has a high potential to lose its structural integrity if it gets any worse.	140	5
12	C1	P2	Heavy barnacle growth, green moss algae, wire rope wearing marks, and heavily corroded connection brackets	This member has the potential to lose its structural integrity if it gets any worse.	172	3
13	C1	P2	Heavy barnacle growth, green moss algae, wire rope wearing marks, and heavily corroded connection brackets	This member has the potential to lose its structural integrity if it gets any worse.	172	3
14	C1	P2	Heavy barnacle growth, green moss algae, wire rope wearing marks, and heavily corroded connection brackets	This member has the potential to lose its structural integrity if it gets any worse.	172	3
15	C3	P3	Hollowing/rotting	The pile cap should no longer be in service due to the loss of strength from degradation of material.	142	6
16	C3	P3	Hollowing/rotting	The pile cap should no longer be in service due to the loss of strength from degradation of material.	150	6

17	C2	P3	Heavy marine growth, green moss algae, early stages of soft rot and hollowing, and heavily corroded connection brackets	This member requires action and has a high potential to lose its structural integrity if it gets any worse.	143	5
18	C2	P3	Partially buried in soil, heavy marine growth, heavy green moss algae, heavily corroded connection brackets, early stages of soft rot.	This member requires action and has a high potential to lose its structural integrity if it gets any worse.	151	5
19	C1	P2	Partially buried in soil, green moss algae, heavily corroded connection bracket, heavy marine growth	This member has the potential to lose its structural integrity if it gets any worse.	151	3
20	C2	P2	Partially buried in soil	Not fully visible for an adequate assessment due to conditions.	173	4
21	C2	P2	Partially buried in soil	Not fully visible for an adequate assessment due to conditions.	173	4
22	C2	P2	Partially buried in soil	Not fully visible for an adequate assessment due to conditions.	173	4
23-45	C2	P2	Buried in soil	Not visible for an assessment due to conditions.	171	4

Table 2. Evaluation of Marine Railway piles.

- Assumed rating based off typical conditions.

Marine Railway Dry Dock Piles							
Grid Line	**Row**	**Condition Rating**	**Priority Rating**	**Condition**	**Impact on the capacity/serviceability**	**Photo**	**Total Rating**
1-5.	A	C2	P2	Buried in soil	Not visible for an assessment due to conditions.	137	4
	B	C2	P2				4
6	A	C3	P3	Hollowing from Teredo (Shipworm) activity around pile cap fasteners	The pile should no longer be in service due to the loss of strength from degradation.	144	6
	B	C2	P2	Buried in soil	Not visible for an assessment due to conditions.	N/A	4
7	A	C2	P2	Buried in soil	Not visible for an assessment due to conditions.	171	4
	B		P2				4
8	A	C2	P2	Buried in soil	Not visible for an assessment due to conditions.	171	4

	B	C2	P3	Early stages of hollowing from Teredo (Shipworm) activity around pile cap fasteners	This member requires action and has a high potential to lose its structural integrity if it gets any worse.	152	5
9	A	C3	P3	Hollowing from Teredo (Shipworm) activity around pile cap fasteners	The pile should no longer be in service due to the loss of strength from degradation.	145	6
	B	C2	P2	Buried in soil	Not visible for an assessment due to conditions.	N/A	4
10	A	C2	P2	Buried in soil	Not visible for an assessment due to conditions.	N/A	4
	B	C3	P3	Hollowing from Teredo (Shipworm) activity around pile cap fasteners	The pile should no longer be in service due to the loss of strength from degradation off material.	146	6
11	A	C1	P2	Marine growth, heavily corroded pile cap fastener	This member has the potential to lose its structural integrity if it gets any worse.	N/A	3
	B	C2	P2	Early stages of hollowing from Teredo (Shipworm) activity around pile cap fasteners	This member requires action and has a high potential to lose its structural integrity if it gets any worse.	140	4
12	A	C3	P3	Hollowing from Teredo (Shipworm) activity around pile cap fasteners	The pile should no longer be in service due to the loss of strength from degradation of material.	153	6

	B	C1	P2	Marine growth, heavily corroded pile cap fastener	This member has the potential to lose its structural integrity if it gets any worse.	N/A	3
13-14	A B	C2	P2	Buried in soil	Not visible for an assessment due to conditions.	N/A	4
15	A B	C2	P2	Buried in soil	Not visible for an assessment due to conditions.	142	4
16	A B	C2	P2	Buried in soil	Not visible for an assessment due to conditions.	N/A	4
17	A B	C2	P2	Buried in soil	Not visible for an assessment due to conditions.	143	4
18-45	A B	C2	P2	Buried in soil	Not visible for an assessment due to conditions.	173	4

Steilacoom Building Trestle

Photo 1B: Steilacoom building trestle

Some of the significant deficiencies include deterioration/marine borer entry of piles supporting the fixed pier, cracking of the welds on the cover plate between the pier and upland entrance, deterioration/splitting of timber curbing, and loose wraps around dolphin piles.

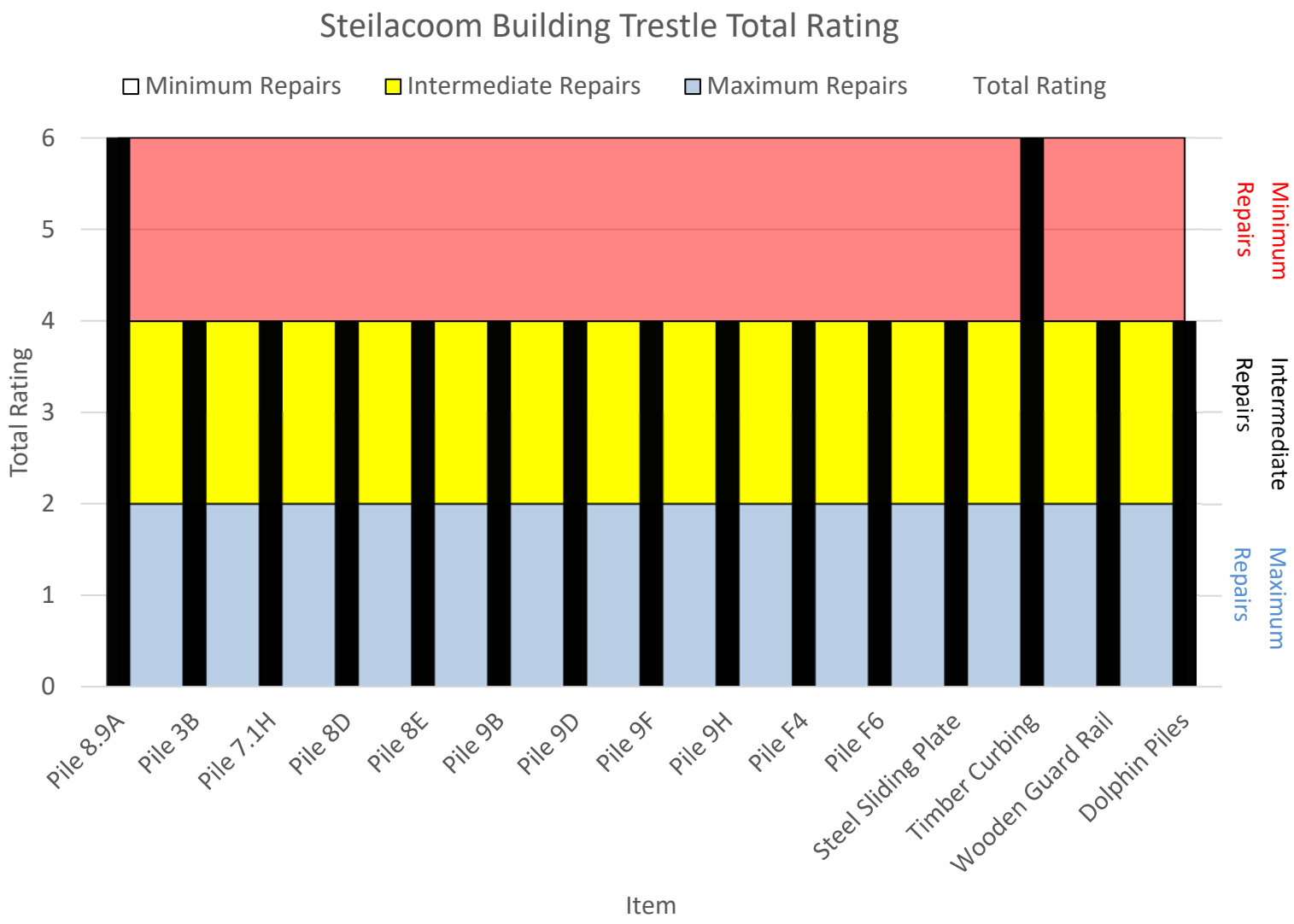


Figure 5. Total ratings for Steilacoom Building Trestle.

Table 3. WSDOT assessment details with total ratings for Steilacoom Building Trestle.

Steilacoom Building Trestle								
Item	***Location***	***Defect***	***Condition Rating***	***Details***	***Repair***	***Priority Rating***	***Photo***	***Total Rating***
Pile 8.9A	*8.9A*	*Rot Cavity*	*C3*	*50% section loss at 9' below pile cap, rot pocket dimensions 12"W x 21"H x 12" deep*	*1. Replace pile or 2. FRP Jacket*	*P3*	*8-11*	*6*
Pile 3B	*3B*	*2 Marine Borer Entries*	*C2*	*Near mudline, 75% area remaining*	*1. Replace pile with new pile or 2. FRP Jacket*	*P2*	*12*	*4*
Pile 7.1H	*7.1H*	*Marine Borer Entry*	*C2*	*2.5" penetration, 75% area remaining*	*1. Replace pile with new pile or 2. FRP Jacket*	*P2*	*13*	*4*
Pile 8D	*8D*	*2 Marine Borer Entry*	*C2*	*3/4" diameter at 2" penetration and 1/2" diameter at 1.5" penetration, 75% area remaining*	*1. Replace pile with new pile or 2. FRP Jacket*	*P2*	*N/A*	*4*

Pile 8E	*8E*	*Marine Borer Entry*	*C2*	*3" penetration, 75% area remaining*	*1. Replace pile with new pile or 2. FRP Jacket*	*P2*	*N/A*	*4*
Pile 9B	*9B*	*3 Marine Borer Entries*	*C2*	*2" penetration, 75% area remaining*	*1. Replace pile with new pile or 2. FRP Jacket*	*P2*	*14*	*4*
Pile 9D	*9D*	*4 holes*	*C2*	*1" W x 2" H x 5" deep, 75% area remaining*	*1. Replace pile with new pile or 2. FRP Jacket*	*P2*	*N/A*	*4*
Pile 9F	*9F*	*2 holes*	*C2*	*3/4" diameter w/ 5 penetration, 75% area remaining*	*1. Replace pile with new pile or 2. FRP Jacket*	*P2*	*N/A*	*4*
Pile 9H	*9H*	*2 Marine Borer Entry*	*C2*	*3" penetration, 3/4" diameter w/ 4" penetration, 75% area remaining*	*1. Replace pile with new pile or 2. FRP Jacket*	*P2*	*N/A*	*4*
Pile F4	*F4*	*6 Marine Borer Entry*	*C2*	*(2) 3/4" diam. w/ 2" pen. (2) 3/4" diam. w/ 2" pen. (2) 3/4"*	*1. Replace pile with new pile or 2. FRP Jacket*	*P2*	*N/A*	*4*

				diam. w/ 3" pen, 75% area remaining				
Pile F6	*F6*	*9 Marine Borer Entry*	*C2*	*(5) holes w/ 3" pen. (2) 3/4" diam. w/ 4" pen. (2) 3/4" diam. w/ 3" pen, 75% area remaining*	*1. Replace pile with new pile or 2. FRP Jacket*	*P2*	*N/A*	*4*
Steel Sliding Plate	*Between DOC-1 Trestle and Pierce County Trestle*	*Stitch welds breaking apart*	*C2*	*2 stitch welds breaking*	*Add more stitch welds and make them closer.*	*P3*	*18, 19*	*4*
Timber Curbing	*Eastern section*	*Timber rotting*	*C3*	*Heavy rotting and section loss near fasteners*	*Replace timber curbing with new timber section.*	*P3*	*17*	*6*
Wooden Guard Rail	*Trestle*	*Soft rot*	*C2*	*Heavy green moss algae growth and early stages of soft rot*	*Replace the members with new ones*	*P2*	*20*	*4*

Dolphin Piles	*North of security building*	*Loose wraps*	*C2*	*Lots of movement from wave action due to loose wraps*	*Tighten wraps to eliminate movement and allow dolphin to act as a unit*	*P2*	*N/A*	*4*

Steilacoom Mooring Float

Photo 2: Steilacoom mooring float

Some of the significant deficiencies include water intrusion into the float, broken fenders and fender anchorage, damage from the pile guides on the float due to jamming between the battered piles during extreme high tides, deteriorated piles, the shackle hangers at the upland end of the gangway are deteriorated, and damage to utilities on the bottom of the gangway due to extreme high tides.

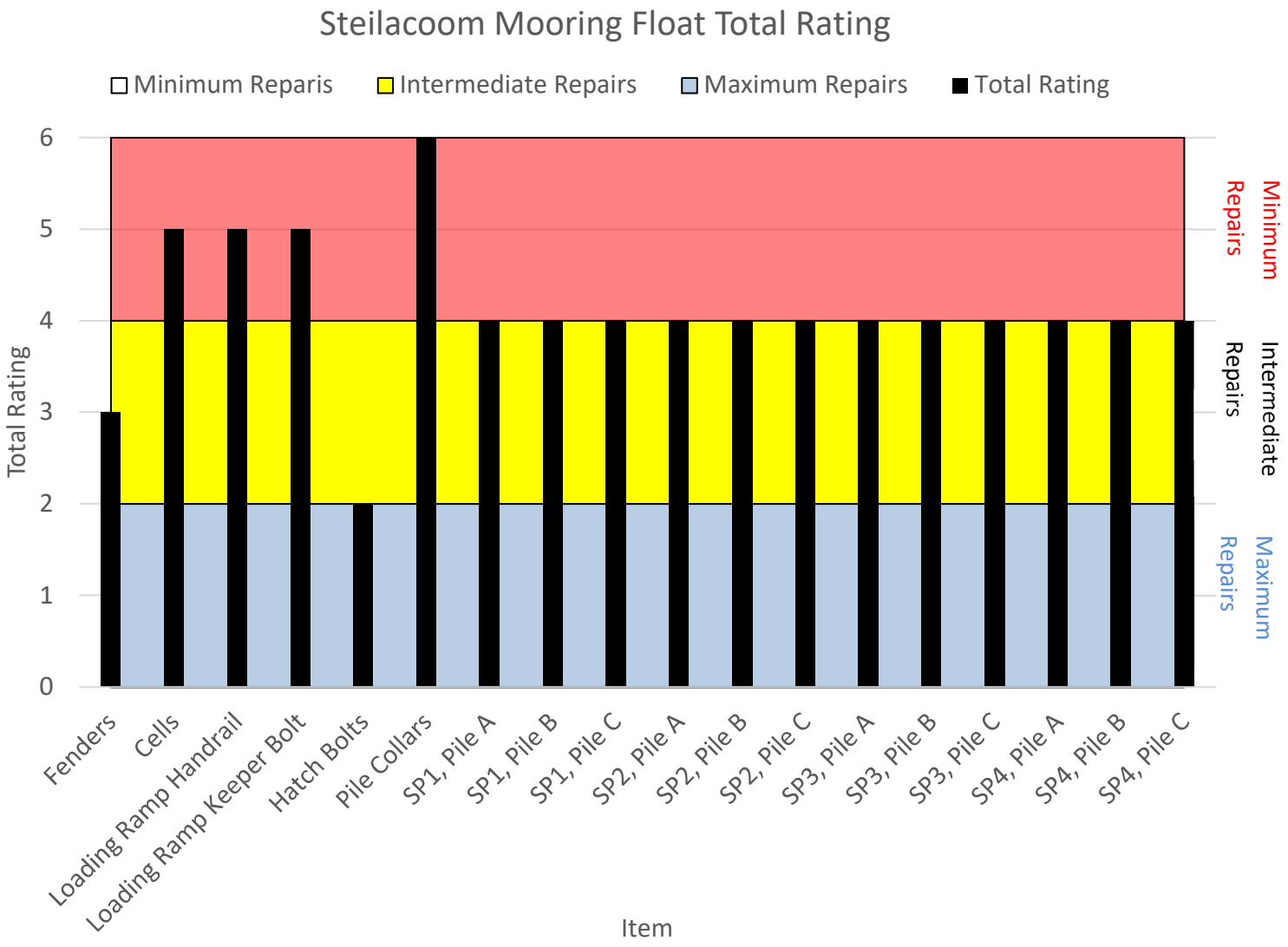


Figure 6. Total ratings for Steilacoom Mooring Float.

Table 4. WSDOT assessment details with total ratings for Steilacoom Mooring Float.

Steilacoom Mooring Float								
Item	**Location**	**Defect**	**Condition Rating**	**Details**	**Repair**	**Priority Rating**	**Photo**	**Total Rating**
Fenders	Perimeter of floating dock	Delamination and surface corrosion	C2	Delamination, surface corrosion, bent fender foot plates, and bent bolts	Sandblast and recoat, replace bolts	P1	24	3
Cells	Floating dock	Leaking	C2	Regular pumping is required to reduce the volume of water inside the cells	Locate source of the leak and repair	P3	25	5
Loading Ramp Handrail	Base of loading ramp	Sharp exposed edge	C2	There is no cap on the end of the handrail, cutting hazard for passengers	Cap the edge of the handrail	P3	21	5
Loading Ramp Keeper Bolt	Top of loading ramp	Bolt head broken off	C2	The South side bolt head is broken off	Replace the bolt	P3	*N/A*	5
Hatch Bolts	Top of hatches	Hatch bolts missing	C1	Hatch bolts missing on all hatches	Install new bolts	P1	25	2

Pile Collars	Western and Eastern side of floating dock	Delamination, surface corrosion and bent angle	C3	Making contact with batter pile during high tide and bending angle	Sandblast, recoat, and repair bent angle	P3	27, 28	6
SP1, Pile A	SP1	Delamination and surface corrosion	C2	25% coating loss, UT thickness reading 0.455"/0.300"	Sandblast and recoat	P2	22	4
SP1, Pile B	SP1	Delamination and surface corrosion	C2	50% coating loss, UT thickness reading 0.455"/0.315"	Sandblast and recoat	P2	22	4
SP1, Pile C	SP1	Delamination and surface corrosion	C2	50% coating loss, UT thickness reading 0.465"/0.340"	Sandblast and recoat	P2	22	4
SP2, Pile A	SP2	Delamination and surface corrosion	C2	25% coating loss, UT thickness reading 0.485"/0.250"	Sandblast and recoat	P2	23	4
SP2, Pile B	SP2	Delamination and surface corrosion	C2	25% coating loss, UT thickness reading 0.470"/0.415", 0.125" pitting, 50% adhesion failure	Sandblast and recoat	P2	23	4

SP2, Pile C	SP2	Delamination and surface corrosion	C2	25% coating loss, UT thickness reading 0.450"/0.255", 50% adhesion failure	Sandblast and recoat	P2	23	4
SP3, Pile A	SP3	Delamination and surface corrosion	C2	25% coating loss, UT thickness reading 0.470"/0.350", 50% adhesion failure	Sandblast and recoat	P2	27	4
SP3, Pile B	SP3	Delamination and surface corrosion	C2	50% coating loss, UT thickness reading 0.300" in pitting area	Sandblast and recoat	P2	27	4
SP3, Pile C	SP3	Delamination and surface corrosion	C2	10% coating loss, UT thickness reading 0.470"/0.370", 50% adhesion failure	Sandblast and recoat	P2	27	4
SP4, Pile A	SP4	Delamination and surface corrosion	C2	25% coating loss, UT thickness reading 0.410"/0.300", 75% adhesion failure	Sandblast and recoat	P2	28	4
SP4, Pile B	SP4	Delamination and surface corrosion	C2	50% coating loss, UT thickness reading 0.480"/0.290"	Sandblast and recoat	P2	28	4

SP4, Pile C	SP4	Delamination and surface corrosion	C2	25% coating loss, UT thickness reading 0.390"/0.250"	Sandblast and recoat	P2	28	4

Island Mooring Float

Photo 3: Island Mooring Float

Some of the significant deficiencies include damaged concrete on the floats, deteriorated piles, damaged rub strips on the piles, broken fenders and fender anchorage, damaged connections between floats, deterioration of the hinge at the upland end of the gangway, and deteriorated emergency ladder.

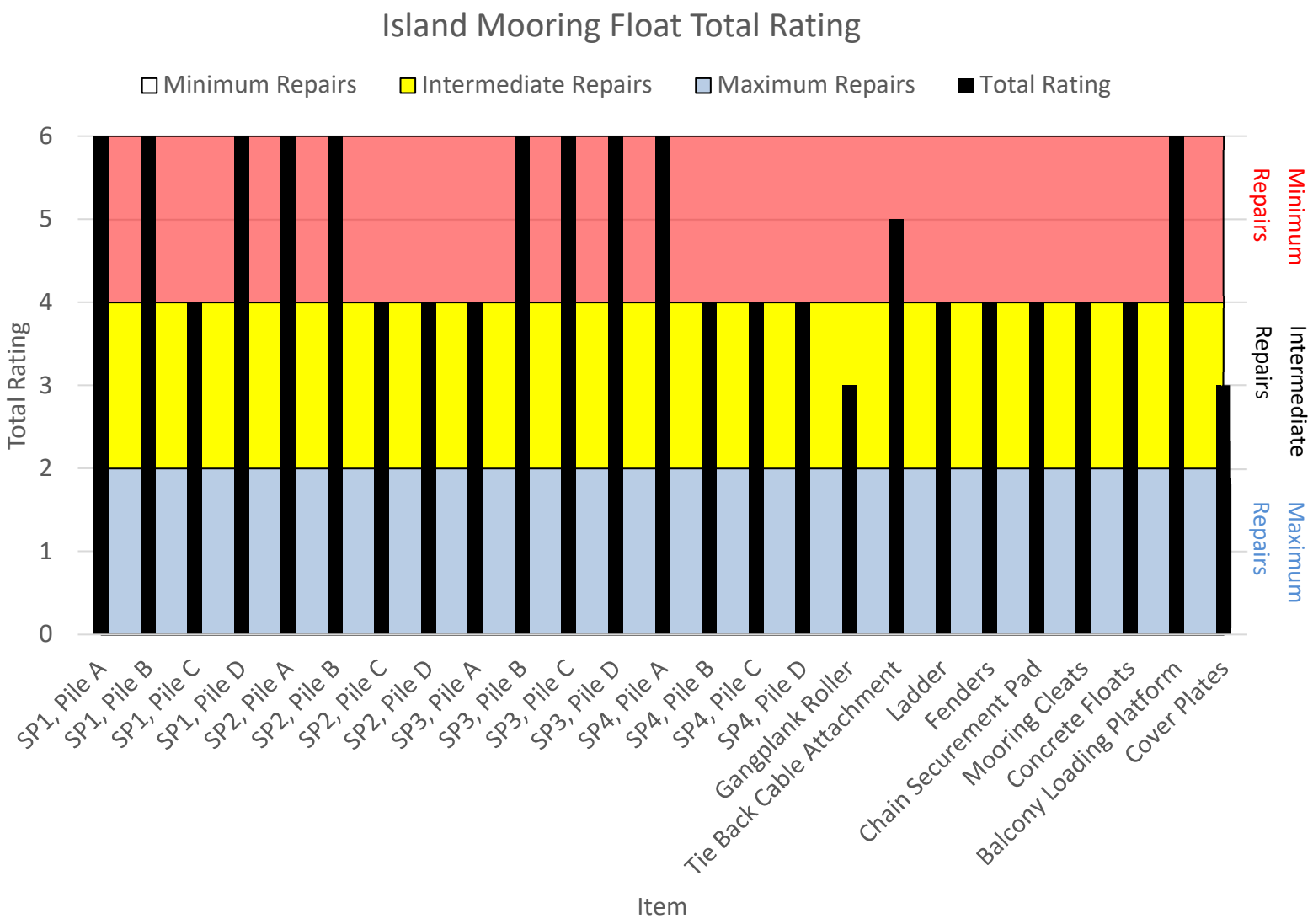


Figure 7. Total ratings for Island Mooring Float.

Table 5. WSDOT assessment details with total ratings for Island Mooring Float.

Island Mooring Float								
Item	**Location**	**Defect**	**Condition Rating**	**Details**	**Repair**	**Priority Rating**	**Photo**	**Total Rating**
SP1, Pile A	SP1	Delamination, holes, and surface corrosion	C3	3' (h) x 2" (w) hole in pile from chain fretting, 50% coating loss, UHMW rub has failed, heavy marine growth, and thickness = 0.485" (2021)	*1. Replace pile with new pile* *or* *2. Insert sleeve w/ new sect.*	P3	43	6
SP1, Pile B	SP1	Delamination, holes, and surface corrosion	C3	3' (h) x 4" (w) hole in pile from chain fretting, 50% coating loss, 3/16" pitting, UHMW rub has failed, heavy marine growth, and thickness = 0.480" (2021)	*1. Replace pile with new pile* *or* *2. Insert sleeve w/ new sect.*	P3	55	6
SP1, Pile C	SP1	Delamination and surface corrosion	C2	1" diameter pitting @ 0.41" depth, 10% coating loss, thickness = 0.485" (2017)	*1. Replace pile with new pile* *or* *2. Insert sleeve w/ new sect.*	P2	55	4

SP1, Pile D	SP1	Delamination, holes, and surface corrosion	C3	3' (h) x 5" (w) hole in pile, 10% coating loss, 3/4" diameter pitting @ 1/4" depth, UHMW rub has failed, heavy marine growth, and thickness = 0.490" (2021)	*1. Replace pile with new pile* *or* *2. Insert sleeve w/ new sect.*	P3	55	6
SP2, Pile A	SP2	Delamination and surface corrosion	C3	18"(h) x 9"(w) area with coating failure with pitting up to 3/8" deep, 50% coating failure and heavy surface corrosion at location of chain fretting, thickness = 0.130"-0.270" at fretted area	*1. Replace pile with new pile* *or* *2. Insert sleeve w/ new sect.*	P3	56	6
SP2, Pile B	SP2	Delamination, section loss, and surface corrosion	C3	10% coating loss, heavy surface corrosion and section loss, thickness = 0.300" - 0.340" in fretted area	*1. Replace pile with new pile* *or* *2. Insert sleeve w/ new sect.*	P3	56	6

SP2, Pile C	SP2	Delamination, pitting, and surface corrosion	C2	10% coating loss, surface corrosion, pitting @ 3/8" deep, thickness = 0.480", and heavy marine growth	*1. Replace pile with new pile* *or* *2. Insert sleeve w/ new sect.*	P2	56	4
SP2, Pile D	SP2	Delamination and surface corrosion	C2	10% coating loss, surface corrosion, and heavy marine growth	*1. Replace pile with new pile* *or* *2. Insert sleeve w/ new sect.*	P2	56	4
SP3, Pile A	SP3	Delamination, surface corrosion, and pitting	C2	10% coating loss, surface corrosion, pitting @ 0.25" deep, thickness = 0.225" @ MDL +18, heavy marine growth	*1. Replace pile with new pile* *or* *2. Insert sleeve w/ new sect.*	P2	57	4
SP3, Pile B	SP3	Delamination, surface corrosion, and section loss	C3	15% coating loss, 3" dia. hole at center of 2' (h) x 6" (w) section of heavy surface corrosion, thickness = 0.490"	*1. Replace pile with new pile* *or* *2. Insert sleeve w/ new sect.*	P3	57	6
SP3, Pile C	SP3	Delamination, surface corrosion, and section loss	C3	10% coating loss, surface corrosion, 3" dia. hole, 1" (h) x 3" (w) hole, 1" dia. hole	*1. Replace pile with new pile* *or*	P3	57	6

					2. Insert sleeve w/ new sect.			
SP3, Pile D	SP3	Delamination, surface corrosion, section loss, weld crack	C3	20% coating loss, 3'(h) x 6" (w) area of surface corrosion and section loss from chain fretting, thickness = 0.300", horizontal crack across butt weld below high water mark.	*1. Replace pile with new pile* *or* *2. Insert sleeve w/ new sect.*	P3	57	6
SP4, Pile A	SP4	Delamination, holes, pitting and surface corrosion	C3	10% coating loss, 3.5' (h) x 4" (w) hole, section of heavy surface corrosion, pitting, heavy marine growth, and thickness = 0.460"	*1. Replace pile with new pile* *or* *2. Insert sleeve w/ new sect.*	P3	39	6
SP4, Pile B	SP4	Delamination, surface corrosion, and pitting	C2	10% coating loss, surface corrosion, pitting @ 0.280" deep, and heavy marine growth		P2	40, 42	4

SP4, Pile C	SP4	Delamination, surface corrosion, and pitting	C2	10% coating loss, surface corrosion, pitting @ 0.350" deep, thickness = 0.515" - 0.260", and heavy marine growth		P2	41	4
SP4, Pile D	SP4	Delamination, surface corrosion, and pitting	C2	10% coating loss, surface corrosion, corrosion band w/ localized pitting, and heavy marine growth		P2	58	4
Tie Back Cable Attachment	Northern section of gangplank	Cracked weld	C2	Weld is cracked on tie back cable attachment	Grind weld off and place a new weld	P3	45	5
Ladder	Southwestern Corner	Delamination and surface corrosion	C2	Delamination and heavy amounts of surface corrosion from the top ladder rung below	Sandblast and recoat	P2	62	4
Fenders	Perimeter of Float	Heavy surface corrosion	C2	2 of the fenders are heavily corroded, some broken fender bolts, bent steel on fender, exposed Northern corner of float from	Sandblast, recoat, replace broken bolts	P2	47-50	4

				missing fender				
Chain Securement Pad	Perimeter of Float at Pile Locations	Heavy surface corrosion	C2	Heavy surface corrosion on the lifting eye and fasteners that secure the chain to the float	Replace lifting eyes and fasteners	P2	53, 54	4
Mooring Cleats	Perimeter of Float	Heavy surface corrosion	C2	Some of the mooring cleats and fasteners are heavily corroded	Replace with new mooring cleats or Sandblast and recoat	P2	49, 50	4
Concrete Floats	Edges of Floats	Spalling and surface cracking	C2	There is spalling on the edges of the floats up to 3" deep and surface cracking in areas around the edges of the floats with exposed reinforcements	Patch the spalling areas	P2	51, 52	4
Balcony Loading Platform	North-West Section of Float	Soft Rot on wood, heavy surface corrosion	C3	The wooden members are rotting, there is heavy surface corrosion on the steel members	Replace the balcony platform system	P3	61	6

Cover Plates	Between Flanker Pontoons and Float	Surface corrosion	C1	The cover plates and pin assembly are corroded	Disassemble, sandblast and recoat or replace	P2	59, 60	3

Island Trestle

Photo 4: Island Trestle

Some of the significant deficiencies include delamination of the concrete deck on the trestle, broken piles, deteriorating dolphin piles, timber handrail splitting, and deteriorated emergency ladders. The boat lift is not included in the cost estimate or the WSDOT condition assessment.

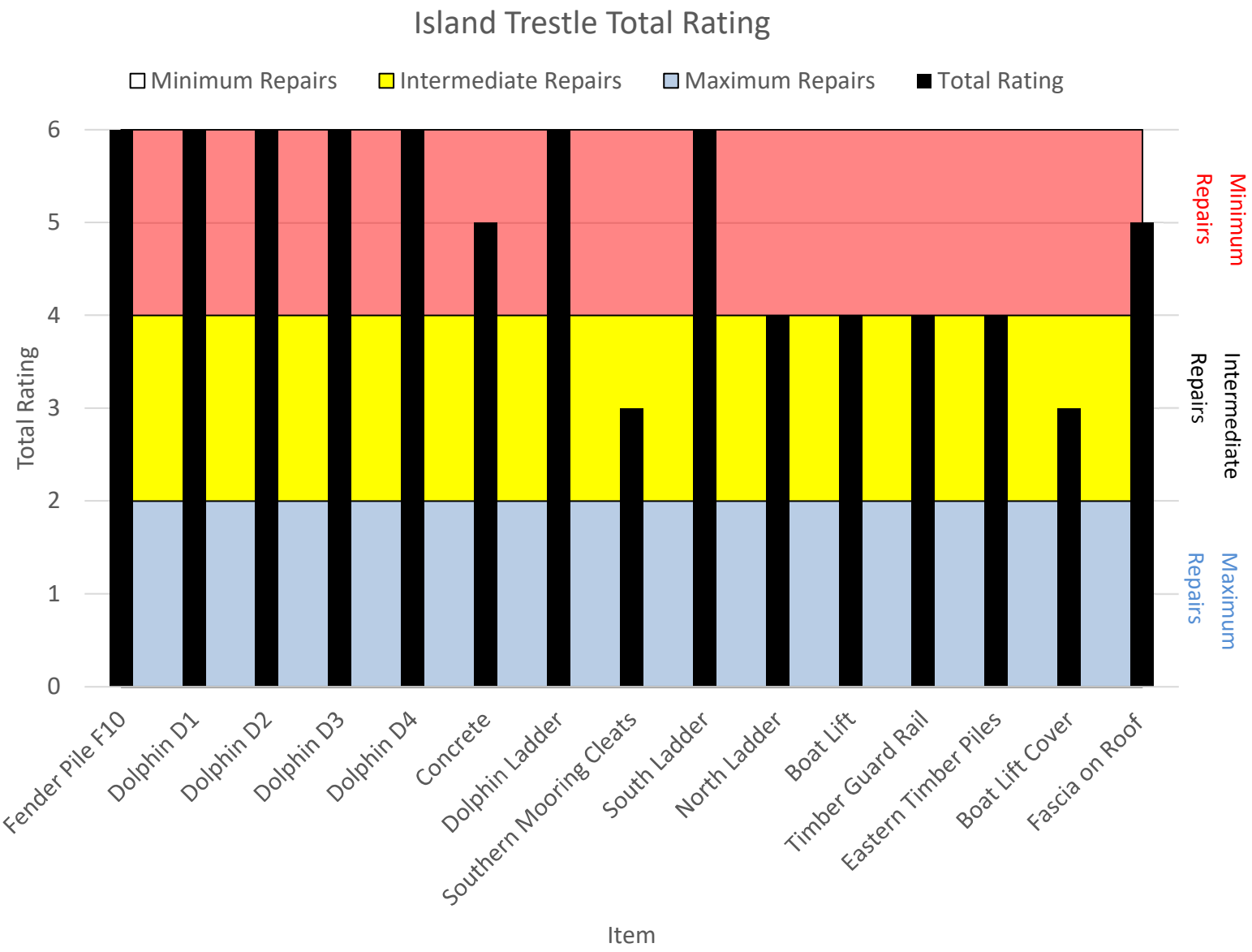


Figure 8. Total ratings for Island Trestle.

Table 6. WSDOT assessment details with total ratings for the Island Trestle.

Island Trestle								
Item	**Location**	**Defect**	**Condition Rating**	**Details**	**Repair**	**Priority Rating**	**Photo**	**Total Rating**
Fender Pile F10	Fender Pile F10	Broken pile	C3	Pile broken off at low water line (non-bearing fender pile)	Replace fender pile	P3	63	6
Dolphin D1	D1	Mechanical abrasion	C3	Outer piles have mechanical abrasion damage, 1/2 pile diameter section loss, marine borer entry, internal decay, missing lower cable wraps, 25% area remaining	Replace outer piles, add lower cable wrap	P3	65	6
Dolphin D2	D2	Mechanical abrasion	C3	Outer piles have mechanical abrasion damage, missing lower cable wraps, 50% area remaining	Replace outer piles, add lower cable wrap	P3	66	6

Dolphin D3	D3	Mechanical abrasion	C3	Outer piles have mechanical abrasion damage, internal decay, missing lower cable wraps, 25% area remaining	Replace outer piles, add lower cable wrap	P3	67	6
Dolphin D4	D4	Mechanical abrasion	C3	Outer piles have mechanical abrasion damage, internal decay, missing lower cable wraps, 50% area remaining	Replace outer piles, add lower cable wrap	P3	68	6
Concrete	See Soffit Spall Map	Spalling	C2	Heavy amounts of concrete spalling underneath trestle in areas where waves make contact with piles, exposed reinforcement	Patch spalling sections	P3	71-73	5
Dolphin Ladder	West side of Trestle on dolphin	Broken, delamination, and surface corrosion	C3	The ladder has shear apart at the top section, heavy delamination and surface corrosion	Replace ladder	P3	66	6

Southern Mooring Cleats	South section of building	Surface corrosion	C2	The mooring cleats have surface corrosion, the fasteners are heavily corroded	Replace fasteners	P1	N/A	3
South Ladder	South section of building	Disconnected (floating)	C3	The ladder is disconnected from the pile below the water	Reconnect to repaired pile	P3	75	6
North Ladder	Norther section of boat lift cover	Bent and surface corrosion	C2	The ladder is bend at the high-water mark, surface corrosion, and heavy marine growth	Repair or replace ladder	P2	74	4
Boat Lift	Eastern section	Heavy surface corrosion and pitting	C3	Abandoned boat lift contain heavy amounts of uniform surface corrosion and pitting	Replace boat lift	P1	77	4
Timber Guard Rail	Eastern section	Cracking and soft rot	C2	Handrail is splitting near splice connection and green moss algae.	Replace member	P2	80	4
Eastern Timber Piles	Eastern section	Rot	C2	Rot at the top of the piles	Replace or Fill w/ concrete	P2	78	4

Boat Lift Cover	Eastern section	White rust	C1	The galvanized structural framing members have white rust	Recoat the members	P2	77	3
Fascia on Roof	Eastern section cover roof assembly	Wood rot	C2	The Fascia boards (edge of roof), have significant rot damage along the western side of the cover	Replace the members	P3	79	5

Barge Dock

Photo 5: Barge Dock

Some of the significant deficiencies include soft timber decking at the upland end of the trestle, worn deck boards, loose deck bolts, corroded brackets, deterioration at the top of the wing wall piles, deterioration on lower wingwalls, and missing and worn hardware at the waterside end of the apron.

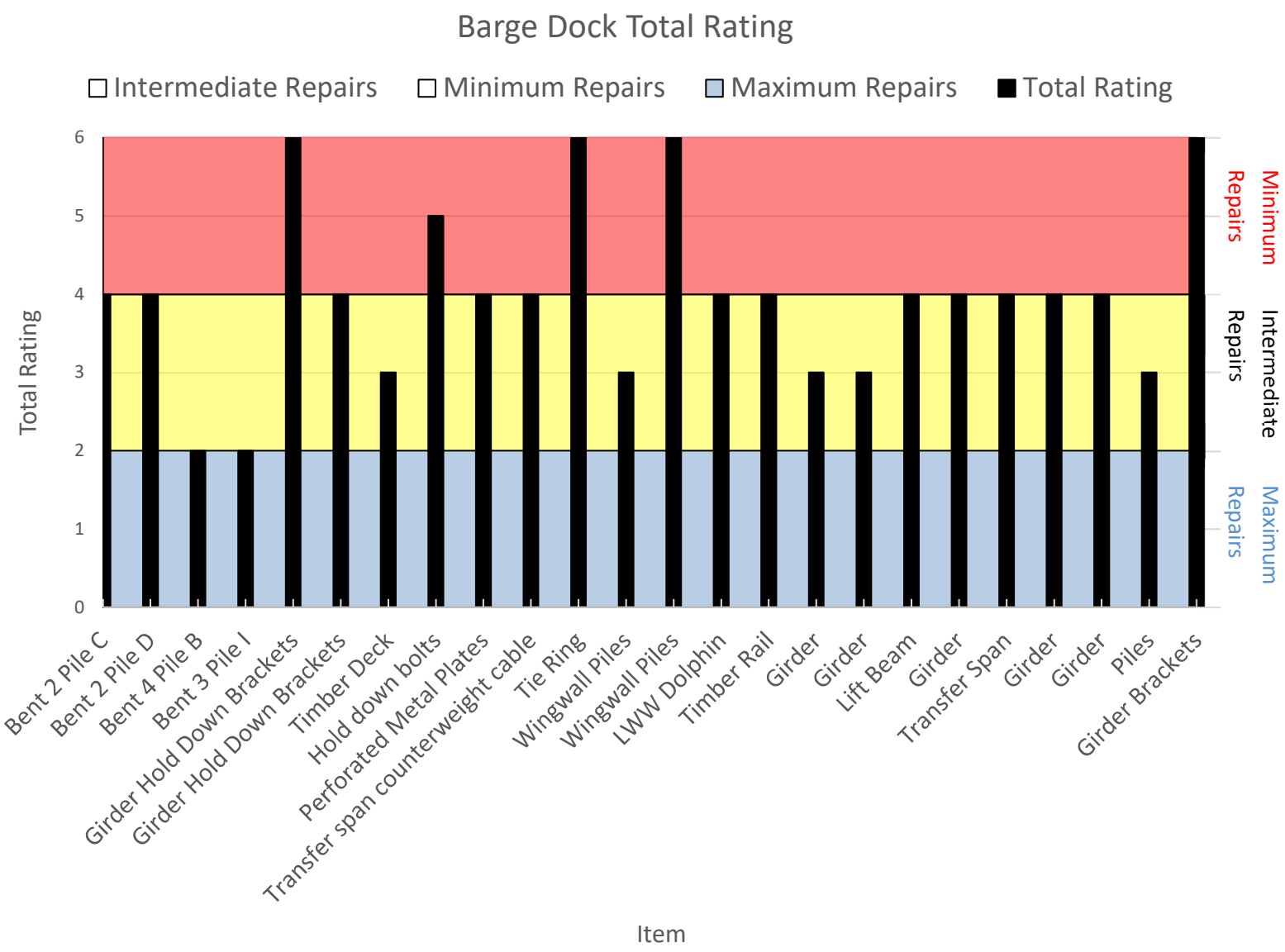


Figure 9. Total ratings for Barge Dock.

Table 7. WSDOT assessment details with total ratings for the Barge Dock.

Barge Dock								
Item	**Location**	**Defect**	**Condition Rating**	**Details**	**Repair**	**Priority Rating**	**Photo**	**Total Rating**
Bent 2 Pile C	Bent 2	Marine Borer Entry	C2	MBE 2" (h) x 3/4" (w) w/ 3" penetration (2) MBE 1/2" diam., w/ 3" pen., 75% area remaining	*1. Replace pile with new pile or 2. FRP Jacket*	P2	81	4
Bent 2 Pile D	Bent 4	Marine Borer Entry	C2	2 MBE's @ 1.75" diam. w/ 1" pen. MBE @ 1/2" diam. w/ 2" pen., 75% area remaining	*1. Replace pile with new pile or 2. FRP Jacket*	P2	N/A	4
Bent 4 Pile A	Bent 4	Marine Borer Entry	C1	2 small MBE's w/ 1" pen.	*1. Replace pile with new pile or 2. FRP Jacket*	P1	82	2
Bent 3 Pile I	Bent 3	Marine Borer Entry	C1	2 MBE's @ 3/4" diam. w/ 2" pen. 2 MBE inside shake 1W x 4"H x 1"D w/ 2.5" of pen., 75% area remaining	*1. Replace pile with new pile or 2. FRP Jacket*	P1	93	2

Girder Hold Down Brackets	Pier 4, Girder D	Surface Corrosion and section loss	C3	Surface corrosion and holed through	Replace the girder hold down bracket	P3	98	6
Girder Hold Down Brackets	Pier 4, Girder D	Surface Corrosion	C2	Surface corrosion	Recoat the brackets	P2	98, 99	4
Timber Deck	Pier 1-4	Timber deck rutting	C2	Timber deck is rutting up to 5/8"deep	Replace members	P1	102, 103	3
Hold down bolts	Beneath Timber Deck	Loose bolts	C2	loose hold down bolts	Tighten hold down bolts	P3	83	5
Timber Deck	Near the abutment	Deflects	C2	Timber deck deflects 3/4" under heavy wheel loads	Strengthen section with member beneath	P3	103	5
Perforated Metal Plates	Near the abutment	Loose	C2	Perforated plates are loose	Tighten the perforated plates	P2	103	4

Transfer span counterweight cable	Transfer Span	No thimble, lacking grease	C2	Transfer span counterweight cable has no thimble and is lacking lubrication/protection	Install thimble and apply lubrication/protection	P2	N/A	4
Tie Ring	Both sides of lifting platform	Surface corrosion, pitting, and section loss	C3	Surface corrosion, heavy pitting and section loss	Replace members	P3	94, 95	6
Wingwall Piles	Wingwalls	Top end rot	C1	Many of the wingwall piles have top end rot	Fill members with concrete	P2	89, 90	3
Wingwall Piles	Lower wingwalls	Timber rot	C3	Lower facing timbers are in poor condition, rot occurring, lower UHMW missing, crushing	Replace members	P3	85-88	6
LWW Dolphin	LWW end dolphin	Broken wraps	C2	Broken lower wraps	Install new lower wraps on dolphins	P2	91	4

Timber Rail	Between pier 2 and 3	Splitting	C2	Left Timber rail is split and splintering	Replace member	P2	101	4
Girder	Right side of girder at floor beam 3	Rust bloom, light pitting	C1	Rust bloom in the exterior face of the web, light rust pitting	Sandblast and recoat	P2	96	3
Girder	Right side of girder at floor beam 6	Rust bloom and section loss	C1	3" diam. Rust bloom in the web w/ 1/16" deep section loss	Sandblast and recoat	P2	96	3
Lift Beam	Lifting Platform	Laminar rust	C2	Laminar rust on the shore side of interior web	Sandblast and recoat	P2	N/A	4
Girder	Floor beam 0	Laminar rust	C2	Right side girder has laminar rust above the bearing, at the stiffener weld	Sandblast and recoat	P2	N/A	4
Transfer Span	Bay 1 and 2	Surface corrosion and delamination	C2	Paint is failing throughout, surface corrosion	Sandblast and recoat	P2	N/A	4

Girder	Floor beam 0	Rust bloom and section loss	C2	Right side connection to the right steel girder has a rust bloom with minor section loss	Sandblast and recoat	P2	N/A	4
Girder	Floor beam 0	Rust bloom and section loss	C2	Left open girder bottom flange has rust blooms w/ minor section loss	Sandblast and recoat	P2	N/A	4
Piles	Steel piles making up left and right dolphins	Rust blooms	C1	Rust blooms starting in the intertidal zone	Sandblast and recoat	P2	N/A	3
Girder Brackets	Girder connections	Surface corrosion	C3	Heavy surface corrosion on girder brackets	Replace girder brackets	P3	99	6

Still Harbor Dock

Photo 6: Still Harbor Dock

The Still Harbor Dock is used as the backup ferry landing as well as the primary dock for the emergency vessel and other vessels and barges that are out of service. The dock consists of concrete floats arranged in a T which are held in place by steel guide piles. The floats are accessed by a hinged aluminum gangway supported at the end of a concrete trestle The trestle is supported by concrete piles. The only issue known at this time is that the steel guide piles have deteriorated.

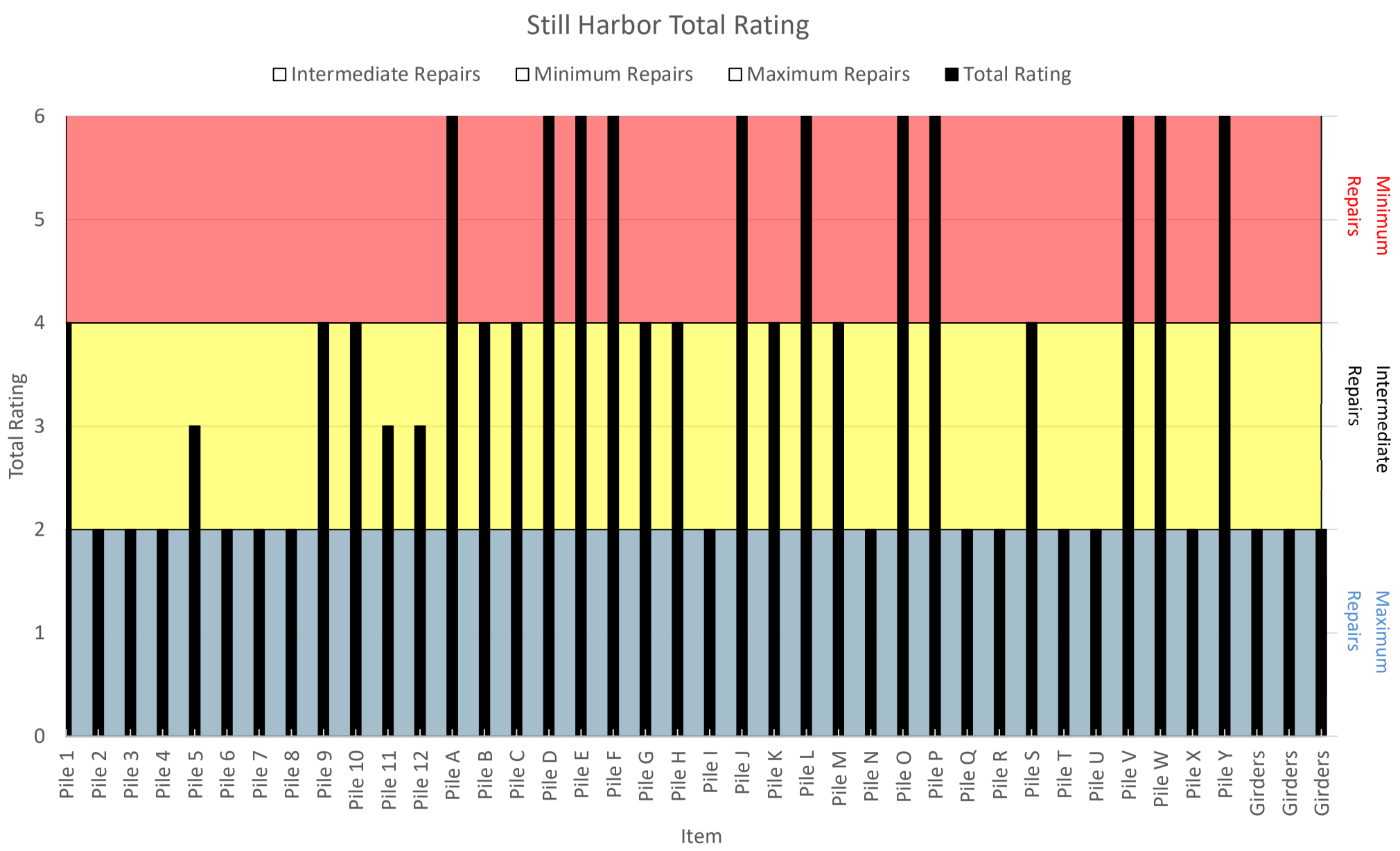


Figure 10. Total ratings for Still Harbor Dock.

Table 8. WSDOT assessment details with total ratings for Still Harbor Dock.

Still Harbor Dock								
Item	**Location**	**Defect**	**Condition Rating**	**Details**	**Repair**	**Priority Rating**	**Photo**	**Total Rating**
Pile 1	Longitudinal onshore to offshore	Delamination, surface corrosion, and pitting	C2	50% area surface rust, heavy marine growth, pitting, thickness = 0.395" (2013)	Sandblast and recoat	P2	N/A	4
Pile 2	Longitudinal onshore to offshore	Delamination, surface corrosion, and pitting	C1	25% area surface rust, heavy marine growth, and pitting	Sandblast and recoat	P1	N/A	2
Pile 3	Longitudinal onshore to offshore	Delamination, surface corrosion, and pitting	C1	25% area surface rust, heavy marine growth, pitting, thickness = 0.370" (2013)	Sandblast and recoat	P1	N/A	2
Pile 4	Longitudinal onshore to offshore	Delamination, surface corrosion, and pitting	C1	25% area surface rust, heavy marine growth, pitting @ 0.25" deep, thickness = 0.375" (2013)	Sandblast and recoat	P1	N/A	2
Pile 5	Longitudinal onshore to offshore	Delamination, surface corrosion, and pitting	C2	25% area surface rust, heavy marine growth, 1.5" diam. hole, and pitting	Sandblast and recoat	P1	N/A	3

Pile 6	Longitudinal onshore to offshore	Delamination, surface corrosion, and pitting	C1	25% area surface rust, heavy marine growth, and pitting	Sandblast and recoat	P1	N/A	2
Pile 7	Longitudinal onshore to offshore	Delamination, surface corrosion, and pitting	C1	25% area surface rust, heavy marine growth, and pitting	Sandblast and recoat	P1	N/A	2
Pile 8	Longitudinal onshore to offshore	Delamination, surface corrosion, and pitting	C1	25% area surface rust, heavy marine growth, and pitting, thickness = 0.375" (2013)	Sandblast and recoat	P1	N/A	2
Pile 9	Longitudinal onshore to offshore	Delamination, surface corrosion, and pitting	C2	25% area surface rust, heavy marine growth, 1." diam. hole and pitting	Sandblast and recoat	P2	N/A	4
Pile 10	Longitudinal onshore to offshore	Delamination, surface corrosion, and pitting	C2	25% area surface rust, heavy marine growth, pitting, and 6" (w) very thin area w/ heavy pitting	Sandblast and recoat	P2	N/A	4
Pile 11	Longitudinal onshore to offshore	Delamination, surface corrosion, and pitting	C1	25% area surface rust, heavy marine growth, and pitting	Sandblast and recoat	P2	N/A	3

Pile 12	Longitudinal onshore to offshore	Delamination, surface corrosion, and pitting	C1	25% area surface rust, heavy marine growth, and pitting, thickness = 0.270" in localized deep pit (2013)	Sandblast and recoat	P2	N/A	3
Pile A	Transverse (Lt to Rt)	Mechanical abrasion and surface corrosion	C3	3" (w) x 36" (h) hole from mechanical abrasion of log boom, surface corrosion, and heavy marine growth	Replace or patch, sandblast and recoat	P3	110, 113	6
Pile B	Transverse (Lt to Rt)	Mechanical abrasion and surface corrosion	C2	1" diam. Hole, 2" (w) x 2" (h) hole, 50% surface rust, heavy marine growth	Patch, sandblast, and recoat	P2	N/A	4
Pile C	Transverse (Lt to Rt)	Mechanical abrasion and surface corrosion	C2	4" (w) flat spot from mechanical abrasion of log boom, 1.5" diam. Star pattern hole in 4" wide flat spot, 1.5" diam. hole, 50% surface rust, heavy marine growth	Patch, sandblast, and recoat	P2	N/A	4
Pile D	Transverse (Lt to Rt)	Mechanical abrasion and surface corrosion	C3	4" (w) x 36" (h) hole mechanical abrasion of log boom, 3" (w) x 12" (h) hole, 1.5" diam. hole, 1" diam. hole, 2" (w) x	Patch, sandblast, and recoat	P3	115A	6

				1" (h) hole, 5" (w) x 2" (h) hole, 50% area surface rust, and heavy marine growth				
Pile E	Transverse (Lt to Rt)	Mechanical abrasion and surface corrosion	C3	2" (w) 18" (h) hole from mechanical abrasion of log boom, 0.5" diam. hole, 4" (w) flat spot, 4.5" (w) x 1.5" (h) hole, 3.5" (w) x 0.75" (h), 2" diam. hole, 25% area surface rust, and heavy marine growth	Patch, sandblast, and recoat	P3	115B	6
Pile F	Transverse (Lt to Rt)	Mechanical abrasion and surface corrosion	C3	3.5" (w) x 18" (h) hole from mechanical abrasion of log boom, 2" (w) x 2.5" (h) hole, 1.5" (w) x 3" (h) hole, 25% area surface rust, and heavy marine growth	Patch, sandblast, and recoat	P3	117	6
Pile G	Transverse (Lt to Rt)	Mechanical abrasion and surface corrosion	C2	3" (w) x 2' (h) flat area from mechanical abrasion of log boom, 0.5" diam. hole in pit, 0.25" diam. hole in pit, 25% area surface rust, and heavy marine growth	Patch, sandblast, and recoat	P2	N/A	4

Pile H	Transverse (Lt to Rt)	Holes and surface corrosion	C2	1" diam. hole, 3" diam. hole, 3" (w) x 2" (h) hole, 2" diam. hole, 25% area surface rust, and heavy marine growth	Patch, sandblast, and recoat	P2		4
Pile I	Transverse (Lt to Rt)	Surface corrosion	C1	25% area surface rust and heavy marine growth	Patch, sandblast, and recoat	P1		2
Pile J	Transverse (Lt to Rt)	Mechanical abrasion and surface corrosion	C3	12" (h) x 2.5" (w) hole from mechanical abrasion of log boom,3" (w) x 18" (h) hole, 4" wide flat spot, 1.5" diam. hole, 1.5" (w) x 2" (h), 3.5" (w) x 1" (h) hole, 25% area surface rust, and heavy marine growth	Patch, sandblast, and recoat	P3	118	6
Pile K	Transverse (Lt to Rt)	Mechanical abrasion and surface corrosion	C2	4" (w) flat spot from mechanical abrasion of log boom, thin but no holes, 25% area surface rust, and heavy marine growth	Patch, sandblast, and recoat	P2		4
Pile L	Transverse (Lt to Rt)	Mechanical abrasion and surface corrosion	C3	3" (w) x 24" (w) hole from mechanical abrasion of log boom, 1" diam. Hole, 5" (w) flat spot, 3" (w)	Patch, sandblast, and recoat	P3	119	6

				x 2" (h) hole, 25% area surface rust, and heavy marine growth				
Pile M	Transverse (Lt to Rt)	Mechanical abrasion and surface corrosion	C2	2" (w) x 3" (h) hole from mechanical abrasion of log boom, 2.5" (w) x 7" hole, 3"-4" wide flat spot, 25% area surface rust, and heavy marine growth	Patch, sandblast, and recoat	P2		4
Pile N	Transverse (Lt to Rt)	Surface corrosion and heavy marine growth	C1	10% area surface rust and heavy marine growth	Patch, sandblast, and recoat	P1		2
Pile O	Transverse (Lt to Rt)	Mechanical abrasion and surface corrosion	C3	4" (w) x 24" (h) hole from mechanical abrasion, 4" wide flat spot, 1" diam. hole, 0.25" diam. hole in pit, 0.5" diam. hole, 1.5" (w) x 0.25" (h) hole, 10% area surface rust, and heavy marine growth	Patch, sandblast, and recoat	P3	120	6
Pile P	Transverse (Lt to Rt)	Mechanical abrasion and surface corrosion	C3	5" (w) x 54" (h) large hole from mechanical abrasion of log boom, 2" diam. hole, 25% area surface rust,	Patch, sandblast, and recoat	P3	121	6

				and heavy marine growth				
Pile Q	Transverse (Lt to Rt)	Surface corrosion and marine growth	C1	25% area surface rust and heavy marine growth	Sandblast, and recoat	P1	N/A	2
Pile R	Transverse (Lt to Rt)	Surface corrosion and marine growth	C1	25% area surface rust and heavy marine growth	Sandblast, and recoat	P1	N/A	2
Pile S	Transverse (Lt to Rt)	Holes and surface corrosion	C2	2" (w) x 1" (h) and 1" diam. Hole, 2" (w) x 3"(h) hole, 2.5" (w) x 6" (h) hole, 25% area surface rust, and heavy marine growth	Patch, sandblast, and recoat	P2	N/A	4
Pile T	Transverse (Lt to Rt)	Surface corrosion and heavy marine growth	C1	25% area surface rust and heavy marine growth	Patch, sandblast, and recoat	P1	N/A	2
Pile U	Transverse (Lt to Rt)	Surface corrosion and heavy marine growth	C1	3" (w) flat area w/ heavy corrosion and pitting, 25% area surface rust, and heavy marine growth	Patch, sandblast, and recoat	P1	N/A	2

Pile V	Transverse (Lt to Rt)	Mechanical abrasion and surface corrosion	C3	4" (w) x 24" (h) hole from mech. abrasion of log boom, 3" (w) x 14" (h) hole, 25% area surface rust, and heavy marine growth	Patch, sandblast, and recoat	P3	122	6
Pile W	Transverse (Lt to Rt)	Mechanical abrasion and surface corrosion	C3	4.5" (w) x 18" (h) hole from mech. abrasion of log boom, 2.5" (w) x 7" (h) hole, 3" (w) x 8" (h) hole, 25% area surface rust, and heavy marine growth	Patch, sandblast, and recoat	P3	123	6
Pile X	Transverse (Lt to Rt)	Surface corrosion and marine growth	C1	25% area surface rust and heavy marine growth	Patch, sandblast, and recoat	P1	N/A	2
Pile Y	Transverse (Lt to Rt)	Mechanical abrasion and surface corrosion	C3	3" (w) x 18" (h) hole from mech. abrasion of log boom, 3" (w) x 7" (h) hole, 3" (w) x 8" (h) hole, 25% area surface rust, and heavy marine growth	Patch, sandblast, and recoat	P3	124	6

Still Harbor Trestle

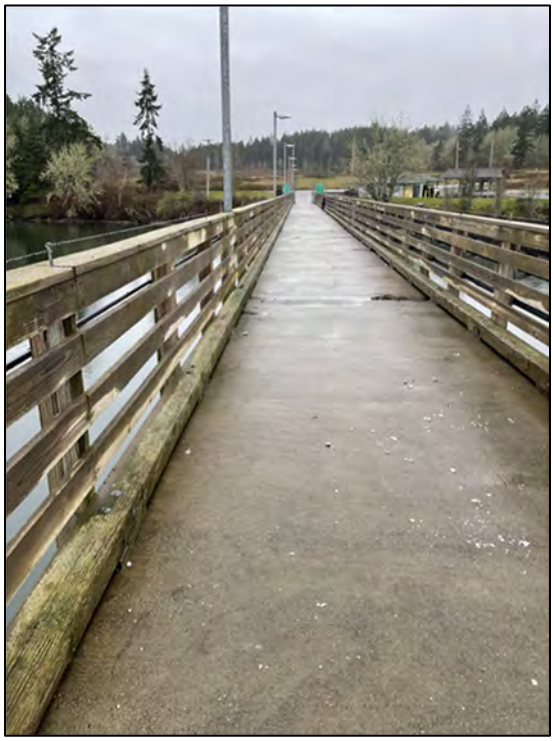


Photo 7: Still Harbor Trestle

Table 9. WSDOT assessment details with total ratings for Still Harbor Trestle.

Still Harbor Trestle								
Item	**Location**	**Defect**	**Condition Rating**	**Details**	**Repair**	**Priority Rating**	**Photo**	**Total Rating**
Girders	Span 1, Pier 2	Leaching Crack	C1	Leaching crack in concrete	Patch crack	P1	104	2

Girders	Span 1, Pier 2	Delamination	C1	End diaphragm has a delamination on the right web of span 1	Patch delamination	P1	104	2
Girders	Span 7, Pier 7	Delamination	C1	End diaphragm has a delamination on the left web of span 7	Patch delamination	P1	106	2
Guard Rail	Perimeter of trestle	Green moss algae	C1	Green moss algae on wooden guard rail members	Maintenance	P1	N/A	2
Timber Whaler	Near spud pile A	Broken	C2	The last four feet of the timber waler is broken	Replace member	P2	108	4

RECOMMENDATIONS

See Appendix A-E for a photo example of each type of damage listed. The best option to fix damage is to completely replace the members, however, we understand that this may not be the most cost effective or feasible way of fixing the damage.

Figures 11-15 are visual representation of how much each level of repair may cost and how long it assumed to last. There are three tiers of repair options presented to provide a cost benefit analysis of the repairs required and the longevity the structure will have as a result of the repairs performed. The longevity of each level of repair is an assumed value based off experience with similar structures. Depending on the value that the total rating is in Figures 1, 2A, 2B, and 3, determines what repair category that member falls into. If a member's condition rating is C3, it is a high priority of P3 with a total rating of 6, then it would fall under the minimum repairs category on the top of Figures 1, 2A, 2B, or 3. That member is then categorized in the cost estimate under minimum repairs and is included in the total cost, see Figures 11-15.

Marine Railway Dry Dock

See Appendix E for a photo example of each type of damage listed.

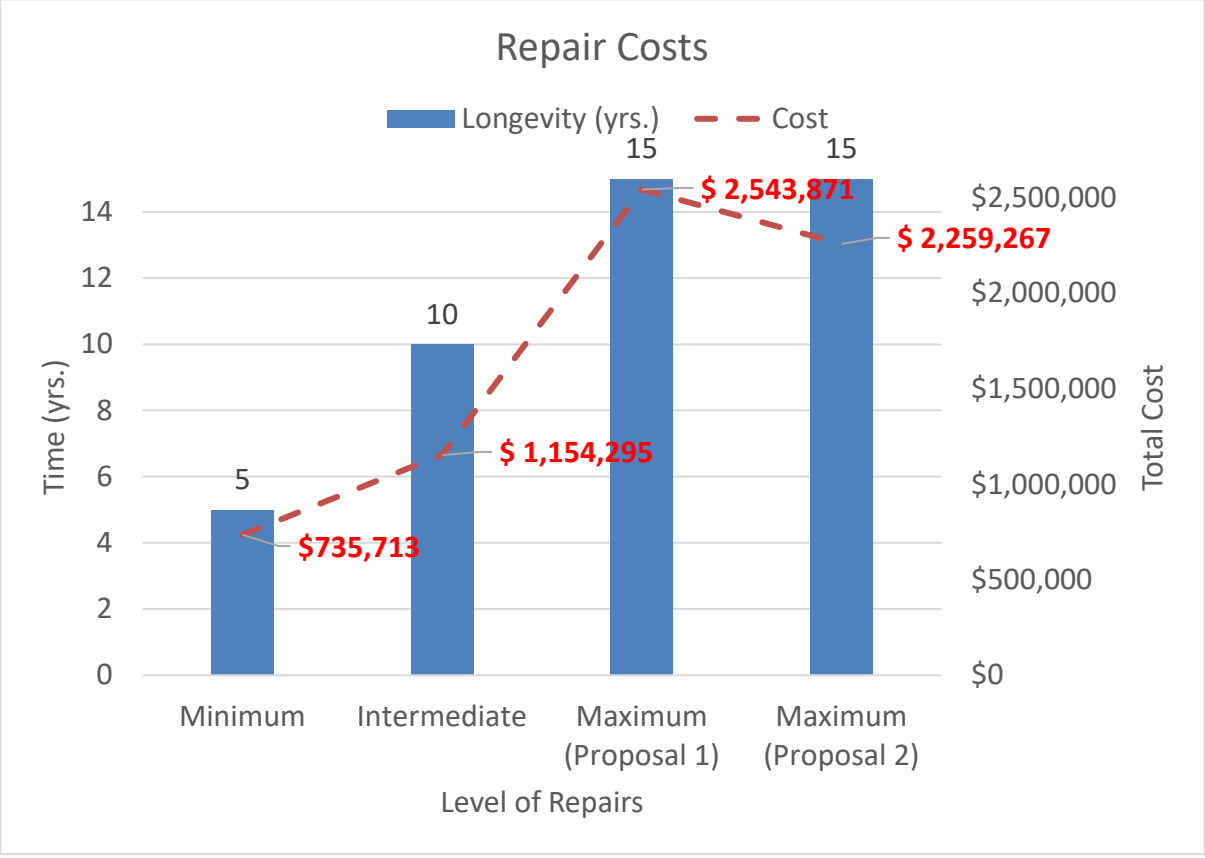


Figure 11. Marine Railway Dry Dock repair costs for different levels of repair.

The scope of work included in each level of repairs is as follows:

Minimum Repairs – Replacing 670 board feet of the timber rail beams, 427.5 board feet of timber pile caps, 400 board feet of timber piles, and fasteners in poor condition. Replacing 1100 linear feet of rails and all associated hardware. Replace all the wheel axles, axle retainers, rail wheels, bronze bushings, wire rope pulleys for bilge blocks, and wire rope pulley shafts for bilge blocks.

Intermediate Repairs – Replacing 1340 board feet of the timber rail beams, 855 board feet of timber pile caps, 800 board feet of timber piles, and fasteners in poor condition. Replacing 1100 linear feet of rails and all associated hardware. Replace all the wheel axles, axle retainers, rail wheels, bronze bushings, wire rope pulleys for bilge blocks, and wire rope pulley shafts for bilge blocks. The intermediate repairs also include the cradle hauling machine.

Maximum Repairs (Proposal 1) – Replacing all timber members and fasteners. Replacing all of the rails and associated hardware. Replace all the wheel axles, axle retainers, rail wheels, bronze bushings, wire rope pulleys for bilge blocks, and wire rope pulley shafts for bilge blocks. Design proposal 1 includes extending the rail and concrete foundation, relocating the hoist house and fence line, building a trench for the hoist and anchor chains, sandblasting and painting the cradle, and installing the cradle hauling machine.

Maximum Repairs (Proposal 2) – Replacing all timber members and fasteners. Replacing all of the rails and associated hardware. Replace all the wheel axles, axle retainers, rail wheels, bronze bushings, wire rope pulleys for bilge blocks, and wire rope pulley shafts for bilge blocks. Design proposal 2 includes extending the rails with curvature, sandblasting and painting the cradle, and installing the cradle hauling machine.

North of Bulkhead Trench

Rails and Rail Fasteners

The rails, rail base plates, and rail spikes North of the bulkhead have remaining serviceable life and could be utilized for a longer period of time with maintenance. KPFF recommends installing more UHMW rub strips to reduce the amount of rubbing on the concrete from the wire rope.

Timber Rail Beams

All the timber rail beams north of the bulkhead trench need to be replaced due to the hollowing that is occurring.

Mechanical Components

KPFF recommends servicing or replacing if required, the snatch block if the existing wire rope system is continued to be used versus changing to a chain driven hauling system. KPFF recommends either replacing the existing hoist system with a chain driven hauling system or retrofitting the current hoist with a chain driven assembly. Replacing the existing wire rope hoist system will increase safety during operation and will also decrease maintenance costs. If a small portion of the wire rope on the existing system had a major discrepancy, the entire length of the wire rope would need to be replaced. If the hauling system were to be changed to a chain driven system, only damaged links would need to be replaced.

South of Bulkhead Trench

Rails and Rail Fasteners

The rails and all of the fasteners south of the bulkhead need to be replaced due to the severe surface corrosion.

Timber Rail Beams

Portions of the timber rail beams south of the bulkhead are recommended to replace due to early stages of soft rot and hollowing.

Pile Caps

KPFF recommends replacing all of the pile caps with a rating of two or worse in this report and any others that are in poor condition that KPFF was not able to assess due to being buried in soil. KPFF also recommends installing more UHMW rub strips on the pile caps to reduce the amount of rub on the beams from the wire rope.

Piles

All piles that are rated two or worse in this report are recommended to replace. KPFF recommends prior to construction that the top of all piles be dug down to two feet to assess the condition. If the conditions of the piles are poor, they are recommended to replace.

Mechanical Components

The snatch block on the south end of the rail system needs to be replaced due to the heavy surface corrosion if the existing wire rope system is continued to be used versus changing to a chain driven hauling system.

Cradle

KPFF recommends sandblasting and repainting the steel members on the cradle system. It is also recommended to replace any plywood decking that is in poor condition. All of the cradle's rail wheels, axle retainers, and wheel axles need to be replaced due to the heavy surface corrosion and freezing of the wheels. Selective replacement of the bilge block pulleys and shafts is recommended as well due to corrosion.

Design Proposal

The existing location of the design cradle severely reduces the production rate of dry dock ship work. During high tide, the existing dry dock location is partially covered in water. The work crew must shift their focus from dry dock work to ensuring that the marine water is not contaminated by pumping the water out of the bulkhead to a safe and approved location.

In order to eliminate the issues that are occurring at the Marine Railway Dry Dock, KPFF recommends the following design proposal options. Design proposal 1, shifting the hoist house and the cradle assembly 50 feet north to move operations out of the intertidal zone, which will eliminate the existing issues for the work crew. Although, this scope will require additional work to be done to make it successful. For the hoist house and cradle assembly to be relocated to the proposed position, the fence line must be rerouted, the rail system must be

extended, the concrete foundation must be extended, and a trench for the hoist's wire rope or anchor chains must be integrated into the existing road.

Alternatively, design proposal 2 is taking the rail system's current 1:32 slope and changing it to a curved slope. Changing this slope to a curved rail system will allow the bulkhead to be raised to prevent this issue. These design proposals are included in the drawing package provided in Appendix F.

Steilacoom Building Trestle and Mooring Float

See Appendix A for a photo example of each type of damage listed. KPFF recommends utilizing fiber reinforced polymers (FRP) jackets as an alternative to replacing piles. This process does not interfere with normal operations of the structure and is a lower cost in comparison to replacing piles. The jacket process includes surface preparation, installing reinforcement FRP mesh to the affected area of the pile, positioning a fiber formed jacket, temporarily securing the form with straps, and finally pour epoxy/grout material into the jacket and allow to cure. The axial capacity of the damaged pile is restored from this repair.

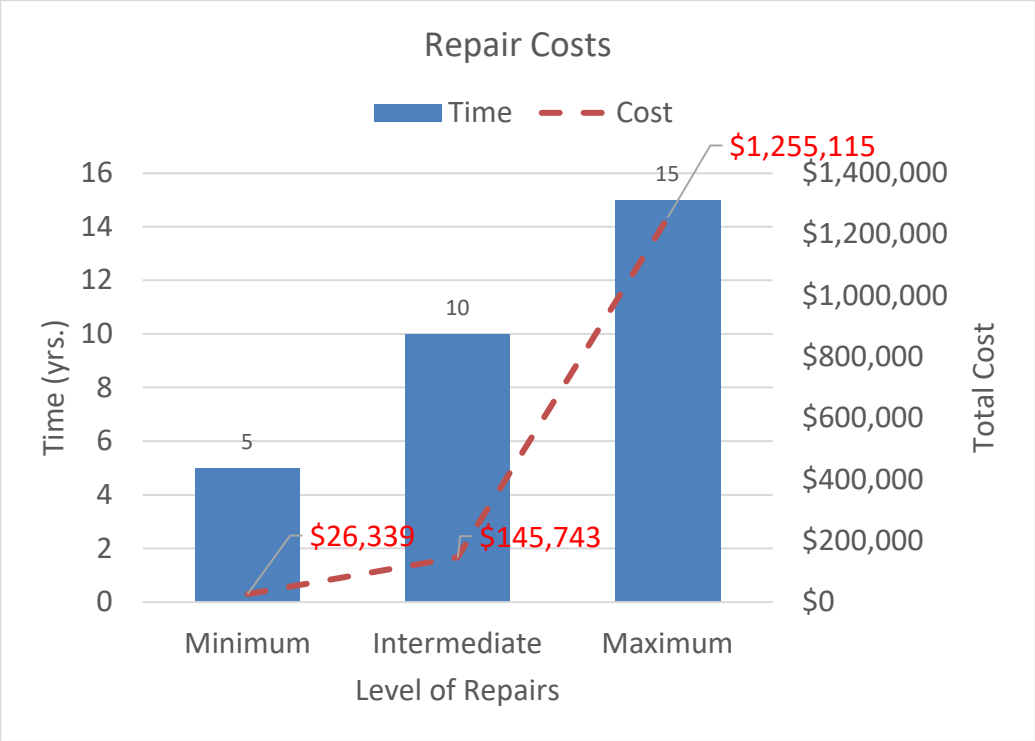


Figure 12. Steilacoom Trestle and Mooring Float repair costs for different levels of repair.

Minimum Repairs – Fiber reinforced jacket on pile 8.9A, replace timber curbing along trestle, sandblast and coat pile collars, repair leaking cell, relocate conduit, and replace keeper bolts.

Intermediate Repairs – Fiber reinforced jacket on poorly rated piles, replace timber curbing along trestle, sandblast and coat pile collars, repair leaking cell, relocate conduit, replace keeper bolts, sandblast and coat steel piles, and replace hatch bolts.

Maximum Repairs – Replacing the entire structure.

Island Trestle and Mooring Float

See Appendix B for a photo example of each type of damage listed.

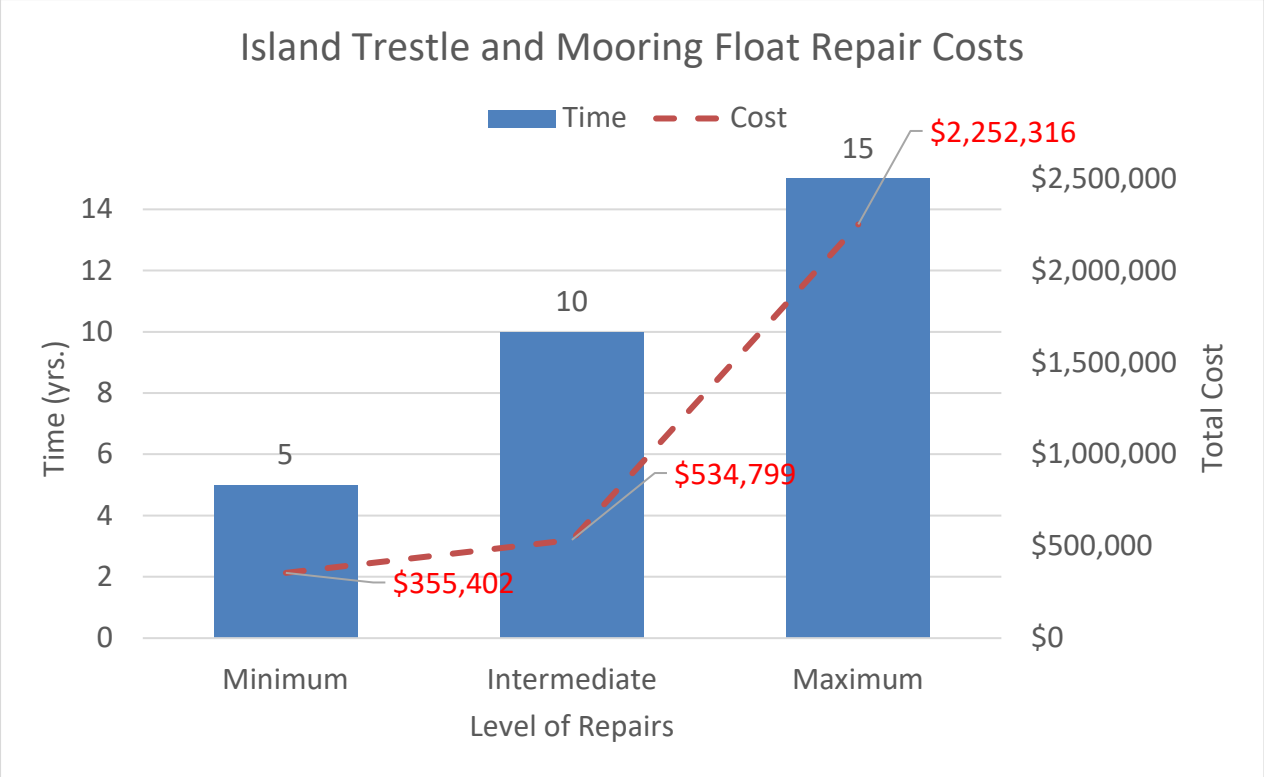


Figure 13. Island Trestle and Mooring Float repair costs for different levels of repair.

Minimum Repairs – Repair trestle piles F10, D1, D2, D3, and D4. Patch concrete spalling, replace ladders, sandblast and coat mooring float piles, replace UHMW, sandblast and coat fenders, replace balcony loading platform, repair tie back cable attachment, and replace pile collar chain securement.

Intermediate Repairs – Repair poorly rated trestle piles, patch concrete spalling, replace ladders, sandblast and coat mooring float piles, replace poorly rated piles, replace UHMW, sandblast and coat fenders, replace balcony loading platform, repair tie back cable attachment, replace pile collar chain securement, repair concrete spalling on float, and replace cover plates.

Maximum Repairs – Replacing the entire structure.

Barge Dock

See Appendix C for a photo example of each type of damage listed.

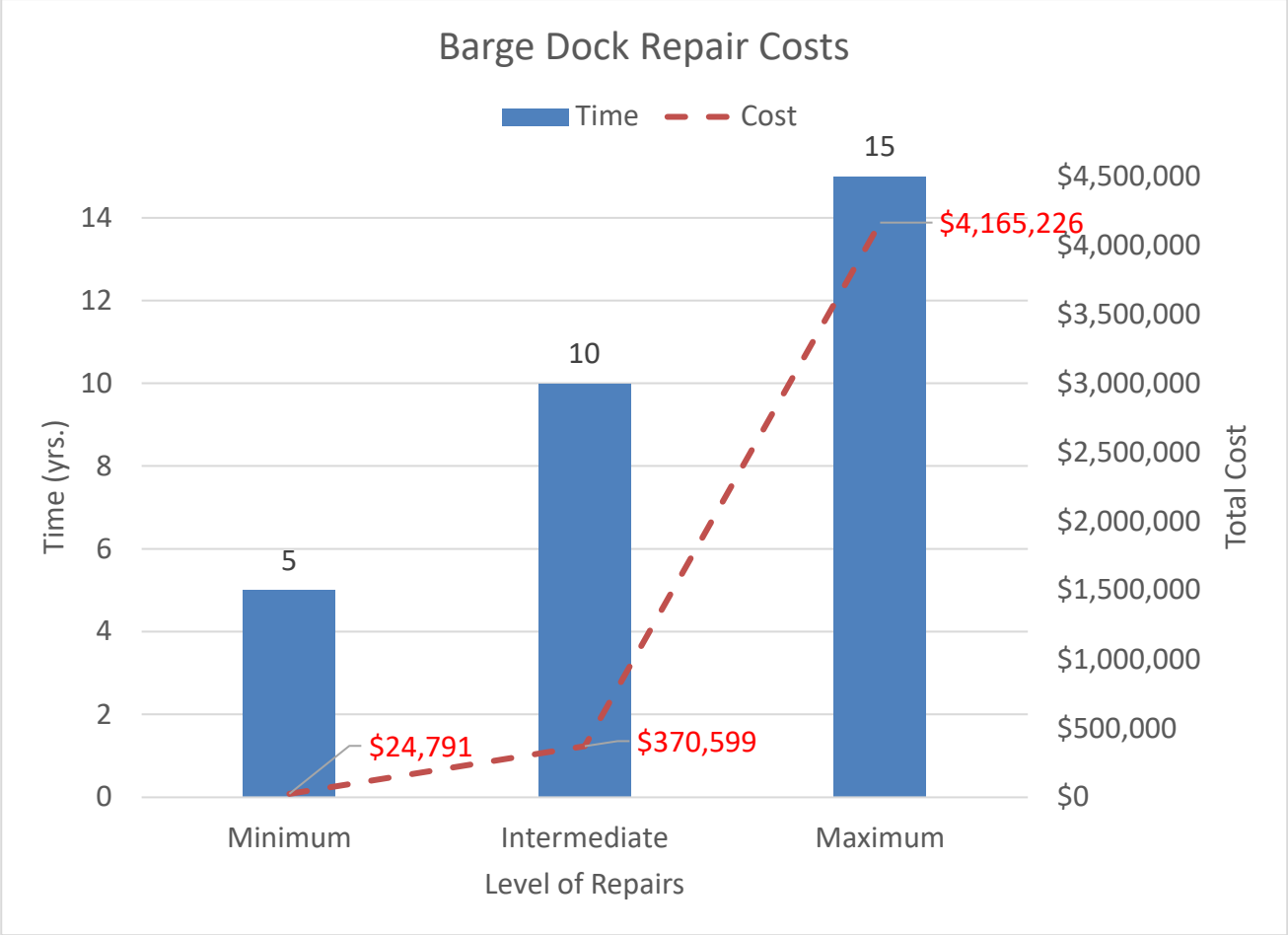


Figure 14. Barge Dock repair costs for different levels of repair.

Minimum Repairs – Replace girder brackets, replace tie rings, repair lower section of wingwalls, repair top end of wingwall piles, repair hold down bolts, grease cables, repair perforated deck bolts.

Intermediate Repairs – Repair piles, replace fasteners, replace girder brackets, replace timber deck, replace timber rail, replace tie rings, repair lower section of wingwalls, repair top end of wingwall piles, repair hold down bolts, grease cables, repair perforated deck bolts, replace dolphin wrap, sand blast and coat girders.

Maximum Repairs – Replacing the entire structure.

Still Harbor

See Appendix D for a photo example of each type of damage listed. KPFF recommends replacing the existing steel piles with new piles.

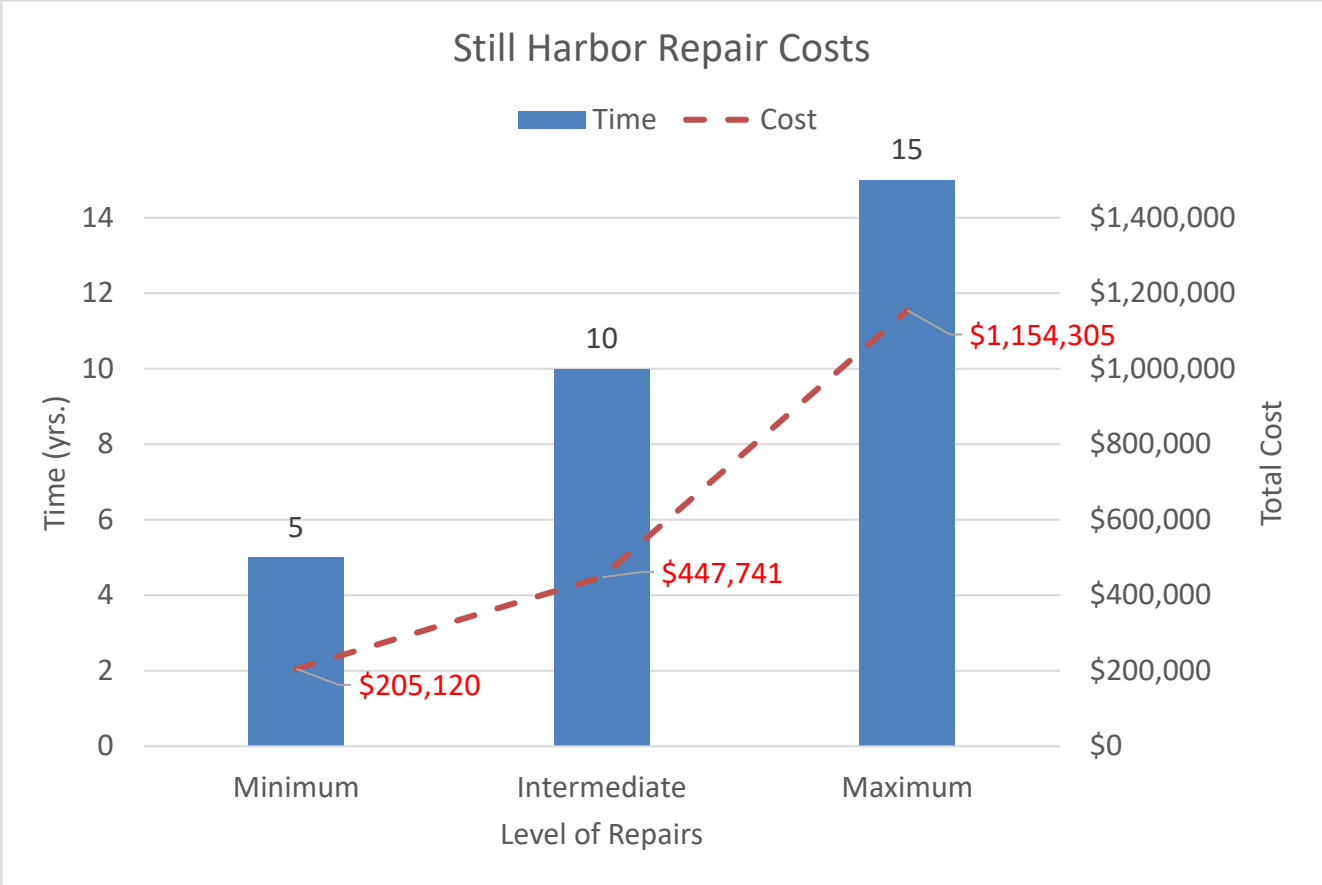


Figure 15. Still Harbor repair costs for different levels of repair.

Minimum Repairs – Replace all poorly rated piles.

Intermediate Repairs – Replace all poorly rated piles, sandblast and coat remaining piles, repair concrete spalling, and replace poorly rated fasteners.

Maximum Repairs – Replacing the entire structure.

PERMITTING

Permitting for work that is in-water and within the shoreline buffer of 200' from OHWM can be a long, involved process consisting of coordination with the designers, preparation of applications, correspondence with permitting agencies, and response to comments and questions. The length of time that the permit process takes is out of the control of the project team. The schedule is driven by the permitting agencies such as the US Army Corps of Engineers, NOAA Marine Fisheries, Washington State Department of Fish and Wildlife, City and County Departments, and others. Recently KPFF has see permits take many years in extreme cases. Typically, once submitted, projects that are in and over water, receive permits within 12 to 24 months. Projects that are within the 200' buffer of the OHWM, but not in-water receive permits within 3 months.

CONCLUSION

The condition of the Marine Railway Dry Dock is fair to poor. A large amount of the timber members are buried beneath the soil, therefore the condition ratings were assumed based off of experience with similar structures. A majority of the timber members have marine growth, green moss algae, early stages of soft rot, and Teredo activity. The rails, fasteners, rail splice bars, and brackets have surface corrosion and marine growth. The mechanical components have heavy amounts of surface corrosion. KPFF recommends replacing all poorly rated structural members and mechanical components in the system.

Based off the condition of structural and mechanical members at the marine railway dry dock, four repair categories were formed to analyze the cost benefit of each level of repair. The repair categories are broken down into minimum repairs, intermediate repairs, proposal 1 maximum repairs, and proposal 2 maximum repairs. Each repair category includes the type, quantity, and estimated cost of repairs. All of the other facilities are broken down into three separate repair categories. The categories are minimum repairs, intermediate repairs, and maximum repairs.

The condition of the Steilacoom Building Trestle and Mooring Float is fair. Deficiencies on the trestle include deterioration/marine borer entry of piles supporting the fixed pier, cracking of the welds on the cover plate between the pier and upland entrance, deterioration/splitting of timber curbing, and loose wraps around dolphin piles. Deficiencies of the mooring float include water intrusion into the float, broken fenders and fender anchorage, damage from the pile guides on the float due to jamming between the battered piles during extreme high tides, deteriorated piles, the shackle hangers at the upland end of the gangway are deteriorated, and damage to utilities on the bottom of the gangway due to extreme high tides.

The condition of the Island Mooring Float and Trestle is fair to poor. Deficiencies of the mooring float include damaged concrete on the floats, deteriorated piles, damaged rub strips on the piles, broken fenders and fender anchorage, damaged connections between floats, deterioration of the hinge at the upland end of the gangway, and deteriorated emergency ladder. Deficiencies on the trestle include delamination of the concrete deck on the trestle, broken piles, deteriorating dolphin piles, timber handrail splitting, and deteriorated emergency ladders. The boat lift is not included in the cost estimate or the WSDOT condition assessment.

The condition of the Barge Dock is fair. Deficiencies of the Barge dock include soft timber decking at the upland end of the trestle, worn deck boards, loose deck bolts, corroded brackets, deterioration at the top of the wing wall piles, deterioration on lower wingwalls, and missing and worn hardware at the waterside end of the apron.

The condition of the Still Harbor Dock and Trestle is fair to poor. Deficiencies include deterioration of steel guide piles and minor delamination on the trestle concrete girders.

We appreciate the opportunity to provide a compilation of WSDOT findings, estimates and a prioritization of the repairs, deficiencies, and replacement of the structures. KPFF thanks McNeil Island employees for the time they took to provide a quality experience throughout the condition assessment. KPFF also thanks McNeil Island employees for information that was provided to ensure the highest level of accuracy during the condition assessment and the cost estimate. Please contact KPFF with any question or concerns.

APPENDICES

Appendix A: Photos of Conditions Observed Steilacoom Trestle and Mooring Float

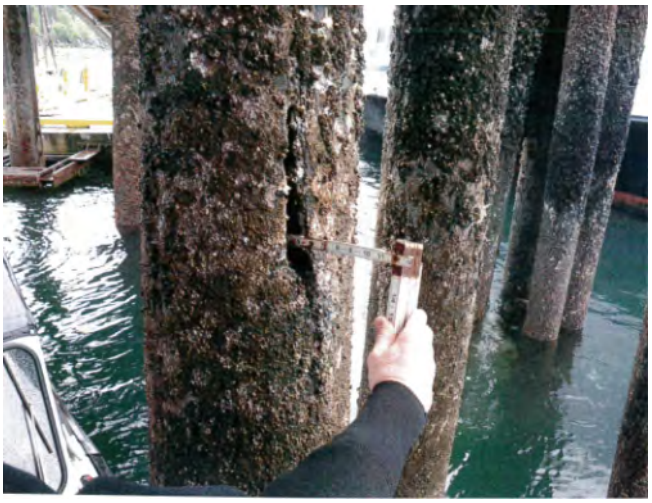


Photo 8: Pile 8.9A Rot cavity (2013)
6”W x 12”H x 6”D

Photo 9: Pile 8.9A Rot cavity (2017)
9”W x 16”H x 8”D

Photo 10: Pile 8.9A Rot cavity (2021)
12”W x 21”H x 12”D

Photo 11: Pile 8.9A Rot cavity (2019)

Photo 12: Pile 3B two marine borer entries (MBE)

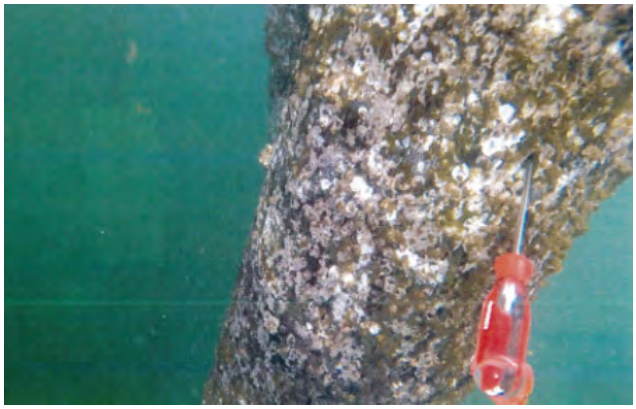


Photo 13: Pile 7.1H marine borer entry (MBE)

Photo 14: Pile 9B 3 marine borer entry (MBE) holes

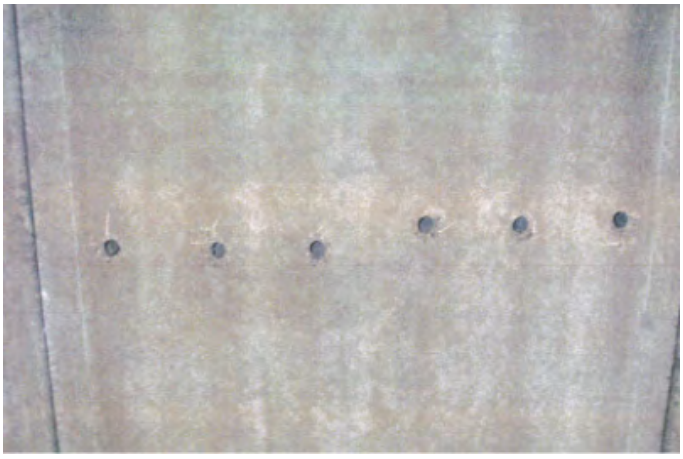


Photo 16: 1” diameter holes drilled at midspan of precast deck

Photo 15: Pile F7 marine borer entry (MBE)

Photo 17: Heavy rotting in timber curbing

Photo 18: Steel sliding plate

Photo 19: Steel sliding plate stitch welds breaking

Photo 20: Wooden guard rail with heavy green moss algae

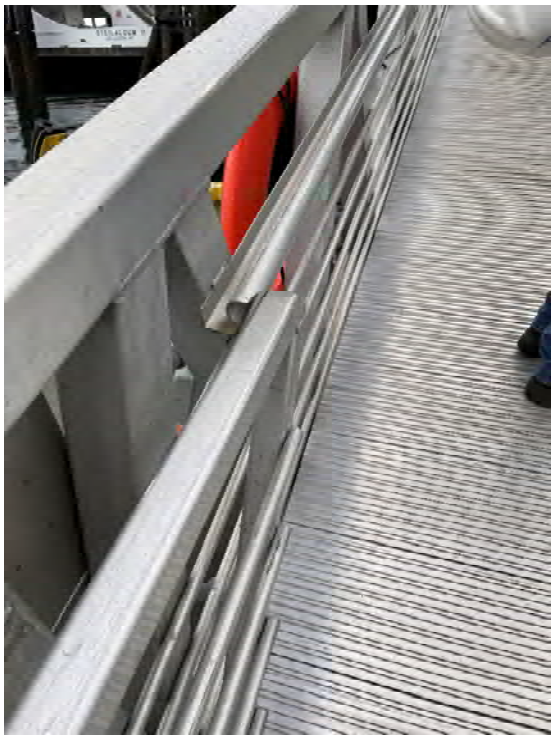


Photo 21: Loading ramp handrail with sharp edge

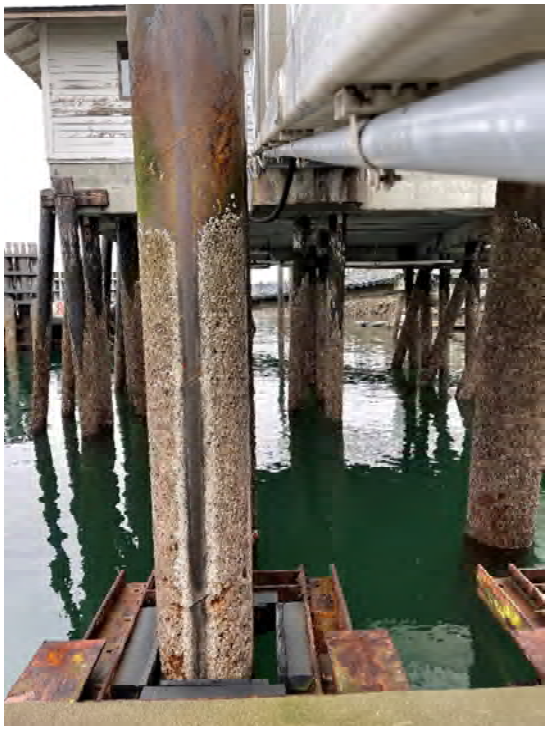


Photo 22: Conduit crushed between loading ramp and float

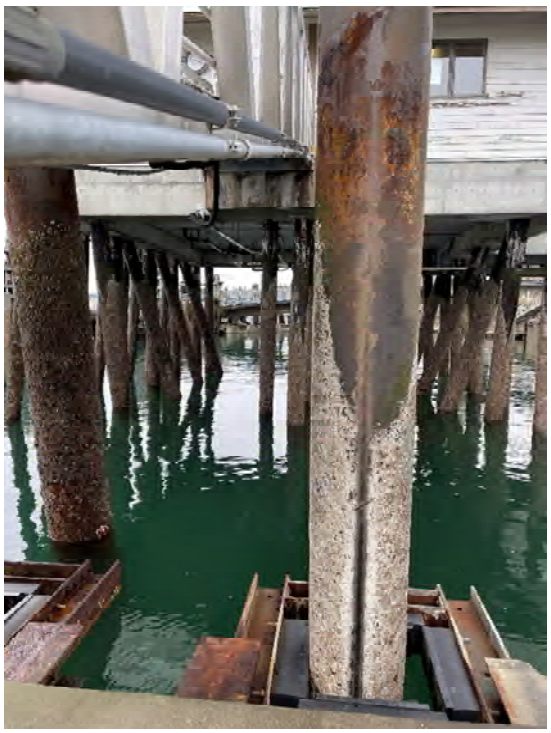


Photo 23: Clearance from pile and loading ramp

Photo 24: Fender with surface corrosion

Photo 25: Cell hatch

Photo 26: Plumb pile and batter pile

Photo 27: Pile collar with bent angle

Photo 28: Pile collar with bent angle from batter pile

Photo 29: Plumb pile and batter pile

Photo 30: Pile collar with bent angle from batter pile

Photo 31: Cell #8 pile collar connections

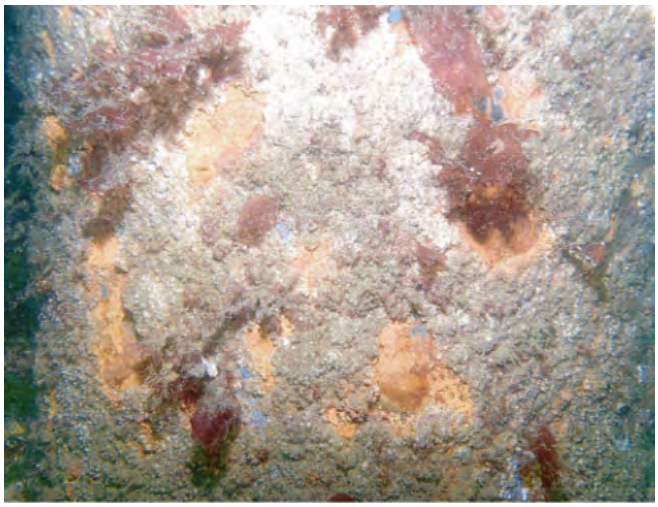


Photo 32: SP1A coating failure and rust blooms

Photo 33: SP3B surface corrosion and section loss

Photo 34: SP4 coating failure and surface corrosion

Appendix B: Photos of Conditions Observed Island Trestle and Mooring Float

Photo 35: SP1-D holed through

Photo 36: SP2-A heavy corrosion and section loss

Photo 37: SP3-B holed through

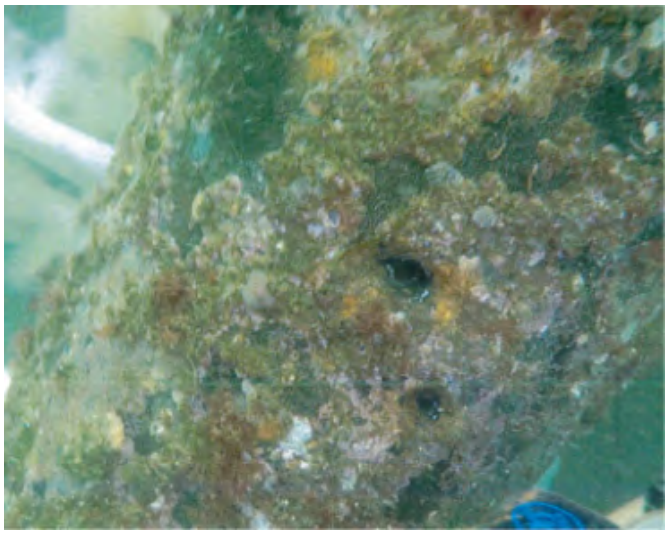


Photo 38: SP3-C holed through pitting

Photo 39: SP4-A holed through

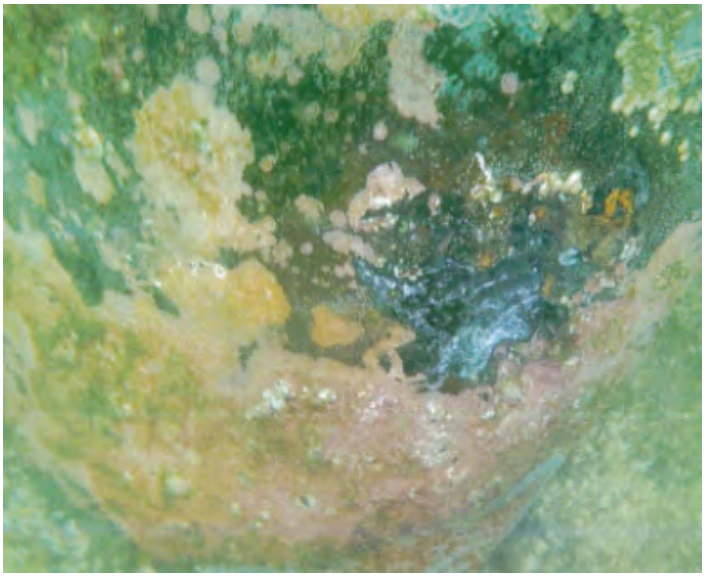


Photo 40: SP4-B deep pitting

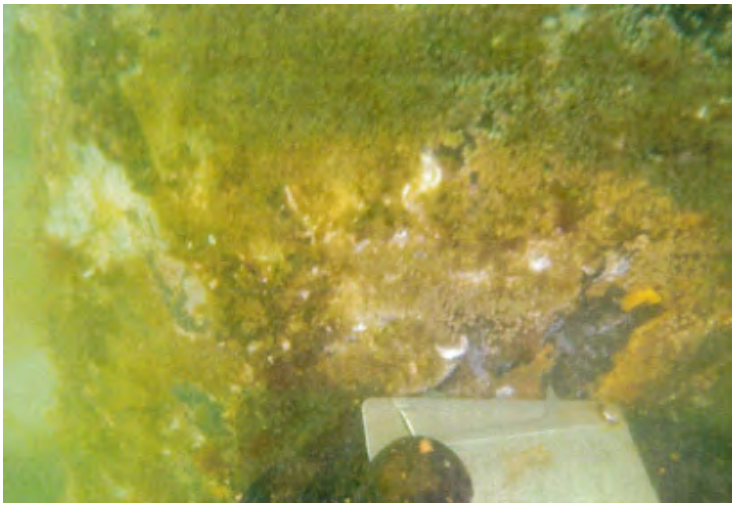


Photo 41: SP4-C deep pits at mid-height

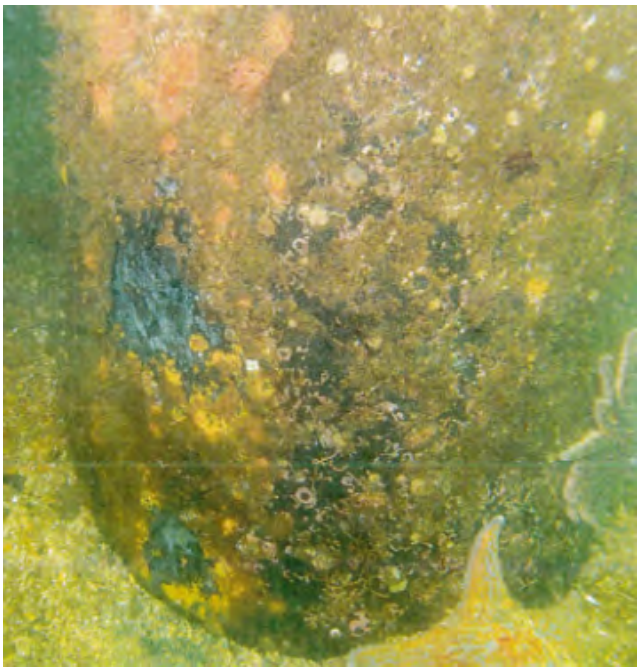


Photo 42: SP4-B typical coating failure and surface corrosion

Photo 43: SP1-A holed through

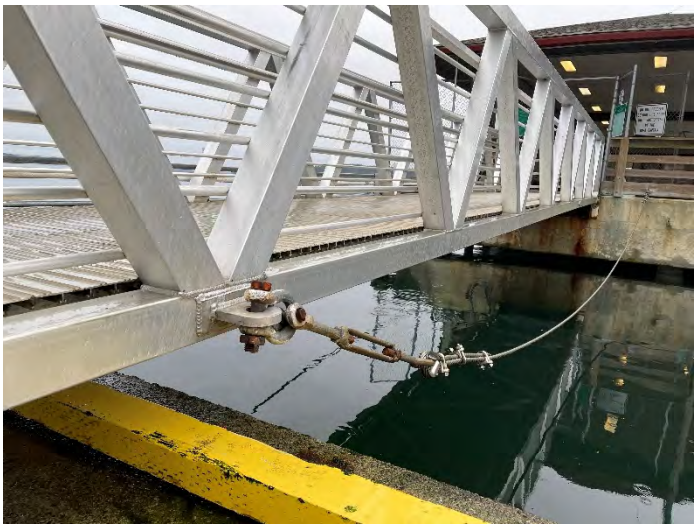


Photo 44: Tie back cable attachment

Photo 45: Tie back cable attachment cracked weld

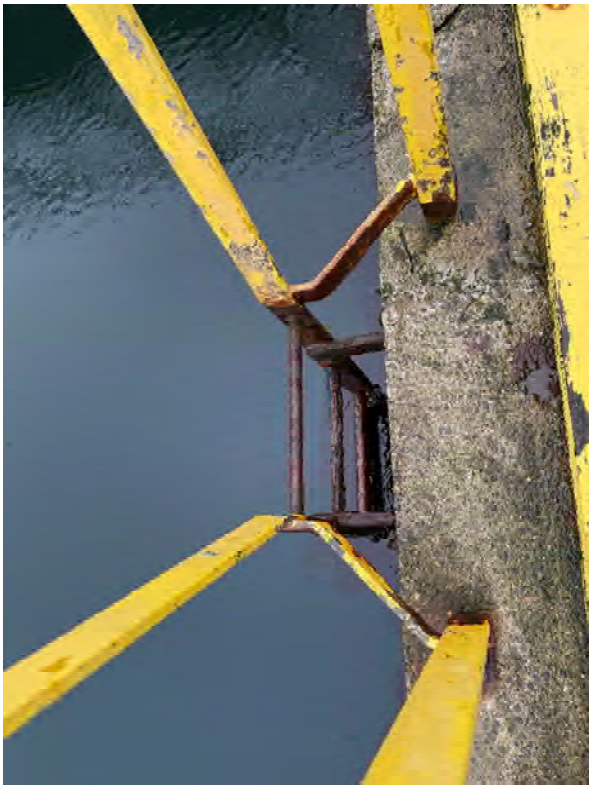


Photo 46: Ladder at Southwestern corner of float

Photo 47: Fender with surface corrosion

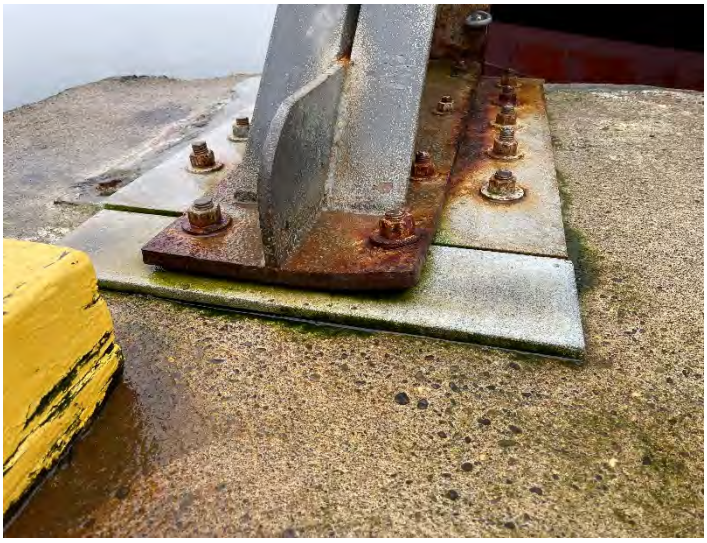


Photo 48: Bent fender with surface corrosion

Photo 49: Missing fasteners on fender, secured by welds

Photo 50: Mooring cleat with surface corrosion

Photo 51: Fender removed and concrete float patched

Photo 52: Concrete spalling along edge of float

Photo 53: Chain rubbing on pile, UHMW rub rails failing

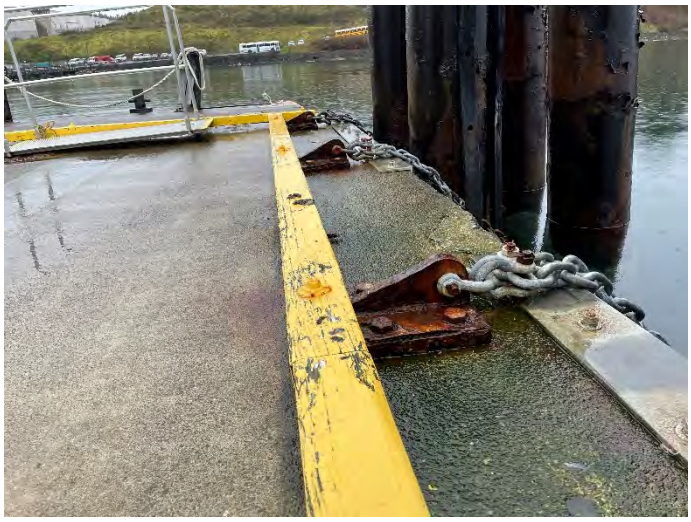


Photo 54: Heavy surface corrosion on chain securement

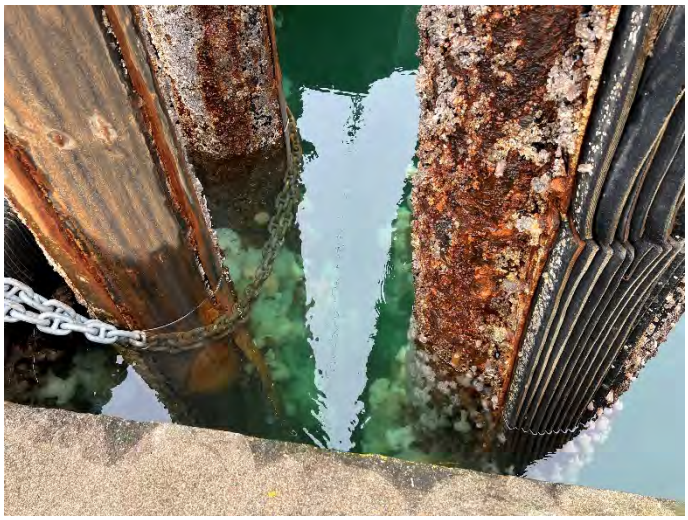


Photo 55: SP1 chain rubbing, UHMW rub rails failing

Photo 56: SP2 coating failure, surface corrosion, and heavy marine growth

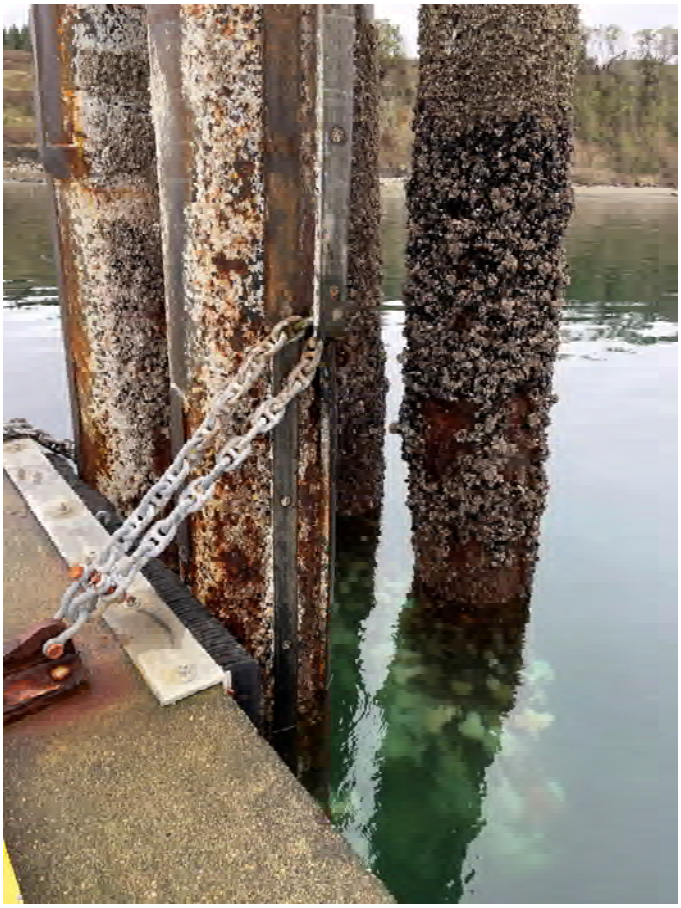


Photo 57: SP3 chain catching on UHMW rub rails

Photo 58: SP4 coating failure, surface corrosion, and heavy marine growth

Photo 59: Surface corrosion on cover plate

Photo 60: Surface corrosion on connections between floats

Photo 61: Balcony loading platform

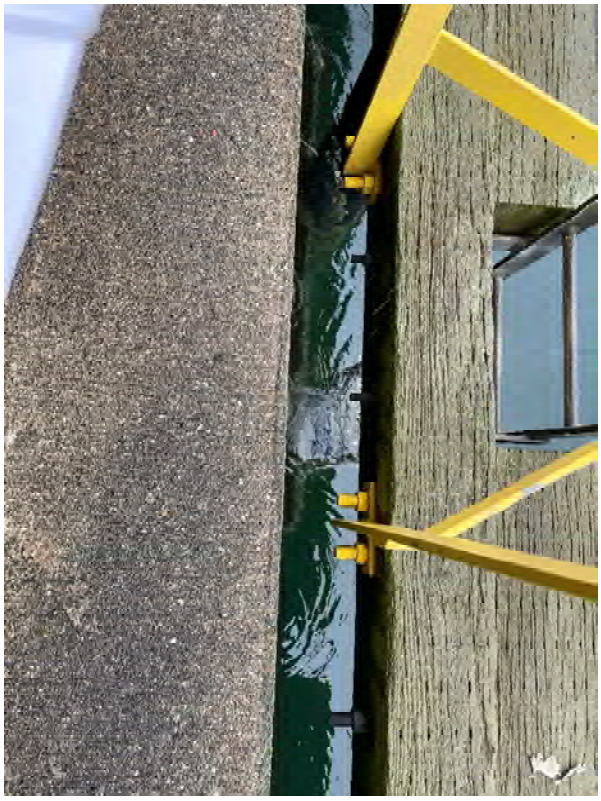


Photo 62: Pile F10 broken, South ladder is unsecured

Photo 63: Pile F10 broken, South ladder is unsecured

Photo 64: Deck panel 7B hold down bolt is necked down to 1.1875” at pier 7

Photo 65: Dolphin D1, mechanical damage, and MBE holes

Photo 66: Dolphin D2 with abrasion damage, ladder detached

Photo 67: Dolphin D3 with abrasion damage and internal decay

Photo 68: Dolphin D4 with abrasion damage and internal decay

Photo 69: Dolphin D1 with abrasion damage and internal decay

Photo 70: Boat lift access ladder has corroded off in lower intertidal zone.

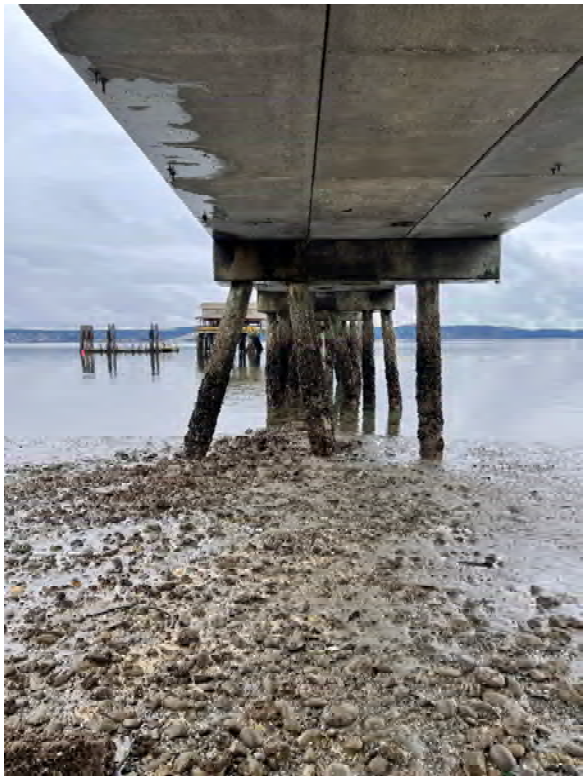


Photo 71: Concrete spalling below trestle

Photo 72: Concrete spalling below trestle

Photo 73: Exposed reinforcement from concrete spalling

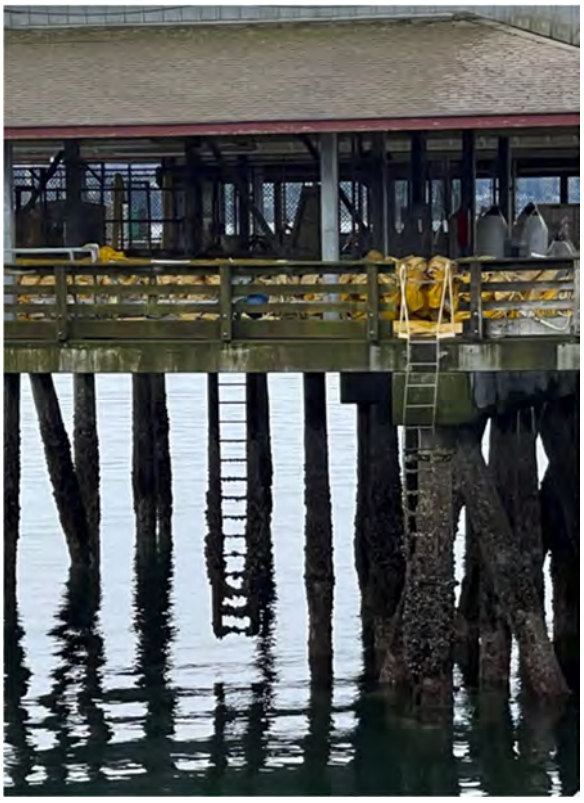


Photo 74: Northern and boat lift access ladders are in very poor condition

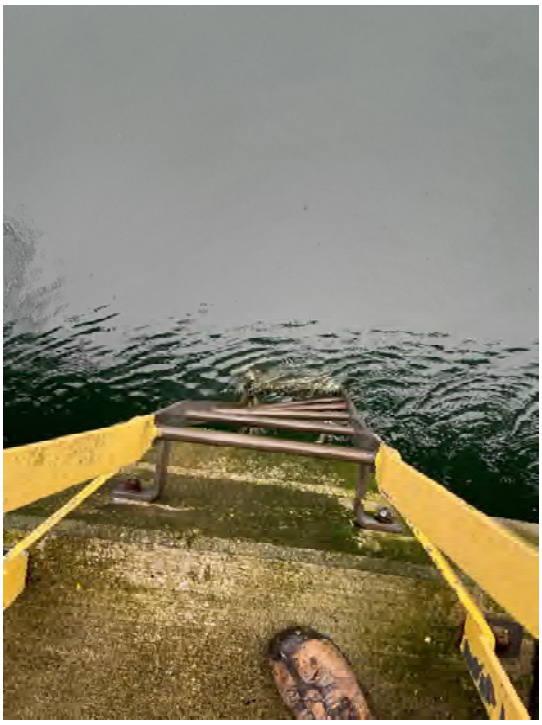


Photo 75: Bent southern ladder

Photo 76: Dolphin ladder broken

Photo 77: Boat lift

Photo 78: Piles F2A,B,C rot at top of piles

Photo 79: Wood rot on Fascia board

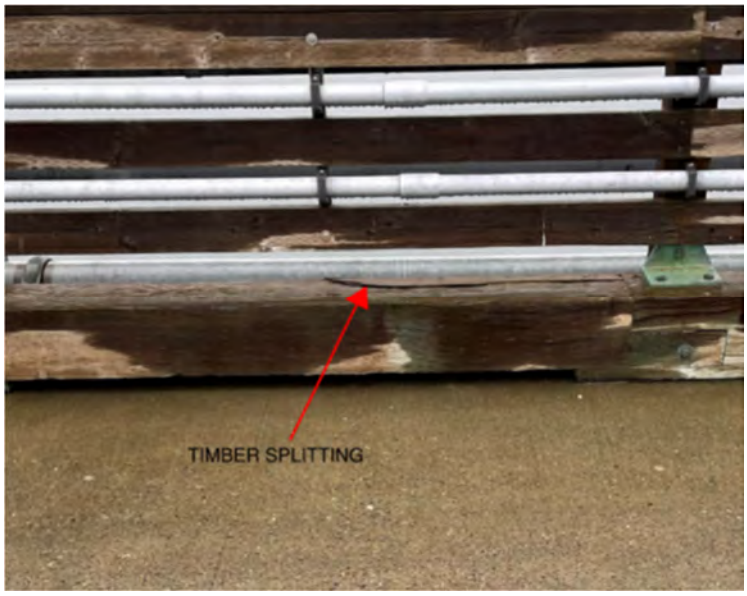


Photo 80: Timber curbing splitting on trestle

Appendix C: Photos of Conditions Observed Barge Dock

Photo 81: Pile 2C Marine borer entry

Photo 82: Pile 4A Marine borer entry

Photo 83: Loose timber deck hold down bolts

Photo 84: Typical wingwall pile with top rot

Photo 85: Left wingwall with rot below UHMW sheets

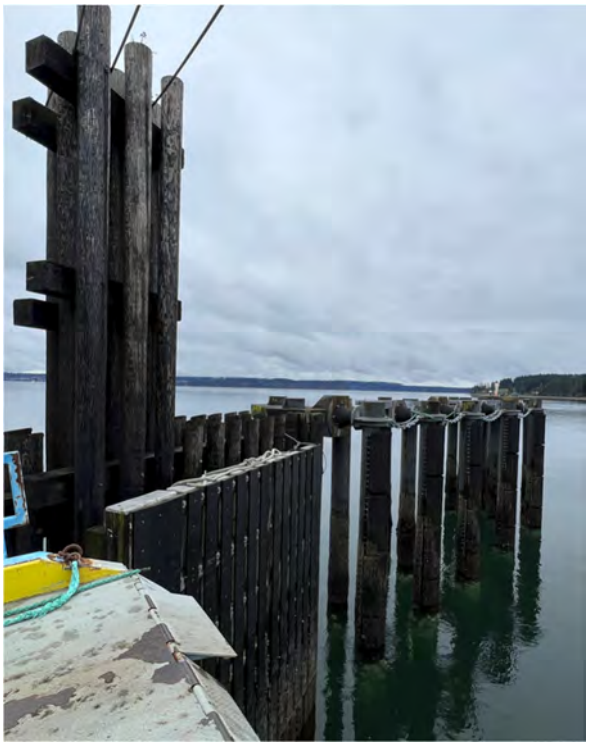


Photo 86: Left wingwall

Photo 87: Right wingwall

Photo 88: Right wingwall with rot below UHMW sheets

Photo 89: Left wingwall

Photo 90: Right wingwall

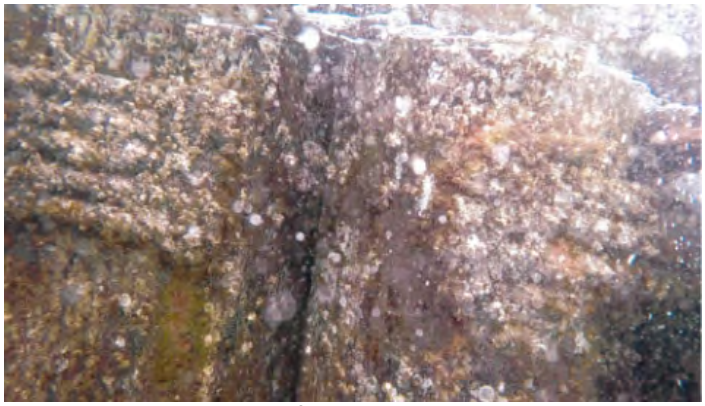


Photo 91: Left wingwall end dolphin lower wraps broken

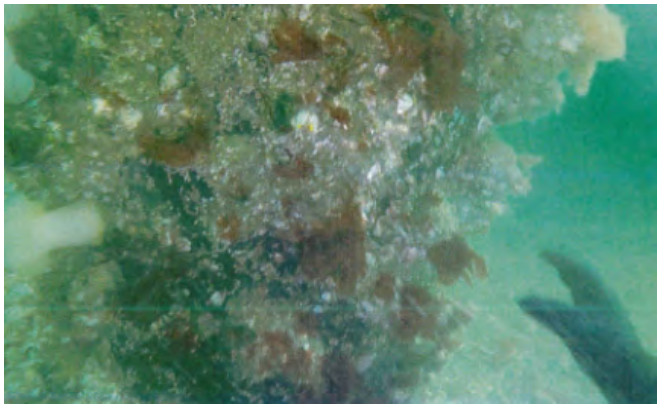


Photo 92: Pile 3A, typical conditions of other piles

Photo 93: Right wingwall, pile 3I with MBE

Photo 94: Left tie ring with section loss

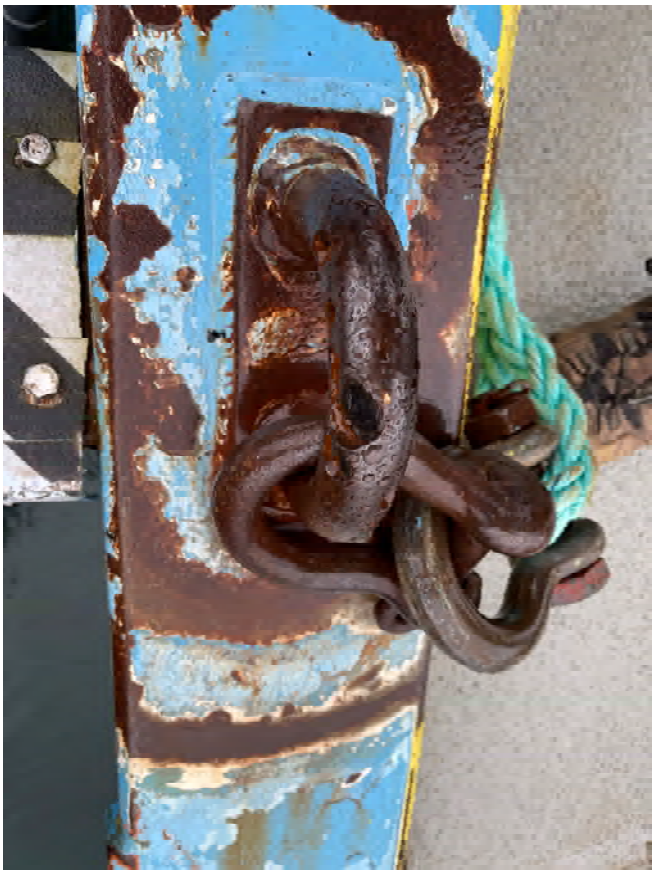


Photo 95: Right tie ring with section loss

Photo 96: Beneath the trestle

Photo 97: Heavy surface corrosion on fasteners

Photo 98: Heavy surface corrosion on girder brackets

Photo 99: Heavily corroded and delaminating girder brackets

Photo 100: Heavily corroded and delaminating nuts

Photo 101: Timber guard rail splitting

Photo 102: 0.625” deep rutting

Photo 103: Timber deck is rutting

Appendix D: Photos of Conditions Observed Still Harbor

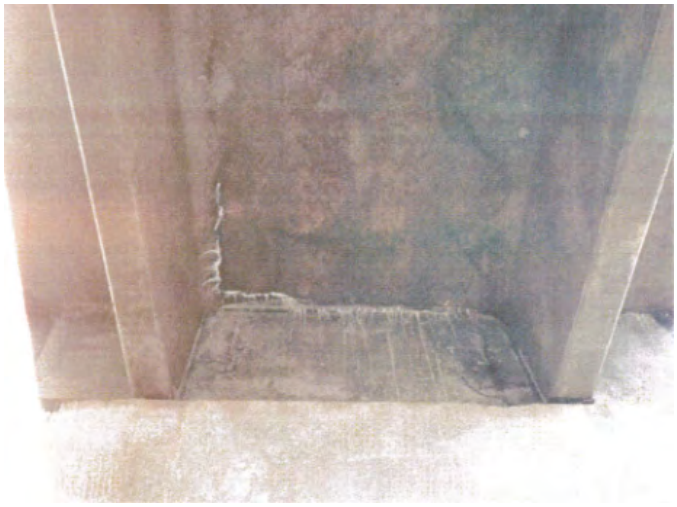


Photo 104: Span 1 with leaching crack at Pier 2

Photo 105: Pier 2 end diaphragm has delamination on the right web of Span 1

Photo 106: Pier 7 end diaphragm has delamination at the left web of Span 7

Photo 107: Panels E and F are uneven up to 1”

Photo 108: Near Spud Pile A, timber waler is broken and corroding fasteners

Photo 109: Eyebolts securing log fenders are bent

Photo 110: Pile A, 18” H x 4” W hole from mechanical abrasion

Photo 111: Pile J, 12” H x 2.5” W hole from mechanical abrasion

Photo 111: Pile O, 18” H x 4” W
hole from mechanical abrasion

Photo 112: Pile P, 3 ft vertical
hole from mechanical abrasion

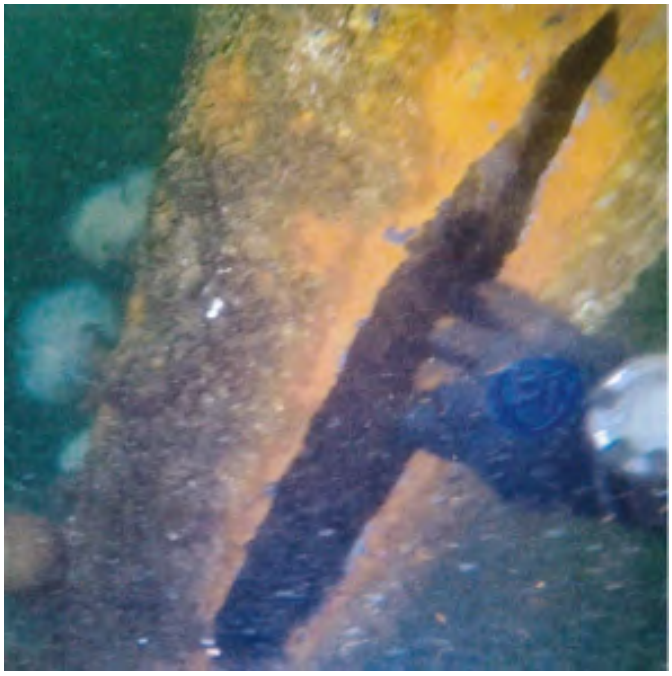


Photo 113: Pile A, 3” W x 36” H
hole from mechanical abrasion

Photo 114: Pile D, 4” W x 36” H
hole from mechanical abrasion

Photo 115A: Pile D, 5” W x 2” H hole

Photo 115B: Pile E, 2” W x 18” H hole from mechanical abrasion

Photo 116: Pile E, 4.5” W x 1.5” H hole and 3.5” W x 0.75” H hole

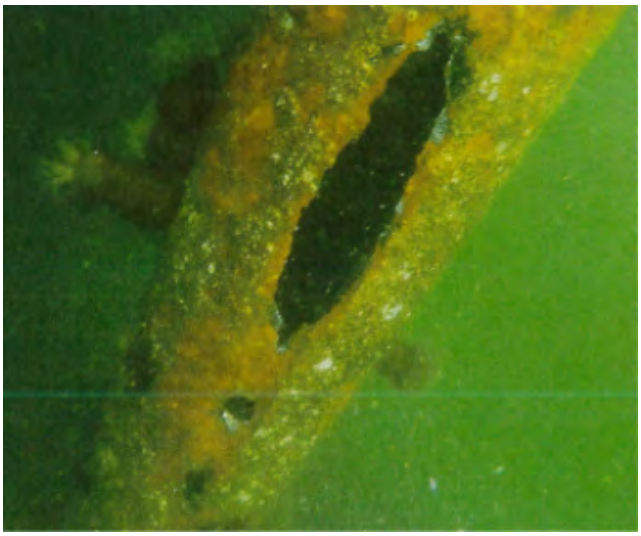


Photo 117: Pile F, 3.5” W x 18” H hole, 2” W x 2.5” H hole, and 1.5” W x 3” H hole from mechanical abrasion

Photo 118: Pile J, 3” W x 18” H hole from mechanical abrasion

Photo 119: Pile L, 3” W x 24” H hole from mechanical abrasion

Photo 120: Pile O, 4” W x 24” H hole from mechanical abrasion

Photo 121: Pile P, 5” W x 54” H hole from mechanical abrasion

Photo 122: Pile V, 4” W x 24” H hole and 3” W x 14” H hole from mechanical abrasion

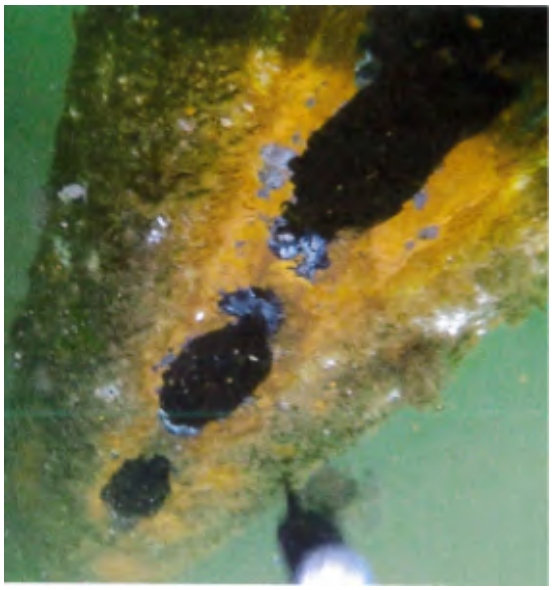


Photo 123: Pile W, 4.5” W x 18” H hole, 2.5” W x 7” H, and 3” W x 8” H hole from mechanical abrasion

Photo 124: Pile Y, 3” W x 18” H hole and 3” W x 6” H hole from mechanical abrasion

Photo 125: Typical pile condition underwater, 25%-50% coating failure and surface corrosion

Appendix E: Photos of Conditions Observed Marine Railway Dry Dock

Photo 126: Surface corrosion on rail North of bulkhead

Photo 127: Rail pitting and surface corrosion North of bulkhead

Photo 128: Timber rail beam (A) North of bulkhead

Photo 129: Timber rail beam (B) North of bulkhead

Photo 130: Rail system looking South

Photo 131: Timber rail and rail North of bulkhead

Photo 132: Timber rail and rail North of bulkhead

Photo 133: Core drill test

Photo 134: Cradle and concrete North of bulkhead

Photo 135: Rail and timber rail North of bulkhead

Photo 136: Rail (A) and timber rail South of bulkhead

Photo 137: Heavy surface corrosion on rails and rail clips

Photo 138: Rail splice plate with heavy surface corrosion

Photo 139: 10th pile cap from bulkhead

= 

Photo 140: 11th pile cap from bulkhead

Photo 141: Heavy surface corrosion on rail and pile cap connection bracket

Photo 142: 15th pile cap with early stages of hollowing

Photo 143: 17th pile cap with early stages of hollowing

Photo 144: Pile 6A, hollowing around pile cap fastener

Photo 145: Pile 9A, hollowing around pile cap fastener

Photo 146: Pile 10B, hollowing around pile cap fastener

Photo 147: Wire rope wearing on pile cap rub beam

Photo 148: Wire rope wearing on pile cap rub beam

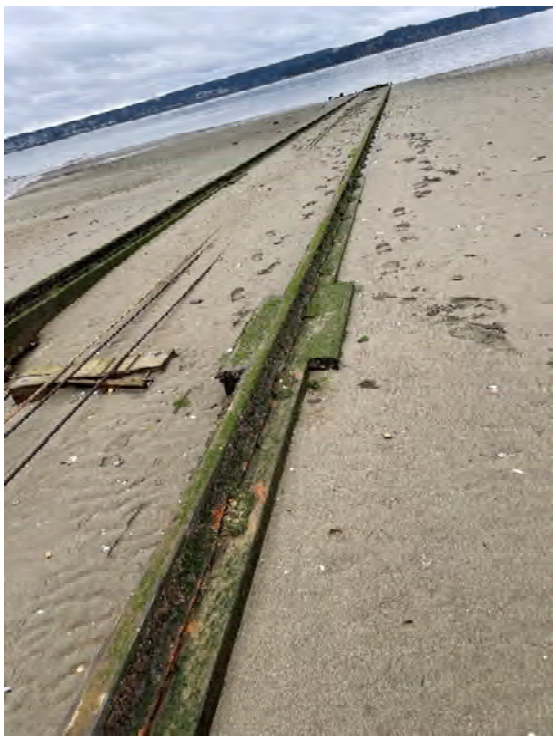


Photo 149: Buried piles and pile caps toward Southern portion of system

Photo 150: 16th pile cap with hollowing

Photo 151: Timber rail splice beam with heavy marine growth

Photo 152: Pile 8B, early stages of hollowing

Photo 153: Pile 12A, hollowing around pile cap fastener

Photo 154: Anchor system at Southern end of track

Photo 155: Anchor system at Southern end of track

Photo 156: Anchor piles at end of track

Photo 157: Anchor pile

Photo 158: Cradle at Northern end of track

Photo 159: Cradle at Northern end of track

Photo 160: Cradle column at North end

Photo 161: Cradle ladder

Photo 162: Cradle column on Western side

Photo 163: Cradle ladder

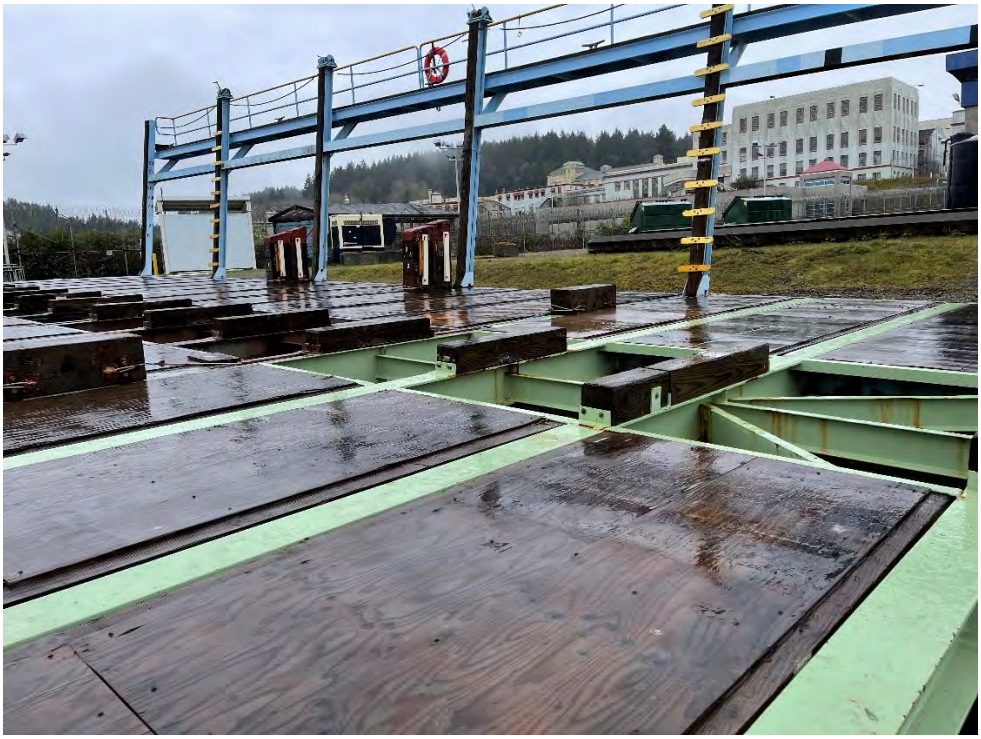


Photo 164: Western side of Cradle

Photo 165: Eastern side of Cradle

Photo 166: Center of Cradle

Photo 167: Western side of Cradle

Photo 168: Center of Cradle

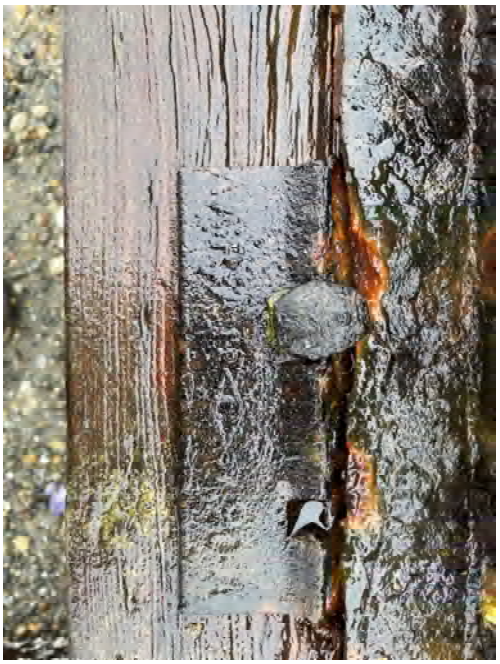


Photo 169: Rail clip and rail near bulkhead burning up

Photo 170: Rail system looking North

Photo 171: Buried members on Southern section of rail system

Photo 172: Rail system looking North

Photo 173: Rail system looking South

Photo 174: Snatch block on South end of rail system

Photo 175: Snatch block on South end of cradle

Photo 176: Snatch block on North end of cradle

Photo 177: Snatch block on South end of rail system

Photo 178: Cradle wheels

Photo 179: Cradle wheel

Photo 180: Cradle wheel

Photo 181: Cradle wheels and decking

Photo 182: Cradle wheel

Photo 183: Hoist machine

Photo 184: Hoist machine electric motor

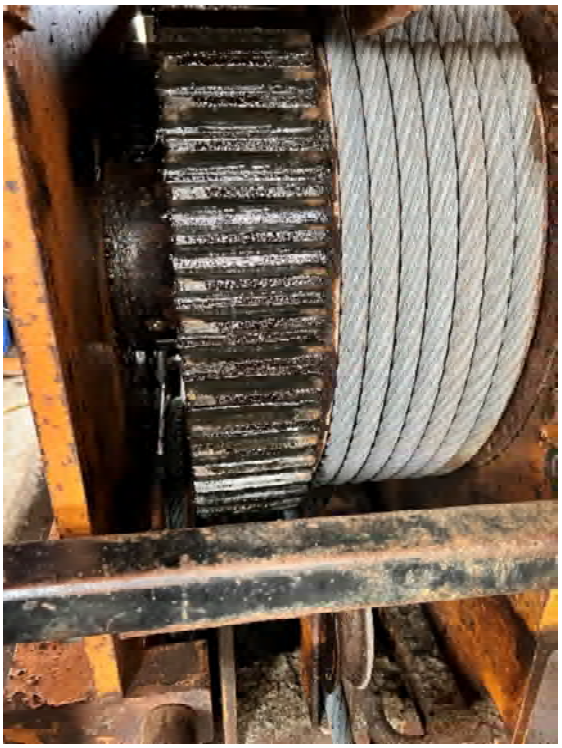


Photo 185: Hoist machine gear and wire rope

Photo 186: Hoist machine gear and wire rope

Photo 187: Bilge block system

Photo 188: Bilge block hand winch

Photo 189: Bilge block hand winch

Photo 190: Bilge block pulley

Photo 191: Bilge block pulley

Photo 192: Bilge block pulley

Photo 193: Bilge block wire rope

Photo 194: Base of column on cradle

Photo 195: Bilge block wire rope

Photo 196: Cradle wheels and rails

Photo 197: Center of cradle

Appendix F: Marine Railway Dry Dock Drawings

OVERALL EXISTING SITE PLAN
SCALE: 1/64" = 1'-0"

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

kpff
2407 North 31st Street, Suite 100
Tacoma, Washington 98407
(253) 396-0150 Fax (253) 396-0162

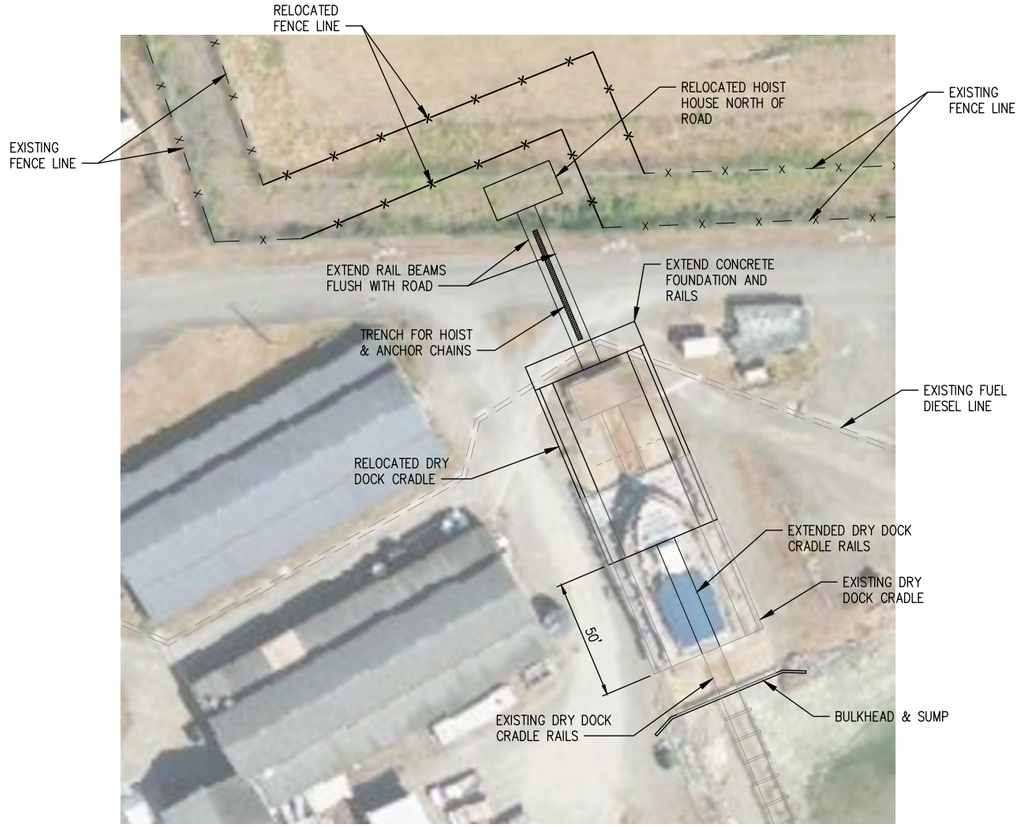
NO.	DATE	BY	REVISION

EXISTING SITE PLAN

DRAWN: TRL	PROJECT NO.:
DESIGN: DF	SCALE: AS SHOWN
CHECKED: IDF	DATE:
DRAWING NO.	**EX-1**
SHEET NO.	**01** OF **SHTS**

Plotted: Mar 29, 2022 - 4:31pm ttemons Layout: Layout1
N:\2022\10182200022 McNeil Island Marine Facilities Priorities\Drawings\EXHIBIT\EX1-EXISTING SITE.dwg

OVERALL SITE PLAN
SCALE: 1/64" = 1'–0"



1 – **DETAIL**
SCALE: 1/32" = 1'–0"

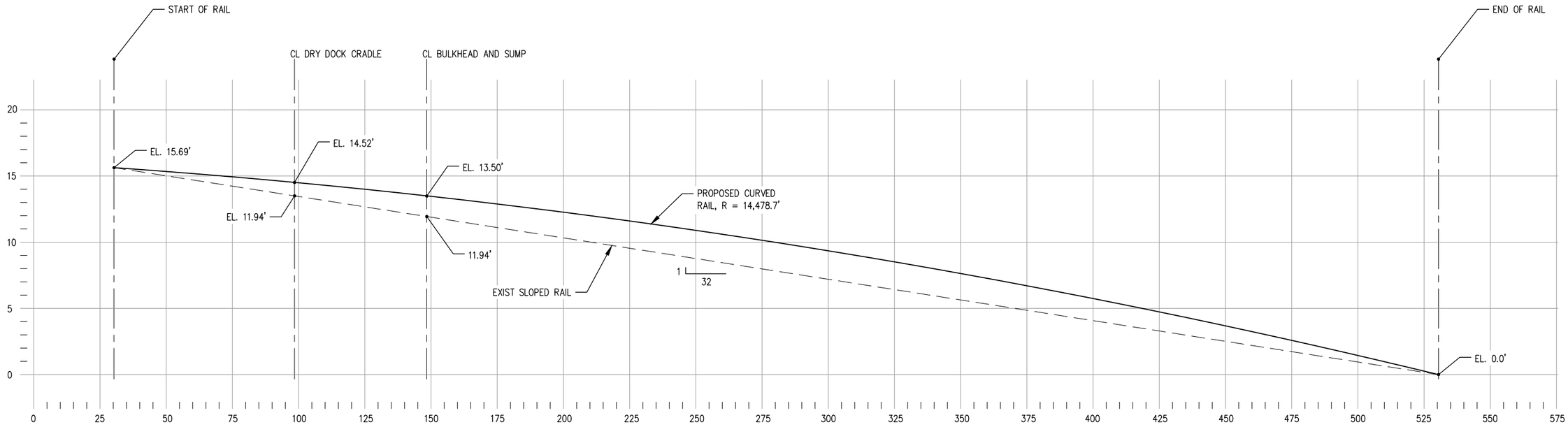
Plotted: Apr 05, 2022 – 10:26am dfelton Layout: Layout1
C:\Users\dfelton\appdata\local\temp\AcPublish_23120\EX2-PROP SITE.dwg

kpff
2407 North 31st Street, Suite 100
Tacoma, Washington 98407
(253) 396-0150 Fax (253) 396-0162

NO.	DATE	BY	REVISION

PROPOSED SITE PLAN

DRAWN: TRL	PROJECT NO.:
DESIGN: DF	SCALE: AS SHOWN
CHECKED: IDF	DATE:
DRAWING NO.	
SHEET NO.	OF



PROFILE

SCALE: HOIZ. 1:20, VERT. 1:4

kpff
2407 North 31st Street, Suite 100
Tacoma, Washington 98407
(253) 396-0150 Fax (253) 396-0162

NO.	DATE	BY	REVISION

PROFILES

DRAWN: TRL	PROJECT NO.:
DESIGN: DF	SCALE: AS SHOWN
CHECKED: IDF	DATE:
DRAWING NO.	**EX-3**
SHEET NO.	**03** OF **SHTS**

Plotted: Mar 30, 2022 - 10:26am tiemons Layout: Layout1
N:\2022\10182200022 McNeil Island Marine Facilities Priorities\Drawings\EXHIBIT\EX3-PROFILE.dwg