KIRKLAND PARKS & COMMUNITY SERVICES

Shoreline Structures Assessment

Kirkland, Washington

September 2019

PREPARED FOR

City of Kirkland, Washington

PREPARED BY

Reid Middleton

FINAL

City of Kirkland
Shoreline Structures Assessment
Kirkland, Washington

September 2019

The engineering material and data contained in this report was prepared under the supervision and direction of the undersigned, whose seal as a registered professional engineer is affixed below.

9/30/2019

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1. ASCE Manuals and Reports on Engineering Practice No. 130, Waterfront Facility Inspection Committee, 2015
2. Report - Kirkland Parks Shoreline Structures Assessment, Associated Earth Sciences Inc. 2014

INTRODUCTION & BACKGROUND

The City of Kirkland owns, operates, and maintains seven park facilities along the shores of Lake Washington. These waterfront parks have a variety of shoreline and in-water infrastructure including swim beaches, riprap shorelines, concrete bulkheads, boat ramps, and piers. Safe public access to the water, improved environmental and habitat conditions, and minimization of long-term maintenance are important aspects of stewardship of these public waterfront park facilities. The City requested that Reid Middleton perform an above- and below-water condition assessment of the current conditions of the waterfront facilities at the seven parks, including Houghton Beach Park, Marsh Park, Settlers Landing, 2nd Avenue Pier, Marina Park, Waverly Beach Park, and Juanita Beach Park. The intent of the assessment is to document the current condition of each park facility, recommend any required repairs or improvements, develop probable construction costs for the repairs, and provide recommendations on prioritization. Reid Middleton was assisted by sub-consultants Echelon Engineering, who provided underwater inspection of portions of the overwater structures. The Reid Middleton team performed a condition assessment of the waterfront facilities from June 24 to July 9, and the results of the assessment are provided in this report.

Figure 1. Location of Kirkland Parks in Condition Assessment.

CONDITION ASSESSMENT – WATERFRONT PARK FACILITIES

The waterfront facilities assessed at the seven parks included beaches, riprap shorelines, concrete and riprap bulkheads, concrete steps, boat ramp, and piers. The pier structures are typically fixed piers with timber piles and superstructure and timber or grated decking. Some of the dock structures such as the 2nd Avenue Pier and Juanita Beach Park have concrete decking. The shorelines and structures vary in age and condition but are all subject to deterioration due to the wet environment and heavy use.

The visible structural components of each facility were inspected.

Reid Middleton conducted a visual observation of the above-water portions of the park shorelines and piers as well as the nearshore below-water portions of the shoreline structures (concrete steps, bulkheads, riprap slopes). Observation included a Level 1 visual inspection, looking for areas of gross damage and deterioration. Visual observation of the pier utility systems (fire protection, potable water, site lighting) were also included in the condition assessment.

Echelon Engineering conducted an underwater dive survey of the submerged portions of the piers and associated piles at each of the seven parks. Observation included a Level 1 visual inspection to identify gross damage or deterioration or other significant damage to the pier superstructure and piles and a Level 2 cleaning and examination of the structures and piles, at random locations and in areas of potential deterioration, with hammer sounding and probing at suspect and representative areas along the length of 10 percent of the piles.

Inspections were performed in accordance with the methods described in the American Society of Civil Engineers' (ASCE) *Manuals and Reports on Engineering Practice No. 130 (MOP 130); Waterfront Facilities Inspection and Assessment*.

The general condition of each element and specific damage conditions observed are discussed below. The results of the site observation are summarized in tabular format for each of the facility components for each of the seven parks. Plans for each park with overall condition for each park facility component are shown in the figures for each park. The Echelon dive reports for each park are included in Appendix A. Additional photos of the various elements are included in Appendix B.

The following observation condition ratings are used in this report:

Good	No visible damage or only minor damage is noted. No repairs are required.
Satisfactory	Limited minor to moderate deterioration was observed. No repairs are required.
Fair	Primary elements are sound, but minor to moderate defects or deterioration are observed. Repairs are recommended, but the priority of the recommended repairs is low.
Poor	Advanced deterioration is observed on widespread portions of the structure. Repairs may need to be executed with moderate urgency.
Serious	Advanced deterioration or breakage may have affected the primary structural components significantly. Local failures are possible, and repairs should be carried out on a high-priority basis.
Critical	Extremely advanced deterioration or breakage has resulted in localized failure(s) of primary structural components. More widespread failures are possible or likely to occur, and repairs should be carried out on a high-priority basis.

HOUGHTON BEACH PARK

The shoreline and overwater structures inspected at the Houghton Beach Park facility include two sections of shoreline armored with riprap, two beaches, concrete shoreline steps, a segment of concrete revetment, an ecology block bulkhead, and a timber pier. Figures 2 and 3 show locations of the park facility components and overall condition rating. Table 1 provides details of the assessment, recommended repairs, and remaining service life of each component.

Figure 2. Houghton Beach Park Aerial.

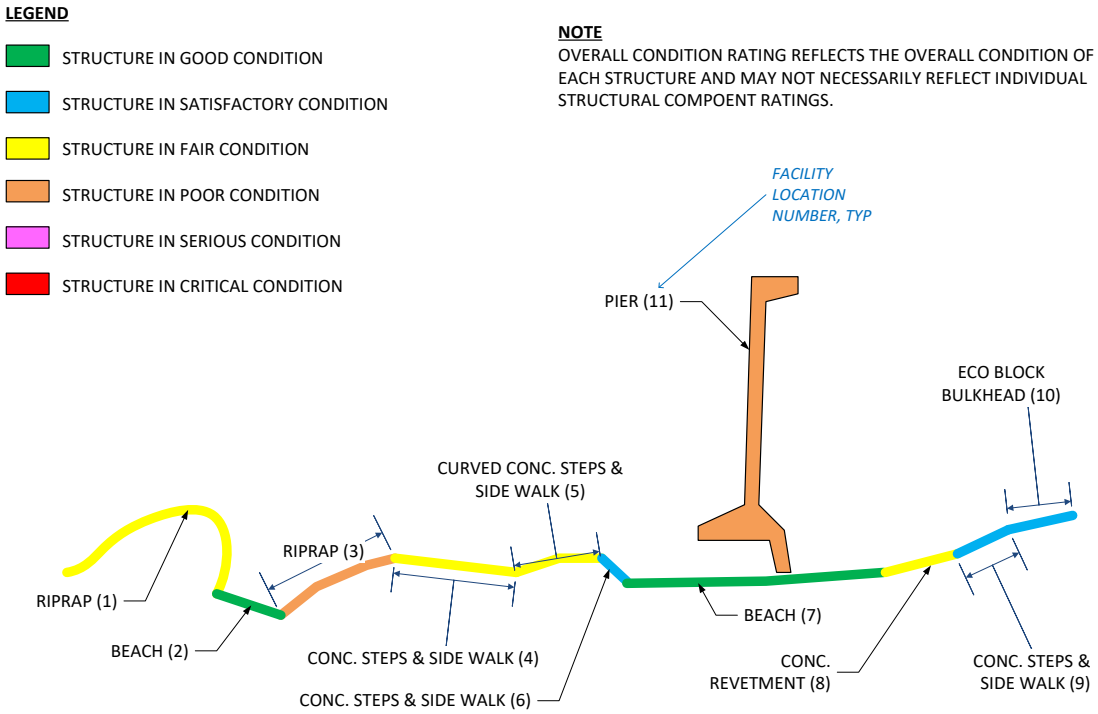


Figure 3. Houghton Beach Park Overall Condition.

Table 1. Houghton Park – Condition, Recommended Repairs, & Remaining Life.

FACILITY LOCATION: 1	
ITEM: Riprap Bank Slope	**OVERALL RATING: Fair**
PHOTO	EXISTING CONDITION / RECOMMENDATIONS
	Existing Condition • Approximately 200 feet of riprap shoreline. • Large (8" to 3') riprap with large voids. • Fair condition with evidence of wave erosion behind riprap at point. Approx. 6'x2'x1' deep. • Erosion is only affecting landscaped (grass) area. Recommended Repairs and Remaining Life • Install quarry spalls to fill large voids in riprap and install geotextile fabric and additional quarry spalls or granular material behind riprap. • 15 years with current condition (30 or more years of service life after repairs).

FACILITY LOCATION: 2	
ITEM: Beach	**OVERALL RATING: Good**
PHOTO	EXISTING CONDITION / RECOMMENDATIONS
	Existing Condition • Approximately 50 feet of shoreline. • Gravel beach with anchor logs at water's edge. • Low to no slope beach. • Riprap boulders provide separation between landscaping and beach areas. • Good condition with no observed deficiencies. Recommended Repairs and Remaining Life • No recommended repairs. • 30 or more years of service life.

FACILITY LOCATION: 3

ITEM: Riprap Bank Slope	**OVERALL RATING: Poor**
PHOTO	EXISTING CONDITION / RECOMMENDATIONS
	Existing Condition • Approximately 130 feet of shoreline. • Large (8" to 3') riprap with large voids. Portion of upper riprap partially encased in concrete. • Poor condition with evidence of wave erosion (sinkholes) behind riprap at five locations with sinkholes approx. 4'x2'x2' deep each. • Irrigation piping and spray head exposed at one sinkhole location (piping appears intact). Recommended Repairs and Remaining Life • Install quarry spalls to fill large voids in riprap and install geotextile fabric and additional quarry spalls or granular material behind riprap. • 5 years with current condition (30 or more years of service life after repairs).

FACILITY LOCATION: 4

ITEM: Concrete Steps & Sidewalk	**OVERALL RATING: Fair**
PHOTOS	EXISTING CONDITION / RECOMMENDATIONS
 	Existing Condition • Approximately 100 feet of shoreline. • The south end of the sidewalk next to the steps is undermined (approx. 3" tall), and the sidewalk corner is cracked. This may be partially due to a sprinkler head being located here as well. • Sidewalk is in fair condition overall with intermittent cracking (1/8" max). • Steps are in fair condition overall with intermittent cracking (1/8" to 1/4") and some spalling of step edges. No undermining at toe observed. Recommended Repairs and Remaining Life • Repair sidewalk by removing cracked corner/edge and installing thickened edge with new concrete. • Repair cracks and spalls. • 15 years with current condition (25 or more years of service life after repairs).

FACILITY LOCATION: 5

ITEM: Curved Conc. Steps & Sidewalk	**OVERALL RATING: Fair**
PHOTO	EXISTING CONDITION / RECOMMENDATIONS
	Existing Condition • Approximately 80 feet of shoreline. • The toe of the steps is undermined uniformly approximately 2 inches. • Sidewalk and steps are in fair condition overall with intermittent cracking (1/8" to 1/4") approx. every 5 feet and some spalling of step edges. Large spall at north end on bottom step (approx. 1'x1'). • Steps appear to have settled approximately 1 inch. Recommended Repairs and Remaining Life • Repair cracks and spalls. • 15 years with current condition (25 or more years of service life after repairs).

FACILITY LOCATION: 6

ITEM: Concrete Steps & Sidewalk	**OVERALL RATING: Satisfactory**
PHOTO	EXISTING CONDITION / RECOMMENDATIONS
	Existing Condition • Approximately 30 feet of shoreline. • Sidewalk and steps are in satisfactory condition overall with minor cracking. Spall and associated cracking at SE intersection of steps and sidewalk. • No undermining of toe observed. Recommended Repairs and Remaining Life • Repair cracks and spalls • 20 years with current condition (25 or more years of service life after repairs).

FACILITY LOCATION: 7

ITEM: Beach	**OVERALL RATING: Good**
PHOTO	EXISTING CONDITION / RECOMMENDATIONS
	Existing Condition • Approximately 240 feet of shoreline. • Gravel beach with low slope. • Beach north of dock has anchor logs at water's edge. • Good condition with no observed deficiencies. Note that PVC drain pipe is filled with beach material. Recommended Repairs and Remaining Life • No recommended repairs. • 30 or more years of service life.

FACILITY LOCATION: 8

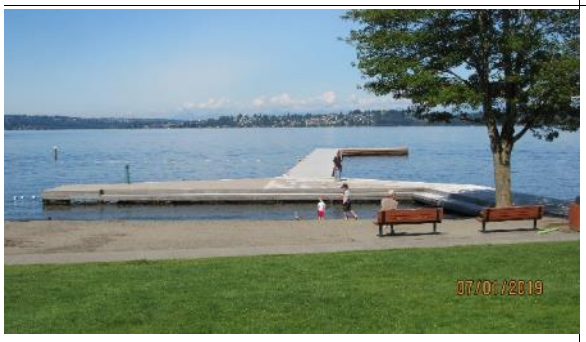
ITEM: Concrete Revetment	**OVERALL RATING: Fair**
PHOTO	EXISTING CONDITION / RECOMMENDATIONS
	Existing Condition • Approximately 60 feet of shoreline. • Revetment is in fair condition overall with minor cracking (3 locations) and spalling. • No undermining of toe observed. Recommended Repairs and Remaining Life • Repair cracks and spalls. • 15 years with current condition (25 or more years of service life after repairs)

FACILITY LOCATION: 9

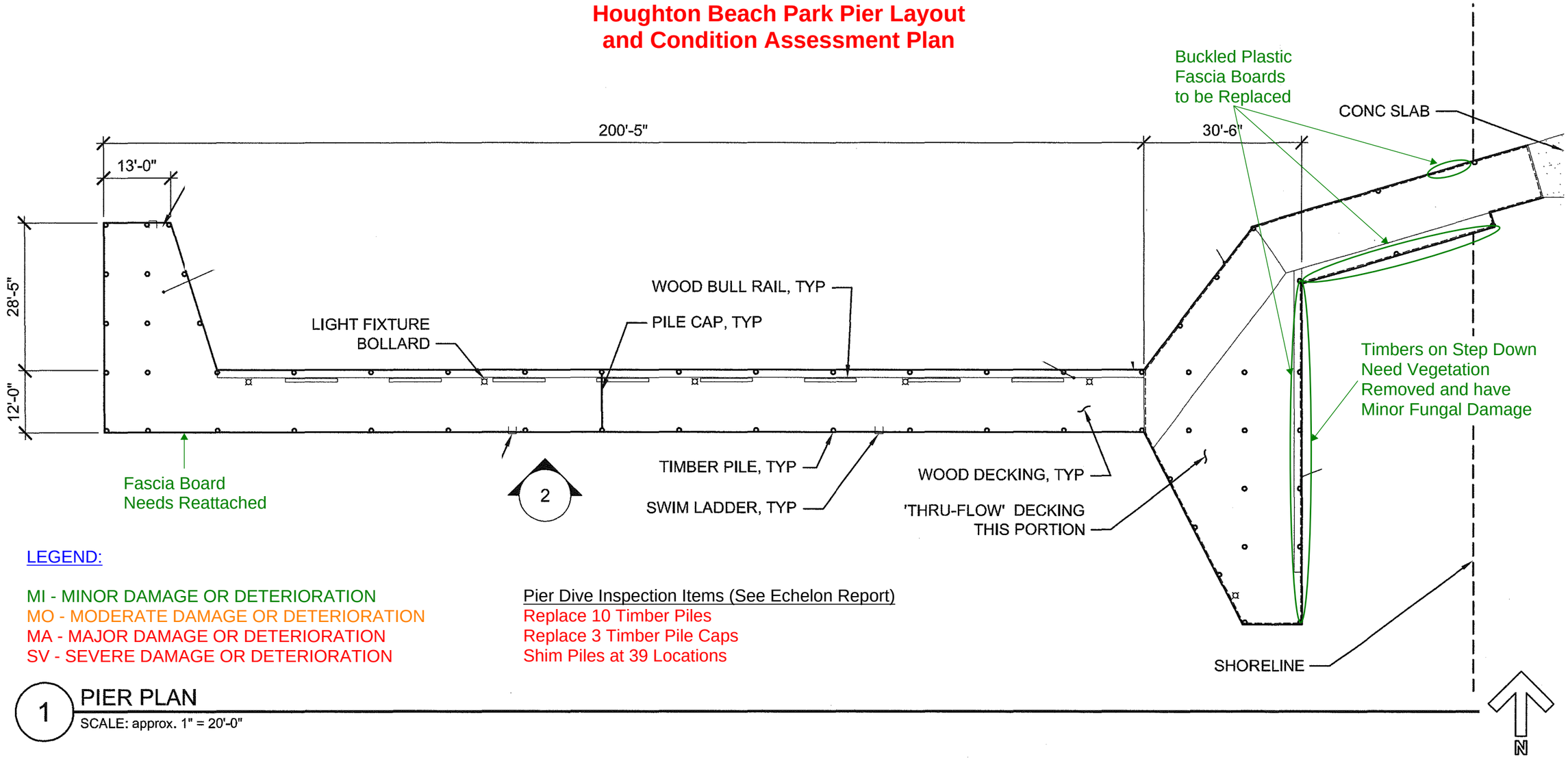
ITEM: Concrete Steps & Sidewalk	**OVERALL RATING: Satisfactory**
PHOTO	EXISTING CONDITION / RECOMMENDATIONS
	Existing Condition • Approximately 50 feet of shoreline. • Sidewalk and steps are in satisfactory condition with minor cracking. • Handrails have peeling paint, rust . Deterioration of handrails is worst at lower steps. • No undermining of toe or settlement observed. Recommended Repairs and Remaining Life • Repair cracks and spalls. • Repaint handrails. • Concrete: 20 years with current condition (25 or more years of service life after repairs). • Handrails: 3 years with current condition (20 or more years of service life after repairs).

FACILITY LOCATION: 10

ITEM: Ecology Block Bulkhead	**OVERALL RATING: Satisfactory**
PHOTO	EXISTING CONDITION / RECOMMENDATIONS
	Existing Condition • Approximately 60 feet of shoreline. • Ecology block wall and concrete sidewalk topping are in satisfactory condition. There is one large spall (approx. 12"x6"x3" deep) in the concrete sidewalk by the steps. • Handrails are rusted. • No undermining of toe or settlement observed. Recommended Repairs and Remaining Life • Repair cracks and spalls. • Repaint handrails. • Concrete: 20 years with current condition (25 or more years of service life after repairs). • Handrails: 3 years with current condition (20 or more years of service life after repairs).

FACILITY LOCATION: 11 (Pier)	OVERALL RATING: Poor
ITEM: Pier Superstructure	**ITEM RATING: Satisfactory**
PHOTOS	EXISTING CONDITION / RECOMMENDATIONS
 	Existing Condition • Typical construction of grated decking over timber stringers and blocking. • Flared section towards shore, decking is Thruflow plastic grating. Remaining decking is fiberglass reinforced grating. Both are in good condition. • North side of pier has newer treated 2x8 fascia and 4x8 steps; south side of pier has newer treated 2x12 fascia. Fascia boards in good condition. • Timbers on step down at swim area have vegetation on top (approx. 10% fungal damage). • Plastic lumber fascia at swim area step warped. • Aluminum swim ladders are in good condition. Recommended Repairs and Remaining Life • Remove vegetation from swim area step timbers. • Replace swim area plastic lumber fascia boards. • 20 years with current condition (25 or more years of service life after repairs).
ITEM: Pier Substructure	**ITEM RATING: Poor**
PHOTO	EXISTING CONDITION / RECOMMENDATIONS
	Existing Condition • 83 piles: 12-14" dia. treated timber. Fair to poor condition. 49 piles: 50% or lower category but shimming would restore near full capacity for 39 piles. 10 piles are heavily biologically degraded. • Pile caps are 10x12 treated timber. Fair condition. Several (approx. 8) have significant damage. • Stringers are 4x10 treated timber. Good condition. • Diagonal braces: good condition. Recommended Repairs and Remaining Life • Shim 39 piles to restore bearing capacity. • Replace 10 timber piles. • Replace 8 damaged timber caps. • Piles: damaged piles, 1 yr (current), 25 yrs (replaced); other piles, 15 yrs (current). • Pile Caps: damaged caps, 3 yrs (current), 25 yrs (replaced); other caps, 10 yrs (current). • Stringers: 15 years (current). • Diagonal braces: 15 years (current).

Houghton Beach Park Pier Layout and Condition Assessment Plan



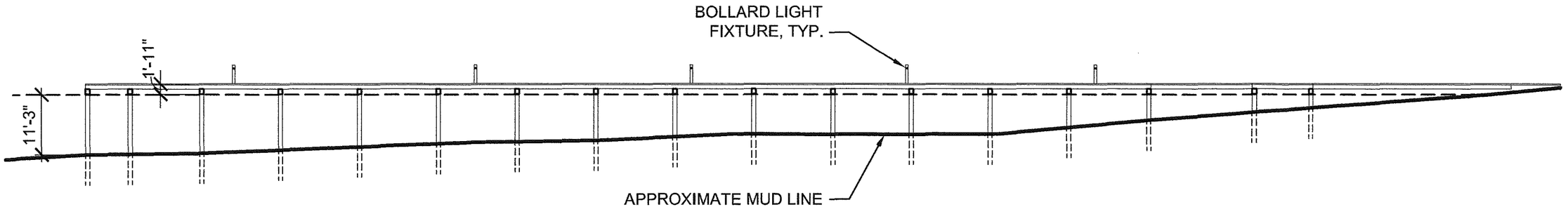
LEGEND:

MI - MINOR DAMAGE OR DETERIORATION
MO - MODERATE DAMAGE OR DETERIORATION
MA - MAJOR DAMAGE OR DETERIORATION
SV - SEVERE DAMAGE OR DETERIORATION

Pier Dive Inspection Items (See Echelon Report)
Replace 10 Timber Piles
Replace 3 Timber Pile Caps
Shim Piles at 39 Locations

1 PIER PLAN

SCALE: approx. 1" = 20'-0"



2 PIER SECTION

SCALE: approx. 1" = 20'-0"

MARSH PARK

The shoreline and overwater structures inspected at the Marsh Park facility include a shoreline armored with riprap, two beaches, two riprap bulkheads, a concrete slab, sidewalk, and steps, and a timber pier. Figures 5 and 6 show locations of the park facility components and overall condition rating. Table 2 provides details of the assessment, recommended repairs, and remaining service life of each component.

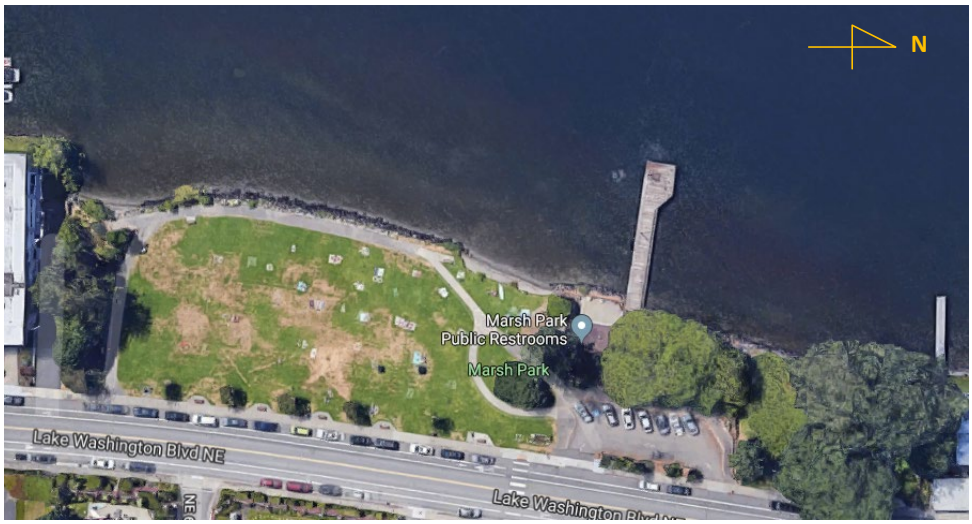


Figure 5. Marsh Park Aerial.

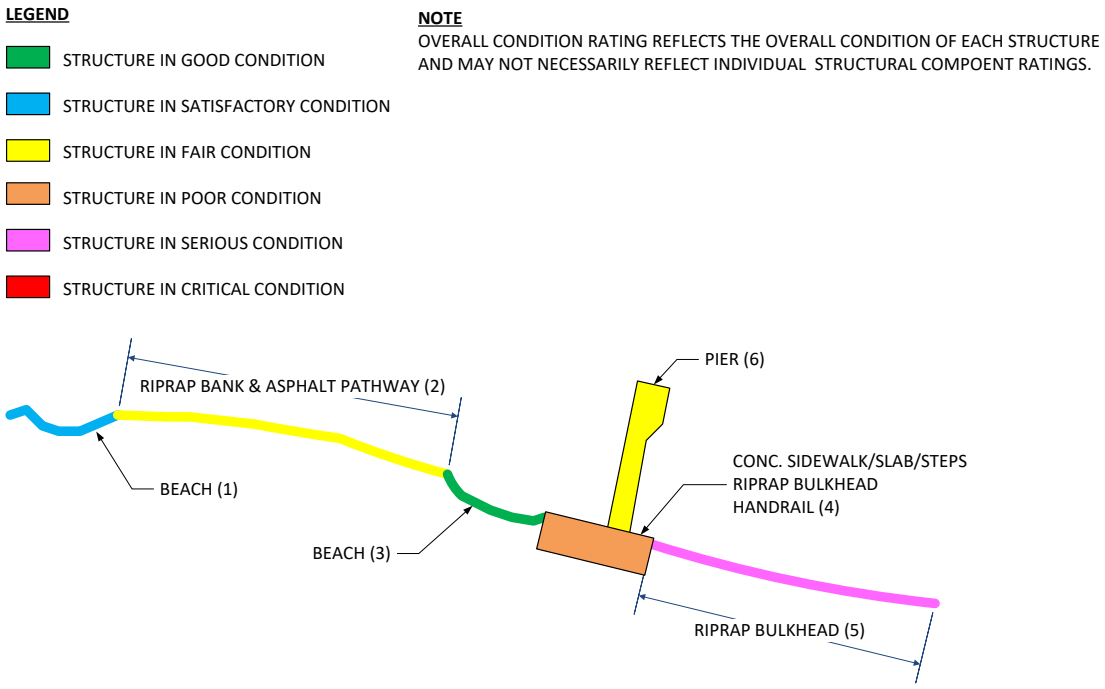


Figure 6. Marsh Park Overall Condition.

Table 2. Marsh Park – Condition, Recommended Repairs, & Remaining Life.

FACILITY LOCATION: 1

ITEM: Beach	**OVERALL RATING: Satisfactory**
PHOTO	EXISTING CONDITION / RECOMMENDATIONS
	Existing Condition • Approximately 40 feet of shoreline. • Gravel pocket beach with low slope. • Riprap boulders provide separation between landscaping and beach areas. • Erosion of asphalt pathway edge at north side of beach on east side of riprap (approx. 6'x 2' wide). Recommended Repairs and Remaining Life • Patch asphalt pathway to prevent erosion / undermining and eliminate possible trip hazards. • 30 or more years of service life.

FACILITY LOCATION: 2

ITEM: Riprap Bank & Asphalt Pathway	**OVERALL RATING: Fair**
PHOTO	EXISTING CONDITION / RECOMMENDATIONS
 	Existing Condition • Approximately 225' of riprap shoreline, 200' of asphalt path, and 25' of concrete sidewalk. • Large (8" to 2.5') riprap with large voids. • Riprap: Fair condition with evidence of erosion behind riprap at south and north ends of pathway. • Asphalt Path: Fair cond. Erosion has caused asphalt path edge to crumble in several locations. These have been filled with landscape bark. • Concrete Path: Fair cond. Concrete is undermined at NW corner of bench slab (approx. 3" x 2.5') Recommended Repairs and Remaining Life • Install geotextile fabric and additional quarry spalls or granular material behind riprap. • Patch crumbled asphalt pathway locations. Seal coat to prevent deterioration / erosion. • Grout under concrete bench slab. • Riprap: 20 yrs (current), 30 yrs (repaired). • Asphalt Path: 10 yrs (current), 20 yrs (repaired). • Concrete Path: 10 yrs (current), 30 yrs (repaired).

FACILITY LOCATION: 3

ITEM: Beach	**OVERALL RATING: Good**
PHOTO	EXISTING CONDITION / RECOMMENDATIONS
	Existing Condition • Approximately 60 feet of shoreline. • Gravel beach with low slope. • Good condition with no observed deficiencies. Recommended Repairs and Remaining Life • No recommended repairs. • 30 or more years of service life.

FACILITY LOCATION: 4	OVERALL RATING: Poor
ITEM: Riprap Bulkhead	**ITEM RATING: Poor**
PHOTO	EXISTING CONDITION / RECOMMENDATIONS
	Existing Condition • Approximately 50 feet of riprap bulkhead. • Large (1.5' to 3') riprap with large voids. • Fair condition with evidence of previous settlement. Several boulders from wall on lakebed. • No filter fabric or smaller granular material. Recommended Repairs and Remaining Life • Install quarry spalls to fill large voids in riprap and install geotextile fabric and additional quarry spalls or granular material behind riprap. • 10 yrs (current), 30 yrs (repaired).
ITEM: Concrete Sidewalk / Slab /Steps	**ITEM RATING: Fair**
PHOTO	EXISTING CONDITION / RECOMMENDATIONS
	Existing Condition • Concrete slab with thickened curbs. Slab has settled in past and been patched. • Some cracking (1/2" max) and large spalls at north steps. Spalls in curbs near SE corner of dock steps. Recommended Repairs and Remaining Life • Repair cracks. • 10 yrs (current), 30 yrs (repaired).
ITEM: Handrail	**ITEM RATING: Critical**
PHOTO	EXISTING CONDITION / RECOMMENDATIONS
	Existing Condition • Galvanized posts in fair condition with surface rust observed. • Timber handrail in critical condition and severely deteriorated due to fungal decay and weathering. Recommended Repairs and Remaining Life • Remove rust and paint posts with zinc paint. • Install new handrails. • 0 yrs (current), 20 yrs (repaired)

FACILITY LOCATION: 5

ITEM: Riprap Bulkhead	**OVERALL RATING: Serious**
PHOTO	EXISTING CONDITION / RECOMMENDATIONS

Existing Condition

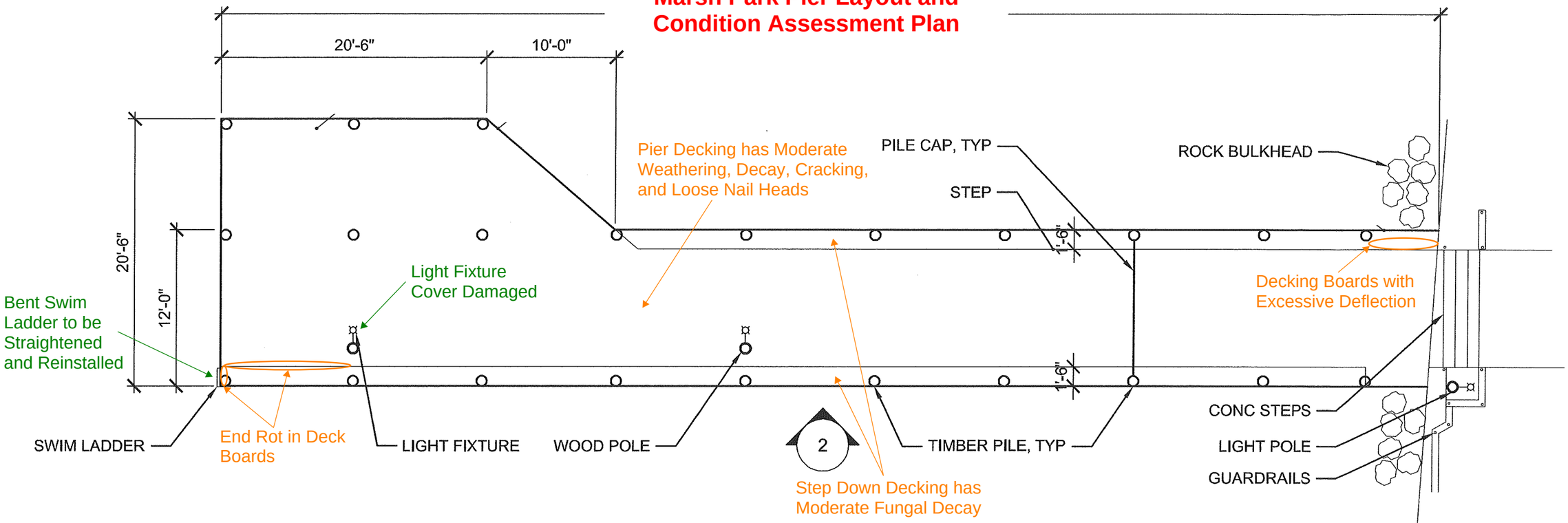
- Approximately 200' of riprap shoreline.
- Large (1.5' to 3') riprap with large voids. No filter fabric or smaller granular material observed behind the large riprap.
- Multiple large sinkholes behind bulkhead due to erosion of fines. Largest 3 sinkholes are approx. 6'x3'x3' deep. Several others are 2'x2'x8"deep.
- Concrete slab at bottom of steps is undermined approx. 6" and extends 3.5' under steps and concrete pour on behind riprap.
- Riprap: Fair condition with evidence of shifting. Multiple boulders from wall on lakebed.
- Concrete Slab: Poor condition (undermined).
- Landscaping: Critical condition (sinkholes).

Recommended Repairs and Remaining Life

- Install quarry spalls to fill large voids in riprap and install geotextile fabric and additional quarry spalls or granular material behind riprap.
- Grout under concrete step slab.
- Riprap: 10 yrs (current), 30+ yrs (repaired).
- Concrete Slab: 5 yrs (current), 20 yrs (repaired).
- Landscaping: 2 yrs (current), 20+ yrs (repaired).

FACILITY LOCATION: 6 (Pier)	**OVERALL RATING: Fair**
ITEM: Pier Superstructure	**ITEM RATING: Satisfactory**
PHOTO	EXISTING CONDITION / RECOMMENDATIONS
	Existing Condition • Typical construction of 2x8 timber decking over timber stringers and blocking. Nail heads loose. • Timber decking on main pier is weathered and has some fungal decay (fair condition). • Timber decking on step downs is weathered and has approx. 25% fungal damage (poor condition). • Galvanized tie-up rings are only lag bolted into timbers but are secure (satisfactory condition). • Light fixture cover is damaged (fair condition). • Aluminum swim ladders is bent (fair condition). Recommended Repairs and Remaining Life • Replace decking with timber or grated decking. • Fix swim ladder and light fixture. • 10 yrs (current), 25 yrs (repaired).
ITEM: Pier Substructure	**ITEM RATING: Fair**
PHOTO	EXISTING CONDITION / RECOMMENDATIONS
	Existing Condition • 23 piles: 12-14" dia. treated timber. Good condition. 2 piles: 0% category but shimming would restore near full capacity. • Pile caps are 12x12 treated timber. Fair to good condition. Some localized areas of weathering and fungal decay on the member surface and cut ends. • Stringers are 3x10 treated timber. Fair to good condition. Some localized areas of weathering and fungal decay on the member surface and cut ends. Recommended Repairs and Remaining Life • Shim 2 piles to restore bearing capacity. • Piles: non-bearing piles, 10 yr (current), 20 yrs (repaired); other piles, 20 yrs (current). • Pile Caps: 15 yrs (current). • Stringers: 15 years (current).

Marsh Park Pier Layout and Condition Assessment Plan

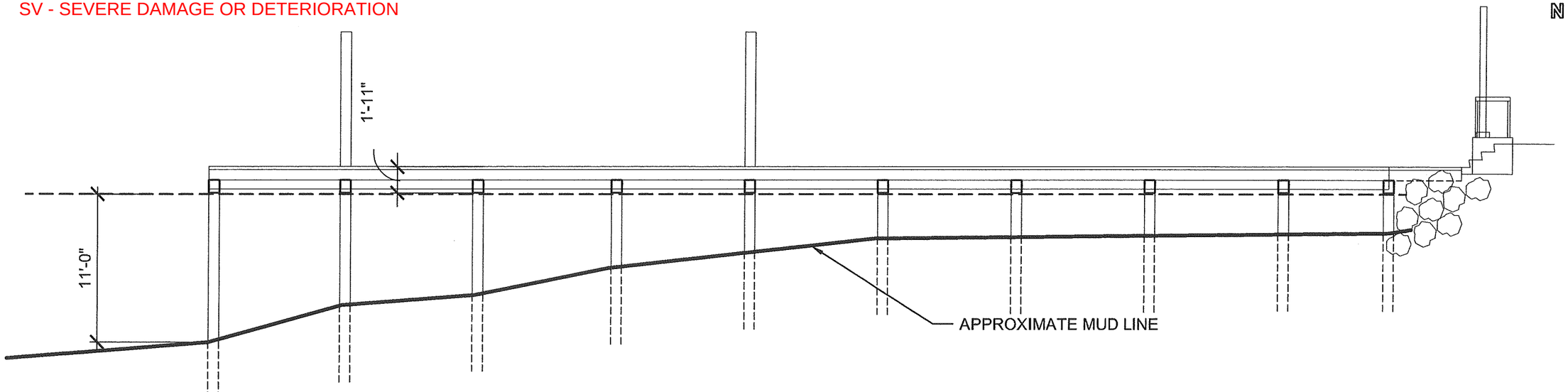


LEGEND:

MI - MINOR DAMAGE OR DETERIORATION
MO - MODERATE DAMAGE OR DETERIORATION
MA - MAJOR DAMAGE OR DETERIORATION
SV - SEVERE DAMAGE OR DETERIORATION

Pier Dive Inspection Items (See Echelon Report)
Shim Piles at 2 Locations

N



2 PIER SECTION
SCALE: approx. 1/8" = 1'-0"

SETTLER'S LANDING PARK

The shoreline and overwater structures inspected at the Settler's Landing Park facility include a shoreline armored with riprap, a concrete slab, sidewalk, and a timber pier. Figures 8 and 9 show locations of the park facility components and overall condition rating. Table 3 provides details of the assessment, recommended repairs, and remaining service life of each component.

Figure 8. Settler's Landing Park Aerial.

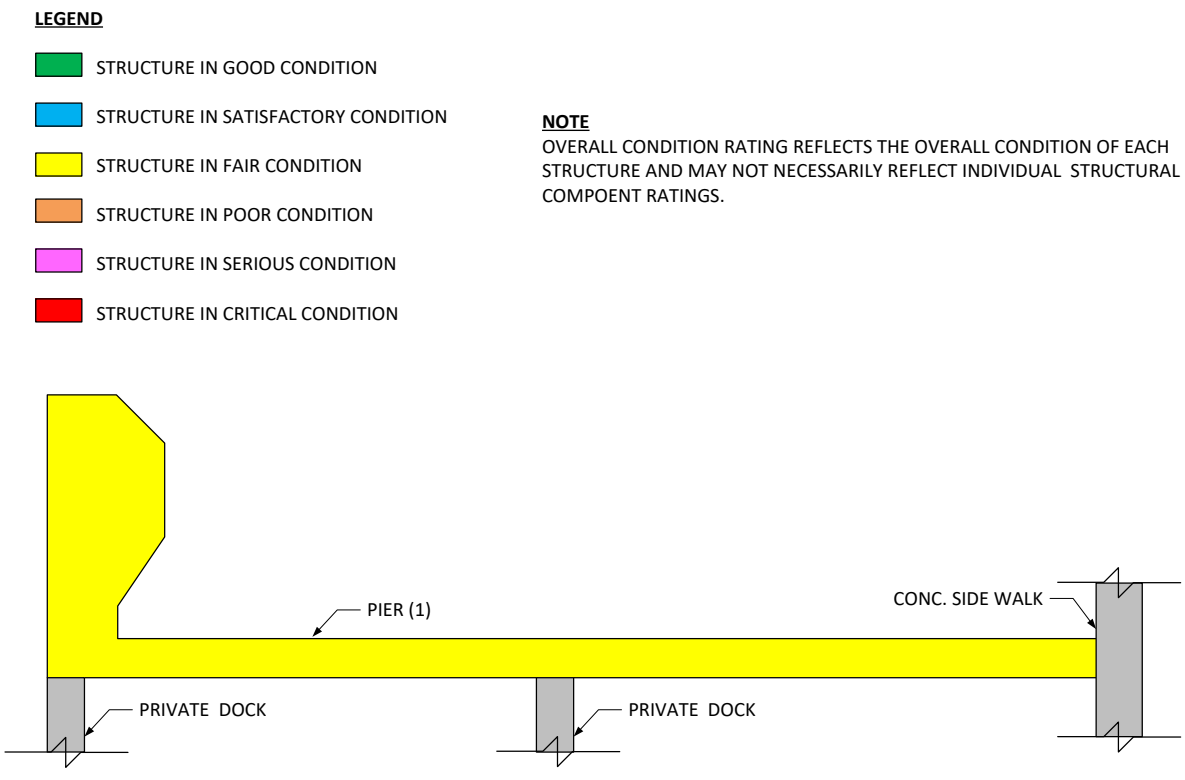
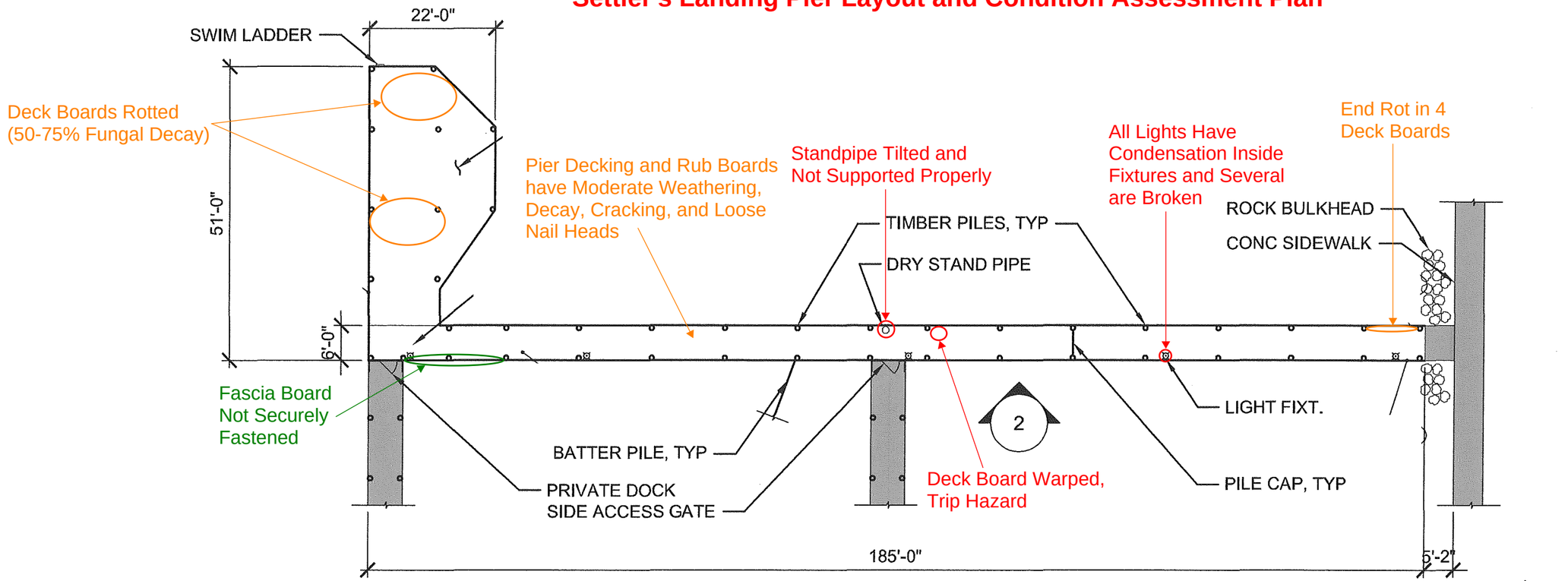


Figure 9. Settler's Landing Park Overall Condition.

Table 3. Settler's Landing Park – Condition, Recommended Repairs, & Remaining Life.

FACILITY LOCATION: 1 (Pier)	**OVERALL RATING: Fair**
ITEM: Pier Superstructure	**ITEM RATING: Fair**
PHOTO	EXISTING CONDITION / RECOMMENDATIONS
 	Existing Condition • Typical construction of 2x6 timber decking over timber stringers. Decking and timber 2x8 fascia weathered w/ fungal decay (15-25%). Nail heads loose and some trip hazards due to loose boards. Overall timber condition is in fair condition. • Fire standpipe is loose and doesn't appear to be connected under the pier (poor condition). • Cleats and aluminum swim ladder are in satisfactory condition. • Two light fixture are broken and others have condensation (poor condition). • Riprap shoreline is stable and has fabric and quarry spalls behind (good condition). Recommended Repairs and Remaining Life • Replace decking with timber or grated decking. • Replace light fixtures and fire standpipe supports. • 10 yrs (current), 25 yrs (repaired).
ITEM: Pier Substructure	**ITEM RATING: Fair**
PHOTO	EXISTING CONDITION / RECOMMENDATIONS
	Existing Condition • 54 piles: 12-14" dia. treated timber. Fair to good condition. 5 piles: 50% category or less but shimming would restore near full capacity. • Pile caps on approach pier are 6x8 & on pier head are 4x8 & 6x8 treated timbers. Good condition. • Stringers on approach pier are 6x8 and on pier head are 4x8 treated timber. Good condition. • Pile caps and stringers have some localized areas of weathering and fungal decay on the member surface and cut ends. Recommended Repairs and Remaining Life • Shim 5 piles to restore bearing capacity. • Piles: non-bearing piles, 10 yrs (current), 20 yrs (repaired); other piles, 20 yrs (current). • Pile Caps: 15 yrs (current). • Stringers: 15 years (current).

Settler's Landing Pier Layout and Condition Assessment Plan

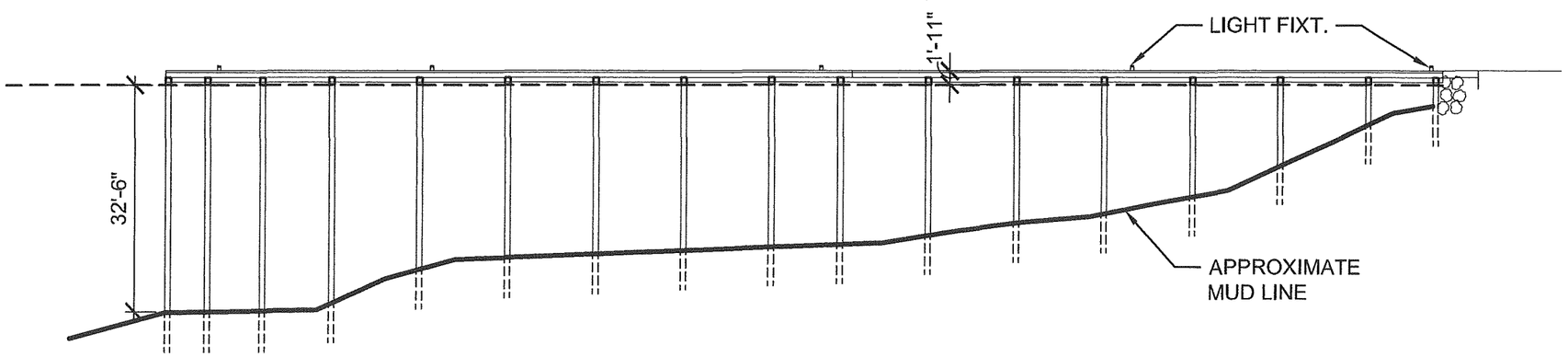


LEGEND:

MI - MINOR DAMAGE OR DETERIORATION
MO - MODERATE DAMAGE OR DETERIORATION
MA - MAJOR DAMAGE OR DETERIORATION
SV - SEVERE DAMAGE OR DETERIORATION

Pier Dive Inspection Items (See Echelon Report)
Shim Piles at 5 Locations

N



2 PIER SECTION

SCALE: approx. 1" = 20'-0"

2ND AVENUE PIER

The shoreline and overwater structures inspected at the 2nd Avenue South Dock facility include a shoreline armored with riprap, a concrete slab, and a concrete pier. Figures 11 and 12 show locations of the park facility components and overall condition rating. Table 4 provides details of the assessment, recommended repairs, and remaining service life of each component.

Figure 11. 2nd Avenue South Dock Aerial.

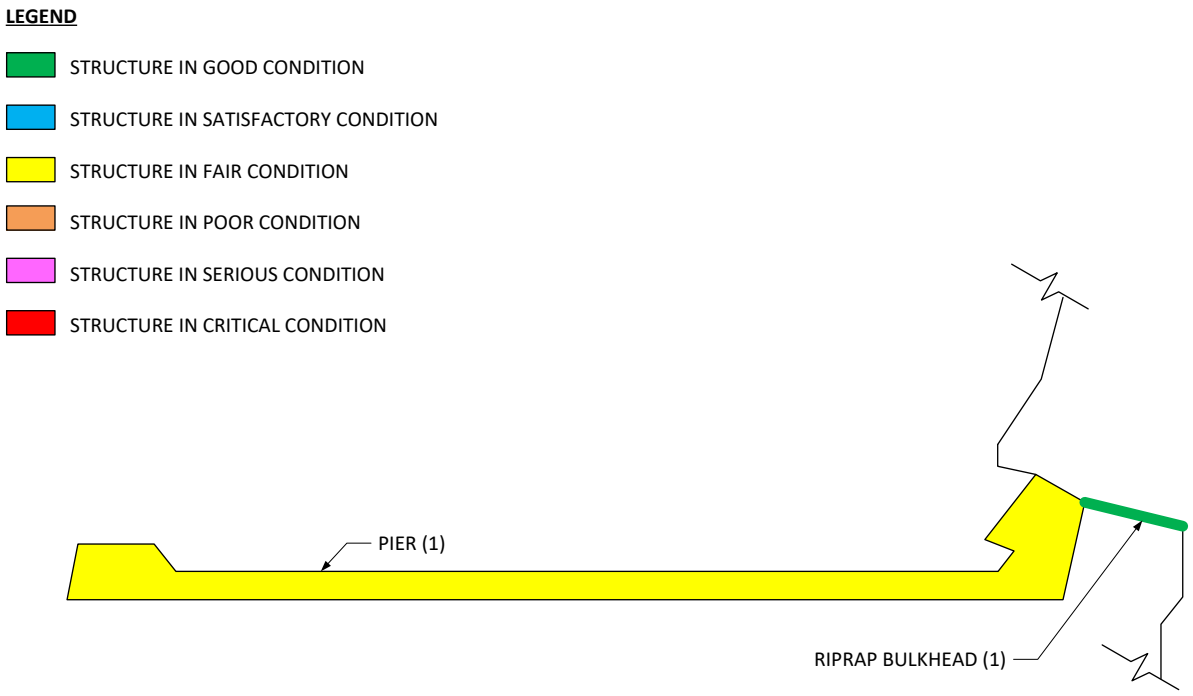
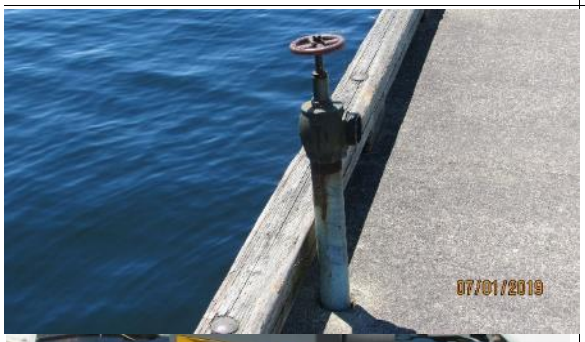


Figure 12. 2nd Avenue South Dock Overall Condition.

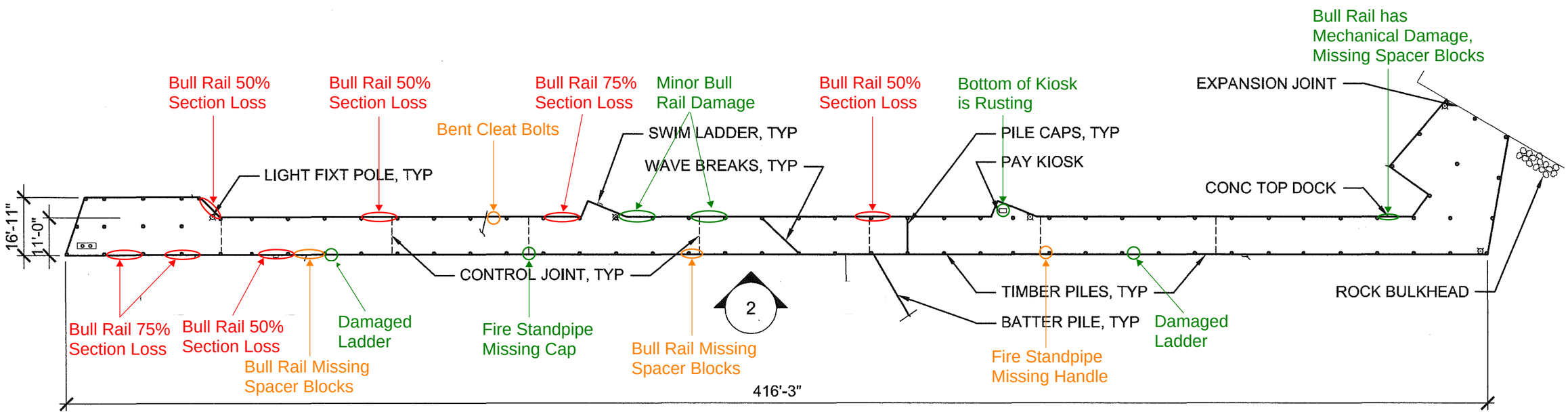
Table 4. 2nd Avenue South Dock – Condition, Recommended Repairs, & Remaining Life.

FACILITY LOCATION: 1 (Pier)	**OVERALL RATING: Fair**
ITEM: Superstructure (Decking)	**ITEM RATING: Fair**
PHOTO	EXISTING CONDITION / RECOMMENDATIONS
	Existing Condition • Cast-in place concrete over corrugated metal over timber stringers. • Concrete has intermittent transverse cracking (1/8" typical) every 8-10 feet and minor spalls throughout at edges / corners. Overall concrete decking condition is fair. • Riprap bulkhead is in good condition. Recommended Repairs and Remaining Life • Repair cracks and spalls. • 10 yrs (current), 20 yrs (repaired).
ITEM: Superstructure (Appurtenances)	**ITEM RATING: Poor**
PHOTO	EXISTING CONDITION / RECOMMENDATIONS
 	Existing Condition • Timber fascia is 4x12 and has light to heavy fungal damage. Overall condition is poor. • Timber bull rails (6x6 with 3x6 spacer blocks) have weathering, fungal, and mechanical damage. There are approx. 6 newer bull rail sections and 10 heavily damaged bull rails. Overall condition for bull rails is fair. • Cleats have multiple sizes installed but are in satisfactory condition overall. One cleat is loose. • Aluminum ladders are in fair condition with one bent ladder at the SW end of the pier and one damaged ladder at the SE end of the pier. Recommended Repairs and Remaining Life • Fascia: 2 years (current), 25 years (replaced). • Bull Rails: 5 years (current), 25 years (repaired). • Cleats: 20 years (current). • Ladders: 10 yrs (current), 25 yrs (repaired).

ITEM: Superstructure (Utilities)	ITEM RATING: Satisfactory
PHOTO	EXISTING CONDITION / RECOMMENDATIONS
 	Existing Condition • Fire standpipes are in satisfactory condition overall with some missing caps and handles and surface rusting observed. • Light poles are in satisfactory condition. • Pay kiosk structure is rusting at the bottom but appears in fair condition overall. Recommended Repairs and Remaining Life • Replace missing fire standpipe caps & handles. • Repair rust on kiosk and repaint. • Fire Standpipes: 15 years (current). • Light Poles: 15 years (current). • Pay Kiosk: 5 years (current), 10 years (repaired).

ITEM: Pier Substructure	ITEM RATING: Fair
PHOTO	EXISTING CONDITION / RECOMMENDATIONS
	Existing Condition • 115 piles: 12-14" dia. treated timber. Good condition with minor biological damage / fungal decay. • Pile caps are a mix of 12x16 glu-lam and sawn timbers. Fair to poor condition. Fungal and biological damage at cut ends (9 locations) • Stringers are mixed 4x10 (primarily) and 8x10 treated timbers. Good condition. • Diagonal braces are 3x8 treated timber. Good condition. Recommended Repairs and Remaining Life • Replace damaged timber caps (10). • Piles:15 yrs (current). • Pile Caps: damaged caps, 2 yrs (current), 25 yrs (replaced); other caps, 10 yrs (current). • Stringers: 15 years (current). • Diagonal braces: 15 years (current).

2nd Ave S Pier Layout and Condition Assessment Plan



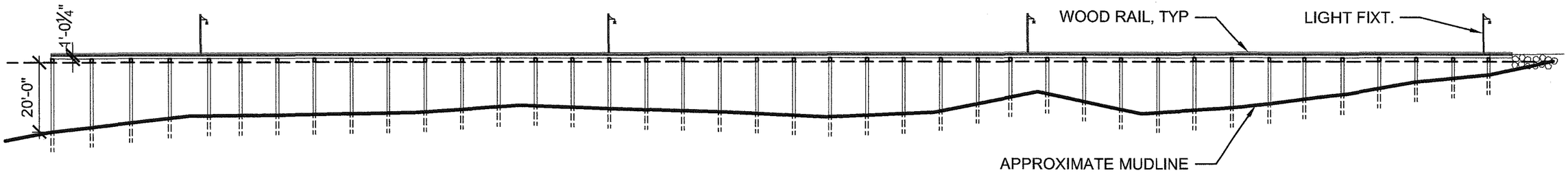
LEGEND:

MI - MINOR DAMAGE OR DETERIORATION
MO - MODERATE DAMAGE OR DETERIORATION
MA - MAJOR DAMAGE OR DETERIORATION
SV - SEVERE DAMAGE OR DETERIORATION

Pier Dive Inspection Items (See Echelon Report)
Replace 10 Damaged Pile Caps

Timber Bull Rails Overall have Minor Checking, Splitting, and Weathering.

Concrete Decking Overall has Minor Intermittent Cracking (Typical 1/8" Transverse Cracking every 8'-10').



2 PIER SECTION
SCALE: approx. 1" = 30'-0"

MARINA PARK

The shoreline and overwater structures inspected at the Marina Park facility include three shoreline areas armored with riprap, a beach, two areas of concrete steps, a concrete boat launch ramp, and two timber piers. Figures 14 and 15 show locations of the park facility components and overall condition rating. Table 5 provides details of the assessment, recommended repairs, and remaining service life of each component.

Figure 14. Marina Park Aerial.

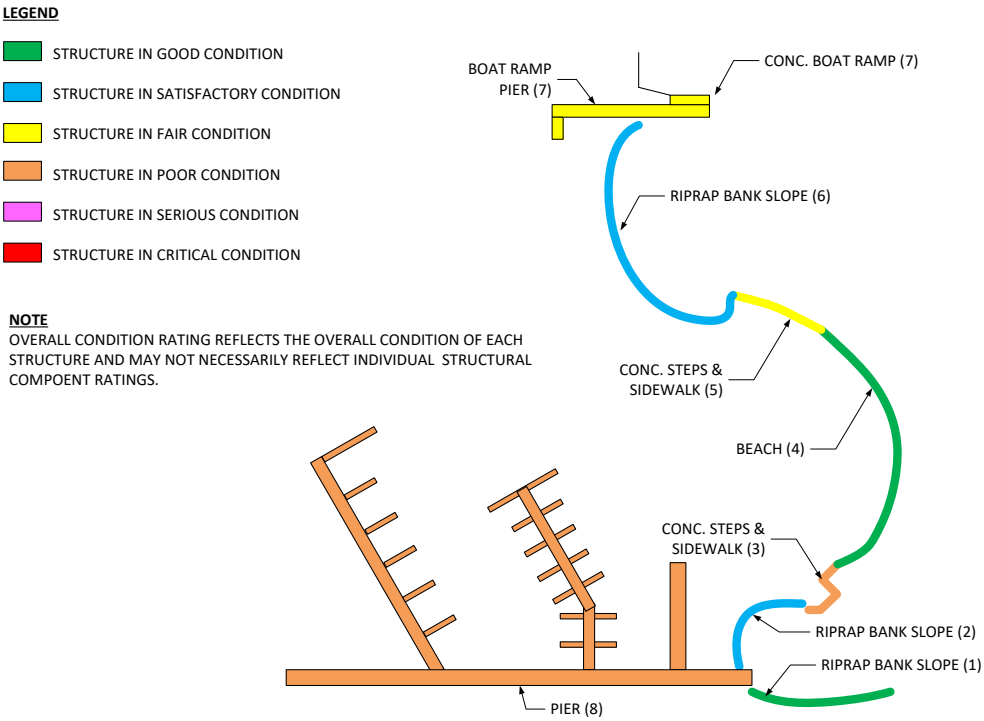


Figure 15. Marina Park Overall Condition.

Table 5. Marina Park – Condition, Recommended Repairs, & Remaining Life.

FACILITY LOCATION: 1	
ITEM: Riprap Bank Slope	**OVERALL RATING: Good**
PHOTO	EXISTING CONDITION / RECOMMENDATIONS
	Existing Condition • Approximately 80 feet of riprap shoreline. • Large (1' to 3') riprap with no smaller aggregate or filter fabric observed. • Approximate slope 2:1. • No erosion or shifting of riprap observed. Recommended Repairs and Remaining Life • None. • 20 years.

FACILITY LOCATION: 2	
ITEM: Riprap Bank Slope	**OVERALL RATING: Satisfactory**
PHOTO	EXISTING CONDITION / RECOMMENDATIONS
	Existing Condition • Approximately 50 feet of riprap shoreline. • Large (8" to 3') riprap with no smaller aggregate or filter fabric observed. • Approximate slope 3:1. • No erosion or shifting of riprap observed. • Minor erosion (1" max) under concrete sidewalk along west side. Erosion likely due mainly to stormwater runoff. Recommended Repairs and Remaining Life • None. • 20 years.

FACILITY LOCATION: 3

ITEM: Concrete Steps & Sidewalk	**OVERALL RATING: Poor**
PHOTOS	EXISTING CONDITION / RECOMMENDATIONS
 	Existing Condition • Approximately 90 feet of shoreline. • The south portion, middle portion, and NW corner of the steps is undermined (2"x1' deep, 7"x2.5'deep, and 1'x15' deep respectively) due to wave action (poor condition). • Concrete for sidewalk and steps is in fair condition overall with some cracking (1/8" max). Recommended Repairs and Remaining Life • Install quarry spalls and granular material to fill undermined areas of steps. • Placement of additional granular material in front of toe of steps to maintain step embedment. • Repair cracks. • 10 years with current condition (25 or more years of service life after repairs).

FACILITY LOCATION: 4

ITEM: Beach	**OVERALL RATING: Good**
PHOTO	EXISTING CONDITION / RECOMMENDATIONS
	Existing Condition • Approximately 200 feet of shoreline. • Gravel/sand beach with low to no slope. • Two step concrete steps at upper beach area provide separation between landscaping and beach areas. • Good condition with no observed deficiencies. Recommended Repairs and Remaining Life • No recommended repairs • 30 or more years of service life

FACILITY LOCATION: 5

ITEM: Concrete Steps & Sidewalk	**OVERALL RATING: Fair**
PHOTOS	EXISTING CONDITION / RECOMMENDATIONS
 	Existing Condition • Approximately 110 feet of shoreline. • Steps and adjacent sidewalk have settled approx. 6" and the gap (expansion joint) between steps and sidewalk has grown to approx. 2" (fair condition). • Moderate undermining of steps at toe due to erosion from wave action. Portions of steps supported by CMU blocks. Undermining ranges from 5-10" tall by 2.5-6' deep along most of the length of the steps (fair condition). • Concrete for sidewalk and steps is in fair condition overall with some minor cracking. Recommended Repairs and Remaining Life • Install quarry spalls and granular material to fill undermined areas of steps. • Placement of additional granular material in front of toe of steps to maintain step embedment. • 15 years with current condition (25 or more years of service life after repairs).

FACILITY LOCATION: 6

ITEM: Riprap Bank Slope	**OVERALL RATING: Satisfactory**
PHOTO	EXISTING CONDITION / RECOMMENDATIONS
	Existing Condition • Approximately 250 feet of riprap shoreline. • Large riprap with fabric observed. • Approximate slope 2:1. • No erosion or shifting of riprap observed. Recommended Repairs and Remaining Life • None. • 30 years.

FACILITY LOCATION: 7 (Boat Ramp) OVERALL RATING: Fair

ITEM: Pier Superstructure	**ITEM RATING: Fair**
PHOTO	EXISTING CONDITION / RECOMMENDATIONS
	Existing Condition • Typical construction of timber decking over timber stringers and blocking. Some loose boards and nail heads. • Timber 2x8 decking and 4x10 fascia boards are weathered and have some fungal decay (fair condition overall). • Cleats are in good condition. • Plastic pile caps on top of piles are in good condition other than two that are deformed. • Light poles and lights are in satisfactory condition. Recommended Repairs and Remaining Life • Replace decking with timber or grated decking. • Replace deformed pile caps. • 10 yrs (current), 25 yrs (repaired).

ITEM: Pier Substructure	**ITEM RATING: Satisfactory**
PHOTOS	EXISTING CONDITION / RECOMMENDATIONS
 	Existing Condition • 38 piles: 12-14" dia. treated timber. Good to satisfactory condition with minor to moderate fungal decay in the pile top. • Pile caps are double 6x10 for Bents 2-10 and single 8x10 in Bents 19 & 20. Good to satisfactory condition with localized areas of weathering and minor fungal decay on surfaces and cut ends. • Stringers are 4x10 treated timbers. Good to satisfactory condition with localized areas of weathering and minor fungal decay on surfaces and cut ends. Recommended Repairs and Remaining Life • No recommended repairs. • Piles: 20 years (current). • Pile Caps: 15 years (current). • Stringers: 15 years (current).

ITEM: Concrete Ramp	**ITEM RATING: Satisfactory**
PHOTO	EXISTING CONDITION / RECOMMENDATIONS
 	Existing Condition • Typical construction of linked concrete panels. • Linking hardware is all newer stainless steel (good condition). • Concrete panels are in satisfactory condition. • Bollards are in good condition. Recommended Repairs and Remaining Life • None. • 20 yrs.

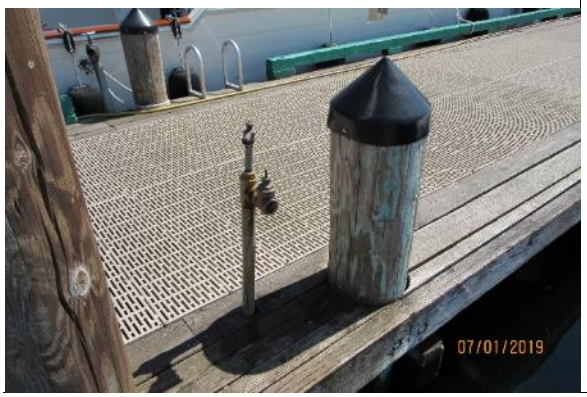
FACILITY LOCATION: 8 (Pier)	**OVERALL RATING: Poor**
ITEM: Superstructure	**ITEM RATING: Poor**
PHOTO	EXISTING CONDITION / RECOMMENDATIONS
 	Existing Condition • Typical construction consists of 3x8 timber decking over timber stringers, 4x10 timber fascia boards, & 6x8 timber bull rails (8x8 bull rails on commercial pier). • Decking on main pier from shore to laterals has “ThruFlow" plastic grated decking and is in fair condition with some weathering and decay. • Timber decking overall is in poor condition with wear, weathering, and approx. 25% fungal decay. • Timber fascia overall is in fair to poor condition with mechanical and weathering damage and approx. 25-50% fungal decay. • Timber bull rails overall are in fair to poor condition with locations of mechanical damage, wear/weathering, & approx. 35-50% fungal decay.

- Timber finger piers are in poor condition due to mechanical and weathering damage and fungal decay and are generally unstable.
- The straight NE lateral pier has significant damage to the NE edge of the step down pier and is currently safety coned off and unusable.
- Cleats are in satisfactory condition. Note that there are multiple locations where the cleats are pulling out of the support timbers they are fastened to.

Recommended Repairs and Remaining Life

- Replace timber decking.
- Replace timber fascia.
- Replace timber bull rails.
- Replace finger piers.
- Repair damaged NE lateral pier.
- Decking: 5 yrs (current), 25 yrs (repaired).
- Fascia: 5 yrs (current), 20 yrs (repaired).
- Bull Rails: 5 yrs (current), 20 yrs (repaired).
- Cleats: 15 yrs (current).

ITEM: Superstructure (Appurtenances)	**ITEM RATING: Satisfactory**
PHOTO	EXISTING CONDITION / RECOMMENDATIONS



Existing Condition

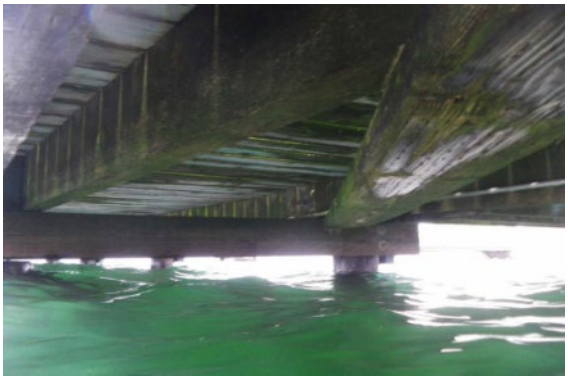
- Fire standpipes are in fair condition overall with some missing caps and handles and surface rusting observed.
- Hose bibs for potable water are in fair condition overall with some broken handles throughout.
- Light poles are in satisfactory condition.
- Timber benches are newer construction, typically timber 3x8 supports and 2x seating, and are in satisfactory condition overall.
- Galvanized steel ladders are in satisfactory condition overall.

Recommended Repairs and Remaining Life

- Replace missing caps and handles on fire standpipe system.
- Replace damaged hose bibs.
- Fire Standpipes: 10 years (current), 20 years (repaired).
- Hose Bibs: 5 years (current), 15 years (repaired).
- Light Poles: 15 years (current).

- Benches: 15 years (current).
- Ladders: 25 yrs.

ITEM: Pier Substructure	**ITEM RATING: Fair**
PHOTOS	EXISTING CONDITION / RECOMMENDATIONS



<u>Existing Condition</u>

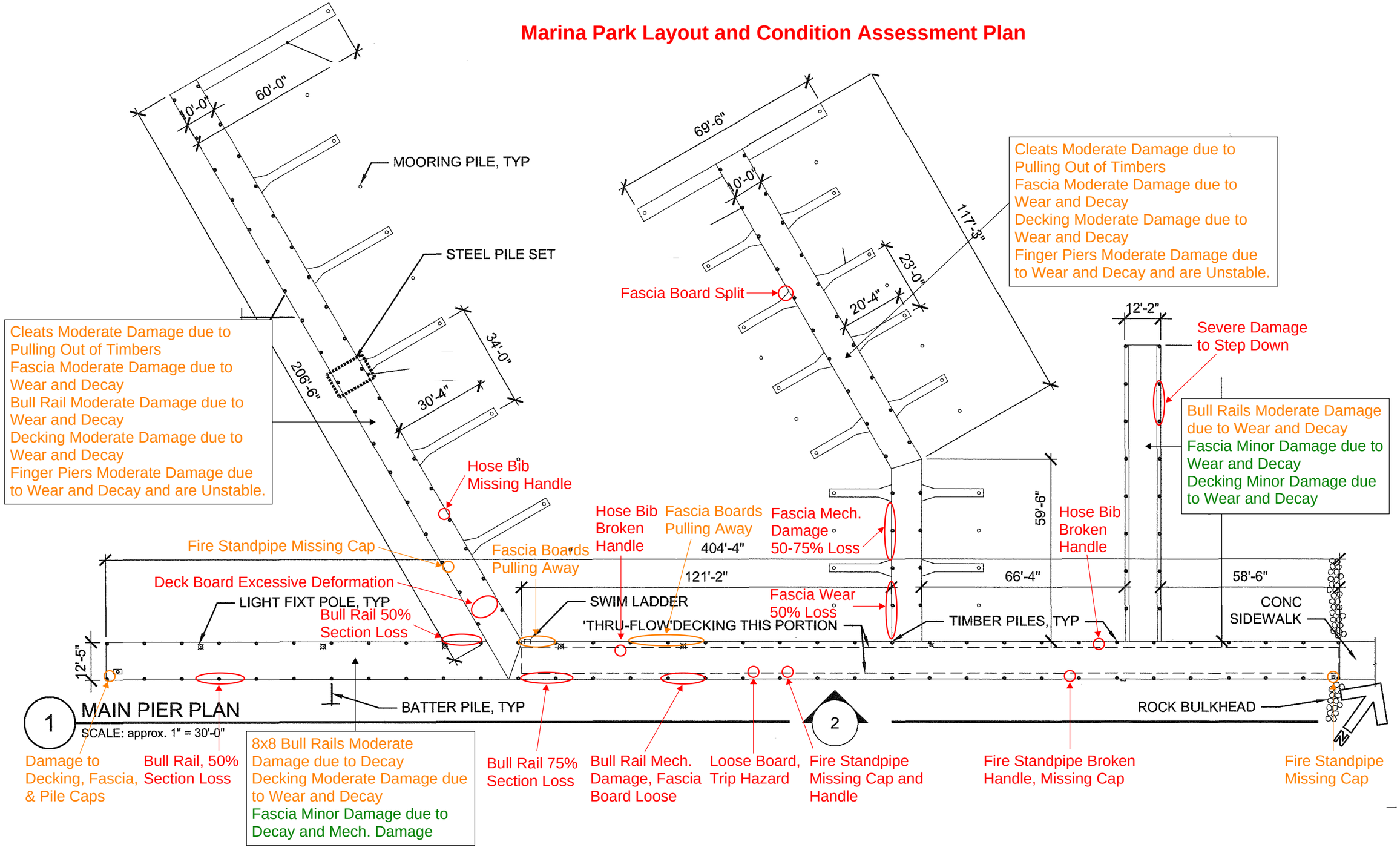
- 247 piles: 12-14" dia. treated timber. Good to poor condition. No / minor deterioration in 232 piles. 3 piles rated at 75% due to fungal decay or loose connections. 12 piles rated at 50% or less due to significant fungal decay (4), loose or broken splice connections (4), non-bearing (3), or impact (1).
- Pile caps are a mix of double 6x10 and single 10x12 timbers. Good to fair condition. Significant mechanical or fungal damage at cap ends (2 locations). Localized areas of weathering and minor fungal damage of surfaces and cut ends.
- Stringers are 4x10 treated timbers. Good condition overall. One stringer has failed due to impact damage. Localized areas of weathering and minor fungal damage of surfaces and cut ends.
- Diagonal braces are treated timber. Good to poor condition. Of 17 braces, 13 have no significant defects and 4 have failed due to impact damage to the timber or failure of one of the connections. Brace hardware is in satisfactory condition with light to moderate surface corrosion.

- Galvanized steel brace system at/near mudline on outer piles on E & W sides of center lateral and E side of outer (western) lateral. Good condition.
- 5 timber firewalls at intervals along structure. Fair condition. 2 firewalls have loose/ missing boards.

<u>Recommended Repairs and Remaining Life</u>

- Replace damaged timber piles (9) & pile caps (2).
- Shim non-bearing piles (3).
- Replace timber stringer (1) & braces (4).
- Repair timber firewall loose/missing boards.
- Piles: damaged piles, 3 yrs (current), 25 yrs (replaced), other piles, 15 yrs (current).
- Pile Caps: damaged caps, 1 yr (current), 25 yrs (replaced); other caps, 15 yrs (current).
- Stringers: failed stringer, 0 yr (current), 25 yr (replaced), other stringers, 15 years (current).
- Diagonal braces: failed braces, 0 yr (current), 25 yr (replaced), other braces, 15 years (current).
- Steel braces: 20 years (current).
- Firewalls: 15 years (current).

Marina Park Layout and Condition Assessment Plan



Cleats Moderate Damage due to Pulling Out of Timbers
Fascia Moderate Damage due to Wear and Decay
Bull Rail Moderate Damage due to Wear and Decay
Decking Moderate Damage due to Wear and Decay
Finger Piers Moderate Damage due to Wear and Decay and are Unstable.

Cleats Moderate Damage due to Pulling Out of Timbers
Fascia Moderate Damage due to Wear and Decay
Decking Moderate Damage due to Wear and Decay
Finger Piers Moderate Damage due to Wear and Decay and are Unstable.

Bull Rails Moderate Damage due to Wear and Decay
Fascia Minor Damage due to Wear and Decay
Decking Minor Damage due to Wear and Decay

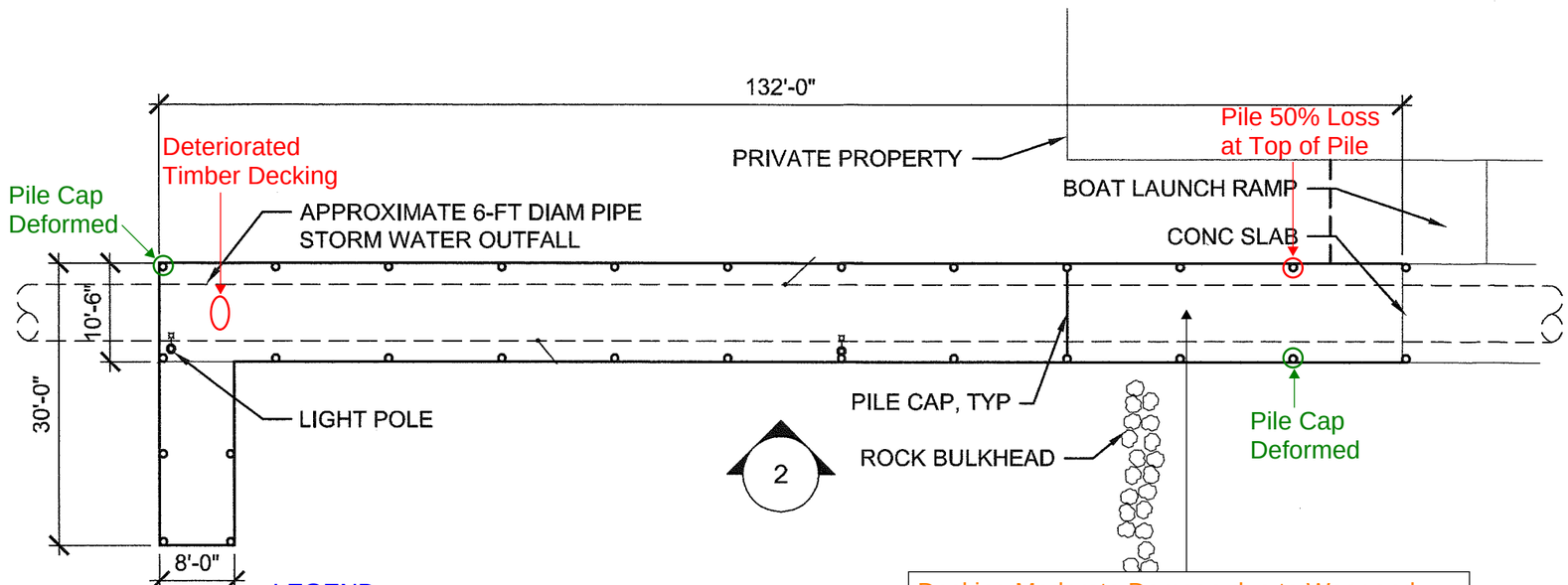
8x8 Bull Rails Moderate Damage due to Decay
Decking Moderate Damage due to Wear and Decay
Fascia Minor Damage due to Decay and Mech. Damage

LEGEND:

MI - MINOR DAMAGE OR DETERIORATION
MO - MODERATE DAMAGE OR DETERIORATION
MA - MAJOR DAMAGE OR DETERIORATION
SV - SEVERE DAMAGE OR DETERIORATION

Pier Dive Inspection Items (See Echelon Report)
Replace 9 Damaged Timber Piles
Replace 2 Damaged Timber Pile Caps
Replace 5 Failed Timber Stringers and Braces
Shim 3 Timber Piles
Repair Timber Firewall Loose / Missing Boards

Marina Park Boat Ramp Layout and Condition Assessment Plan



LEGEND:

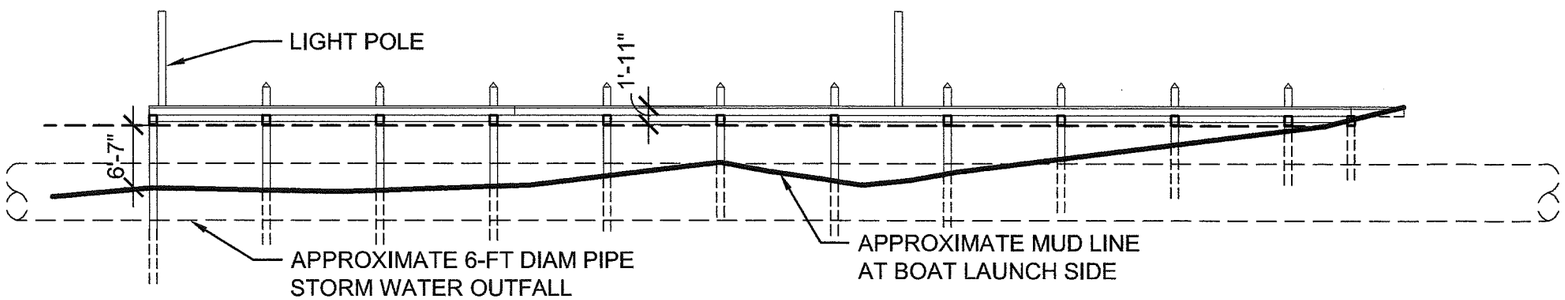
MI - MINOR DAMAGE OR DETERIORATION
MO - MODERATE DAMAGE OR DETERIORATION
MA - MAJOR DAMAGE OR DETERIORATION
SV - SEVERE DAMAGE OR DETERIORATION

Decking Moderate Damage due to Wear and Decay, Loose Boards and Nail Heads

Fascia Boards Moderate Damage due to Decay

1 SMALL PIER PLAN

SCALE: approx. 1/16" = 1'-0"



2 SMALL PIER SECTION

SCALE: approx. 1/16" = 1'-0"

WAVERLY PARK

The shoreline and overwater structures inspected at the Waverly Park facility include a riprap bulkhead, beach, concrete pier, concrete steps and sidewalk, ecology block bulkhead, and a timber pier. Figures 18 and 19 show locations of the park facility components and overall condition rating. Table 6 provides details of the assessment, recommended repairs, and remaining service life of each component.

Figure 18. Waverly Park Aerial.

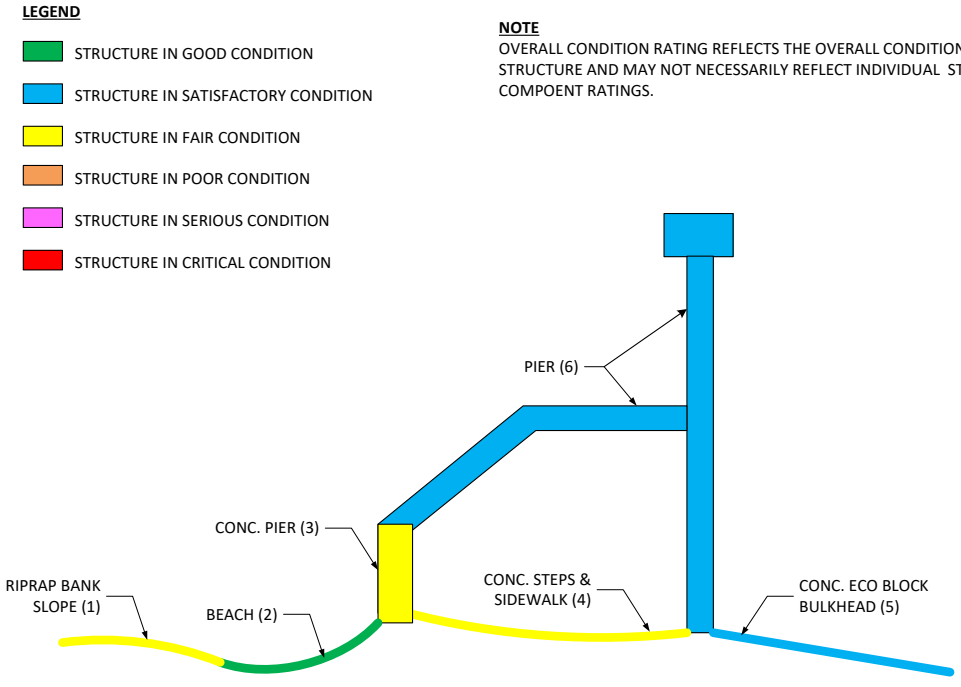


Figure 19. Waverly Park Overall Condition.

Table 6. Waverly Park – Condition, Recommended Repairs, & Remaining Life.

FACILITY LOCATION: 1	
ITEM: Riprap Bulkhead	**OVERALL RATING: Good**
PHOTO	EXISTING CONDITION / RECOMMENDATIONS
	Existing Condition • Approximately 115 feet of riprap shoreline. • Large riprap with filter fabric behind and well arranged. • Wall stable with no evidence of erosion at toe or settlement of rocks. • Riprap bulkhead is in good condition. Recommended Repairs and Remaining Life • None. • Riprap: 30 yrs .

FACILITY LOCATION: 2	
ITEM: Beach	**OVERALL RATING: Good**
PHOTO	EXISTING CONDITION / RECOMMENDATIONS
	Existing Condition • Approximately 130 feet of shoreline. • Gravel beach with low slope. • Good condition with no observed deficiencies. Recommended Repairs and Remaining Life • No recommended repairs. • 30 or more years of service life.

FACILITY LOCATION: 3

ITEM: Concrete Pier	**OVERALL RATING: Fair**
PHOTO	EXISTING CONDITION / RECOMMENDATIONS
	Existing Condition • Approximately 45 feet of shoreline. • Concrete pier toe has minor undermining along south edge. Small void at intersection of NE corner of concrete pier and SW corner of steps. • Concrete pier surface has minor cracking throughout (hairline to 1/4" max). Recommended Repairs and Remaining Life • Install granular material to fill undermined areas at toe of pier structure. • Repair cracks. • 15 years with current condition (25 or more years of service life after repairs).

FACILITY LOCATION: 4

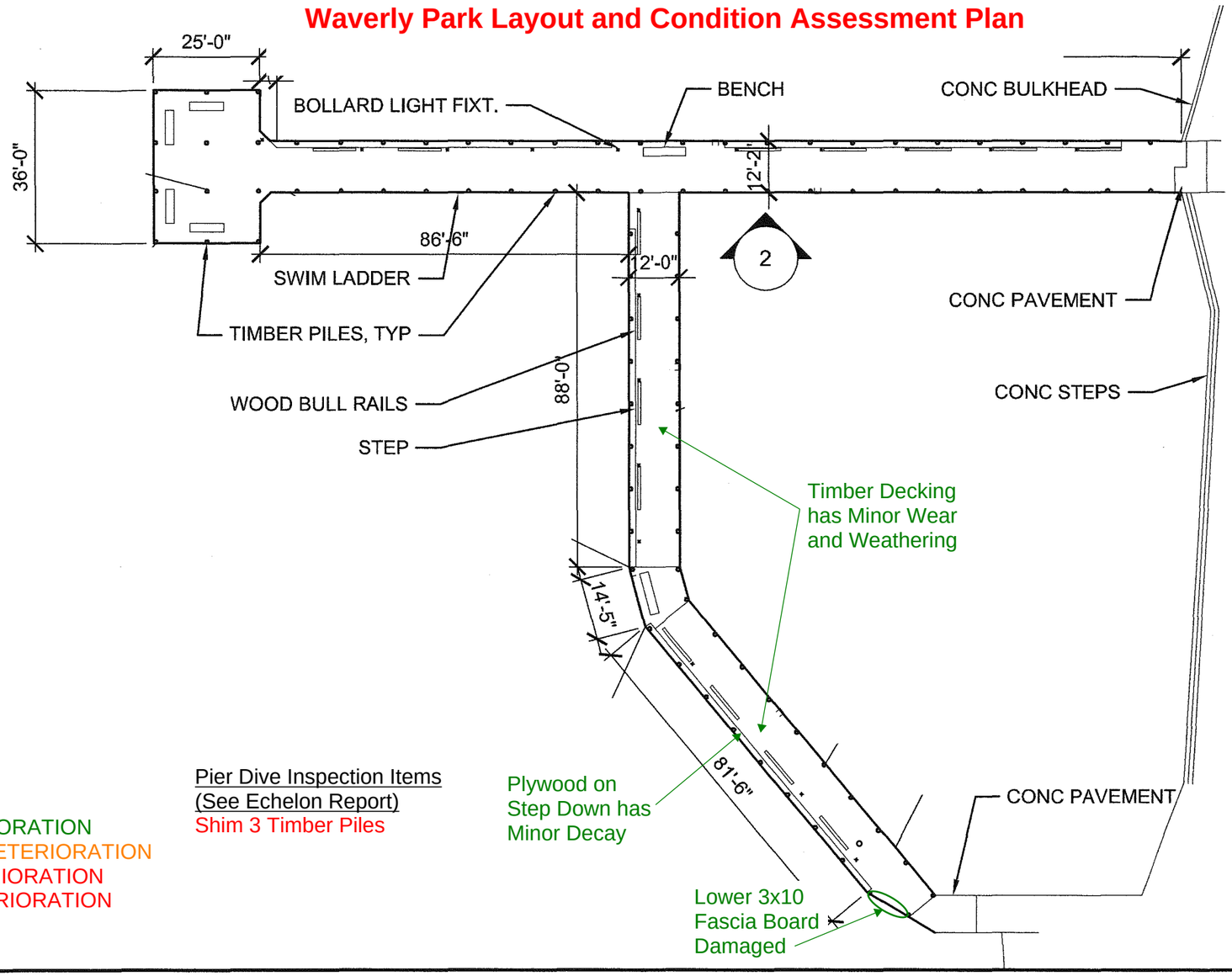
ITEM: Concrete Steps & Sidewalk	**OVERALL RATING: Fair**
PHOTOS	EXISTING CONDITION / RECOMMENDATIONS
	Existing Condition • Approximately 160 feet of shoreline. • There is minor undermining under the north end of the stairs (approx. 10' long x 2" tall x 1' deep). • There is a moderate crack along the base of the riser of the top step (approx. 30' x 1/2" tall). • There are several major cracks in the sidewalk near the north end of the stairs including one approx. 8' x 1/4" and one 8'x 3/4"full depth. • Steps: fair condition overall with intermittent cracking and some spalling of step edges. • Sidewalk: fair condition overall with intermittent cracking and several large cracks. Recommended Repairs and Remaining Life • Install granular material to fill undermined areas at toe of concrete steps. • Repair sidewalk cracks. • 10 years with current condition (20 or more years of service life after repairs)

FACILITY LOCATION: 5

ITEM: Ecology Block Bulkhead	**OVERALL RATING: Satisfactory**
PHOTO	EXISTING CONDITION / RECOMMENDATIONS
	Existing Condition • Approximately 130 feet of shoreline. • Ecology block wall with poured concrete bulkhead on top. Handrail and built in picnic benches mounted to top of concrete bulkhead wall. • No undermining observed, but gaps (1" typical) between ecology blocks. • Handrail is in good condition. Recommended Repairs and Remaining Life • None. • Remaining life: 20 years .

FACILITY LOCATION: 6 (Pier)	**OVERALL RATING: Fair**
ITEM: Pier Superstructure	**ITEM RATING: Satisfactory**
PHOTO	EXISTING CONDITION / RECOMMENDATIONS
	Existing Condition • South angled portion of pier has timber 4x8 decking, 3x10 fascia, and 6x6 bull rails. Decking and fascia are in satisfactory condition (minor wear) and bull rail is in good condition. • Straight section of pier has fiberglass grated decking, timber 3x10 fascia and 6x6 bull rails. All elements are newer and are in good condition. • Timber benches, light bollards, hardware, and aluminum ladders are all newer and in good condition. Recommended Repairs and Remaining Life • None • Remaining life: 20 years
ITEM: Pier Substructure	**ITEM RATING: Fair**
PHOTO	EXISTING CONDITION / RECOMMENDATIONS
	Existing Condition • 95 piles: 8-14" dia. treated timber. Good to satisfactory condition with minor biological damage / mechanical damage. Three piles rated 50% or less, shimming would restore them to near full capacity. • Pile caps are a mix of 8x10 and 10x12 treated timbers. Good to fair condition. Localized fungal and biological damage at cut ends. • Stringers are mixed 4x12, mix of treated and untreated. Good to fair condition. • Diagonal braces in good condition with minor biological degradation of outer surface. Hardware in fair condition with moderate surface corrosion. Recommended Repairs and Remaining Life • Shim 3 piles to restore bearing capacity. • Piles: 15 yrs (current). • Pile Caps: 10 yrs (current) • Stringers: 15 years (current) • Diagonal braces: 15 years (current)

Waverly Park Layout and Condition Assessment Plan



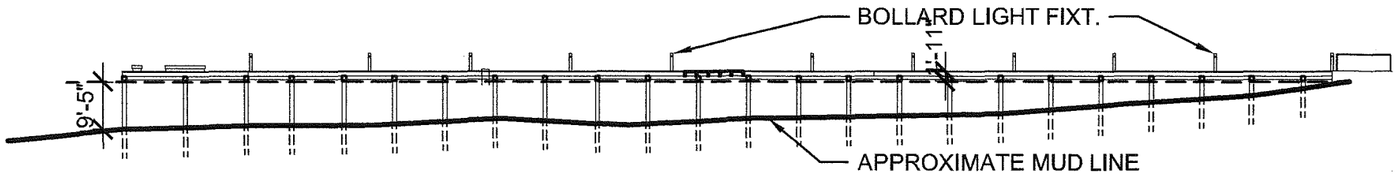
LEGEND:

MI - MINOR DAMAGE OR DETERIORATION
MO - MODERATE DAMAGE OR DETERIORATION
MA - MAJOR DAMAGE OR DETERIORATION
SV - SEVERE DAMAGE OR DETERIORATION

Pier Dive Inspection Items
(See Echelon Report)
Shim 3 Timber Piles

1 PIER PLAN

SCALE: approx. 1" = 30'-0"



2 PIER SECTION

SCALE: approx. 1" = 30'-0"

JUANITA BEACH PARK

The shoreline and overwater structures inspected at the Juanita Beach Park facility include a concrete pier and a beach. Figures 21 and 22 show locations of the park facility components and overall condition rating. Table 7 provides details of the assessment, recommended repairs, and remaining service life of each component.

Figure 21. Juanita Beach Park Aerial.

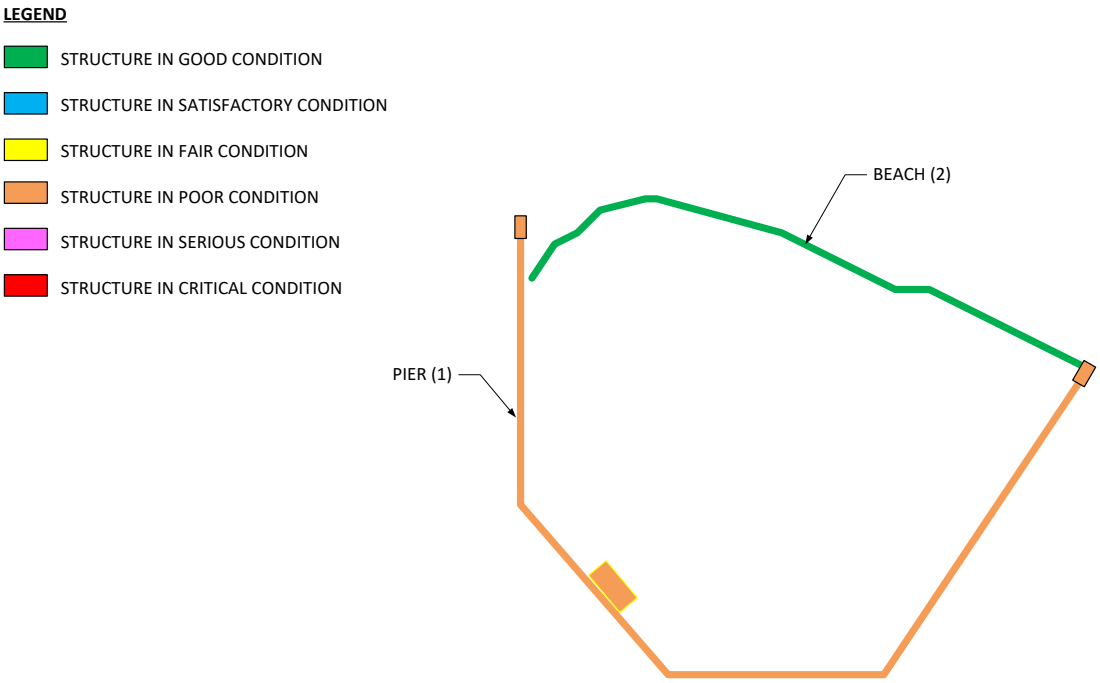


Figure 22. Juanita Beach Park Overall Condition.

Table 7. Juanita Beach Park – Condition, Recommended Repairs, & Remaining Life.

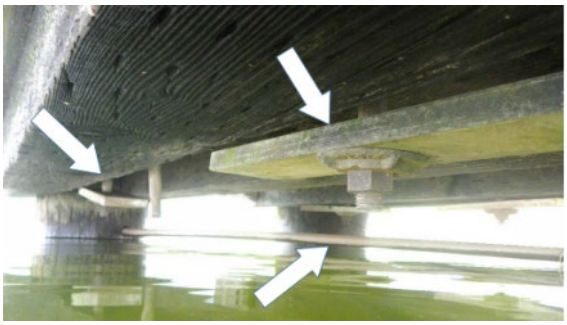
FACILITY LOCATION: 1 (Pier)	**OVERALL RATING: Poor**
ITEM: Pier Superstructure	**ITEM RATING: Fair**
PHOTO	EXISTING CONDITION / RECOMMENDATIONS

Existing Condition

- Typical construction consists of precast concrete panels (approx. 8'x24'x1') over timber pile caps with metal pipe handrails side mounted and ladders top mounted to the concrete panels.
- Panel joints are filled with concrete closure pour and there are expansion joints with steel diamond plate covers every third panel.
- Concrete edge spalls are typical at each closure pour and at several handrail post locations. Concrete surface has minor wear and cracking.
- Steel diamond plate at expansion joints are missing screws (between 4 and 12 of 16 screws). The plate at the NE end of the pier is missing 12 screws and is sticking up (tripping hazard).
- There is a concrete swim float at the SW side of the pier. The expansion joint material in the center of the float is missing or sagging along its length.
- Concrete pier: fair condition
- Concrete swim float: fair condition
- Handrails: fair condition with surface rust throughout and on connection hardware to panels.
- Ladders: good condition
- Timber light poles: fair to poor condition with fungal decay (25-35%) throughout.

Recommended Repairs and Remaining Life

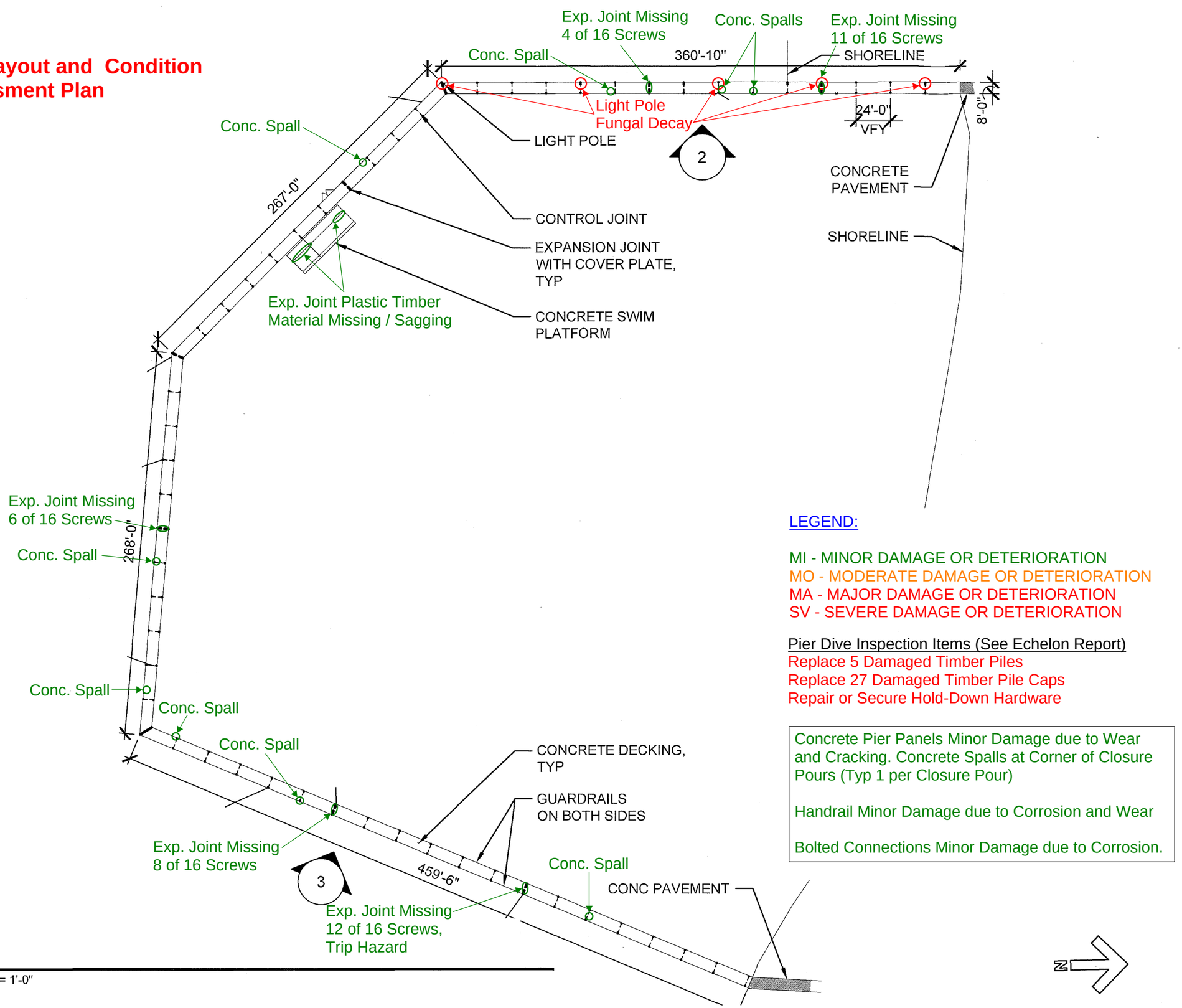
- Repair concrete panel spalls and cracks.
- Install screws in expansion joint plates.
- Replace expansion joint material in swim float.
- Remove rust and repair coating on handrails.
- Replace light poles.
- Panels, Float, Handrails: 15 years (current), 25 or more years (repaired).
- Light Poles: 1 year (current), 20 years (replaced).

ITEM: Pier Substructure	ITEM RATING: Poor
PHOTO	EXISTING CONDITION / RECOMMENDATIONS
 	Existing Condition • 126 piles: 12-14" dia. treated timber. Good to satisfactory condition with minor biological damage / mechanical damage. Five piles are rated at 25% or less due to significant fungal decay and are in poor condition. • Pile caps are double 6x10 treated timbers thru-bolted to piles and along their length. Good to fair condition. Significant fungal damage for 27 pile caps (poor condition). • Steel hold-down hardware to secure concrete panels to timber caps in poor condition due to loose or missing components. • Diagonal tension rods at each expansion joint. Rods and hardware are in satisfactory condition with moderate surface corrosion. Recommended Repairs and Remaining Life • Replace 5 damaged piles. • Replace damaged pile caps (27 locations). • Repair and/or secure hold down hardware. • Piles: damaged piles 2 yrs (current), 25 yrs (replaced); other piles 15 years (current) • Pile Caps: damaged pile caps 2 yrs (current), 25 yrs (replaced); other pile caps 10 yrs (current) • Steel hold down hardware: 2 yrs (current), 10 years (repaired / secured) • Diagonal braces: 20 years (current)

FACILITY LOCATION: 2

ITEM: Beach	OVERALL RATING: Good
PHOTO	EXISTING CONDITION / RECOMMENDATIONS
	Existing Condition • Approximately 1,100 feet of shoreline. • Sand beach with low slope. • Good condition with no observed deficiencies. Recommended Repairs and Remaining Life • No recommended repairs • 30 or more years of service life

Juanita Beach Layout and Condition Assessment Plan



1 PIER PLAN

SCALE: approx. 1/64" = 1'-0"

LEGEND:

MI - MINOR DAMAGE OR DETERIORATION
MO - MODERATE DAMAGE OR DETERIORATION
MA - MAJOR DAMAGE OR DETERIORATION
SV - SEVERE DAMAGE OR DETERIORATION

Pier Dive Inspection Items (See Echelon Report)
Replace 5 Damaged Timber Piles
Replace 27 Damaged Timber Pile Caps
Repair or Secure Hold-Down Hardware

Concrete Pier Panels Minor Damage due to Wear and Cracking. Concrete Spalls at Corner of Closure Pours (Typ 1 per Closure Pour)

Handrail Minor Damage due to Corrosion and Wear

Bolted Connections Minor Damage due to Corrosion.

RECOMMENDED REPAIRS AND REPLACEMENT

Recommended Repairs – High Priority

The shoreline elements and piers have been periodically maintained but there are some high priority repairs recommended where elements have failed or have significant deterioration and are no longer functional. These elements are detailed in the table below, along with recommendations for repair, probable construction costs, and recommended repair timelines.

Table 8. Recommended Repairs – High Priority.

Structure/Items	Recommendation	Probable Construction Cost	Recommended Timeline
Houghton Park – Riprap Bank Slope (Location 3)	Install quarry spalls to fill large voids in riprap and install geotextile fabric and additional quarry spalls or granular material behind riprap.	$5,000	0-2 years
Houghton Park – Pier Substructure (Location 11)	Replace 10 timber piles. Replace 3 timber pile caps.	$106,000	Piles 1 yr. Pile Caps 3 yr.
Houghton Park – Pier Substructure (Location 11)	Shim 39 piles to restore bearing capacity.	$39,000	1-2 years
Marsh Park – Handrail (Location 4)	Remove rust and paint posts with zinc paint. Install new handrails.	$4,000	Immediate
Marsh Park – Voids Behind Riprap (Location 5)	Install quarry spalls to fill large voids in riprap and install geotextile fabric and additional quarry spalls or granular material behind riprap. Grout under concrete step slab.	$8,000	Immediate
Marsh Park – Pier (Location 6)	Shim 2 piles to restore bearing capacity.	$2,000	1 year
Settler's Landing – Pier (Location 1)	Replace fire standpipe supports.	$1,000	1 year
Settler's Landing – Pier (Location 1)	Shim 5 piles to restore bearing capacity. Replace 2 light fixtures.	$5,500	1-2 years
2nd Ave S Dock – Pier Decking (Location 1)	Replace damaged timber pile caps	$20,000	0-1 year

Table 8. Recommended Repairs – High Priority.

Structure/Items	Recommendation	Probable Construction Cost	Recommended Timeline
Marina Park – Concrete Steps & Sidewalk (Locations 3 and 5)	Install quarry spalls and granular material to fill undermined areas of steps. Placement of additional granular material in front of toe of steps to maintain step embedment. Repair cracks and fill expansion joint gap.	$15,000	1 year
Marina Park – Pier (Location 8)	Replace damaged timber piles (9) and pile caps (2).	$94,000	1 year
Marina Park – Pier (Location 8)	Replace failed timber stringer (1) and braces (4).	$2,500	1 year
Marina Park – Pier (Location 8)	Repair damaged NE lateral pier step-down.	$5,000	Immediate
Marina Park – Pier (Location 8)	Replace missing fire standpipe caps & handles. Replace damaged hose bibs.	$1,000	1-2 years
Marina Park – Pier (Location 8)	Shim 3 piles to restore bearing capacity.	$3,000	1-2 years
Juanita Park – Pier (Location 1)	Replace light poles.	$8,000	0-1 year
Juanita Park – Pier (Location 1)	Replace 5 damaged piles. Replace damaged pile caps (27 locations). Repair and/or secure hold-down hardware.	$107,000	1-2 year

Total High Priority Repairs Construction Cost: $426,000

Recommended Repairs – Medium Priority (within 5 years)

The shoreline elements and piers have been periodically maintained but there are some medium priority repairs recommended where elements should be repaired or replaced within the next five years due to existing and expected additional deterioration. These elements are detailed in the table below, along with recommendations for repair, probable construction costs, and recommended repair timelines.

Table 9. Recommended Repairs – Medium Priority.

Structure/Items	Recommendation	Probable Construction Cost	Recommended Timeline
Houghton Park –Concrete Steps & Sidewalk (Location 9)	Repaint handrails	$500	2-3 yrs
Houghton Park –Ecology Block Bulkhead (Location 10)	Repaint handrails	$1,000	2-3 years
Settler's Landing – Pier (Location 1)	Replace pier decking with grated decking	$84,000	2-5 years
2nd Ave S Dock – Pier Decking (Location 1)	Replace timber fascia and bull rails.	$25,000	2-5 years
2nd Ave S Dock – Pier Decking (Location 1)	Replace missing fire standpipe caps & handles. Repair rust, repaint kiosk	$1,000	2-3 years
Marina Park – Pier (Location 8)	Replace timber decking, fascia, and bull rails	$508,000	3-5 years
Marina Park – Pier (Location 8)	Replace timber finger piers incl. piles.	$544,000	2-4 years
Marina Park – Pier (Location 8)	Repair timber firewall loose / missing boards.	$4,000	2-3 years
Waverly Park – Concrete Pier (Location 3)	Install granular material to fill undermined areas. Repair cracks.	$3,000	3-5 years
Waverly Park – Concrete Steps and Sidewalk (Location 4)	Install granular material to fill undermined areas at toe. Repair sidewalk cracks.	$3,000	2-3 years
Waverly Park – Pier (Location 6)	Shim 3 piles to restore bearing capacity	$3,000	2-3 years

Total Medium Priority Repairs Construction Cost: $1,176,500

Recommended Repairs – Low Priority (within 5 to 20 years)

The shoreline elements and piers have been periodically maintained but there are some low-priority repairs recommended where elements should be repaired or replaced within the next five to twenty years due to expected additional deterioration. These elements are detailed in the table below, along with recommendations for repair, probable construction costs, and recommended repair timelines.

Table 10. Dock Facilities Recommended Repairs – Low Priority.

Structure/Items	Recommendation	Probable Construction Cost	Recommended Timeline
Houghton Park – Riprap Bank Slope (Location 1)	Install quarry spalls to fill large voids in riprap and install geotextile fabric and additional quarry spalls or granular material behind riprap.	$5,000	5-10 years
Houghton Park – Concrete Steps & Sidewalk (Location 4)	Repair sidewalk by removing cracked corner/edge and installing thickened edge with new concrete.	$1,000	5-10 years
Houghton Park – Concrete Steps & Sidewalk, Revetment, Ecology Block Bulkhead (Locations 4, 5 6, 8, 9, & 10)	Repair cracks and spalls	$2,000	10-15 years
Houghton Park – Pier Superstructure (Location 11)	Remove vegetation from swim area step timbers, replace plastic lumber fascia boards	$12,000	5-10 years
Marsh Park – Asphalt Pathway (Locations 1 and 2)	Patch & seal asphalt pathway to prevent erosion / undermining and eliminate trip hazards.	$9,000	5 years
Marsh Park – Riprap Bank & Concrete Sidewalk / Slab (Locations 2 and 4)	Install geotextile fabric and additional quarry spalls or granular material behind riprap. Grout under concrete bench slab. Repair cracks	$3,500	10-15 years
Marsh Park – Pier (Location 6)	Replace decking with timber or grated decking, fix swim ladder and light fixture	$58,500	5 years
2nd Ave S Dock – Pier Decking (Location 1)	Repair cracks and spalls, repair or replace 2 damaged ladders	$2,500	5 years
Marina Park – Boat Ramp Pier (Location 7)	Replace decking with timber or grated decking, replace 2 deformed plastic pile caps	$467,000	5-10 years

Table 10. Dock Facilities Recommended Repairs – Low Priority.

Structure/Items	Recommendation	Probable Construction Cost	Recommended Timeline
Juanita Park – Pier (Location 1)	Repair concrete panel cracks and spalls. Install screws in expansion joint steel plates. Replace expansion joint material in swim float Remove rust, repaint handrails.	$9,500	5-10 years

Total Low Priority Repairs Construction Cost: $570,000

Total Construction Cost: $2,172,500

Construction costs include contractor general conditions, and contractor overhead and profit, but does not include any mobilization and demobilization, escalations, contingencies, sales tax, permitting, engineering, etc. (See Appendix C for individual park cost estimates that include all of these items except escalations). Cost estimate methodology is based on a 25-year or more service life for waterfront structural members, with the assumption of proper maintenance. Once members reach the end of their design life, they typically need to be replaced rather than undergo further repairs and maintenance. Estimated construction costs are based on RS Means, bid tab results from recent projects, and correspondence with suppliers, manufacturers, and contractors.

Repair Priority Ranking

Several repairs are recommended as immediate or very near term projects that should be addressed prior to other overall park projects. These include the following:

1. Marsh Park – Voids Behind Riprap (Location 5). These voids are a public safety concern and are recommended to be addressed immediately.

2. Marsh Park – Handrail (Location 4). The timber top members of the handrails at this location have severe decay and section loss and should be replaced. These timber members are a public safety concern and are recommended to be addressed immediately.

3. Marina Park – Undermined Concrete Steps (Location 5). While the steps appear to be relatively stable at the current time, the recommendation is that this area is addressed soon due to the significant length and depth of undermining and the fact that the steps are currently only supported by intermittent CMU blocks on the gravel substrate.

4. Marina Park – Pier (Location 8). The damaged step-down location on the NE lateral pier is currently barricaded off for public access and use. Due to the damage, it is recommended that this area be addressed soon to resolve the safety concern and to restore function to this area of the pier.

Based on evaluation of the overall conditions of the seven parks included in the assessment, below is the ranking of the recommended order of repairs by park. Note that this ranking assumes that the above-mentioned four repairs are done independently of overall park repair work.

1. Marina Park
2. Juanita Beach Park
3. Houghton Beach Park
4. 2nd Ave South Dock
5. Marsh Park
6. Settlers Landing Park
7. Waverly Park

Ongoing Maintenance Recommendations

Periodic inspections should be performed in accordance with the ASCE MOP 130-2015, *Waterfront Facilities Inspection and Assessment*, which recommends another routine inspection in approximately five years, given the deterioration observed.

SUMMARY

Houghton Beach Park shoreline structures are in Poor to Good Condition. Riprap bank slopes are in fair to poor conditions with several areas of erosion damage. Recommended high-priority repairs include filling large voids in riprap and installation of geotextile fabric and additional quarry spalls or granular material behind riprap. The pier structure is in poor condition due to several majorly deteriorated piles and pile caps. Recommended high priority repair includes replacement of the deteriorated piles and pile caps with the new piles and pile caps.

Marsh Park shoreline structures are in Serious to Good Condition. Riprap bulkhead structures are in poor to serious condition with large voids due to erosion. Recommended high-priority repair includes filling large voids with quarry spalls or granular material behind riprap after installation of geotextile fabric and replacement of the timber top handrail members.

Settlers Landing Pier structure is in Fair Condition. Recommended high-priority repairs include repair of loose fire standpipe supports, replacement of the broken light fixtures, and installation of new shims between the piles and the pile caps to restore bearing capacity.

Second Avenue South Dock shoreline structures are in Fair to Good Condition. The timber pier substructure is deteriorated. Several pile caps have major damage due to fungal decay. Recommended high-priority repairs include replacement of the damaged pile caps with new pile caps.

Marina Park shoreline structures are in Poor to Good Condition. Various structural components of the timber pier have major deterioration. Recommended high-priority repairs include installation of quarry spalls and granular material to fill undermined areas of steps and placement of additional granular material in front of toe of steps to maintain step embedment as well as replacement of deteriorated timber piles, pile caps, stringer, and braces as well as repairing the damaged northeast lateral pier step-down, shimming several piles to restore bearing capacity, and replacing any missing fire standpipe caps and handles or damaged hose bibs. Several locations of the concrete steps and sidewalk structure adjacent to the pier are undermined due to wave action and the decking bull rails, and fascia boards and finger piers are all deteriorating. Recommended medium (short term) priority repairs include replacement of the decking, bull rails, fascia boards, and finger piers.

Waverly Park shoreline structures are in Fair to Good Condition. The concrete pier shows minor undermining along south edge of pier toe. Recommended repair includes installation of granular material to fill undermined areas at toe of pier structure.

Juanita Beach Park shoreline structures are in Fair to Good Condition. There are several timber piles and multiple timber pile caps supporting the pier structure that have major deterioration and several light poles on the pier also have significant fungal decay. Recommended high-priority repairs include replacement of the deteriorated pile caps, piles, and light poles.

It is recommended that the shoreline structures continue to be repaired and maintained for public safety.

APPENDIX A: ECHELON DIVE REPORT

ECHELON ENGINEERING, INC.

Civil/Marine Consulting Engineers

2019
Dock & Pier Assessment
Kirkland Parks & Community Services
Kirkland, Washington

Prepared For:

Reid Middleton
728 134th Street SW, Suite 200
Everett, WA 98204

ATTN: Mr. Willy Ahn, PhD., PE, Leed AP
Sr. Project Manager
Tel: 425 / 741.3800

Prepared By:

Echelon Engineering, Inc.
21027 61st Avenue West
Seattle, WA 98036

ATTN: Ms. Shelley Sommerfeld, PE
President
Tel: 425 / 672.8924

August 2019
19-2565

TABLE OF CONTENTS

Echelon
Engineering

Civil / Marine
Consulting Engineers

August 9, 2019

Reid Middleton, Inc.
728 – 134th Street SW
Everett, Washington 98204

ATTN: Mr. Willy Ahn, PE, Ph.D, LEED, AP
Project Manager / Sr. Engineer

RE: FINAL REPORT – 2019 Dock & Pier Assessment
Kirkland Parks & Community Services, Kirkland, WA

Dear Mr. Ahn:

This report is submitted to document the findings of our recent inspection of the piles and under-deck superstructure members within seven facilities owned and operated by the City of Kirkland's Parks & Community Services Department. The structures are located on the eastern shore of Lake Washington and are constructed using a combination of timber and concrete members. The inspection was carried out to document the current condition of the various members in support of your evaluation, and recommendations for the various facilities.

INTRODUCTION

We understand that the Kirkland Parks & Community Services Department has tasked Reid Middleton with the evaluation of the seven facilities. Echelon's responsibility was to conduct inspection of the piles and under-deck superstructure members in support of Reid Middleton's evaluation and recommendations for the facilities. The following structures, listed sequentially from north to south, were included within the investigation:

A. Juanita Beach Park Waterwalk (126 timber piles, associated timber caps, steel rod bracing, and concrete deck panels)

B. Waverly Beach Park Pier (95 timber piles, and associated timber caps, stringers and under surface of deck)

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Figure 1 – Facility Locations

C. Marina Park

C.1. Marina Park - Main Pier (247 timber piles, and associated timber bracing, timber caps, stringers and under surface of deck)

C.2. Marina Park - Small Pier (39 timber piles, and associated timber caps, stringers and under surface of deck)

D. Second Avenue South Pier (115 timber piles, timber bracing, timber wavebreaks, and associated timber caps, stringers and concrete deck)

E. Settler's Landing Pier (54 timber piles, and associated timber caps, stringers, and under surface of deck)

F. Marsh Park Pier (23 timber piles, and associated timber caps, stringers, and under surface of deck)

G. Houghton Beach Park Pier (83 timber piles, timber bracing and associated timber caps, stringers and under surface of deck)

SCOPE OF SERVICES

The scope of this project covered the underwater and above water inspection of accessible substructure members, including the piles and under-deck members within the seven facilities. The project was authorized as a six day field effort. The effort included full inspection of the Marina Park facility and as much inspection as possible of the remaining six facilities, which resulted in the investigation of a representative sampling of the members within each of these six structures.

The work was conducted diligently, with properly qualified personnel and in conformance with the usual standards of similar companies performing similar services under similar circumstances. The project was conducted as a Routine Inspection as outlined in the American Association of Civil Engineers (ASCE) publication *Waterfront Facilities Inspection and Assessment* (ASCE Manuals and Reports on Engineering Practice No. 130) and included Level I, II and III inspection techniques. The inspected members received Level I visual/tactile inspection for the inspected length. This included investigation of the piles, and the superstructure members. Level II examination, including spot cleaning, and probing was also conducted at suspect locations. Level III inspection was performed at the Marina Park facility. No Level III inspection was conducted at any of the other six sites. Areas of damage were recorded, including the location and quantification of specific deterioration encountered. All elevations were referenced to the water surface.

The inspected piling and accessible superstructure members (i.e. caps, stringers, and the undersurface of the decking) were subjected to Level I visual inspection looking for areas of gross damage and deterioration. Additionally Level II examination, including localized cleaning,

hammer sounding and probing was conducted at suspect or representative areas along the length of ~10% of the inspected members. Level III inspection at the Marina Park facility including coring / drilling of ~5% of the inspected members to assist with confirmation of the extent of section loss. The Level III test sites were selected using engineering judgement and were conducted at suspect locations, at the discretion of the inspection crew. All Level III inspection holes in the timber members were plugged with tight fitting treated timber dowels to prevent possible intrusion by damaging biological agents. No Level III inspection / testing of the concrete members was conducted.

The results of the investigation are summarized in the following seven sub-sections which match the 2565 A – 2565 G Park designated subsections listed above. Within each subsection are a brief description of the facility, a discussion of the results in the Observed Conditions section, Photographs illustrating typical conditions encountered are presented for each facility, along with a drawing or pile plan providing the location and identification of the inspected members. Specific data on the condition of the inspected piling is also provided in tabular format.

QUALIFICATIONS OF INSPECTORS

The project was conducted by a crew composed of professional and technical personnel capable and experienced in both the underwater and above water inspection and assessment of structural timber members. The personnel utilized on this project included the following Echelon Engineering personnel:

S.D. Sommerfeld, P.E.	Project Manager/Engineer - Diver Licensed Professional Engineer, WA, Guam, Alaska 34 Years Specializing in Marine Structures Inspection & Design
E.B. Vegsund, B.Sc.	Marine Specialist/Biologist - Diver BS in Marine Biology - Emphasis on Marine Biological Studies 44 Years Specializing in Marine Structures Inspection
D. B. Beattie	Inspection Technician - Diver 3 Years' Experience in Marine Structures Inspection
B.R. Rohrig	Inspection Technician - Diver 1 Years' Experience in Marine Structures Inspection

INSPECTION METHODOLOGY AND RATING SYSTEM

As is typical with structures in a fresh water environment, the damage is primarily due to fungal decay or rot. Additionally, other biological agents such as insects and/or bacteria may contribute to the damage. For the purposes of this report, the term **biological degradation** has been used to describe damage to a member that may be a combination of one or more

of these three deteriorative agents. Additionally biological degradation is typically evident as surface erosion. The term **fungal damage** as noted in this report is used to denote internal section loss. On many members both biological degradation and fungal damage has occurred. For these members the combined loss of cross-sectional area (i.e. damage) has been utilized along with engineering judgment to determine the final member rating.

Throughout the discussion the overall condition of the inspected members and component types is described as good, fair or poor in accordance with the following definitions:

- A member in **good condition** has no damage or only minor damage.
- A member in **fair condition** has sustained minor to moderate damage, but has no evidence of overstressing.
- A member in **poor condition** has sustained major to severe damage that affects the member's load bearing capacity. This damage may be evident as advanced deterioration, overstressing or breakage.

Piling

Inspection was carried out to identify areas of damage or deterioration including internal fungal damage, external biological degradation, mechanical impact, abrasion or other significant deterioration. All examined piles were inspected from the top to the mudline. Areas of damage were recorded, including the location and quantification of specific deterioration identified. The pile condition has been expressed as a percentage of the remaining cross-sectional area of the member. A breakdown of the rating classifications is as follows:

100% Remaining Cross-sectional Area / Rating Classification
(No damage or deterioration)

90% Remaining Cross-sectional Area / Rating Classification
(Minor damage or deterioration; 90-99% remaining area)

75% Remaining Cross-sectional Area / Rating Classification
(Moderate damage or deterioration; 75-89% remaining area)

50% Remaining Cross-sectional Area / Rating Classification
(Moderate-Major damage or deterioration; 50-74% remaining area)

25% Remaining Cross-sectional Area / Rating Classification
(Major damage or deterioration; 25-49% remaining area)

0% Remaining Cross-sectional Area / Rating Classification
(Destroyed; 0-24% remaining area)

Timber Bracing

Inspection was carried out to identify areas of damage or deterioration including fungal damage, external biological degradation, mechanical impact, abrasion or other significant deterioration. All examined braces were inspected for their full accessible length. Areas of damage were recorded, including the location and quantification of specific deterioration identified. A breakdown of the brace rating classifications is as follows:

Undamaged (UD)	No significant damage or deterioration (0-5% loss of section)
Functional (F)	Minor damage that does not significantly impact serviceability (6-25% loss of section and no significant damage to connection)
Damaged (D)	Moderate to major damage that significantly impacts serviceability (greater than 25% loss of section and/or damage to connection)

Superstructure Members

The condition of the superstructure members is based on the overall damage noted along the length of the member using Level I visual inspection and as augmented by the various testing techniques. Areas of damage were identified and detailed information obtained, including the location and quantification of the specific deterioration encountered. A breakdown of the rating classifications for caps, stringers and the undersurface of the decking is as follows:

Undamaged	No significant damage or deterioration (0 – 4% loss of cross section)
Light Damage	Minor defects, No significant loss of capacity, No observed overstressing (5 – 24% loss of cross section)
Moderate Damage	Moderate defects, Moderate loss of capacity, No observed overstressing (25 - 49% loss of cross section)
Heavy Damage	Advanced deterioration, Significant loss of capacity, Possible areas of overstressing (50 – 100% loss of cross section)

OBSERVED CONDITIONS

The field investigation was carried out during the period of June 24 to July 3, 2019 . Weather was seasonably warm and water conditions were generally calm. Underwater visibility ranged from 5 to 15 feet. The USACOE Lockmaster at the Ballard Locks reported that the lake elevation at the time of the inspection was 21.6 feet. The inspection findings are as follows:

A. Juanita Beach Park Waterwalk

Description of Structure

The Juanita Beach Park Waterwalk is a fixed pier structure. The structure is a semi-circle pedestrian walkway. Based on the information provided in the previous structure assessment report by others conducted in 2014, the structure is approximately 1,360 LF in length and extends to the south. The piles are identified by a conventional bent and row system, with the accessible bents numbered 1 beginning on the east shore and progressing sequentially to bent 62 on the west shore. The rows are identified alphabetically from the exterior of the structure. A 20 ft. x 50 ft. swim platform is attached to the Waterwalk at Bents 40 – 42.

The piles are treated and have an average pile diameter are approximately 12-14 inches. The pile caps are double 6x10 treated timbers thru-bolted to the piles, as well as along their length. The deck is composed of pre-cast concrete deck panels secured to the pile caps with vertical bolts and hold-down brackets. The deck panels have a total of eight accessible expansion joints spaced along the structure. A double bent system is located at each expansion joint, with a set of diagonal tension rods secured to the pile tops and securing the joint.

Observed Conditions

The inspection of the Juanita Park Waterwalk was limited to a sample investigation of representative members. Given the time constraints dictated by the scope of the investigation the members were subjected primarily to Level I visual inspection with limited Level II cleaning and hammer sounding of suspect areas. Based on the inspection the overall condition of the structure is fair to good. The findings of the inspection are as follows:

Piles

1. The accessible portions of the Waterwalk is supported by a total of 126 treated timber piles. The overall condition of these piles was found to be good.

2. Inspection noted that the pile tops have been notched on two sides to provide a seat for the double cap timbers. Investigation of these notches noted that they appear to have been coated with tar during original construction as a preventative maintenance measure to inhibit fungal decay. The placement of this material appears to have been very effective at limiting and preventing fungal decay in these pile top notches. Refer to Photos No. 3.

3. Inspection also noted that the horizontal tension rods spanning the expansion joints are secured to the pile tops through drilled bolt holes. The steel rods and hardware appear to be in generally good condition with localized minor surface corrosion. The rods appear to be secured with only a nut at each end as no evidence of washers was found.

Additionally, inspection of the piles tops noted that the majority of these drilled holes have been reamed and enlarged. Due to limited access, these areas were difficult to investigate. However, no areas of significant fungal decay was found associated with these holes at this time. Refer to Photos No. 5, 7, 8 and 12.

4. Six piles (4.8%) have been rated in the 100% classification. No evidence of any significant damage or deterioration was found on any of these piles.

5. One Hundred and thirteen piles (89.7%) have been rated in the 90% classification. The damage to these piles is primarily due to minor biological degradation or mechanical damage. Refer to Photo No. 3.

6. Two piles (1.6%) have been rated in the 75% rating category. These piles are short with limited access. Both are located at the western end of the structure and were found to have sustained moderate fungal decay.

7. Four piles (3.2%) have been rated in the 25% rating category. These piles are short with limited access. All four are located at the western end of the structure and were noted to have sustained significant fungal decay.

8. One pile (0.8%) has been rated in the 0% rating category. This pile was found to have a sustained extensive fungal decay at it's top.

Steel Rod Braces

9. Inspection of the steel tension rods throughout the structure found them to be in overall fair to poor condition.

10. Inspection of the submerged portions of the piles noted diagonal tension rods extending from the mudline of the Row A piles up to where they are embedded in the grout plug securing the deck panels between the two 6x10 caps. These rods are located on the Row A piles between Bents 23 and 48 of the structure.

    Inspection found the rods to be secured to the piles at the mudline with a steel clamp. Investigation of the members found the clamps and rods to have sustained moderate to heavy corrosion with visible loss of base metal. Refer to Photos No. 9 – 11.

11. Inspection of the diagonal expansion joint tension rods noted in the superstructure elevation noted one location where the rod has been spliced. Refer to Photo No. 7. Additionally, the rods were found to have reamed out the holes drilled in the pile tops which are used to secure the rods. Refer to Photo No. 8. No other anomalies were identified.

Superstructure

12. The overall condition of the pile caps was found to be fair. These members are treated timbers and were found to be primarily free of gross damage. However, several cap

timbers were noted to have sustained significant damage. Refer to Photo Nos. 2, 4 and 6 They are as follows:

- Bent 23, West Cap – 50% Fungal/Mechanical @ Row A
- Bent 48, East & West Cap – 25-50% Fungal @ Row A
- Bent 49, North & South Cap –50-75% Fungal @ Row A
- Bent 50, North & South Cap –25-50% Fungal @ Row A End in 6”
- Bent 51, North & South Cap –25-50% Fungal @ Row B End in 6”
- Bent 52, North & South Cap –25-50% Fungal @ Row B End in 6”
- Bent 53, North & South Cap –25-50% Fungal @ Row B
- Bent 54, North & South Cap –25-50% Fungal @ Row B
- Bent 55, North & South Cap –25-50% Fungal @ Row B
- Bent 56, North & South Cap –25-50% Fungal @ Row B End in 1’
- Bent 57, North & South Cap –25-50% Fungal @ Row B End in 6”
- Bent 58, North & South Cap –25-50% Fungal @ Row B End in 1’
- Bent 59, North & South Cap –25% Fungal @ Row B End in 6”
- Bent 60, North & South Cap –15% Fungal @ Row B End in 6”

No other evidence of significant mechanical damage, fungal decay or other significant deterioration was identified. However, localized areas of weathering and minor fungal decay of the member surfaces and cut ends, was visible.

13. Investigation of the under-surface of the concrete deck found it to be in overall fair to good condition. No evidence of any significant cracking, impact damage or other damage was noted. At least one location of corner spalling was noted, however all of the concrete was noted to be sound with good rebound when struck with a hammer. Refer to Photos No. 1, 2 and 4

    However, inspection also noted that the steel hold-down hardware designed to secure the concrete panels to the timber caps was in overall poor condition. Although the galvanized steel hardware was in generally good condition with minor surface corrosion, many of the components are loose or are missing. Refer to Photo No. 5.

<u>Miscellaneous</u>

14. Inspection also noted that the structure apparently was designed with a wavebreak. Remnants of the wavebreak system(s) are evident along the western portion of the structure from Bent 23 to western shore and consist of large dimension timber baffles attached to the under-surface of the concrete deck (refer to Photo No. 16), as well as a system of submerged vertical lagging timbers, (refer to Photos No. 13 -15) and an above water system that appears to be a combined debris screen and wavebreak (refer to Photo No. 2). The condition of the wavebreak system(s) is poor with multiple loose and missing components. The system is assumed to be derelict and was not inspected.

PHOTO No. 1: Juanita Beach Park, Looking West - The structure is built on treated piles with double cap timbers at each bent. Inspection noted that the piles have been notched on both sides to provide a ledger for the cap timbers. The structure has a concrete deck system, as well as an old deteriorated timber wave baffle system and diagonal steel tension rods located in areas underwater and in the plane of the deck.

PHOTO No. 2: Bent 48-49, Row A, Looking Northeast - Note the vegetation growth located at the Bent 48, west cap. Inspection of these members found the pile top to have sustained an estimated 90% fungal decay and both cap timbers to have an estimated 50% loss of section also due to fungal decay. Inspection of the Bent 49 cap timbers also found significant damage. Note the screwdrivers inserted in the western cap (refer to arrow) which was found to have an estimated 75% fungal cavity.

PHOTO No. 3: Bent 9, Row A, Pile / Cap Connection - Note the construction notches on both sides of the pile to provide a seat for the cap timbers. Also note the apparent field treatment of the pile at the notched areas (Refer to arrow). Inspection found that typically the piles have sustained weathering and/or minor biological degradation from the top down to low water.

PHOTO No. 4: Bent 23, Row A - Note the 50% fungal / mechanical damage to the west cap which was found to extend from the end to the attachment bolts. Also note the overall good condition of the concrete deck panel above.

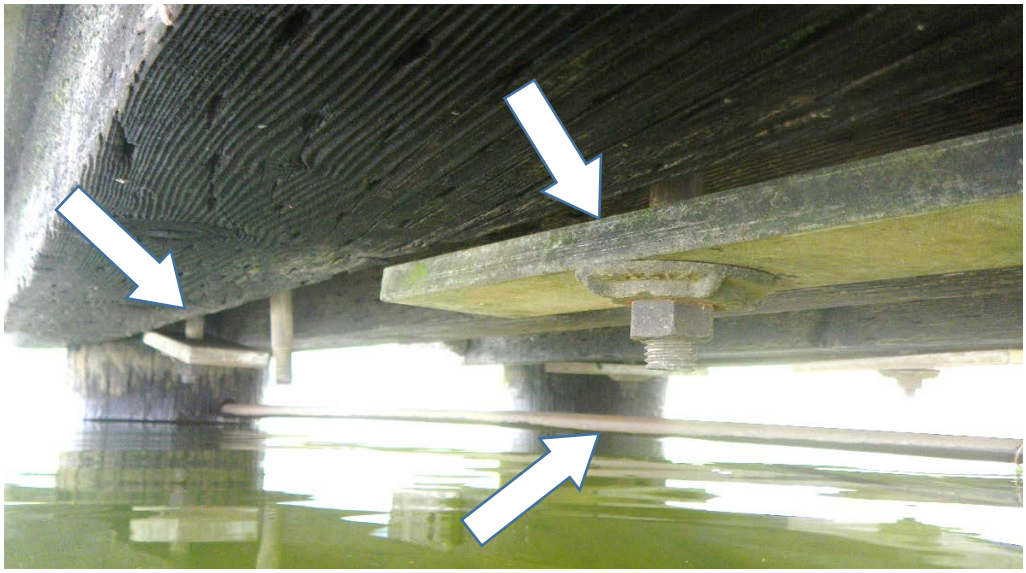


PHOTO No. 5: Bent 8 and 9, Pile Caps - Note the upper arrows indicating loose and misaligned brackets designed to secure the concrete deck panels to the timber caps. Inspection noted that throughout the structure, these brackets were found to be loose with missing components. Also note that the lower arrow indicating a set of horizontal tension rods securing the expansion joint at Bent 8-9. Investigation of these members found the general condition of the galvanized hardware is good with minimal surface corrosion.

PHOTO No. 6: Bent 58, Row B, Cap Timbers - Note the fungal decay evident in the ends of these two cap timbers. Further inspection estimated the damage to be between 25-50%, with visible vegetation growth.

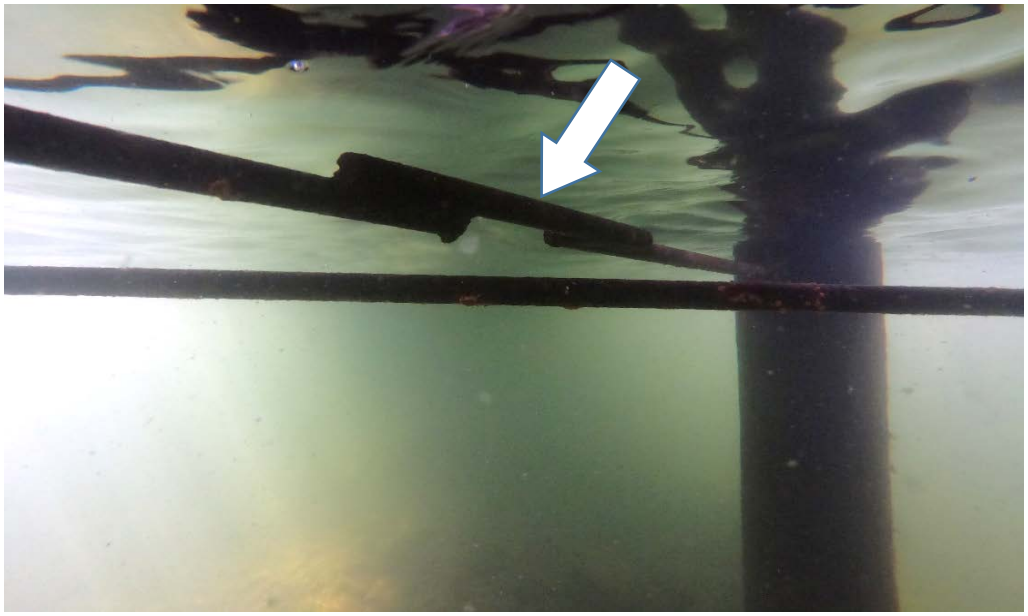


PHOTO No. 7: Bent 35 and 36, Expansion Joint Tension Rods - Inspection noted that one of the tension rods at this expansion joint has been spliced. No evidence of any damage associated with this condition was noted.

PHOTO No. 8: Bent 8, Row A Pile - Note the expansion joint tension rod connection has been reamed out due to movement over the life of the structure. This condition was found to be typical at the majority of the connections for the expansion joints. Also note that there is no washer and the pile has sustained a minor amount of weathering / biological degradation.

PHOTO No. 9: Bent 24, Row A Pile - Note the large dimension horizontal timbers at the mudline which appear to span between the piles. Also note the steel bracket at the base of the pile and the diagonal tension rod which extends up and is embedded in the poured in place concrete between the two cap timbers.

PHOTO No. 10: Bent 24, Row A-B Tension Rod - Note the overall fair condition of the steel tension rod at this location of Level II cleaning. overall, these rods were found to have sustained moderate to heavy surface corrosion with minimal visible section loss.

PHOTO No. 11: Bent 24, Row A Pile - Note the heavy corrosion on this attachment bracket securing a diagonal tension rod (refer to Photos No. 9 and 10). Also note the rough surface of the steel in the area of Level II cleaning.

PHOTO No. 12: Bent 35, Row A Pile - Note the reamed out connection for the expansion joint tension rod (upper arrow) and the minor mechanical damage extending vertically down the pile (lower arrows)

PHOTO No. 13: Bent 40 - 42, Row B, Looking West - Note the step-down in the concrete deck at the intersection of the water-walk and the swim platform along Row B. Also note the vertical boards, assumed to be a wave screen, which are secured to the underside of the deck. Investigation noted that a number of the boards appear to have gone missing or to have been removed.

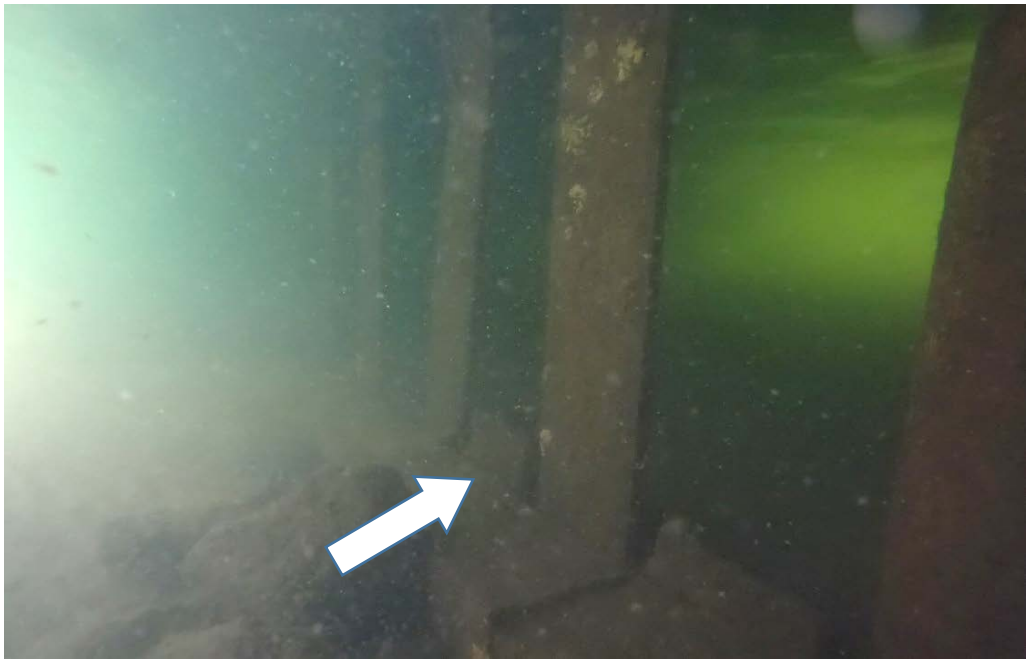


PHOTO No. 14: Bent 40 - 42, Row B, Looking West - Note the arrow indicating a missing or removed board. Inspection noted these 2x12's to be intermittent and to extend from the deck, down to the mudline.

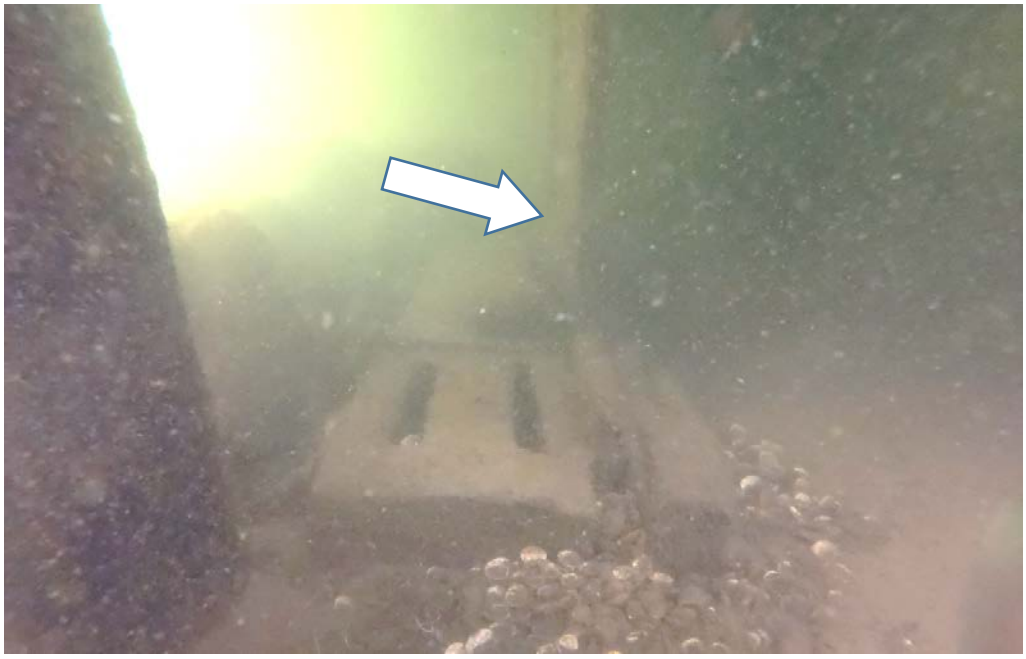
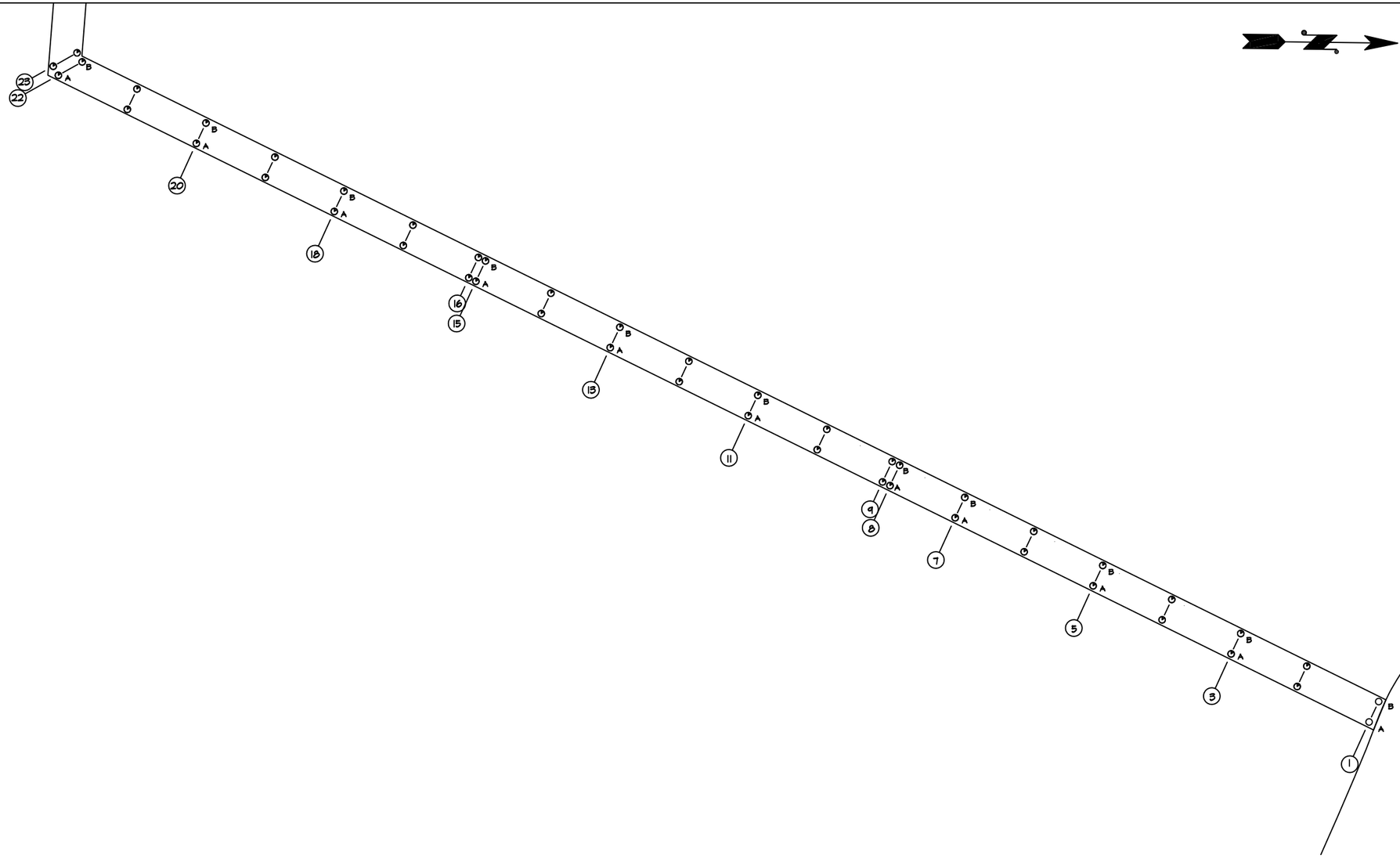


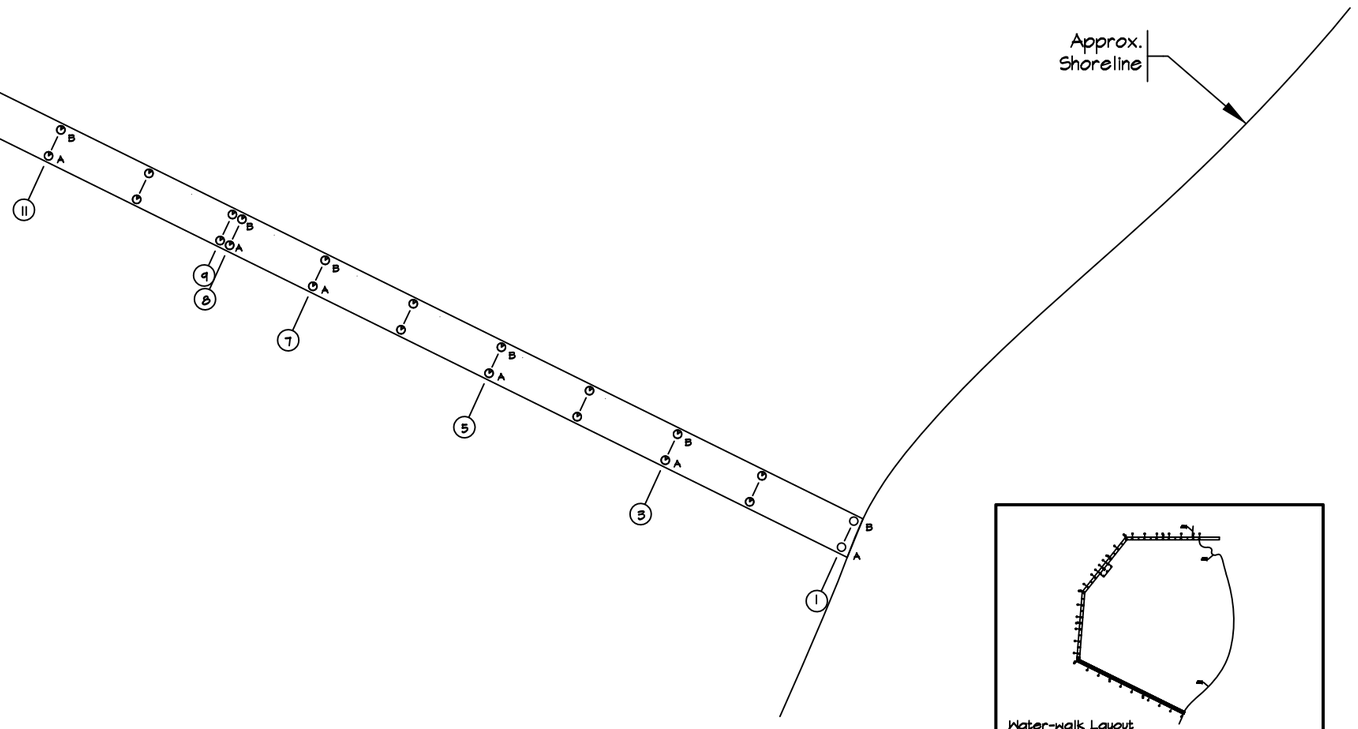
PHOTO No. 15: Bent 40 - 42, Bottom Wave Screen Connection - Note the arrow indicating a vertical 2x12 board. Also note the timber framing members embedded in the lake bottom that appear to secure the bottom ends of these boards.

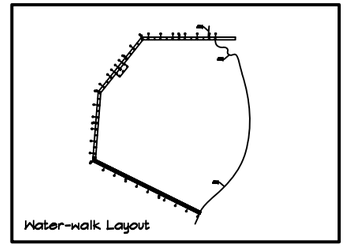
PHOTO No. 16: Bent 23, Row A, Looking West - Note the large baffle timbers attached to the underside of the concrete deck with galvanized angle brackets and hardware. Inspection found the timbers and the associated hardware to be in generally good condition. However, a number of the timbers appear to have gone missing. Inspection noted that these wave baffle board are located between Bent 22 through 48.

Matchline Sheet 2

Matchline Sheet 2







PLAN

Bents 1 - 23

LEGEND

- Bent Number
- Pile/Row ID
- Timber Pile
- 100% Remaining Cross Sectional Area
- 90% Remaining Cross Sectional Area
- 75% Remaining Cross Sectional Area
- 50% Remaining Cross Sectional Area
- 25% Remaining Cross Sectional Area
- 0% Remaining Cross Sectional Area

SCALE: Not To Scale

Reid Middleton, Inc.

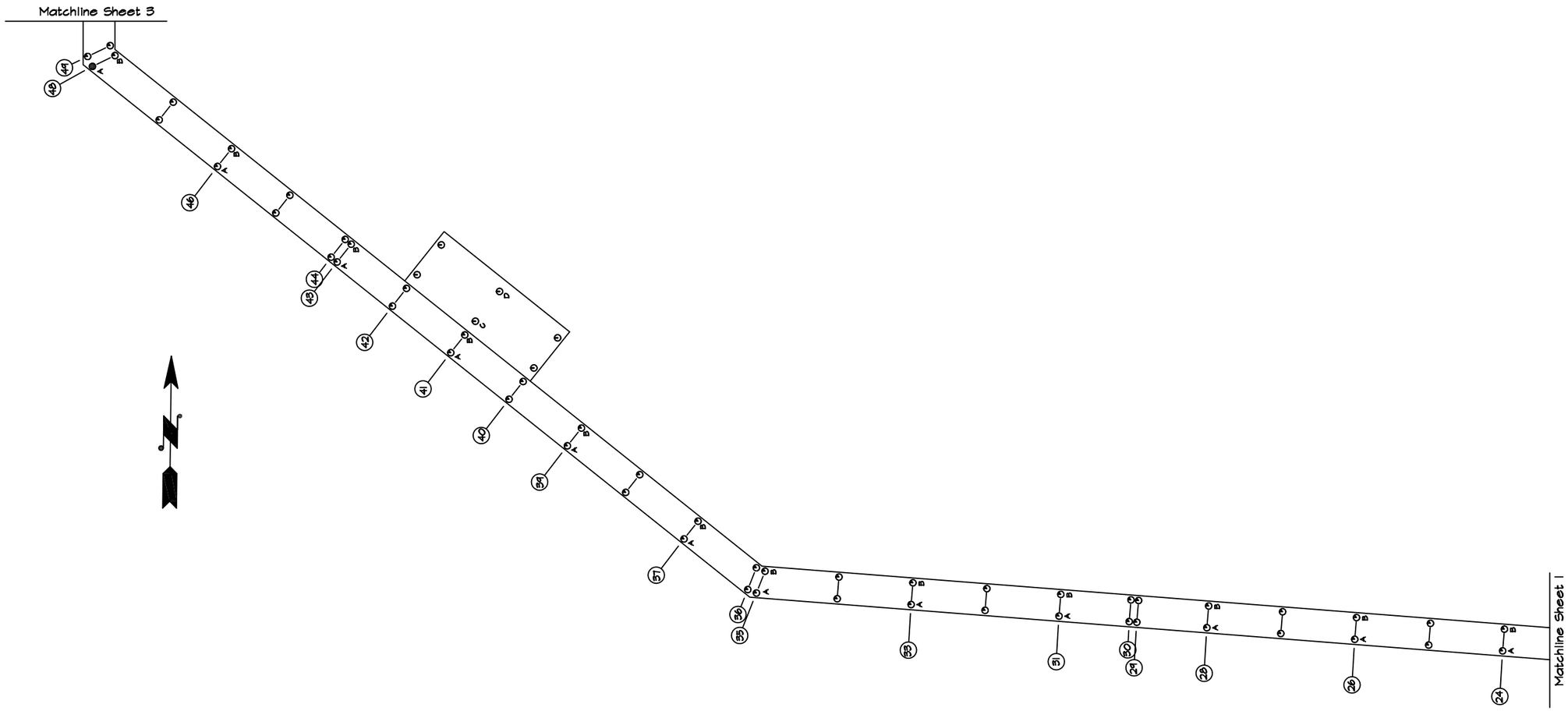
PILE PLAN; Bents 1-23

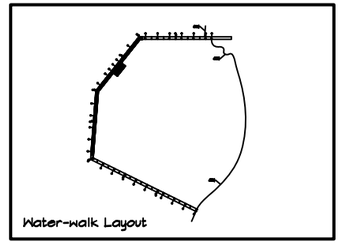
City of Kirkland Parks
Juanita Beach Water-Walk

DATE	REVISION

DATE: July 2019
PROJECT: 19-2565A
SHEET: 1 of 3
DRAWN: SDS / JDS

ECHELON ENGINEERING, INC.
Civil/Marine Consulting Engineers
Lynnwood, Washington
Tel: (425) 672-8424





LEGEND

- Bent Number
- Pile/Row ID
- Timber Pile
- 100% Remaining Cross Sectional Area
- 90% Remaining Cross Sectional Area
- 75% Remaining Cross Sectional Area
- 50% Remaining Cross Sectional Area
- 25% Remaining Cross Sectional Area
- 0% Remaining Cross Sectional Area

PLAN

Bents 24 - 49

SCALE: Not To Scale

Reid Middleton, Inc.

PILE PLAN; Bents 24-49

City of Kirkland Parks
Juanita Beach Water-Walk

DATE	REVISION

DATE: July 2019
PROJECT: 19-2565A
SHEET: 2 of 3
DRAWN: SDS / JDS

ECHELON ENGINEERING, INC.
Civil/Marine Consulting Engineers
Lynnwood, Washington
Tel: (425) 672-8424

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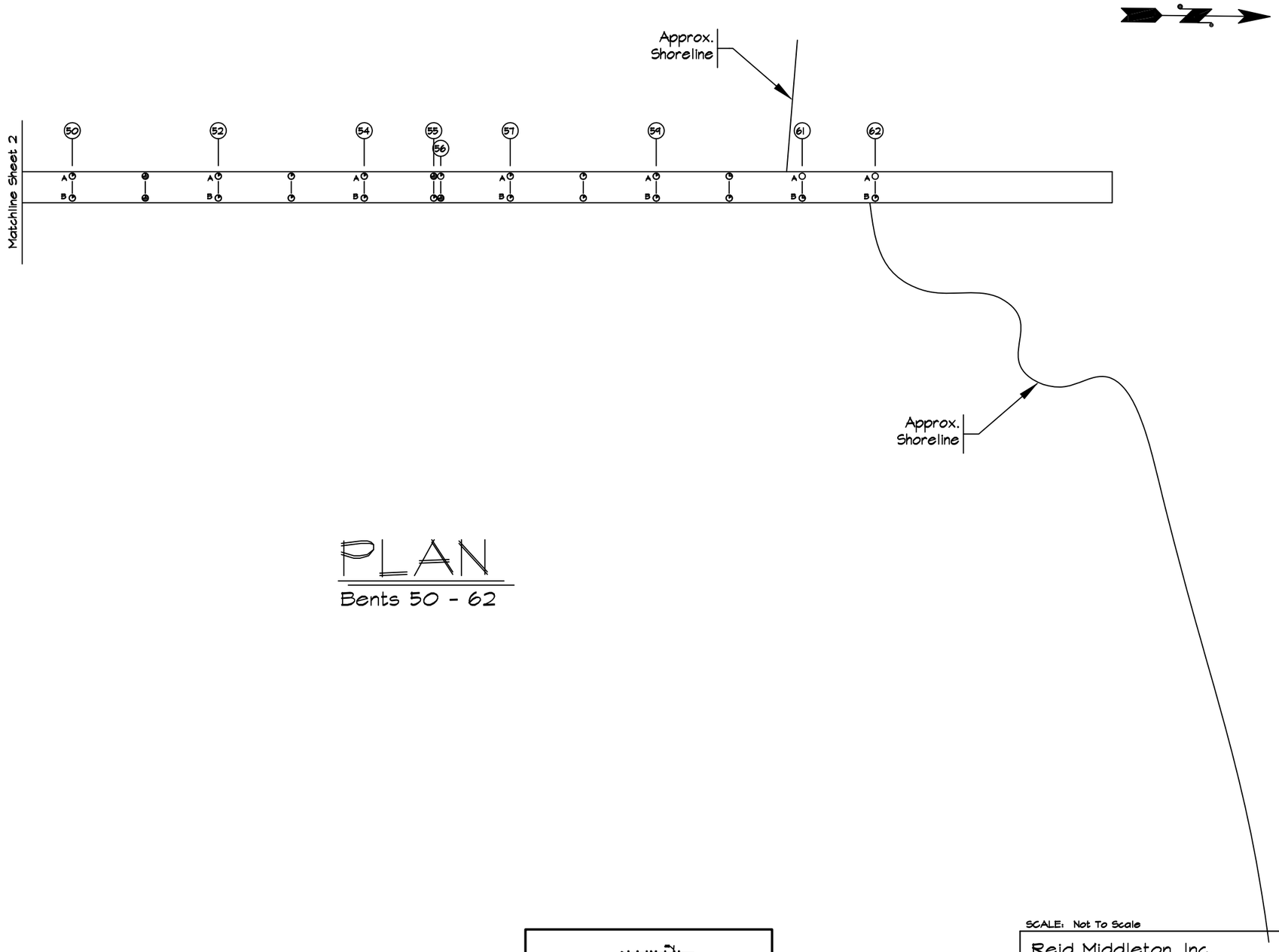
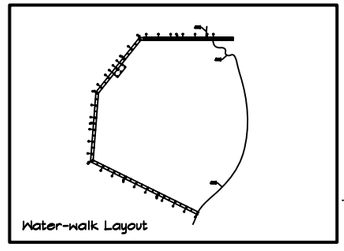


PLAN

Bents 50 - 62

LEGEND

- Bent Number
- Pile/Row ID
- Timber Pile
- 100% Remaining Cross Sectional Area
- 90% Remaining Cross Sectional Area
- 75% Remaining Cross Sectional Area
- 50% Remaining Cross Sectional Area
- 25% Remaining Cross Sectional Area
- 0% Remaining Cross Sectional Area



SCALE: Not To Scale

Reid Middleton, Inc.

PILE PLAN; Bents 50-62

City of Kirkland Parks
Juanita Beach Water-Walk

DATE	REVISION

DATE: July 2019
PROJECT: 19-2565A
SHEET: 3 of 3
DRAWN: SDS / JDS

ECHELON ENGINEERING, INC.
Civil/Marine Consulting Engineers
Lynnwood, Washington
Tel: (425) 672-8424

TABLE A-1 Juanita Park Waterwalk
PILE INSPECTION DATA

PILE LOCATION		MEMBER RATING	CONDITION / DAMAGE	
			Elevation (Chart Datum)	Details / Remarks
Bent	Row			
1	A	---		Buried
	B	---		Buried
2	A	90		
	B	90		
3	A	90	Top / -1.5'	1% Biological Degradation
	B	90	Top / -1.5'	1% Biological Degradation
4	A	90	Top / -1.5'	1% Biological Degradation
	B	90	Top / -1.5'	1% Biological Degradation
5	A	90	Top / -1.5'	1% Biological Degradation
	B	90	Top / -1.5'	1% Biological Degradation
6	A	90	Top / -1.5'	2% Biological Degradation
	B	90	Top / -1.5'	1% Biological Degradation
7	A	90	Top	5% Fungal
			Top / -1.5'	1% Biological Degradation
	B	90	Top / -1.5'	2% Biological Degradation
8	A	90	Top	Steel Expansion Joint Tension Rod w/ Light Corrosion; Holes Reamed Out
			Top / -1.5'	1% Biological Degradation
	B	90	Top	Steel Expansion Joint Tension Rod w/ Light Corrosion; Holes Reamed Out
			Top / -1.5'	1% Biological Degradation
9	A	90	Top	Steel Expansion Joint Tension Rod w/ Light Corrosion; Holes Reamed Out
			Top / -1.5'	1% Biological Degradation
	B	90	Top	Steel Expansion Joint Tension Rod w/ Light Corrosion; Holes Reamed Out
			Top / -1.5'	1% Biological Degradation
10	A	90	Top / -1.5'	1% Biological Degradation
	B	90	Top / -1.5'	1% Biological Degradation
11	A	90	Top / -1.5'	1% Biological Degradation
	B	90	Top / -1.5'	1% Biological Degradation
12	A	90	Top / -1.5'	1% Biological Degradation
	B	90	Top / -1.5'	1% Biological Degradation

TABLE A-1 Juanita Park Waterwalk
PILE INSPECTION DATA

PILE LOCATION		MEMBER RATING	CONDITION / DAMAGE	
			Elevation (Chart Datum)	Details / Remarks
Bent	Row			
13	A	90	Top / -1.5'	1% Biological Degradation
	B	90	Top / -1.5'	1% Biological Degradation
14	A	90	Top / -1.5'	2% Biological Degradation
	B	90	Top / -1.5'	2% Biological Degradation
	A	90	Top	Steel Expansion Joint Tension Rod w/ Light Corrosion; Holes Reamed Out
			Top / -1.5'	2% Biological Degradation
	B	90	Top	Steel Expansion Joint Tension Rod w/ Light Corrosion; Holes Reamed Out
			Top / -1.5'	1% Biological Degradation
16	A	90	Top	Steel Expansion Joint Tension Rod w/ Light Corrosion; Holes Reamed Out
			Top / -1.5'	1% Biological Degradation
	B	90	Top	Steel Expansion Joint Tension Rod w/ Light Corrosion; Holes Reamed Out
			Top / -1.5'	1% Biological Degradation
17	A	90	Top / -1.5'	2% Biological Degradation
	B	90	Top / -1.5'	2% Biological Degradation
18	A	90	Top / -1.5'	2% Biological Degradation
	B	90	Top / -1.5'	1% Biological Degradation
19	A	90	Top	10% Fungal
			Top / -1.5'	1% Biological Degradation
	B	90	Top / -1.5'	1% Biological Degradation
20	A	90	Top / -1.5'	1% Biological Degradation
	B	90	Top / -1.5'	1% Biological Degradation
21	A	90	Top / -1.5'	1% Biological Degradation
	B	90	Top / -1.5'	1% Biological Degradation
22	A	90	Top / -1.5'	1% Biological Degradation
	B	90	Top / -1.5'	1% Biological Degradation
23	A	90	Top	10% Fungal
			Top / -1.5'	1% Biological Degradation
	B	90	Top / -1.5'	1% Biological Degradation

TABLE A-1 Juanita Park Waterwalk
PILE INSPECTION DATA

PILE LOCATION		MEMBER RATING	CONDITION / DAMAGE	
Bent	Row		Elevation (Chart Datum)	Details / Remarks
24	A	90	Top / -1.5'	1% Biological Degradation
	B	90	Top / -1.5'	1% Biological Degradation
25	A	90	Top / -1.5'	1% Biological Degradation
			MDL	Steel Bracket & Tension Bar System w/ Heavy Corrosion
	B	90	Top / -1.5'	1% Biological Degradation
26	A	90	Top / -1.5'	1% Biological Degradation
			MDL	Steel Bracket & Tension Bar System w/ Heavy Corrosion
	B	90	Top / -1.5'	1% Biological Degradation
27	A	90	Top / -1.5'	1% Biological Degradation
			MDL	Steel Bracket & Tension Bar System w/ Heavy Corrosion
	B	90	Top / -1.5'	1% Biological Degradation
28	A	90	Top / -1.5'	1% Biological Degradation
			MDL	Steel Bracket & Tension Bar System w/ Heavy Corrosion
	B	90	Top	5% Fungal
			Top / -1.5'	1% Biological Degradation
29	A	90	Top	Steel Expansion Joint Tension Rod w/ Light Corrosion; Holes Reamed Out
			Top / -1.5'	1% Biological Degradation
	B	90	Top	Steel Expansion Joint Tension Rod w/ Light Corrosion; Holes Reamed Out
			Top / -1.5'	1% Biological Degradation
30	A	90	Top	10% Fungal; Steel Expansion Joint Tension Rod w/ Light Corrosion; Holes Reamed Out
			Top / -1.5'	1% Biological Degradation
	B	90	Top	Steel Expansion Joint Tension Rod w/ Light Corrosion; Holes Reamed Out
			Top / -1.5'	1% Biological Degradation

TABLE A-1 Juanita Park Waterwalk
PILE INSPECTION DATA

PILE LOCATION		MEMBER RATING	CONDITION / DAMAGE	
Bent	Row		Elevation (Chart Datum)	Details / Remarks
31	A	90	Top	5% Fungal
			Top / -1.5'	1% Biological Degradation
			MDL	Steel Bracket & Tension Bar System w/ Heavy Corrosion
	B	90	Top / -1.5'	1% Biological Degradation
32	A	90	Top	5% Fungal
			Top / -1.5'	1% Biological Degradation
			MDL	Steel Bracket & Tension Bar System w/ Heavy Corrosion
	B	90	Top / -1.5'	1% Biological Degradation
33	A	90	Top / -1.5'	1% Biological Degradation
			MDL	Steel Bracket & Tension Bar System w/ Heavy Corrosion
	B	90	Top / -1.5'	1% Biological Degradation
34	A	90	Top	<1% Mechanical
			Top / -1.5'	1% Biological Degradation
			MDL	Steel Bracket & Tension Bar System w/ Heavy Corrosion
	B	90	Top / -1.5'	1% Biological Degradation
35	A	90	Top	Steel Expansion Joint Tension Rod w/ Light Corrosion; Holes Reamed Out
			Top / -1.5'	1% Biological Degradation; 2% Mechanical
	B	90	Top	Steel Expansion Joint Tension Rod w/ Light Corrosion; Holes Reamed Out; Rod Spliced
			Top / -1.5'	1% Biological Degradation
36	A	90	Top	Steel Expansion Joint Tension Rod w/ Light Corrosion; Holes Reamed Out; Rod Spliced
			Top / -1.5'	1% Biological Degradation
	B	90	Top	Steel Expansion Joint Tension Rod w/ Light Corrosion; Holes Reamed Out
			Top / -1.5'	1% Biological Degradation

TABLE A-1 Juanita Park Waterwalk
PILE INSPECTION DATA

PILE LOCATION		MEMBER RATING	CONDITION / DAMAGE	
Bent	Row		Elevation (Chart Datum)	Details / Remarks
37	A	90	Top / -1.5'	1% Biological Degradation
			MDL	Steel Bracket & Tension Bar System w/
				Heavy Corrosion
	B	90	Top / -1.5'	1% Biological Degradation
38	A	90	Top / -1.5'	1% Biological Degradation
			MDL	Steel Bracket & Tension Bar System w/
				Heavy Corrosion
	B	90	Top / -1.5'	1% Biological Degradation
39	A	90	Top / -1.5'	1% Biological Degradation
			MDL	Steel Bracket & Tension Bar System w/
				Heavy Corrosion
	B	90	Top / -1.5'	1% Biological Degradation
40	A	90	Top / -1.5'	1% Biological Degradation
			MDL	Steel Bracket & Tension Bar System w/
				Heavy Corrosion
	B	90	Top / -1.5'	1% Biological Degradation
	C	100		
	D	100		
41	A	90	Top / -1.5'	1% Biological Degradation
			MDL	Steel Bracket & Tension Bar System w/
				Heavy Corrosion
	B	90	Top / -1.5'	1% Biological Degradation
	C	100		
	D	100		
42	A	90	Top / -1.5'	1% Biological Degradation
			MDL	Steel Bracket & Tension Bar System w/
				Heavy Corrosion
	B	90	Top / -1.5'	1% Biological Degradation
	C	100		
	D	100		

TABLE A-1 Juanita Park Waterwalk
PILE INSPECTION DATA

PILE LOCATION		MEMBER RATING	CONDITION / DAMAGE	
Bent	Row		Elevation (Chart Datum)	Details / Remarks
43	A	90	Top	Steel Expansion Joint Tension Rod w/ Light Corrosion; Holes Reamed Out
			Top / -1.5'	1% Biological Degradation
	B	90	Top	Steel Expansion Joint Tension Rod w/ Light Corrosion; Holes Reamed Out
			Top / -1.5'	2% Biological Degradation
44	A	90	Top	Steel Expansion Joint Tension Rod w/ Light Corrosion; Holes Reamed Out
			Top / -1.5'	1% Biological Degradation
	B	90	Top	Steel Expansion Joint Tension Rod w/ Light Corrosion; Holes Reamed Out
			Top / -1.5'	<1% Biological Degradation
45	A	90	Top / -1.5'	<1% Biological Degradation
	B	90	Top / -1.5'	<1% Biological Degradation
			MDL	Steel Bracket & Tension Bar System w/ Heavy Corrosion; Bracket Buried
46	A	90	Top / -1.5'	1% Biological Degradation
	B	90	Top / -1.5'	<1% Biological Degradation
			MDL	Steel Bracket & Tension Bar System w/ Heavy Corrosion; Bracket Buried
47	A	90	Top / -1.5'	1% Biological Degradation
	B	90	Top / -1.5'	1% Biological Degradation
			MDL	Steel Bracket & Tension Bar System w/ Heavy Corrosion; Bracket Buried
48	A	0	Top Dn 0.5'	90% Fungal
			Top / -1.5'	1% Biological Degradation
	B	90	Top / -1.5'	<1% Biological Degradation
			MDL	Steel Bracket & Tension Bar System w/ Heavy Corrosion; Bracket Buried
49	A	90	Top / -1.5'	<1% Biological Degradation
	B	90	MDL	Steel Bracket & Tension Bar System w/ Heavy Corrosion & Loose; Bracket Buried

TABLE A-1 Juanita Park Waterwalk
PILE INSPECTION DATA

PILE LOCATION		MEMBER RATING	CONDITION / DAMAGE	
Bent	Row		Elevation (Chart Datum)	Details / Remarks
50	A	90	Top / -1.5'	1% Biological Degradation
	B	90	Top / -1.5'	<1% Biological Degradation
51	A	25	Top	75% Fungal
			Top / -1.5'	<1% Biological Degradation
	B	25	Top	75% Fungal
			Top / -1.5'	1% Biological Degradation
52	A	90	Top / -1.5'	1% Biological Degradation
	B	90	Top / -1.5'	1% Biological Degradation
53	A	90	Top / -1.5'	1% Biological Degradation
	B	90	Top	5% Fungal
			Top / -1.5'	1% Biological Degradation
54	A	90	Top / -1.5'	1% Biological Degradation
	B	90	Top	5% Fungal
			Top / -1.5'	1% Biological Degradation
55	A	25	Top Dn 0.5'	75% Fungal
	B	90	Top / -1.5'	1% Biological Degradation
56	A	90	Top	2% Fungal
			Top / -1.5'	<1% Biological Degradation
	B	25	Top	75% Fungal
			Top / -1.5'	1% Biological Degradation
57	A	90	Top / -1.5'	1% Biological Degradation
	B	90	Top / -1.5'	<1% Biological Degradation
58	A	90		
	B	90	Top / -1.5'	1% Biological Degradation
59	A	90		Limited Access-Vegetation
	B	90	Top	2% Fungal
			Top / -1.5'	<1% Biological Degradation
60	A	75		Limited Access-Vegetation
	B	90	Top / -1.5'	<1% Biological Degradation
61	A	---		Buried
	B	75	Top	25% Fungal
			Top / -1.5'	1% Biological Degradation
62	A	---		Buried
	B	90		Notched for cap, one side-UD

B. Waverly Park Pier

Description of Structure

The Waverly Park Pier is a fixed pier structure. The main portion of the structure extends perpendicular from the shore and has an intermediate auxiliary access which provides an outer barrier for the Park's swim area, as well as an additional access to the pierhead. Based on the information provided in the previous structure assessment report by others conducted in 2014, the pier extends perpendicular from the shore, to the west for approximately 215 LF. The piles are identified by a conventional bent and row system, with the bents supporting the main approach and the pierhead are numbered 1 through 20 from the east (shore) and the rows identified alphabetically from the north. Bents within the auxiliary approach are numbered sequentially, 21 through 37 from the north and rows are identified alphabetically from the west. The piles appear to be treated with diameters ranging from approximately 8 inches to 14 inches. The pile caps are a combination of 10x8 and 10x12 treated members and the stringers are a combination of 4x12 treated and untreated timbers. The deck within the main approach and the pierhead is a composite plastic grate system. The decking within the auxiliary approach is constructed using 3x8 treated timbers.

Observed Conditions

The inspection of the Waverly Park Pier was limited to a sample investigation of representative members. Given the time constraints dictated by the scope of the investigation the members were subjected primarily to Level I visual inspection with limited Level II cleaning and hammer sounding of suspect areas. Based on the inspection the overall condition of the structure is fair. The findings of the inspection are as follows:

Piles

1. The pier is supported by a total of 95 timber piles. The overall condition of these piles was found to be good.
2. Sixty-two piles (65.3%) have been rated in the 100% classification. No evidence of any significant damage or deterioration was found on any of these piles.
3. Thirty piles (31.6%) have been rated in the 90% classification due to minor biological degradation or mechanical damage.
4. One pile (1.1%) has been rated in the 50% rating category. This pile was found to have a partial bearing condition at the pile top / cap connection. Shimming of this pile would restore it to near full capacity.
5. One pile (1.1%) has been rated in the 25% rating category. This pile was found to have a partial bearing condition at the pile top / cap connection. Shimming of this pile would restore it to near full capacity.

6. One pile (1.1%) has been rated in the 0% rating category. This pile was found to be non-bearing at the pile top / cap connection. Shimming of this pile would restore it to full capacity.

Diagonal Braces

7. Two sets of longitudinal bracing were found within the main approach, spanning Bents 4 to 5 and Bents 12 to 13. Two sets of longitudinal bracing were also found within the auxiliary approach, spanning Bents 21 to 22 and Bents 30 to 31. Additionally, both longitudinal and transverse bracing was found in the pierhead. Refer to the pile plan for the location of these diagonal braces.

8. The overall condition of the diagonal members was found to be good. These braces are treated timbers and were found to be undamaged with minor biological degradation of the outer surface. Investigation of the attachment hardware that secures them to the piles found the thru-bolts to be in generally fair condition with moderate surface corrosion. Refer to Photo Nos. 9 and 10.

Superstructure

9. The overall condition of the pile caps was found to be fair to good. These members are treated timbers and were found to be free of gross damage. However, localized areas of weathering and minor fungal decay of the member surfaces and cut ends, was visible. Refer to Photos No. 2, 5 and 6.

10. The overall condition of the stringers was found to be fair to good. These members are primarily treated timbers and were found to be free of gross damage. Refer to Photo Nos. 4, 5 and 6.

11. The original deck on the main approach and pierhead has been replaced by a composite or plastic grating. The under-surface of the grate was observed to be in good condition with no evidence of deterioration or damage found. Additionally, no significant damage was noted to the multiple treated framing timbers or attachment hardware used to secure the grate and match the original deck height. Refer to Photo No. 4.

    The decking on the auxiliary approach was found to be treated timber planks. The overall condition of the under-surface of the timber decking was found to be fair with weathering and minor fungal decay of the members bottom surface.

Miscellaneous

12. Inspection noted one location between Bent 6 and 7, where a utility hanger has failed. At this location the utility are unsupported and hanging in the water. Refer to Photo No. 5.

PHOTO No. 1: Waverly Park Pier, Looking Northeast - The pier is constructed on timber piling with timber caps, stringers and decking.

PHOTO No. 2: Shore Abutment - Note the overall good condition of the treated 6x6 cap, stringers, as well as the concrete abutment which has sustained minor loss of surface paste. Also note the rock and gravel that comprise the mudline near the shore.

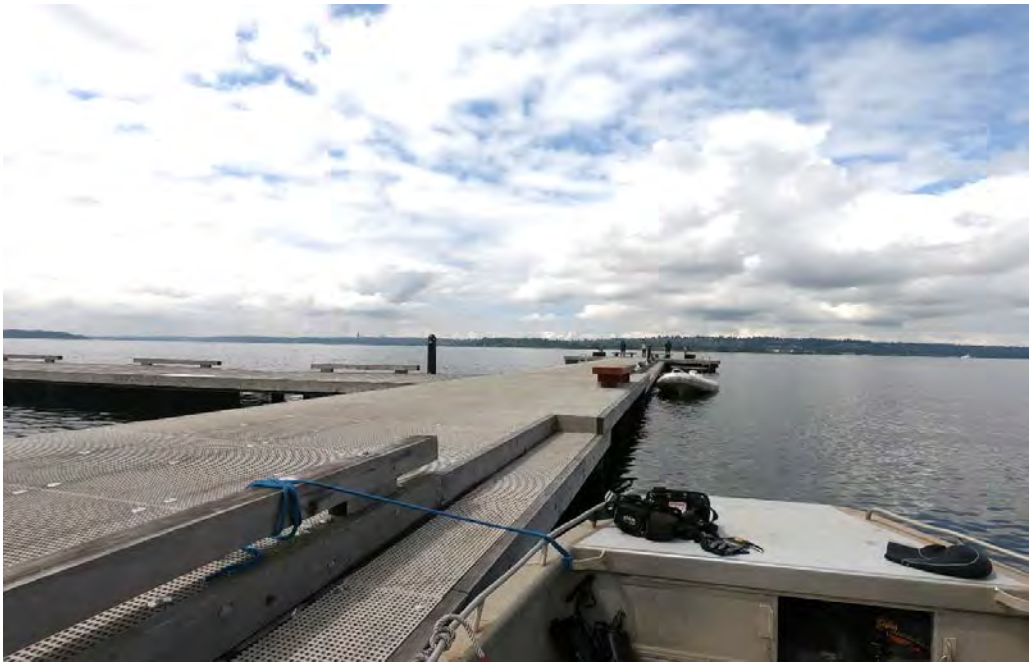


PHOTO No. 3: Main Approach, Looking West - Note the overall good condition of the composite / plastic deck used in the majority of the structure. Also note the secondary access which is decked with timber planks and extends to the south before curving to the east (shore).

PHOTO No. 4: Main Approach, Looking West - Note the use of untreated stringers to support the lower elevation deck which runs along the perimeter of the structure. Also note the overall good condition of the utilities secured to the superstructure.

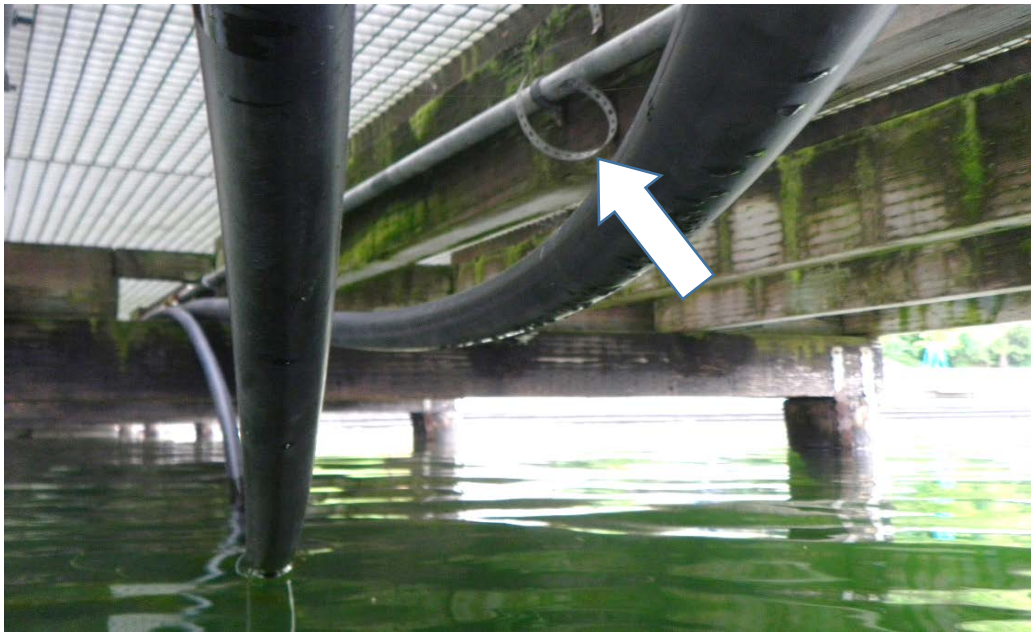


PHOTO No. 5: Bent 6-7, Unsupported Utilities - Note the arrow indicating a failed utility hanger. Also note the overall good condition of the treated stringers and pile caps which have visible algae growth and water staining, but no significant defects.

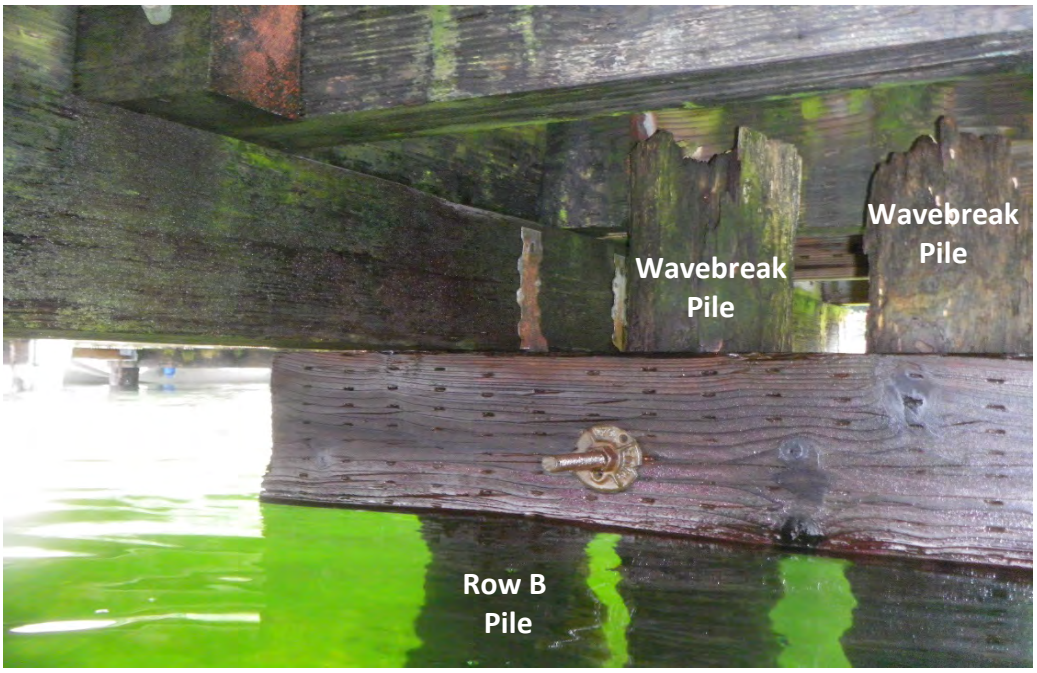


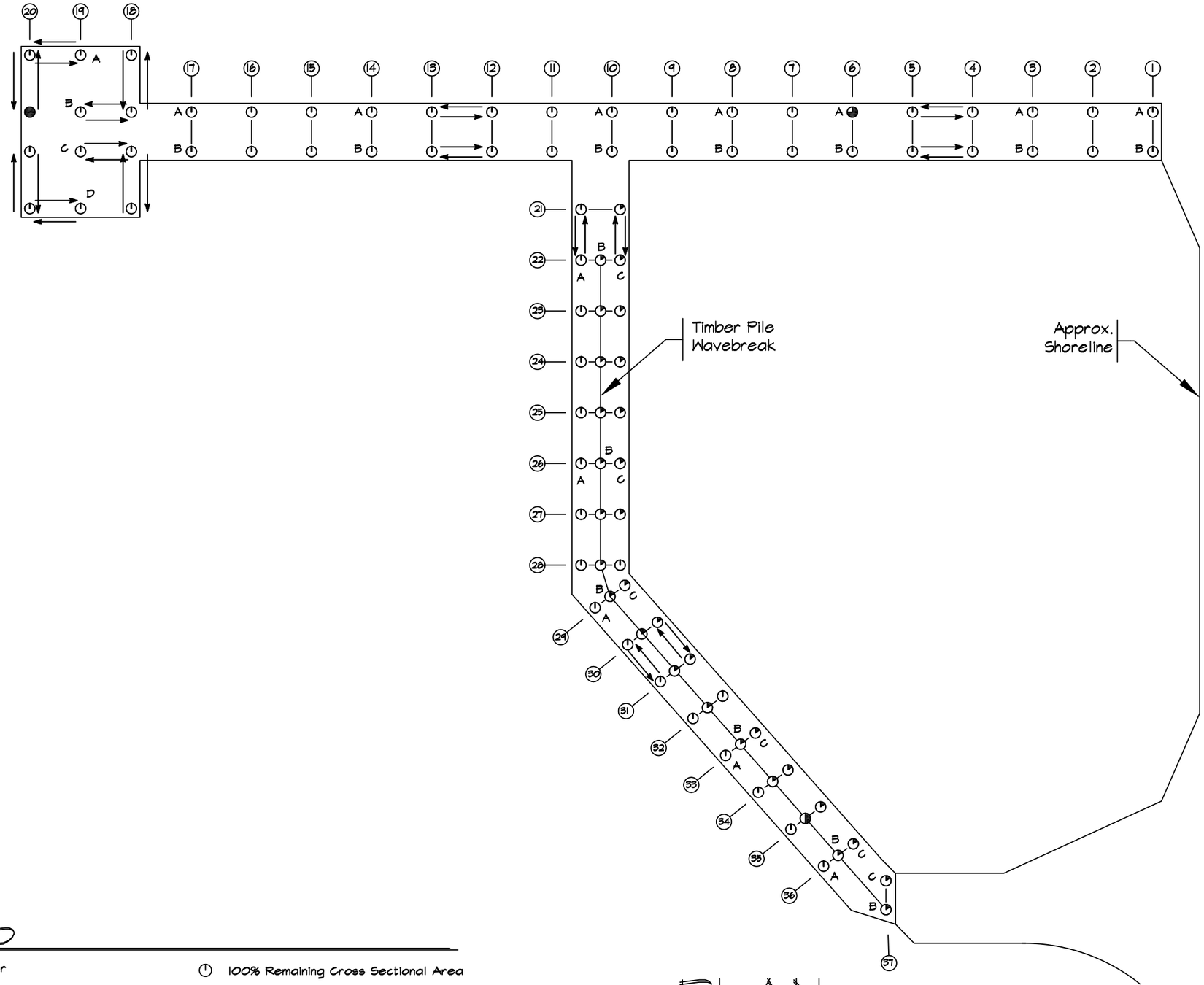
PHOTO No. 6: Bent 22, Row B, Wavebreak - Inspection found that a number of the wavebreak piles have been used to support the individual caps from Bent 22 - 37. Note the Row B pile in this Bent is bearing beneath the cap, and also functioned as a wavebreak pile. Also note the light corrosion of the Simpson ties used to secure the pile to the cap. The timber piles, to the right, appear to have been a wavebreak at some point in the past.

PHOTO No. 7: Bent 36, Row A Pile - Note the moderate to heavy corrosion of the Simpson ties used to secure the pile top / cap connection. Also note that the nails securing the straps are failing and the left strap is not secured. Inspection found the majority of the piles to be treated and to have sustained a minor amount of biological degradation or softening of the outer surface.

PHOTO No. 8: Bent 37, Row C Pile - Note the thinning of the pile near the mudline, which appears to have been caused by abrasion. Inspection of the timber found it to be generally sound with minor softening of the surface.

PHOTO No. 9: Bent 4 -5, Row A, Diagonal Bracing, Looking South - Note the moderate corrosion of the thru-bolt and the use of a center block at the mid-connection on this set of diagonal braces. Inspection found the bracing timbers to be in generally good condition with no evidence of any gross damage.

PHOTO No. 10: Bent 4 -Bent 5, Row A, Diagonal Bracing, Looking North - Note the overall good condition of the treated timber brace and center block. Also note the 2-4 inch rock that comprises the mudline in this shoreward area.



PLAN

LEGEND

- Bent Number
- Pile/Row ID
- Timber Pile
- Diagonal Brace (Arrowhead @ Bottom)
- 100% Remaining Cross Sectional Area
- 90% Remaining Cross Sectional Area
- 75% Remaining Cross Sectional Area
- 50% Remaining Cross Sectional Area
- 25% Remaining Cross Sectional Area
- 0% Remaining Cross Sectional Area

SCALE: Not To Scale

Reid Middleton, Inc.

PILE PLAN

City of Kirkland Parks
Waverly Park Pier

DATE: July 2019
PROJECT: 19-2565B
SHEET: 1 of 1
DRAWN: SDS / JDS

DATE	REVISION

ECHELON ENGINEERING, INC.
Civil/Marine Consulting Engineers
Lynnwood, Washington
Tel: (425) 672-8424

TABLE B-1 Waverly Park Pier
PILE INSPECTION DATA

PILE LOCATION		MEMBER RATING	CONDITION / DAMAGE	
			Elevation (Chart Datum)	Details / Remarks
Bent	Row			
1	A	100		
	B	100	MDL	<1% Mechanical
2	A	100		
	B	100		
3	A	100		
	B	100		
4	A	100		
	B	100		
5	A	100		
	B	100		
6	A	25	Top	25% Bearing (100% Remaining Area)
	B	100		
7	A	100		
	B	100		
8	A	100		
	B	100		
9	A	100		
	B	100		
10	A	100		
	B	100		
11	A	100		
	B	100		
12	A	100		
	B	100		
13	A	100		
	B	100		
14	A	100		
	B	100		
15	A	100		
	B	100		
16	A	100		
	B	100		
17	A	100		
	B	100		

TABLE B-1 Waverly Park Pier
PILE INSPECTION DATA

PILE LOCATION		MEMBER RATING	CONDITION / DAMAGE	
Bent	Row		Elevation (Chart Datum)	Details / Remarks
18	A	100		
	B	100		
	C	100		
	D	100		
19	A	100		
	B	100		
	C	100		
	D	100		
20	A	100		
	B	0	Top	Non-Bearing (100% Remaining Area)
	C	100		
	D	100		
21	A	100		
	C	90	Top/MDL	1% Biological Degradation
22	A	100		
	B	90	Top/MDL	Wavebreak Pile; 5% Biological Degradation
	C	90	Top/MDL	1% Biological Degradation
23	A	100		
	B	90	Top/MDL	Wavebreak Pile; 5% Biological Degradation
	C	90	Top/MDL	1% Biological Degradation
24	A	100		
	B	90	Top/MDL	Wavebreak Pile; 5% Biological Degradation
	C	90	Top/MDL	1% Biological Degradation
			Top Dn 1'	Check-UD
25	A	100		
	B	90	Top/MDL	Wavebreak Pile; 5% Biological Degradation
	C	90	Top/MDL	1% Biological Degradation
26	A	100		
	B	90	Top/MDL	Wavebreak Pile; 5% Biological Degradation
	C	90	Top/MDL	1% Biological Degradation
27	A	100		
	B	90	Top/MDL	Wavebreak Pile; 5% Biological Degradation
	C	90	Top/MDL	1% Biological Degradation

TABLE B-1 Waverly Park Pier
PILE INSPECTION DATA

PILE LOCATION		MEMBER RATING	CONDITION / DAMAGE	
Bent	Row		Elevation (Chart Datum)	Details / Remarks
28	A	100		
	B	90	Top/MDL	Wavebreak Pile; 5% Biological Degradation
	C	100		
29	A	100		
	B	90	Top/MDL	Wavebreak Pile; 5% Biological Degradation
	C	90	Top/MDL	1% Biological Degradation
30	A	100		
	B	90	Top/MDL	Wavebreak Pile; 5% Biological Degradation
	C	90	Top/MDL	1% Biological Degradation
			MDL	2% Mechanical
31	A	100		
	B	90	Top/MDL	Wavebreak Pile; 5% Biological Degradation
	C	90	Top/MDL	1% Biological Degradation
			MDL	2% Mechanical
32	A	100		
	B	90	Top/MDL	Wavebreak Pile; 5% Biological Degradation
	C	100		
33	A	100		
	B	90	Top/MDL	Wavebreak Pile; 5% Biological Degradation
	C	90	Top/MDL	1% Biological Degradation
34	A	100		
	B	90	Top/MDL	Wavebreak Pile; 5% Biological Degradation
			MDL	5% Abrasion
	C	90	Top	2% Mechanical
			Top/MDL	2% Biological Degradation
35	A	100		
	B	50	Top	50% Bearing (90% Remaining Area)
			Top/MDL	Wavebreak Pile; 5% Biological Degradation
	C	90	Top	2% Mechanical
			Top/MDL	2% Biological Degradation

TABLE B-1 Waverly Park Pier
PILE INSPECTION DATA

PILE LOCATION		MEMBER RATING	CONDITION / DAMAGE	
Bent	Row		Elevation (Chart Datum)	Details / Remarks
36	A	100		
	B	90	Top/MDL	Wavebreak Pile; 5% Biological Degradation
			MDL	5% Abrasion
	C	90	Top	2% Mechanical
			Top/MDL	1% Biological Degradation
37	B	90	Top/MDL	Wavebreak Pile; 5% Biological Degradation
	C	90	Top/MDL	1% Biological Degradation
			MDL	5% Abrasion

C. Marina Park

C.1 Marina Park, Main Pier

Description of Structure

The Marina Park Main Pier is constructed on treated timber piles with a treated superstructure. Based on the information provided in the previous structure assessment report by others conducted in 2014, the pier extends perpendicular from the shore, to the west for approximately 400 LF. The structure also has three finger / moorage piers which extend off the north side of the Approach.

The piles are identified by a conventional bent and row grid system, with the bents in the Approach are numbered 1 through 35 from the east (shore) and the rows identified alphabetically A and B from the north. Bents within the eastern finger pier have been numbered sequentially, 36 through 44, from the south, with pile rows identified alphabetically A and B from the west. Bents within the center mooring finger are numbered 45 through 60, from the south, with pile rows are identified alphabetically A - F from the west. Bents within the outer, western mooring finger pier are numbered 61 through 88 also from the south, with pile rows identified alphabetically A – F from the west.

The structure is supported on treated timber piles, a number of which extend above the deck level to act as mooring bollards and light posts. The piles have an average diameter of approximately 12 -14 inches. A galvanized steel brace system is located at or near the mudline along the outer mooring piles on the east and west side of the center finger pier and along the outer mooring piles located on the east side of the outer, west finger.

Several of the bents in the outer, western mooring finger, are braced by a set of diagonal brace timbers. Additionally, batter piles are located along the length of the Approach, as well as in the outer, western mooring finger.

The superstructure within the pier is composed of various size treated timber members. The Approach (Bents 1-23), as well as the three Moorage Finger Piers are constructed using double 6x10 timbers for pile caps, 4x12 stringers and 3x8 timber deck planks. Also, within the Approach, the pile caps are thru-bolted to the pile tops, as well as having a section of 6x10 attached vertically to the piles to act as a ledger support for the cap timbers. This portion of the facility also has 3x10 treated timbers running diagonally from bent to bent in the elevation of the caps. Within Bents 24-35 of the Approach the structure is supported on 10x12 timber pile caps bearing on the pile tops, with 6x10 stringers and 3x8 timber deck planks.

The pier has five timber firewalls located at intervals along the structure. The structure also has a number of diagonal timbers located in the superstructure of the Approach section, as well as in the three finger piers.

Observed Conditions

The inspection of the Marine Park Main Pier provided for full inspection of all accessible under-deck members. Accessible members were subjected to Level I visual inspection along with Level II and limited Level III investigation. Based on the inspection the overall condition of the structure is fair to good. The findings of the inspection are as follows:

Piles

1. The pier is supported by a total of 245 treated structural timber piles. Two additional driven piles were noted which function as light posts. A number of the piles extend above the deck. The tops of these piles have been covered with a protective plastic cap to protect the end grain of the members against fungal decay. Refer to Photo No. 1 and 2. The overall condition of the piles was found to be good.

2. One hundred and fifty-six piles (63.2%) have been rated in the 100% classification with no evidence of any significant biological, mechanical damage or other significant deterioration identified.

3. Seventy-seven piles (31.2%) have been rated in the 90% rating category due to minor fungal decay, biological degradation or mechanical damage. These piles can be considered to be at or near their original capacity. Refer to Photo No. 8.

4. Three piles (1.2%) have been rated in the 75% category. One of these piles has sustained significant fungal decay in the pile top which has been filled with concrete grout. Refer to Photo No. 7. One pile is a batter pile which was found to have a loose connection at its top. And the third of the piles in this category was found to be a timber pile post repair which has sustained heavy surface corrosion of the steel splice plates and hardware and is now loose.

5. Four piles (1.6%) have been rated in the 50% category. Two of these piles were found to have sustained an estimated 50% loss of section due to fungal decay. The other two piles in this category were noted to be timber pile posts which have been secured at the submerged splice with steel pipe pile sleeves. The steel sleeve connection on both of these piles is thru-bolted to the upper replacement post and to the lower timber pile stub. It appears that the steel pipe pile sleeves were oversized and therefore were originally shimmed to prevent movement. Over time, the shims appear to have gone missing, allowing the upper post section to list and move as a result of the loose splice connection. Refer to Photo No. 14.

6. Four piles (1.6%) have been rated in the 25% category. Two of these piles were found to have sustained heavy fungal decay in the pile top. Refer to Photo No. 6. The remaining two piles were found to be timber piles that have been posted with sections of steel pipe pile which appear to have been pressure fit over the lower timber stub. No apparent lag

bolts, thru-bolts or other hardware appears to secure the steel pipe pile sections in place. These two piles are located in Bent 88, at the D and D-Br positions. Inspection of the pile top connections on these pile noted that the steel pipe piles have been tack welded to a steel plate and bracket. Inspection of these welds found them to be minimal, of poor quality and that a number have failed. Refer to Photos No. 11-13.

7. Three piles (1.2%) have been rated in the 0% category. Two of these piles were found to have partial or non-bearing conditions at the pile top / cap connection. One of these piles could be repaired by the installation of shims to restore bearing. The other pile could be restored by re-heading the pile and installing a corbel or other method to remove the damaged pile top and provide bearing beneath the cap. The third pile was found to be broken near the mudline, apparently due to impact damage. Refer to Photo No. 10.

Diagonal Braces

8. Nine sets of timber transverse diagonal braces were found spanning Bents 66, 68, 71, 73, 77, 80, 82, 85, and 87. One timber wale was also found on Bent 87. These members have been shown on the attached drawing. The overall condition of these brace members was found to be fair. These braces are treated timber with the majority found to be undamaged with no evidence of any gross damage or deterioration. However, minor biological degradation and general weathering of the timber was noted.

9. A total of 19 brace timbers were inspected. Fourteen braces (73.7%) were found to be undamaged with no evidence of any significant defects.

10. Five braces (26.3%) were found to have failed either due to impact damage of the timber or to loss of the nut and washer at one of the connections. Refer to Photo No. 16.

11. Investigation of the attachment hardware that secure the timber braces to the piles found the thru-bolts to be in generally good condition with light to moderate surface corrosion. Refer to Photo No. 16.

12. Inspection also noted that throughout the structure, the majority of the bents are braced in the elevation of the superstructure with a diagonal timber brace. The location of these diagonal brace timbers has been shown on the attached drawing. These members are treated and, overall, are in good condition with no evidence of any significant gross damage or deterioration. Refer to Photo No. 21.

Superstructure

13. The overall condition of the pile caps was found to be fair to good. These members are treated timbers and were found to be primarily free of gross damage. However, significant damage to a couple of the cap ends was noted. Refer to Photo Nos. 17 and 18. The specific locations identified are as follows:

- Bent 35, Cap – 25% Mechanical Damage @ Row B
- Bent 43, North Cap – 75% Fungal @ Row B

No other evidence of gross mechanical damage, fungal decay or other significant deterioration was identified. However, localized areas of weathering and minor fungal decay of the member surfaces and cut ends, was visible.

14. The overall condition of the stringers was also found to be good. These members are treated timbers and were found to be generally free of gross damage. With one exception, no evidence of significant mechanical damage, fungal decay or other significant deterioration was identified. However, localized areas of weathering and minor fungal decay of the member surfaces and cut ends, was visible. The one exception was a perimeter stringer which appears to have failed due to impact damage. This stringer is located on Bent 88, spanning from Row B to Row C. Refer to Photo No. 19.

15. The original deck on the main Approach has been replaced by a composite or plastic grating. The under-surface of the grate was observed to be in good condition with no evidence of deterioration or damage found. Additionally, no significant damage was noted to the multiple treated framing timbers or attachment hardware used to secure the grate and match the original deck height. Refer to Photo No. 2.

16. Inspection of the accessible portions of the under-surface of the deck planks located throughout the rest of the structure, found them to be in overall fair to good condition with weathering and localized minor fungal decay of the members bottom surface.

Miscellaneous

17. Inspection of the firewalls that are located along the length of the structure noted them to be in overall fair condition. Of the five firewalls identified and inspected, two were noted to be undamaged. Of the three damaged firewalls, one is located at Bent 16 and was found to have a number of missing and loose boards, with an estimated 75% of the firewall noted to be damaged. The second damaged firewall is located at Bent 45 and was noted to have several loose boards (Refer to Photo No. 22). The third damaged firewall is located at Bent 63 and was found to have several missing boards with an estimated 25% of the firewall noted to be damaged.

18. Inspection of the steel channel brace systems which run near the mudline of the Row A and Row D piles in the center mooring finger and along the Row D piles in the outer, western mooring finger found them to be in overall good condition. No evidence of any significant damage or deterioration was found. The members are attached to the piles ~1.5 ft. above the mudline and the galvanized coating on the hardware and the members was noted to be 100% intact. Refer to Photo No. 14.

PHOTO No. 1: Marina Park, Main Pier, Looking Southeast - The structure is constructed using typical timber construction with treated timber piles, pile caps, stringers, and decking. Note that a number of the piles extend above the elevation of the deck.

PHOTO No. 2: Main Approachway, Looking West - Note the overall good condition of the composite / plastic decking, the bull rail and the various benches along the structure. Also note the multiple piles which extend up above the deck elevation.

PHOTO No. 3: Eastern Finger, Looking North - Note the generally good condition of the timber decking and the arrow indicating a plastic pile cap located on the Bent 5, Row A Pile.

PHOTO No. 4: Center Mooring Finger, Looking North - Note the two light posts which were found to be driven timber piles, and the Row D piles to the right which extend up above the elevation of the deck and serve as mooring piles. Also note the majority of these piles are capped with a plastic cap to prevent accelerated damage to the pile tops due to fungal decay.

PHOTO No. 5: Western Mooring Finger, Looking Northwest - Note the overall good condition of the timber decking, bull rail, and bench. Also note the piles that extend above the elevation of the deck and the plastic caps covering the pile top end grain on the majority of the piles.

PHOTO No. 6: Bent 56, Row D Pile - Inspection found that is pile has sustained an estimated 75% fungal damage extending from the pile top down approximately 1 ft. This pile was also noted to not have a plastic cap protecting the end grain of the pile.

PHOTO No. 7: Bent 88, Row E Pile - Note the center of the pile has been filled with concrete grout. Inspection of the pile estimated that the pile has internal fungal damage below the concrete which extends down several feet. Also note the missing plastic cap and the new edge member indicating on-going maintenance of the framing and decking at this location.

PHOTO No. 8: Bent 60, Row B Pile - Note the fungal damage at the waterline of this pile. Inspection found this decay to be localized at this location resulting in an estimated 10% loss of section. Also note the generally good condition of the cap timber which is bolted to the pile.

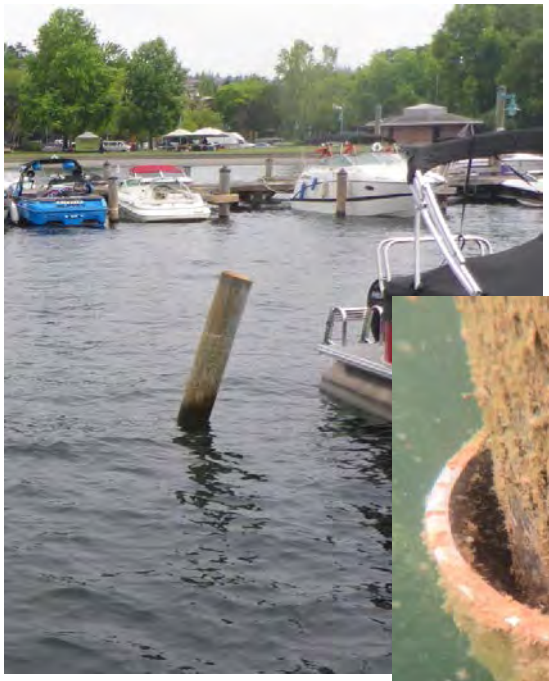
PHOTO No. 9: Bent 46, Row C Pile - Note the generally good condition of the pile, as well as the algae growth covering the surface in the submerged zone. This was found to be typical of the piles throughout the facility in the submerged zone.

PHOTO No. 10: Bent 30, Row A Pile - Inspection found this pile to have failed near the mudline. Note that the pile is split vertically and broken at this elevation. Also note the good condition of the adjacent Bent 29.8, Row A pile which functions as a light post.

PHOTO No. 11: Bent 88, Row D, Steel Sleeved Pile - Note the algae growth, surface corrosion and rust nodules visible on the steel pipe pile sleeve which appears to have been installed over the top of the original timber pile. No apparent lag bolts or other hardware was noted securing this sleeve to the timber stub.

PHOTO No. 12: Bent 88, Row D, Steel Sleeved Pile - Note the rough surface of the steel sleeve in this area of Level II cleaning. Although pitting of the base metal was visible, no areas of significant section loss or perforation were noted.

PHOTO No. 13: Bent 88, Row D, Steel Sleeved Pile - Note the minimal amount of tack welds securing the top of this steel pipe pile sleeve to the steel plate on the connection bracket. Also note the minor surface corrosion of the uncoated steel above water.



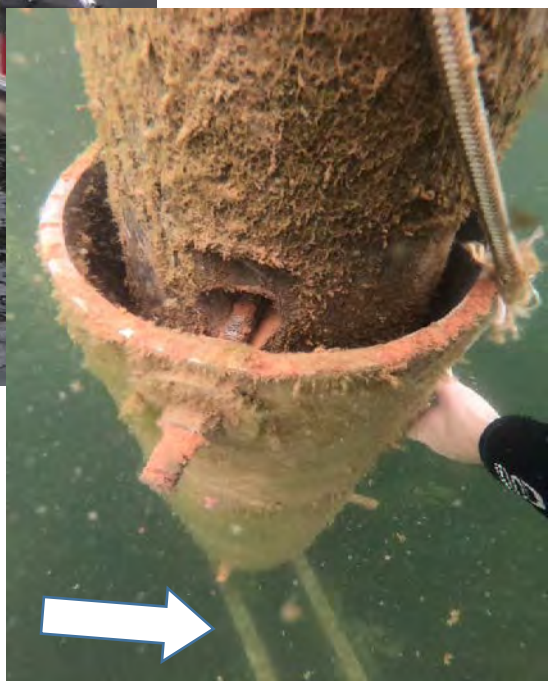


PHOTO No. 14: Bent 72, Row D Pile - Note the significant list of the pile which is due to a loose splice connection on this timber pile posted pile. The submerged splice is secured with a steel pipe pile sleeve that is thru-bolted to the upper post and lower timber stub. Investigation found that the sleeve is oversized allowing the upper post to move. Also note the light corrosion on the galvanized steel sleeve and the attachment hardware, as well as the good condition of the steel brace system located near the mudline (arrow) which runs along the Row D piles in this mooring finger.

PHOTO No. 15: Bent 51, Row D, Pile Post - Note the overall good condition of the steel sleeve and connection hardware used to secure the splice connection. Inspection of the steel found it to have sustained light to moderate surface corrosion and to be tight.

PHOTO No. 16: Bent 82, Bow B Pile - Note the brace timber which originally spanned from the Bent 82, Row A Pile to the Row B Pile is no longer secured to the Row A pile and is hanging from its lower bolted connection. Investigation found that the timber has failed at the upper connection on the Row A Pile.

PHOTO No. 17: Bent 35, Row B Pile - Inspection noted this mechanical damage to the end of the cap which has been estimated at 25% loss. The structure has apparently sustained impact damage resulting in damage to the steel bracket securing the batter pile, as well as exposing the attachment bolts.

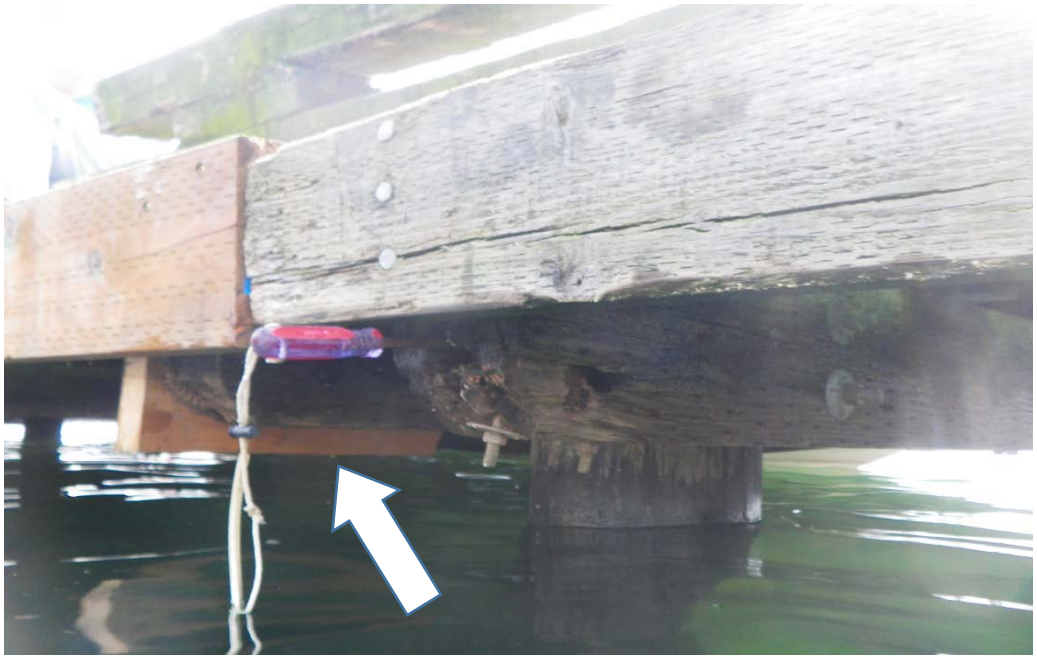


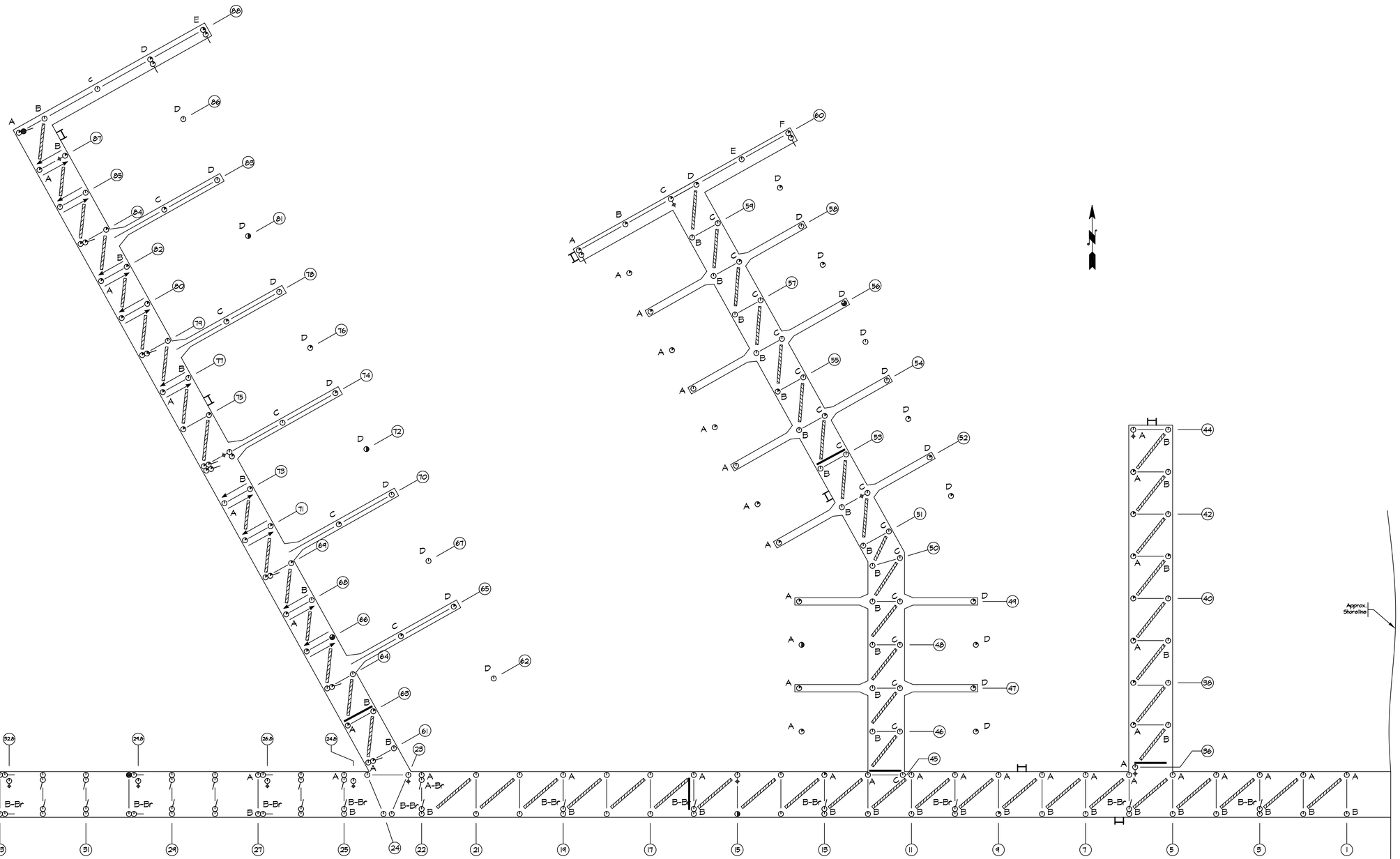
PHOTO No. 18: Bent 43, Row B Pile - Note the combined mechanical damage and fungal decay to the north cap. Also note the new fascia board and the arrow indicating a scabbed repair timber on the southern cap timber.

PHOTO No. 19: Bent 88, Row B-C, North Perimeter Stringer - Note the failure of this perimeter stringer, which is one of two stringers providing support for the deck. Inspection also noted the newer members sistered to and secured to the damaged stringer.

PHOTO No. 20: Bent 32.8, Row A, Light Post - Inspection found the light posts throughout the facility to be driven piles. Note the post is offset slightly from the cap and secured with framing, as well as with a galvanized hoop. Also note the good condition of the treated superstructure timber at this location.

PHOTO No. 21: Bent 82 to Bent 83, Superstructure - Note the diagonal brace located at the elevation of the cap (refer to arrow) and extending diagonally from the Row A Pile to the Row B Pile. Also note the overall good condition of the cap, stringers, and the under-surface of the deck timber.

PHOTO No. 22: Bent 45, Firewall - Inspection found a number of firewalls throughout the facility. Inspection of this firewall found it to be in poor condition with several loose and missing boards.



PLAN

LEGEND

- Bent Number
- Pile/Row ID
- Timber Pile
- Diagonal Brace (Arrowhead @ Bottom)
- Firewall
- Diagonal Superstructcure Brace
- 100% Remaining Cross Sectional Area
- 90% Remaining Cross Sectional Area
- 75% Remaining Cross Sectional Area
- 50% Remaining Cross Sectional Area
- 25% Remaining Cross Sectional Area
- 0% Remaining Cross Sectional Area
- Light / Sign Post (Driven Pile)
- Safety Ladder

SCALE: Not To Scale

Reid Middleton, Inc.

PILE PLAN

City of Kirkland Parks
Marina Park - Main Pier

DATE: July 2019
PROJECT: 19-2565C
SHEET: 1 of 2
DRAWN: SDS / JDS

DATE	REVISION

ECHELON ENGINEERING, INC.
Civil/Marine Consulting Engineers
Lynnwood, Washington
Tel: (425) 672-8924

2565C-Marina Pk Main Pier-Shtl.dwg
8/9/2019 9:13 AM
SDS, Echelon Engineering, Inc.

TABLE C-1 Marina Park, Main Pier
PILE INSPECTION DATA

PILE LOCATION		MEMBER RATING	CONDITION / DAMAGE	
			Elevation (Chart Datum)	Details / Remarks
Bent	Row			
MAIN PIER				
1	A	100		LA (Limited Access)
	B	100		
2	A	100	Top	Plastic Cap (El. +4')
	B	100	Top	LA
3	A	100	Top	Plastic Cap (El. +4')
	B-Br	100	Top	LA
	B	100	Top	LA
4	A	100	Top	Plastic Cap (El. +4')
	B	100	Top	LA
5	A	100	Top	Plastic Cap (El. +4')
	B	100	Top	LA
6	A	100	Top	Plastic Cap (El. +4')
	B	100	Top	Plastic Cap (El. +4')
7	A	100	Top	LA
	B	100	Top	LA
8	A	100	Top	LA
	B	100	Top	LA
9	A	100	Top	LA
	B	100		
10	A	100	Top	LA
	B-Br	100		
	B	100	Top	LA
11	A	100	Top	LA
	B	100	Top	LA
12	A	100	Top	Plastic Cap (El. +4')
	B	100	Top	LA
13	A	90	Top	1% Mechanical
	B-Br	100		
	B	100	Top	LA
14	A	100	Top	LA
	B	100	Top	LA

TABLE C-1 Marina Park, Main Pier
PILE INSPECTION DATA

PILE LOCATION		MEMBER RATING	CONDITION / DAMAGE	
			Elevation (Chart Datum)	Details / Remarks
Bent	Row			
15	A	100	Top	Light pole, Plastic Cap (El. +10')
	B	50	Top	Plastic Cap (El. +4')
			Top Dn 1.5'	50% Fungal
16	A	100	Top	Plastic Cap (El. +4')
	B-Br	100		
	B	100	Top	LA
17	A	100	Top	LA
	B	100	Top	LA
18	A	100	Top	LA
	B	100	Top	LA
			MDL	<1% Mechanical
19	A	100	Top	Plastic Cap (El. +4')
	B-Br	100		
	B	100	Top	LA
20	A	100	Top	Plastic Cap (El. +5')
	B	100	Top	LA
21	A	100	Top	Plastic Cap (El. +5')
	B	100	Top	LA
22	A	100	Top	LA
	B-Br	100		
	B	100	Top	LA
23	A	100	Top	Light Post, Plastic Cap (El. +10')
	B	100	Top	LA
24	A	100		
	B	100		
25	A	100	Top	LA
	A-Br	100		
	B-Br	100		
	B	100	Top	LA
26	A	100	Top	LA
	A-Br	100		
	B-Br	100		
	B	100	Top	LA

TABLE C-1 Marina Park, Main Pier
PILE INSPECTION DATA

PILE LOCATION		MEMBER RATING	CONDITION / DAMAGE	
			Elevation (Chart Datum)	Details / Remarks
Bent	Row			
26.8	A	100	Top	Light Post, Plastic Cap (El. +10')
27	A	100		
	A-Br	100		
	B-Br	100		
	B	100		
28	A	100		
	A-Br	100		
	B-Br	100		
	B	100		
29	A	100		
	A-Br	100		
	B-Br	100		
	B	100		
29.8	A	100	Top	Light Post, Plastic Cap (El. +10')
30	A	0	MDL	Broken
	A-Br	100		
	B-Br	100		
	B	100		
31	A	100		
	A-Br	100		
	B-Br	100		
	B	100		
32	A	100		
	A-Br	100		
	B-Br	100		
	B	100		
32.8	A	100	Top	Light Post, Plastic Cap (El. +10')
33	A	100		
	A-Br	100		
	B-Br	100		
	B	100		

TABLE C-1 Marina Park, Main Pier
PILE INSPECTION DATA

PILE LOCATION		MEMBER RATING	CONDITION / DAMAGE	
			Elevation (Chart Datum)	Details / Remarks
Bent	Row			
34	A	100		
	A-Br	100		
	B-Br	100		
	B	100		
35	A	100		
	A-Br	75		Treated Pile Post
			-8'	Splice w/ Steel Plates and Thru-bolts;
				Bolts Loose; Moderate / Heavy Corrosion
	B-Br	100		
	B	0	Top	Non-Bearing (50% Remaining Area)
			Top Dn 1'	50% Mechanical
36	A	100	Top	Light Pole, Plastic Cap (El. +10')
37	A	90	Top	LA
			Top / MDL	1% Biological Degradation
	B	100		
38	A	90	Top	LA
			Top / MDL	1% Biological Degradation
	B	100	Top	LA
39	A	90	Top	LA
			Top / MDL	1% Biological Degradation
			0'	10% Mechanical
	B	100	Top	LA
40	A	90	Top	LA
			Top / MDL	1% Biological Degradation
	B	100	Top	LA
41	A	90	Top	LA
			0' / -3'	2% Mechanical/Abrasion
	B	90	Top	10% Construction Notch
42	A	90	Top	LA
			0' / -3'	2% Mechanical
			Top / MDL	1% Biological Degradation
	B	100	Top	LA

TABLE C-1 Marina Park, Main Pier
PILE INSPECTION DATA

PILE LOCATION		MEMBER RATING	CONDITION / DAMAGE	
Bent	Row		Elevation (Chart Datum)	Details / Remarks
43	A	90	Top	LA
			0' / MDL	1% Biological Degradation
	B	100	Top	LA
44	A	100	Top	Light Pole, Plastic Cap (El. +10')
	B	100	Top	Chemonite, LA
			-1'	<1% Mechanical
45	C	100		LA
46	A	90	Top	Plastic Cap Missing (El. +4')
			0'	1% Abrasion
	B	100	Top	LA
	C	100	Top	LA
			MDL	Conctruction Debris (Concrete Pour)
	D	90	Top	Plastic Cap (El. +4')
			0'	1% Abrasion
47	A	90	Top	Plastic Cap (El. +5')
			Top / MDL	1% Biological Degradation
	B	100	Top	LA
	C	100	Top	LA
	D	90	Top	Plastic Cap (El. +5')
			Top / MDL	1% Biological Degradation
48	A	50	Top	Plastic Cap Missing (El. +4')
			Top Dn 1'	50% Fungal
			0'	1% Abrasion
	B	100	Top	LA
	C	100	Top	LA
	D	90	Top	Plastic Cap (El. +4')
			0'	1% Abrasion
49	A	90	Top	Plastic Cap (El. +5')
			Top / MDL	1% Biological Degradation
	B	100	Top	LA
	C	100	Top	LA
	D	90	Top	Plastic Cap (El. +5')
			Top / MDL	1% Biological Degradation

TABLE C-1 Marina Park, Main Pier
PILE INSPECTION DATA

PILE LOCATION		MEMBER RATING	CONDITION / DAMAGE	
Bent	Row		Elevation (Chart Datum)	Details / Remarks
50	B	100	Top	LA
	C	100	Top	LA
51	B	100	Top	LA
	C	100	Top	LA
	D	90		Treated Pile Post
			Top	Plastic Cap (El. +5')
			-2' / -5'	Splice w/ Steel Sleeve and Thru-bolts; Light / Moderate Corrosion
52	A	90	Top	Plastic Cap (El. +5')
			Top / MDL	1% Biological Degradation
	B	100	Top	LA
	C	100	Top	Light Pole, Plastic Cap (El. +10')
	D	90	Top	Plastic Cap (El. +5')
			Top / MDL	1% Biological Degradation
53	A	90	Top	Plastic Cap (El. +4')
			0'	2% Abrasion
	B	100	Top	LA
	C	100	Top	Plastic Cap (El. +5')
	D	90		Treated Pile Post
			Top	Plastic Cap (El. +5')
			-2' / -3'	Splice w/ Steel Sleeve and Thru-bolts; Light / Moderate Corrosion
54	A	100	Top	Plastic Cap (El. +5')
	B	100	Top	LA
	C	90	Top	LA
			Top / MDL	1% Biological Degradation
	D	100	Top	Plastic Cap (El. +5')
55	A	90	Top	Plastic Cap (El. +4')
			0'	2% Mechanical
	B	90	Top	LA
			Top / MDL	1% Biological Degradation
	C	100	Top	LA
	D	100	Top	Plastic Cap (El. +4')
			0'	<1% Abrasion

TABLE C-1 Marina Park, Main Pier
PILE INSPECTION DATA

PILE LOCATION		MEMBER RATING	CONDITION / DAMAGE	
Bent	Row		Elevation (Chart Datum)	Details / Remarks
56	A	100	Top	Plastic Cap (El. +5')
	B	100	Top	LA
	C	100	Top	LA
	D	25	Top	Plastic Cap Missing (El. +5')
			Top Dn 1'	75% Fungal
			Top / MDL	1% Biological Degradation
57	A	90	Top	Plastic Cap (El. +4')
			0'	1% Abrasion
	B	100	Top	LA
	C	100	Top	LA
	D	90	Top	Plastic Cap Damaged (El. +4')
			+1' / 0'	5% Abrasion
58	A	90	Top	Plastic Cap (El. +5')
			0'	1% Abrasion
	B	100	Top	LA
	C	90	Top	Plastic Cap Missing (El. +5')
			Top / 0'	5% Fungal
			0' / MDL	1% Biological Degradation
	D	100	Top	Plastic Cap (El. +5')
			+1'	<1% Mechanical/Abrasion
59	A	90	Top	Plastic Cap (El. +4')
			0'	1% Abrasion
	B	100	Top	LA
	C	90	Top	Plastic Cap (El. +5')
			Top / MDL	1% Biological Degradation
	D	90	Top	Plastic Cap (El. +4')
			+1'	1% Abrasion
60	A	90	Top	LA
			0'	1% Mechanical
			Top / MDL	1% Biological Degradation
	A-Br	90	Top / MDL	1% Biological Degradation
	B	90	0'	10% Fungal

TABLE C-1 Marina Park, Main Pier
PILE INSPECTION DATA

PILE LOCATION		MEMBER RATING	CONDITION / DAMAGE	
Bent	Row		Elevation (Chart Datum)	Details / Remarks
60	C	90	Top	Light Pole, Plastic Cap (El. +10')
			0'	1% Abrasion
	D	90	Top	LA
			Top / MDL	1% Biological Degradation
	E	100	Top	LA
	F	90	Top / MDL	1% Biological Degradation
	F-Br	90	Top / MDL	1% Biological Degradation
61	A	100	Top	LA
			Top / MDL	<1% Biological Degradation
	A-Br	90	Top	LA
			Top / MDL	1% Biological Degradation
	B	100	El. +5'	Plastic Cap
			Top / MDL	<1% Biological Degradation
62	D	100	Top	Plastic Cap (El. +4')
			0'	<1% Abrasion
63	A	90	Top	LA
			Top / MDL	1% Biological Degradation
	B	90	Top	LA
			Top / MDL	1% Biological Degradation
64	A	100	Top	Plastic Cap (El. +5')
			Top / MDL	<1% Biological Degradation
	A-Br	90	Top	LA
			Top / MDL	1% Biological Degradation
	B	100	Top	LA
			Top / MDL	<1% Biological Degradation
65	C	90	Top	LA
			Top / MDL	1% Biological Degradation
	D	90		Treated Pile Post
			Top	Plastic Cap (El. +5')
			-8' / -10'	Splice w/ Steel Sleeve and Thru-bolts; Light / Moderate Corrosion

TABLE C-1 Marina Park, Main Pier
PILE INSPECTION DATA

PILE LOCATION		MEMBER RATING	CONDITION / DAMAGE	
Bent	Row		Elevation (Chart Datum)	Details / Remarks
66	A	90	Top	LA
			Top / MDL	1% Biological Degradation
	B	25	Top	Plastic Cap Missing (El. +5')
			Top Dn 1'	75% Fungal
67	D	100	Top	Plastic Cap Missing (El. +5')
			0'	<1% Abrasion
68	A	90	Top	LA
			Top / MDL	1% Biological Degradation
	B	100	Top	LA
			Top / MDL	<1% Biological Degradation
69	A	90	Top	LA
			Top / MDL	1% Biological Degradation
	A-Br	90	Top / MDL	1% Biological Degradation
	B	90	Top	LA
			Top / MDL	1% Biological Degradation
70	C	90	Top	LA
			Top / MDL	1% Biological Degradation
	D	100	Top	Plastic Cap (El. +5')
			Top / MDL	<1% Biological Degradation
71	A	90	Top	LA
			0'	1% Mechanical
			Top / MDL	<1% Biological Degradation
	B	90	Top	Plastic Cap (El. +5')
			Top / MDL	1% Biological Degradation
72	D	50		Treated Pile Post - Listing / Loose
			Top	Plastic Cap Missing (El. +5')
			-8' / -10'	Splice w/ Steel Sleeve and Thru-bolts; Light / Moderate Corrosion; Bolts Reamed Out; Shims Missing
73	A	100	Top	LA
			Top / MDL	<1% Biological Degradation
	B	90	Top	Plastic Cap (El. +5')
			Top / MDL	1% Biological Degradation

TABLE C-1 Marina Park, Main Pier
PILE INSPECTION DATA

PILE LOCATION		MEMBER RATING	CONDITION / DAMAGE	
Bent	Row		Elevation (Chart Datum)	Details / Remarks
74	A	90	Top	LA
			0'	2% Mechanical
	A-S	90		Steel Pipe Pile
			Top / MDL	75-90% Coating Intact
	A-Br	90	Top	LA
			Top / MDL	2% Biological Degradation
	A-SBr	90		Steel Pipe Pile
			Top / MDL	75-90% Coating Intact
	B	100	Top	Light Pole, Plastic Cap (El. +10')
			Top / MDL	<1% Biological Degradation
	B-S	90		Steel Pipe Pile
			Top / MDL	75-90% Coating Intact
	C	100	Top	LA
			Top / MDL	<1% Biological Degradation
	D	90	Top	Plastic Cap (El. +5')
			Top / MDL	1% Biological Degradation
75	A	90	Top	LA
			Top / MDL	1% Biological Degradation
	B	90	Top	LA
			Top / MDL	1% Biological Degradation
76	D	90	Top	Plastic Cap (El. +5')
			0'	1% Abrasion
			-1'	1% Mechanical
77	A	90	Top	LA
			Top / MDL	1% Biological Degradation
	B	100	Top	Plastic Cap (El. +5')
78	C	90	Top	LA
			Top / MDL	1% Biological Degradation
	D	100	Top	Plastic Cap (El. +5')
			Top / MDL	<1% Biological Degradation
			-1'	<1% Mechanical

TABLE C-1 Marina Park, Main Pier
PILE INSPECTION DATA

PILE LOCATION		MEMBER RATING	CONDITION / DAMAGE	
Bent	Row		Elevation (Chart Datum)	Details / Remarks
79	A	90	Top	LA
			Top / MDL	1% Biological Degradation
	A-Br	75	Top	LA; Connection Loose
			Top / MDL	2% Biological Degradation
	B	100	Top	LA
			Top / MDL	<1% Biological Degradation
80	A	90	Top	Plastic Cap (El. +5')
			Top Dn 1.5'	5% Mechanical
	B	90	Top	LA
			Top / MDL	1% Biological Degradation
81	D	50		Treated Pile Post - Listing / Loose
			Top	Plastic Cap (El. +5')
			-8' / -10'	Splice w/ Steel Sleeve and Thru-bolts; Light / Moderate Corrosion; Bolts Reamed Out; Shims Missing
82	A	90	Top	LA
			Top / MDL	1% Biological Degradation
	B	90	Top	LA; Brace Connection Reamed Out
			Top / MDL	1% Biological Degradation
83	C	90	Top	LA
			Top / MDL	1% Biological Degradation
	D	100	Top	Plastic Cap (El. +5')
			Top / MDL	<1% Biological Degradation
84	A	90	Top	LA
			Top / MDL	1% Abrasion; 1% Biological Degradation
	A-Br	90	Top / MDL	1% Biological Degradation
	B	90	Top	LA
			Top / MDL	1% Biological Degradation
85	A	100	Top	LA
			Top / MDL	<1% Biological Degradation
	B	100	Top	Plastic Cap (El. +5')
			Top / MDL	<1% Biological Degradation

TABLE C-1 Marina Park, Main Pier
PILE INSPECTION DATA

PILE LOCATION		MEMBER RATING	CONDITION / DAMAGE	
Bent	Row		Elevation (Chart Datum)	Details / Remarks
86	D	100	Top	Plastic Cap (El. +5')
87	A	90	Top	LA
			Top / MDL	1% Biological Degradation
	B	90	Top	Light Pole, Plastic Cap (El. +10')
			0' / MDL	1% Biological Degradation
88	A	90	Top	LA
			Top Dn 1'	10% Biological Degradation
	A-Br	0	Top	Non-Bearing (50% Remaining Area)
			Top Dn 1'	25-50% Mechanical/ Biological Degradation
	B	100	Top	LA
	C	100	Top	LA
			Top / MDL	<1% Biological Degradation
	D	25	Top	Tack Welds Heavily Deteriorated or Broken
			Top / -12'	Steel Sleeved; Moderate/Heavy Corrosion
	D-Br	25	Top	Tack Welds Heavily Deteriorated or Broken
			Top / -4'	Steel Sleeved; Moderate/Heavy Corrosion
	E	75	Top	Plastic Cap (El. +5')
			Top Dn 1'	75% Fungal-Filled with Grout
			Top / MDL	<1% Biological Degradation
	E-Br	90	Top / MDL	1% Biological Degradation

TABLE C-2, Main Pier
BRACE INSPECTION DATA

MEMBER LOCATION			MEMBER RATING	CONDITION / DAMAGE	
Upper End (Bent-Row)	Lower End (Bent-Row)	Type & Orientation		Location	Details / Remarks
66-A	66-B	S. Diag.	Undamaged		
66-B	66-A	N. Diag.	Undamaged		
68-A	68-B	S. Diag.	Undamaged		
68-B	68-A	N. Diag.	Undamaged		
71-A	71-B	S. Diag.	Undamaged		
71-B	71-A	N. Diag.	Undamaged		
73-A	73-B	S. Diag.	Undamaged		
73-B	73-A	N. Diag.	Undamaged		
77-A	77-B	S. Diag.	Undamaged		
77-B	77-A	N. Diag.	Damaged	Row A	Timber Failed; Bolt Remains In Row A Pile
80-A	80-B	S. Diag.	Undamaged		
80-B	80-A	N. Diag.	Undamaged		
82-A	82-B	S. Diag.	Damaged	Row A	Timber Failed; Bolt Remains In Row A Pile
82-B	82-A	N. Diag.	Undamaged		
85-A	85-B	S. Diag.	Undamaged		
85-B	85-A	N. Diag.	Damaged	Row A	Nut and Washer Missing; Brace Not Attached
87-A	87-B	S. Diag.	Undamaged		
87-B	87-A	N. Diag.	Damaged	Row A	Nut and Washer Missing; Brace Not Attached
				Row B	Timber Has 25% Abrasion From Bolt
87-A	87-B	N Wale	Damaged	Row B	Wale Not Attached; 50% Abrasion From Bolt in Row B Pile

C.2. Marina Park, Small Pier

Description of Structure

The Marina Park Small Pier is a relatively short structure. Based on the information provided in the previous structure assessment report by others conducted in 2014, the pier extends perpendicular from the shore, to the west for approximately 132 LF. The Approachway is approximately 10 feet in width and the structure has a small Pierhead that is 20 feet long and 8 feet wide at the western end. The piles are identified by a conventional bent and row grid system, with the bents numbered 1 through 20 from the east (shore) and the rows identified alphabetically A and B. The structure is supported by treated timber piles, a number of which extend above the deck level to act as mooring bollards and light posts. The piles have an average diameter of approximately 12 -14 inches. The pile caps are double 6x10's in Bents 2-18 and a single 8x10 in Bent 19 and 20. The stringers are 4x10 treated timbers and the treated deck planks are 3x8's.

Observed Conditions

The inspection of the Marine Park Small Pier provided for full inspection of all accessible under-deck members. Access to the members beneath the structure, including the portions of the piles just below the deck, caps, stringers and the under-surface of the deck planks, was limited primarily to Level I visual inspection. Limited Level II and III investigation was conducted at this structure due to the limited access conditions which resulted from the presence of the storm sewer outfall below the pier and the horizontal lagging of the perimeter fender system. Based on the inspection the overall condition of the structure is good. The findings of the inspection are as follows:

Piles

1. Inspection of the members supporting the pier was limited due to the presence of a large diameter concrete storm sewer outfall that is located beneath the pier and runs from the shore parallel with the approach and ending at Bent 18. The pier also has a protective fender system of horizontal lagging timbers around the perimeter of the structure. Due to the outfall location, and the presence of the fender system, there is minimal access to the piles and superstructure members.

2. The pier is supported by a total of 38 treated timber piles. It also contains one timber post, located in Bent 1 that was included in the inspection, but does not appear to support the pier. A number of the piles extend above the deck. The tops of these piles have been covered with a protective plastic caps to protect the end grain of the members. Refer to Photo No. 1. The overall condition of the piles was found to be good.

3. Thirty-two of the piles (82.0%) have been rated in the 100% classification with no evidence of any significant biological or mechanical damage or deterioration identified. Refer to Photo No. 2.

4. Three piles (7.7%) have been rated in the 90% rating category due to minor fungal decay or mechanical damage.

5. Four piles (10.3%) have been rated in the 75% category due to moderate fungal decay in the pile top.

Superstructure

6. The overall condition of the pile caps was found to be good. These members are treated timbers and were found to be free of gross damage. No evidence of significant mechanical damage, fungal decay or other significant deterioration was identified. Refer to Photo No. 3 and 4. However, localized areas of weathering and minor fungal decay of the member surfaces and cut ends, was visible.

7. The overall condition of the stringers was also found to be good. These members are treated timbers and were found to be free of gross damage. No evidence of significant mechanical damage, fungal decay or other significant deterioration was identified. Refer to Photo No. 3 and 4. However, localized areas of weathering and minor fungal decay of the member surfaces and cut ends, was visible.

8. Inspection of the accessible portions of the under-surface of the deck planks found them to be in overall good condition with weathering and localized minor fungal decay of the members bottom surface.

Miscellaneous

9. Inspection of the fender system that is located along the perimeter of the structure found it to be in fair condition. Although the horizontal lagging was noted to be in generally good condition, the individual boards of varying sizes and several were noted to be missing. Refer to Photos No. 5 and 6.

10. Inspection of the concrete storm sewer outfall found it to be in overall good condition. The concrete was noted to be sound with minor loss of surface paste. No evidence of any significant cracking, spalling or other gross damage was identified. Inspection also found the outfall to be partially buried, with no apparent obstructions that would constrict flow. Refer to Photos No. 5, 7 and 8.

PHOTO No. 1: Marina Park, Small Pier, Looking North - The pier is constructed using treated members, including timber piles, pile caps, stringers and decking. A large diameter concrete storm sewer is located beneath the structure running to the west from the shore. See Photo No. 5 and 7.

PHOTO No. 2: Bent 16, Row A Pile - A number of piles were found to extend above the deck providing a place to moor vessels. Note the good condition of the timber pile at this elevation.

PHOTO No. 3: Bent 17 Superstructure - Note the overall good condition of the pile cap, stringers, and the underside of the decking within the pier. Also note the good condition of the galvanized angle bracket securing the stringer to the cap.

PHOTO No. 4: Bent 17, Row A Pile - Note the good condition of the treated cap and stringers in this area. This good condition was found to be typical throughout the structure. Also note the generally good condition of the horizontal members of the fender system in the background.

PHOTO No. 5: Bent 16, Looking East - Note the large concrete storm sewer outflow which runs the length of the structure. Also note the fender system running along the north and south perimeter of the pier. The presence of the outfall resulted in limited access to the piles and superstructure members.

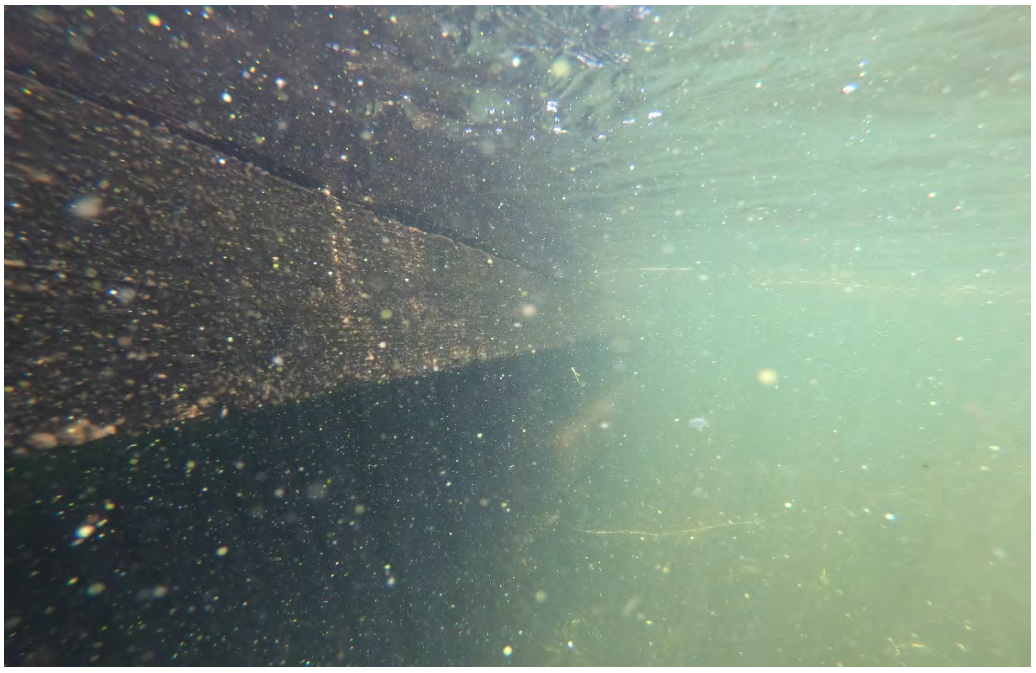


PHOTO No. 6: Bent 17, South Side, Fender System - Note the typical good condition of the horizontal timbers in the fender system timbers. Several members were noted to be missing throughout the length of the pier.

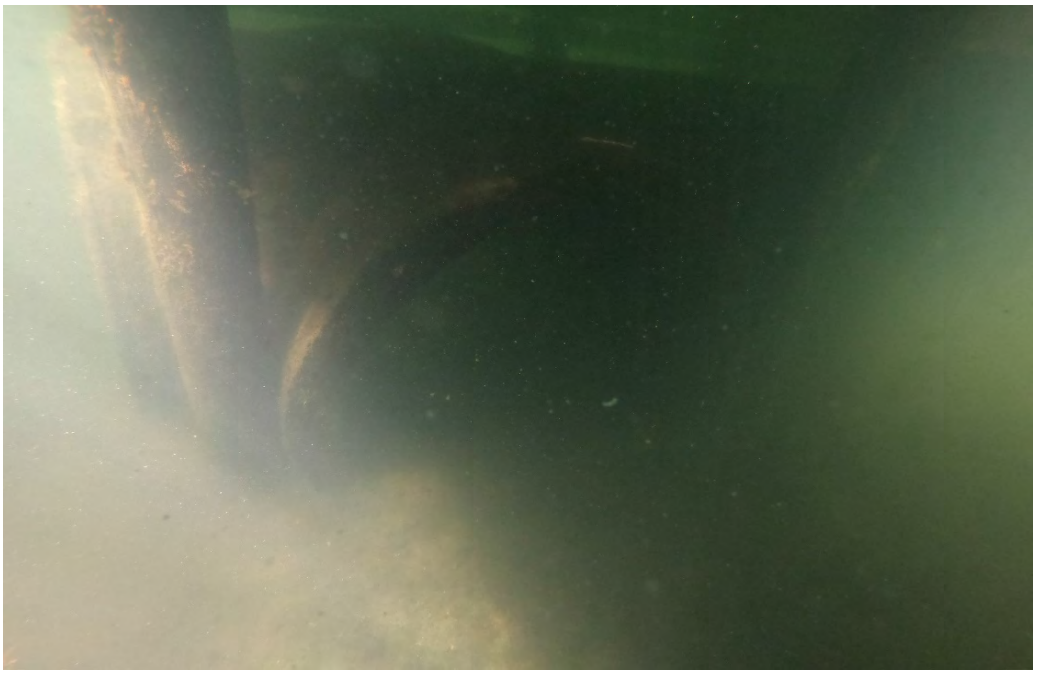
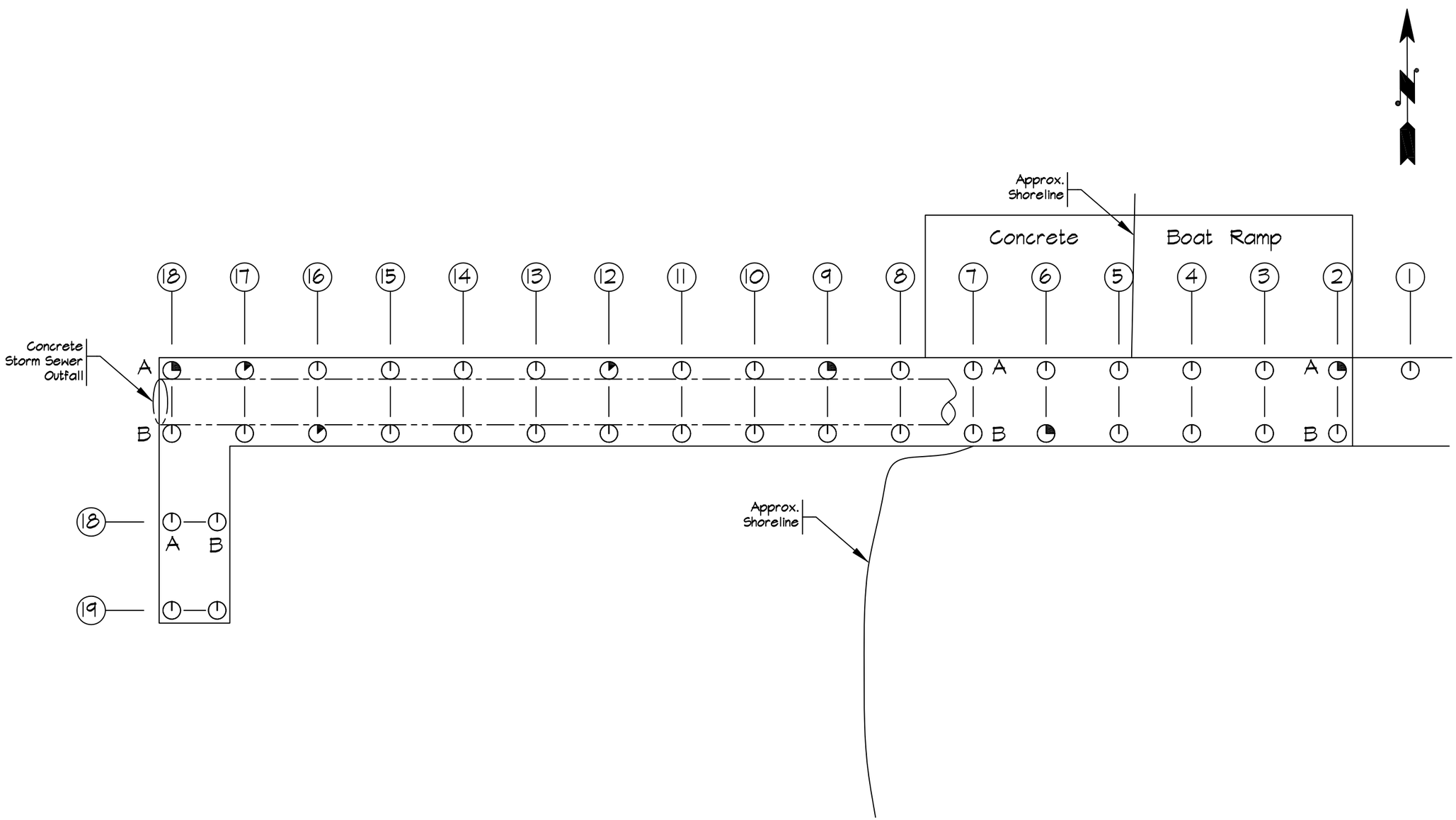


PHOTO No. 7: Bent 18, Row A, Looking East - Note the discharge end of the storm sewer outfall which is located between the Row A and B piles. Inspection found the concrete to be in overall good condition with sharp well defined edges and minor loss of cement past on the outer surfaces. Also note the typical good condition of the pile in the submerged zone.

PHOTO No. 8: Bent 18, Row A Pile, Looking South - Note the coating of algae and the typical good condition of the pile near the mudline. Also note the discharge end of the outfall and the typical soft mud and silty sediment composition of the lake bottom.



PLAN

LEGEND

- Bent Number
- Pile/Row ID
- Timber Pile
- 100% Remaining Cross Sectional Area
- 90% Remaining Cross Sectional Area
- 75% Remaining Cross Sectional Area
- 50% Remaining Cross Sectional Area
- 25% Remaining Cross Sectional Area
- 0% Remaining Cross Sectional Area

SCALE: Not To Scale

Reid Middleton, Inc.

PILE PLAN

City of Kirkland Parks
Marina Park - Small Pier

DATE:	July 2019
PROJECT:	19-2565C
SHEET:	2 of 2
DRAWN:	SDS / JDS

DATE	REVISION

ECHELON ENGINEERING, INC.
Civil/Marine Consulting Engineers
Lynnwood, Washington
Tel: (425) 672-8424

TABLE C-2 Marina Park, Small Pier
PILE INSPECTION DATA

PILE LOCATION		MEMBER RATING	CONDITION / DAMAGE	
Bent	Row		Elevation (Chart Datum)	Details / Remarks
1	A	100	Top	Plastic Cap (El. +5')
2	A	75	Top	25% Fungal; No Plastic Cap (El. +2')
	B	100	Top	Plastic Cap (El. +4')
3	A	100	Top	Plastic Cap (El. +6')
	B	100	Top	Plastic Cap (El. +6')
4	A	100	Top	Plastic Cap (El. +6')
	B	100	Top	Plastic Cap (El. +6')
5	A	100	Top	Plastic Cap (El. +6')
	B	100	Top	Plastic Cap (El. +6')
6	A	100	Top	Plastic Cap (El. +6')
	B	75		Light Post
			Top	El. +12'
			Top Dn 1.5'	90% Fungal
7	A	100		Limited Access
	B	100		Limited Access
8	A	100	Top	Plastic Cap (El. +6')
	B	100	Top	Plastic Cap (El. +6')
9	A	75	Top Dn 1'	15% Fungal
	B	100		Limited Access
10	A	100	Top	Plastic Cap (El. +6')
	B	100	Top	Plastic Cap (El. +6')
11	A	100		Limited Access
	B	100		Limited Access
12	A	90	Top	Plastic Cap (El. +6')
			Top Dn 1'	5% Fungal
	B	100	Top	Plastic Cap (El. +6')
13	A	100		Limited Access
	B	100		Limited Access
14	A	100	Top	Plastic Cap (El. +6')
	B	100	Top	Plastic Cap (El. +6')
15	A	100		Limited Access
	B	100		Limited Access

TABLE C-2 Marina Park, Small Pier
PILE INSPECTION DATA

PILE LOCATION		MEMBER RATING	CONDITION / DAMAGE	
Bent	Row		Elevation (Chart Datum)	Details / Remarks
16	A	100	Top	Plastic Cap (El. +6')
	B	90	Top	Plastic Cap (El. +6')
			0'	2% Mechanical
17	A	90	Top Dn 1'	5% Fungal
	B	100		Limited Access
18	A	75	Top	Plastic Cap (El. +6')
			Top Dn 2'	15% Fungal
	B	100		Light Post
			Top	El. +12'
19	A	100		Limited Access
	B	100		Limited Access
20	A	100		Limited Access
	B	100		Limited Access

D. Second Avenue South Pier

Description of Structure

The Second Avenue South Pier is a long and narrow fixed pier structure extending westwards from the shore. Based on the information provided in the previous structure assessment report by others conducted in 2014, the structure is approximately 416 LF in length and extends to the west. The structure has an irregular shaped section at the shore and a straight Approachway section which extends to a small Pierhead at the western end. The Approachway section of the structure is ~10 feet in width and the small Pierhead section is approximately 18 feet wide.

The piles are identified by a conventional bent and row system. Bent numbers are sequential, beginning at Bent 1 at the shore, and progressing to Bent 46 in the Pierhead. Pile rows are identified alphabetically from the south.

The piles are treated and have an average pile diameter of approximately 12-14 inches. Many of the bents are braced either by a single diagonal brace timber or with a batter pile. The brace timbers extend from the top of the Row A piles down to the Row B pile. These timbers are 3x12 treated members. The batter piles are located at Row A and extend down in a northerly direction similar to the brace timbers.

The superstructure within the pier is composed of various size treated timber glu-lams and sawn timber. The glu-lam caps are 12x16 members notched above the piles. The sawn timber caps, located in the shoreward section and in the Pierhead section area also treated. The stringers are a mix of 4x10 and 8x10 treated timbers. The deck is a poured in-place concrete slab with a galvanized corrugated steel sub-pan. The structure has four timber firewalls located at intervals along the pier. The structure also has a number of diagonal timber wavebreak baffle walls located throughout the approachway section.

Observed Conditions

The inspection of the Second Avenue South Pier was limited to a sample investigation of representative members. Given the time constraints dictated by the scope of the investigation the members were subjected primarily to Level I visual inspection with limited Level II cleaning and hammer sounding of suspect areas. Based on the inspection the overall condition of the structure is fair to good. The findings of the inspection are as follows:

Piles

11. The pier is supported by and estimated 115 piles. The inspection covered a sample investigation of 25 piles selected from represented bents throughout the structure.

12. The overall condition of the examined piles is good. All 25 of the inspected piles (100%) have been rated in the 90% classification due to minor biological degradation or fungal damage. Refer to Photo Nos. 12 and 13.

Diagonal Braces

13. Inspection of a sampling of the diagonal bracing found them to be in generally good condition. Investigation of the attachment bolts found them to have sustained light to moderate corrosion and section loss. Refer to Photo No. 12.

Superstructure

14. The majority of these members are treated 12x16 glu-lam timbers. Many of the glu-lams have been notched at the piles. The glu-lams are primarily found along the main approach portion of the structure from Bents 12 - 44. The shoreward section (Bents 1-11) and the pierhead section (Bents 45 and 46), as well as the small diagonal deck areas located on the north side of the approachway at Bents 15.7 Row C and Bent 27.8 Row C are constructed using treated, sawn timber cap members. The sawn timber caps have sustained more significant damage primarily at their cut ends.

15. Overall the caps were found to be in generally fair condition with the areas beneath the concrete deck found to be free of gross damage. However, significant damage to a number of the cap ends was noted. Refer to Photo Nos. 3, 4, 7, and 8. The specific locations identified in the sample inspection are as follows:

    - Bent 3, Cap – 90% Fungal @ Row A
    - Bent 4, Cap – 15-75% Fungal Throughout
    - Bent 15.7, Cap –50-90% Fungal Throughout
    - Bent 27.7, Cap –50% Fungal Throughout
    - Bent 44, Cap –50% Fungal @ Row A
    - Bent 45, Cap –15% Fungal @ Row A
    - Bent 46,Sub-cap –50-75% Fungal @ Row A
    - Bent 46, Sub-cap – 25-50% Fungal @ Row A
    - Bent 46,Sub-cap –25-50% Fungal @ Row C
    - Bent 46, Cap – 90% Fungal @ Row E

    No other evidence of gross mechanical damage, fungal decay or other significant deterioration was identified. However, localized areas of weathering and minor fungal decay of the member surfaces and cut ends, was visible.

16. Inspection of the stringers found them to be primarily 4x10 treated members which were noted to be in good condition with no obvious defects observed. Refer to Photos No. 5 and 6,

17. Investigation of the under-surface of the concrete deck found it to be in overall good condition. The deck is a poured-in-place slab with a corrugated steel sub-pan. The pan was observed to have localized corrosion with areas of perforation. An estimated 20-25% of the pan exhibits corrosion. In areas of perforation the concrete was noted to be sound. Refer to Photo No. 6.

Miscellaneous

18. Inspection identified firewalls on Bents 12, 22, 32, and 41. These members were found to be undamaged and in generally good condition with minor biological deterioration of the timbers and light corrosion of the attachment hardware.

19. The structure was also found to have a number of diagonal timber wavebreak baffle walls that extend down from the water surface into the submerged zone. These members span from the Row A Pile to the Row B Pile of the adjacent bent to the west. Sample inspection of these wavebreaks found them to be in generally fair condition. The wavebreak wall are constructed of treated horizontal 3x10 timbers that are secured by vertical 3x10 timbers which are through bolted to the piles. A number of the horizontal members were noted to be loose or missing and in a number of locations the upper through bolts were observed to be reaming out the horizontal boards. Close access to the drilled holes in the piles was restricted. However, the holes through the piles appear to be undamaged at this time. Refer to Photo Nos. 9 – 11.

20. Inspection also noted that several of the ladders are loose or damaged.

PHOTO No. 1: Second Avenue South Pier, Looking Northeast - The structure is constructed on timber piles with treated caps and stringers, supporting a galvanized sub pan and poured in-place concrete deck. Note that pleasure craft moored along the north side of the pier.

PHOTO No. 2: Bent 13, Row A, Looking Northeast - Note the top of the diagonal wavebreak extending from this location at Bent 13, Row A (arrow) to the Bent 14, Row B pile to the left. Also note the additional wavebreaks located in the bents visible in the background.

PHOTO No. 3:
Bent 46, Row A, Looking Southeast - Note the heavy fungal damage in the ends of the sub-caps over the pile (refer to arrow). Inspection of these members found them to have sustained an estimated 25-90% fungal decay.

PHOTO No. 4: Bent 15.7, Row C Pile Looking South - Note the severe fungal damage to the two corbels above this pile. Inspection found the pile to be in generally good condition with minor fungal decay at the top. Also note the vegetation growth located between the top of the perimeter stringer and the deck plank.

PHOTO No. 5:
Shore Abutment, Looking North - Note the deterioration of the vertical lagging timbers used as a backwall to contain the shoreward soils. Inspection did not identify any apparent loss of back fill.

PHOTO No. 6: Bents 39-40, Corrugated Deck Pan - Note the corrosion of the galvanized sub pan at this location. Overall, the condition of the sub-pan was found to be generally fair with an estimated 20-25% of the surface found to have localized surface corrosion with areas of perforation.

PHOTO No. 7: Bent 3, Row A, Looking West - Note the extensive section loss and visible compression that has resulted from fungal damage of the cap timber.

PHOTO No. 8: Bent 46, Row E Pile, Looking West - Note the folding ruler inserted in a large fungal cavity in the end of the sub-cap. Inspection found that the damage, estimated at 90%, has progressed along the timber and over the pile.

PHOTO No. 9: Bent 38, Row A Vertical and Batter Pile - Note the galvanized angle brackets used to connect the batter pile top (left), and the vertical pile top (right) to the glu-lam cap. Also note the diagonal wavebreak which is attached to the vertical pile (refer to arrow) and the algae and water staining on the glu-lam cap.

PHOTO No. 10: Bent 37, Row A Pile - Note the diagonal brace timber secured to the cap and the galvanized bracket attachment. Also note the condition of the corrugated sub-pan and the utilities that run over the cap.

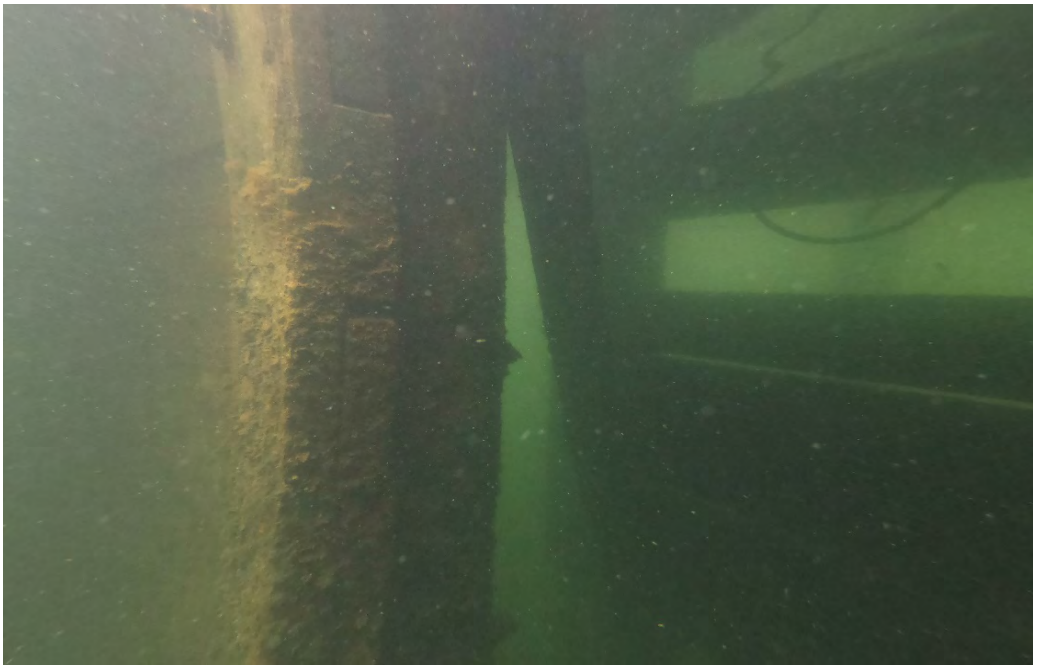


PHOTO No. 11: Typical Wave Break Connection To Row A Pile - Note the missing boards in the damaged wavebreak on the right side of the pile. Also note the horizontal timbers are secured to the pile with a vertical timber and thru-bolts.

PHOTO No. 12: Bent 16, Row B Pile - Note the lower diagonal brace connection located near the mudline. Inspection of the brace timbers found them to be in generally good condition with moderated corrosion of the connection hardware. Also note the typical good condition of the pile in the submerged zone which was noted to be typical throughout the structure.

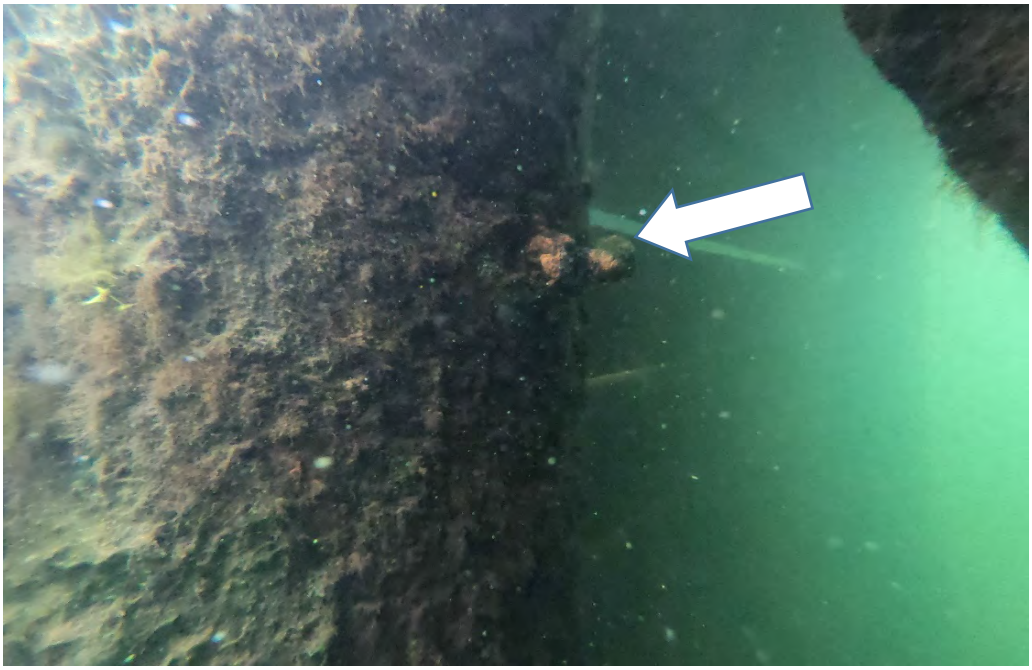


PHOTO No. 13: Bent 18, Row A Pile - Note the moderate corrosion evident on the surface of this thru-bolt that secures a diagonal wavebreak. Also note the typical algae growth and the typical good condition of pile in submerged zone.

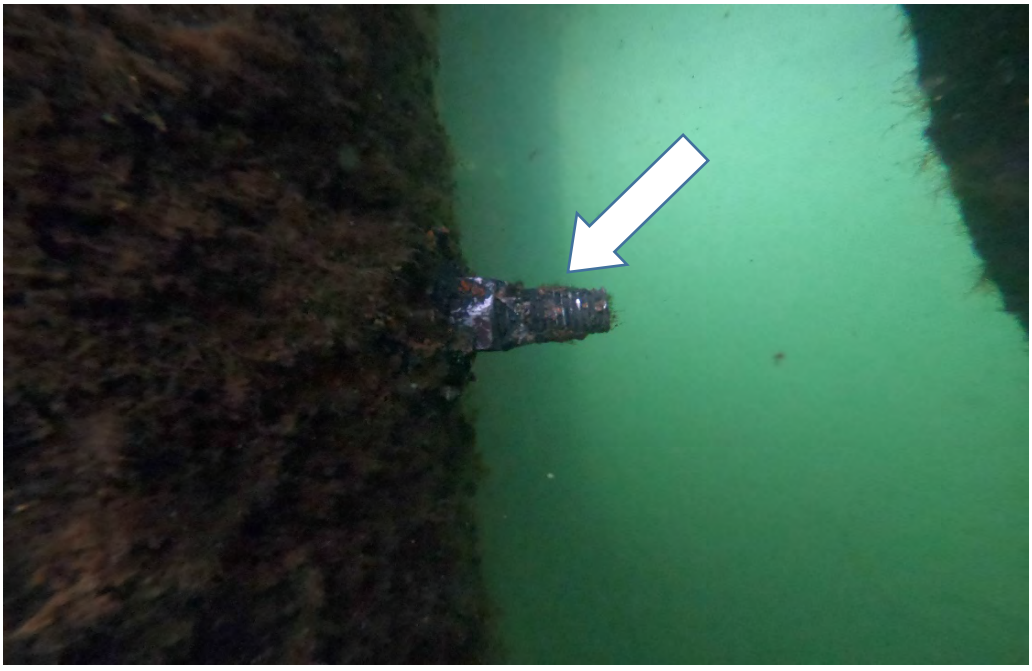
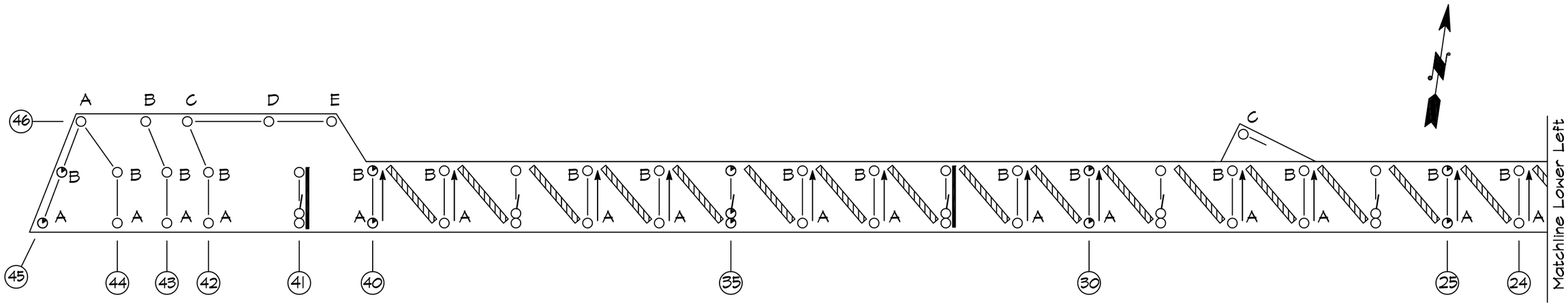
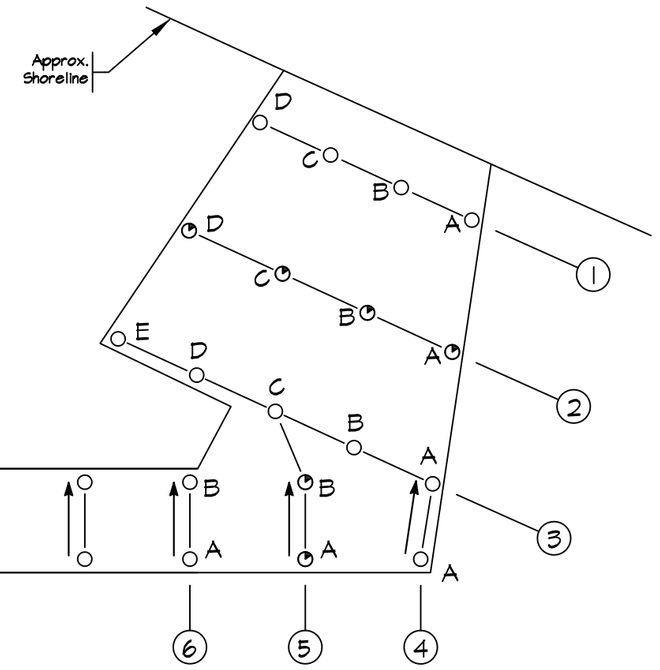


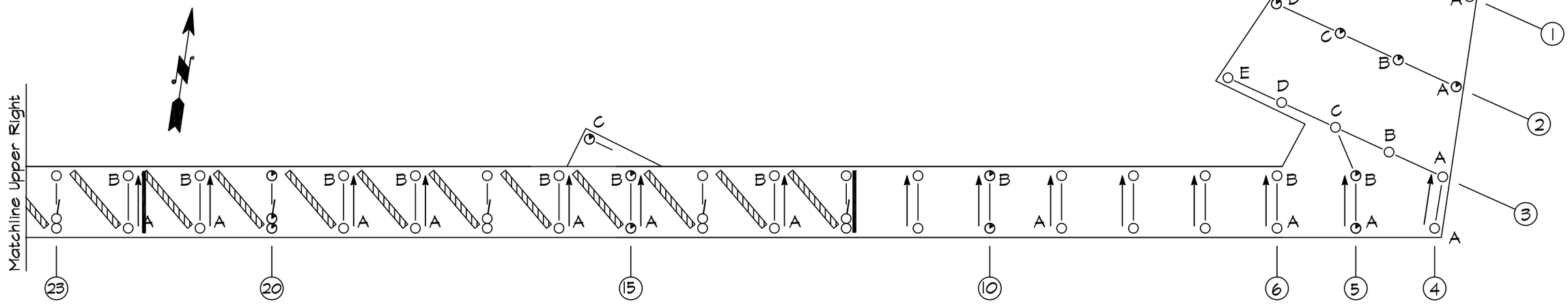
PHOTO No. 14: Bent 18, Row A Pile - Note the Level II cleaned condition of this thru-bolt. Inspection of the bolt found it have visible loss of section due as a result of corrosion, particularly in the threads.



PLAN

Bents 24-46





PLAN

Bents 1-23

LEGEND

- Bent Number
- Pile/Row ID
- Timber Pile - (Limited Inspection)
- Diagonal Brace (Arrowhead @ Bottom)
- Firewall
- Timber Wave Break
- 100% Remaining Cross Sectional Area
- 90% Remaining Cross Sectional Area
- 75% Remaining Cross Sectional Area
- 50% Remaining Cross Sectional Area
- 25% Remaining Cross Sectional Area
- 0% Remaining Cross Sectional Area

SCALE: Not To Scale

Reid Middleton, Inc.

PILE PLAN

City of Kirkland Parks
2nd Avenue South Pier

DATE:	July 2019
PROJECT:	19-2565D
SHEET:	1 of 1
DRAWN:	SDS / JDS

DATE	REVISION

ECHELON ENGINEERING, INC.
Civil/Marine Consulting Engineers
Lynnwood, Washington
Tel: (425) 672-8424

TABLE D-1 Second Avenue S. Pier
PILE INSPECTION DATA

PILE LOCATION		MEMBER RATING	CONDITION / DAMAGE	
Bent	Row		Elevation (Chart Datum)	Details / Remarks
2	A	90	Top / MDL	1% Biological Degradation
	B	90	Top / MDL	1% Biological Degradation
	C	90	Top / MDL	2% Biological Degradation
	D	90	Top / MDL	1% Biological Degradation
5	A	90	Top / MDL	1% Biological Degradation
	B	90	Top / MDL	1% Biological Degradation
10	A	90	Top / MDL	1% Biological Degradation
	B	90	Top / MDL	1% Biological Degradation
15	A	90	Top / MDL	1% Biological Degradation
	B	90	Top / MDL	1% Biological Degradation
15.7	C	90	Top	2% Fungal
			Top / MDL	1% Biological Degradation
20	A	90	Top / MDL	1% Biological Degradation
	A-Br	90	Top	1% Fungal
			Top / MDL	1% Biological Degradation
	B	90	Top / MDL	1% Biological Degradation
25	A	90	Top / MDL	1% Biological Degradation
	B	90	Top / MDL	2% Biological Degradation
30	A	90	Top / MDL	1% Biological Degradation
	B	90	Top / MDL	1% Biological Degradation
35	A	90	Top / MDL	1% Biological Degradation
	A-Br	90	Top / MDL	1% Biological Degradation
	B	90	Top / MDL	1% Biological Degradation
40	A	90	Top / MDL	1% Biological Degradation
	B	90	Top / MDL	1% Biological Degradation
45	A	90	Top / MDL	1% Biological Degradation
	B	90	Top / MDL	1% Biological Degradation

E. Settler's Landing Pier

Description of Structure

The Pier at Settler's Landing Park is a long narrow structure. Based on the information provided in the previous structure assessment report by others conducted in 2014, the pier extends perpendicular from the shore, to the west for approximately 185 LF. The Approachway is 6 feet in width and the Pierhead is 51 feet wide. There are two private mooring piers That extend off the south side of the approach. These sections of the pier are gated to prevent public access. One is located at the approximate mid-point of the pier and the second is at the western end. These private structures were not included in this investigation.

The piles are identified by a conventional bent and row system, with the bents in the Approachway numbered 1 through 16 from the east (shore) and the bents in the Pierhead numbered 17 through 21. Pile rows are identified alphabetically A and B in the Approach section and A - C in the Pierhead. The piles are of an average diameter of approximately 12 -14 inches and are treated.

Within the Approachway, the pile caps are 6x8 treated members with one timber located on bents without batter piles and two 6x8 cap timbers located in bents with batter piles. Stringers within this section of the structure are also 6x8 treated timbers. The decking is also treated timber. Within the Pierhead, the pile caps area combination of 4x8 and 6x8 treated members. Stringers within this section of the structure are 4x8 treated timbers. The decking is also treated timber.

Observed Conditions

The inspection of the Settler's Landing Pier was limited to a sample investigation of representative members. Given the time constraints dictated by the scope of the investigation the members were subjected primarily to Level I visual inspection with limited Level II cleaning and hammer sounding of suspect areas. Based on the inspection the overall condition of the structure is fair to good. The findings of the inspection are as follows:

Piles

1. The pier is supported by a total of 54 treated timber piles/posts. The overall condition of these piles was found to be fair to good.
2. The shoreward bent is supported with three-6x6 treated timber posts. All three of these posts bear directly on the rip rap shore protection. Refer to Photo Nos. 3 and 4.
3. Thirty-four piles (63.0%) have been rated in the 100% remaining area category with no evidence of any significant biological or mechanical damage or deterioration identified. Refer to Photo No. 6.

4. Ten piles (18.5%) have been rated in the 90% rating category. The majority of these piles were noted to have sustained minor biological deterioration or to have partial bearing conditions, or loose connection hardware. Refer to Photo Nos. 7, 8 and 9.

5. Five piles (9.3%) have been rated in the 75% rating category. These piles were all found to have partial bearing conditions due to uneven cuts at their tops resulting in the loss of ~25% of the bearing at the pile top / cap connection.

6. Three piles (5.6%) have been rated in the 50% rating category. These piles were all found to have partial bearing conditions due to uneven cuts at their tops resulting in the loss of ~50% of the bearing at the pile top / cap connection.

7. Two piles (3.7%) piles have been rated in the 0% category. These two piles were found to have partial or non-bearing conditions at their tops resulting in the loss of bearing at the pile top / cap connection.

8. One pile located at Bent 16, Row A was noted to have undergone a pile post repair. As shown in Photo No. 9, the upper portion of the pile has been cut off and replaced with a new section of timber pile. The sections of pile have been secured in place by steel splice plates. Inspection of the steel members found them to have sustained moderate surface corrosion and section loss. However, the splice was noted to be tight. Overall, the repair was found to be in good condition and the pile has been rated in the 90% category.

<u>Superstructure</u>

9. The overall condition of the pile caps was found to be good. These members are treated timbers. At several locations the caps were noted to have been notched to accommodate perimeter stringers. Overall, inspection found the caps to be free of any gross damage. No evidence of significant mechanical damage, fungal decay or other significant deterioration was identified. Refer to Photo No. 12. However, localized areas of weathering and minor fungal decay of the member surfaces and cut ends, was visible.

10. The overall condition of the stringers was found to be good. These members are treated timbers and were found to be free of gross damage. No evidence of significant mechanical damage, fungal decay or other significant deterioration was identified. Refer to Photo No. 2 and 3. However, localized areas of weathering and minor fungal decay of the member surfaces and cut ends, was visible.

11. Inspection of the under-surface of the deck planks found them to be in overall fair condition with weathering and minor fungal decay of the members bottom surface. No evidence of any gross damage to these members was identified below deck. Refer to Photo No. 2.

PHOTO No. 1: Settler's Landing Pier, Looking Southeast - The pier is constructed with treated timber piles, and superstructure, including pile caps, stringers, and decking. Note the boat moored to one of two privately owned moorage piers that extend to the south and were not included in the investigation.

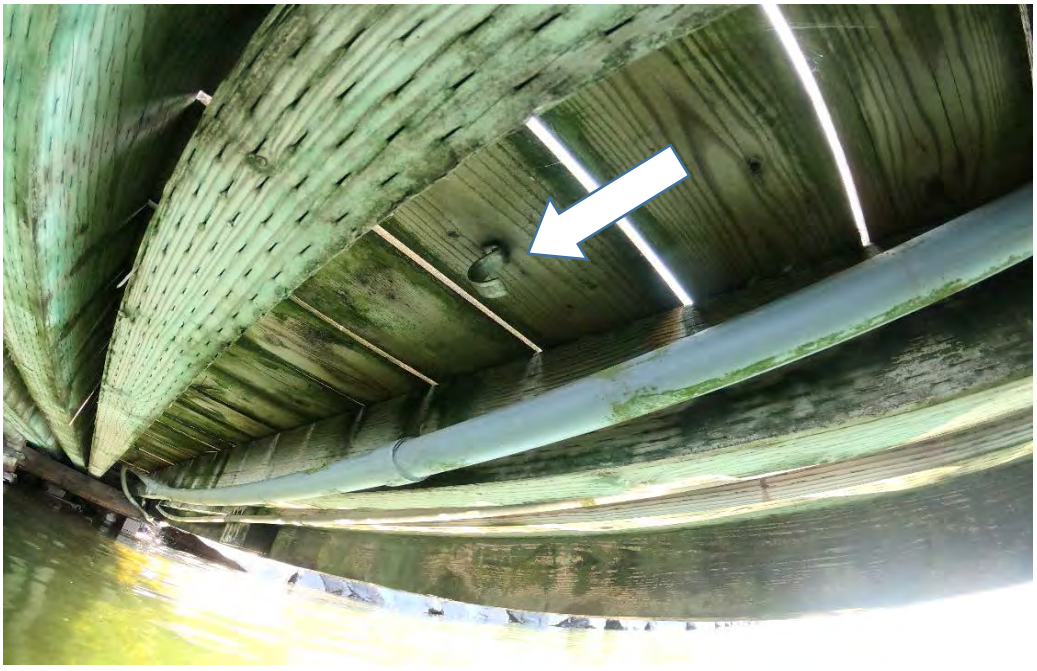


PHOTO No. 2: Bent 1 - 2, Looking East - Note the good condition of the Chemonite treated stringers and the under-surface of the deck planks which was typical throughout the pier. Also note the arrow showing a failed utility hangar.

PHOTO No. 3: Bent 1, Looking East - Note the three 6x6 posts supporting Bent 1 and the overall good condition of the superstructure members. Inspection of the posts found them to be in generally good condition but noted that all three are bearing directly on large rock. Additionally, the center, Row B post, was found to be non-bearing beneath the cap.

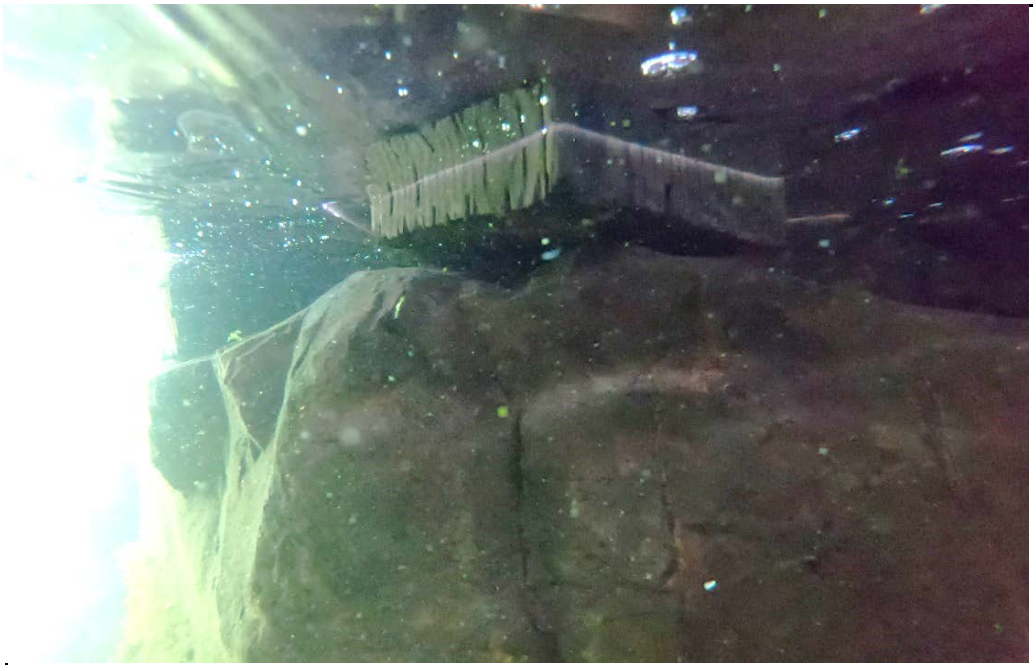


PHOTO No. 4: Bent 1, Row B Post - Note the post is only partially bearing on the shore protection rock. Also note the overall good condition of the post.

PHOTO No. 5: Bent 15, Row B Pile - Note partial bearing condition of the pile beneath the cap. Inspection noted that the protective metal cover on this pile is missing and the bearing has been estimated at 10%.

PHOTO No. 6: Bent 10, Row A Vertical and Batter Piles - Inspection noted the hardware securing the batter pile to the vertical pile to be in overall good condition with minor surface corrosion. Also note the arrow indicating remnants of the protective metal cover on the batter pile.

PHOTO No. 7: Bent 16, Row A Pile - Note moderate accumulation of algae on the pile, and the mudline. Also note the wheelchair which has been dumped off the pier. Investigation of the bottom found the bottom to be composed primarily of soft mud and silt at this location.

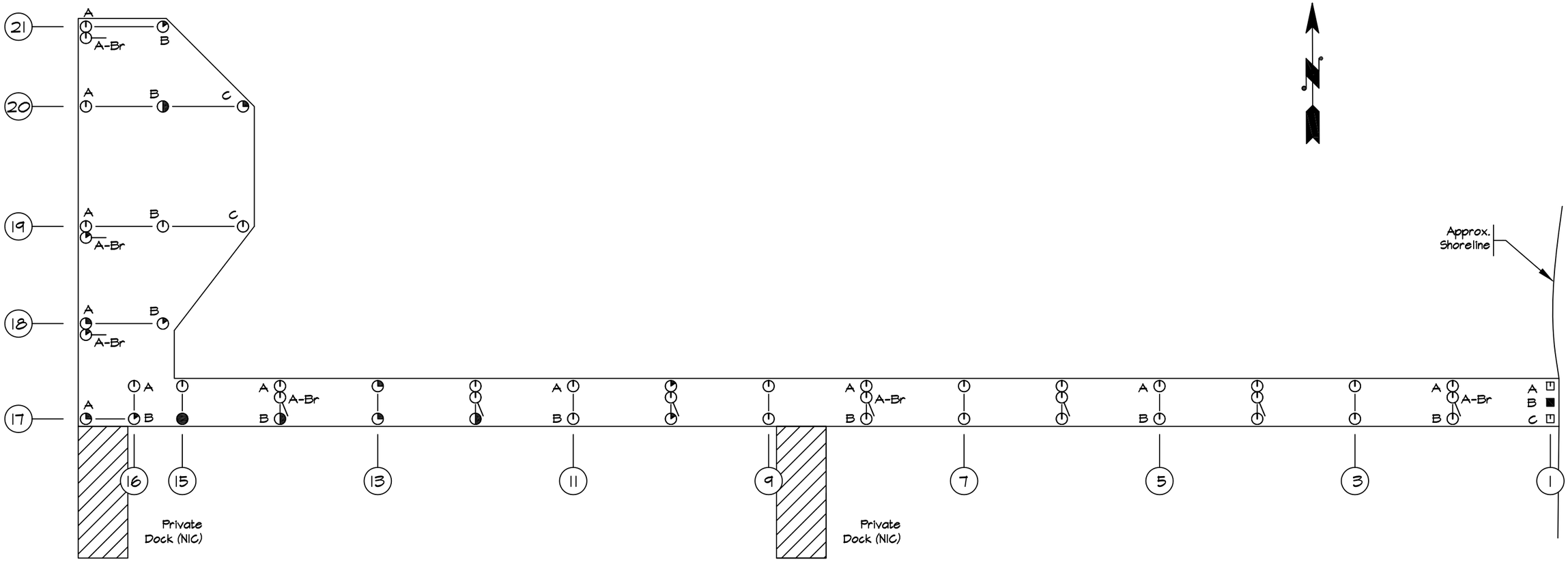
PHOTO No. 8: Bent 16, Row A Pile - Note the area of Level II cleaning which revealed an estimated 5% loss of section due to biological degradation. This type of minor section loss was found to be typical of the piles within the submerged zone.

PHOTO No. 9: Bent 18, Row A Batter Pile - Inspection noted this loose hardware securing the batter pile to the vertical pile. Several loose batter pile connections were identified throughout the structure. Additionally, no blocking was found on any of the batter piles throughout the pier, between the top of the piles and the superstructure.

PHOTO No. 10: Bent 16, Row A Pile Post Splice - Note the surface corrosion and pitting on the steel splice plate which secures the pile post connection. Overall, the plates and connection hardware were found to be tight and in overall fair condition.

PHOTO No. 11: Pierhead Framing, Looking North - Note the good condition of the treated superstructure timbers supporting the pierhead portion of the structure. Also note the good condition of the galvanized joist hangers used to secure the stringers.

PHOTO No. 12: Bent 15, Row A Cap - Note the notch in the cap to accommodate the perimeter stringer and maintain a constant deck elevation. The member was found to be in overall good condition with no evidence of any significant deterioration or damage.



PLAN

LEGEND

- (X) Bent Number
- X Pile/Row ID
- ○ Timber or Steel Pipe Pile
- ◔ 100% Remaining Cross Sectional Area
- ◔ 90% Remaining Cross Sectional Area
- ◔ 75% Remaining Cross Sectional Area
- ◑ 50% Remaining Cross Sectional Area
- ◕ 25% Remaining Cross Sectional Area
- ● 0% Remaining Cross Sectional Area

SCALE: Not To Scale

Reid Middleton, Inc.

PILE PLAN

City of Kirkland Parks
Settler's Landing Pier

DATE	REVISION

DATE: July 2019
PROJECT: 19-2565E
SHEET: 1 of 1
DRAWN: SDS / JDS

ECHELON ENGINEERING, INC.
Civil/Marine Consulting Engineers
Lynnwood, Washington
Tel: (425) 672-8424

2565E-Houghton-Shtl.dwg
7/16/2019 9:19 AM
SDS, Echelon Engineering, Inc.

TABLE E-1 Settler's Landing Pier
PILE INSPECTION DATA

PILE LOCATION		MEMBER RATING	CONDITION / DAMAGE	
Bent	Row		Elevation (Chart Datum)	Details / Remarks
1	A	90	Top / MDL	Square Treated Post
			MDL	Bearing on Rock
	B	0	Top / MDL	Square Treated Post
			Top	Non-Bearing (90% Remaining Area)
			MDL	Partial Bearing on Rock
	C	90	Top / MDL	Square Treated Post
			MDL	Bearing on Rock
2	A	100	Top / MDL	<1% Biological Degradation
	A-Br	100	Top / MDL	<1% Biological Degradation
	B	100	Top / MDL	<1% Biological Degradation
3	A	100	Top / MDL	<1% Biological Degradation
	B	100	Top / MDL	<1% Biological Degradation
4	A	100	Top / MDL	<1% Biological Degradation
	A-Br	100	Top / MDL	<1% Biological Degradation
	B	100	Top / MDL	<1% Biological Degradation
5	A	100	Top / MDL	<1% Biological Degradation
	B	100	Top / MDL	<1% Biological Degradation
6	A	100	Top / MDL	<1% Biological Degradation
	A-Br	100	Top / MDL	<1% Biological Degradation
	B	100	Top / MDL	<1% Biological Degradation
7	A	100	Top / MDL	<1% Biological Degradation
	B	100	Top / MDL	<1% Biological Degradation
8	A	100	Top / MDL	<1% Biological Degradation
	A-Br	100	Top / MDL	<1% Biological Degradation
	B	100	Top / MDL	<1% Biological Degradation
9	A	100	Top / MDL	<1% Biological Degradation
	B	100	Top / MDL	<1% Biological Degradation
10	A	90	Top	90% Bearing (Misaligned w/ Cap)
			Top / MDL	<1% Biological Degradation
	A-Br	100	Top / MDL	<1% Biological Degradation
	B	90	Top / MDL	1% Biological Degradation
11	A	100	Top / MDL	<1% Biological Degradation
	B	100	Top / MDL	<1% Biological Degradation

TABLE E-1 Settler's Landing Pier
PILE INSPECTION DATA

PILE LOCATION		MEMBER RATING	CONDITION / DAMAGE	
			Elevation (Chart Datum)	Details / Remarks
Bent	Row			
12	A	100	Top / MDL	<1% Biological Degradation
	A-Br	100	Top / MDL	<1% Biological Degradation
	B	50	Top	50% Bearing (Due to Uneven Cut);
				(100% Remaining Area)
			Top / MDL	<1% Biological Degradation
13	A	75	Top	75% Bearing (Due to Uneven Cut);
				(100% Remaining Area)
			Top / MDL	<1% Biological Degradation
	B	75	Top	75% Bearing (Due to Uneven Cut);
				(100% Remaining Area)
			Top / MDL	<1% Biological Degradation
14	A	100	Top / MDL	<1% Biological Degradation
	A-Br	100	Top / MDL	<1% Biological Degradation
	B	50	Top	50% Bearing (Due to Uneven Cut);
				(100% Remaining Area)
			Top / MDL	<1% Biological Degradation
15	A	100	Top / MDL	<1% Biological Degradation
	B	0	Top	10% Bearing (Due to Uneven Cut);
				(100% Remaining Area)
			Top / MDL	<1% Biological Degradation
16	A	90	Top / MDL	2% Biological Degradation; Timber Pile Post
			-5'	Splice w/ Steel Splice Plates, Thru-Bolted; Heavy Corrosion
	B	90	Top	90% Bearing (Due to Uneven Cut);
				(100% Remaining Area)
			Top / MDL	<1% Biological Degradation
17	A	75	Top	75% Bearing (Due to Uneven Cut);
				(100% Remaining Area)
			Top / MDL	<1% Biological Degradation

TABLE E-1 Settler's Landing Pier
PILE INSPECTION DATA

PILE LOCATION		MEMBER RATING	CONDITION / DAMAGE	
Bent	Row		Elevation (Chart Datum)	Details / Remarks
18	A	75	Top	75% Bearing (Due to Uneven Cut);
				(100% Remaining Area)
	A-Br	90	Top	Connection Hardware Loose
			Top / MDL	<1% Biological Degradation
	B	90	Top / MDL	<1% Biological Degradation
			-25'	<1% Mechanical
19	A	100	Top / MDL	<1% Biological Degradation
	A-Br	90	Top	Connection Hardware Loose
			Top / MDL	<1% Biological Degradation
	B	100	Top / MDL	<1% Biological Degradation
	C	100	Top / MDL	<1% Biological Degradation
20	A	100	Top / MDL	<1% Biological Degradation
	B	50	Top	50% Bearing (Due to Uneven Cut);
				(100% Remaining Area)
			Top / MDL	<1% Biological Degradation
	C	75	Top	75% Bearing (Due to Uneven Cut);
				(100% Remaining Area)
			Top / MDL	<1% Biological Degradation
21	A	100	Top / MDL	<1% Biological Degradation
	A-Br	100	Top / MDL	<1% Biological Degradation
	B	90	Top	90% Bearing (Due to Uneven Cut);
				(100% Remaining Area)
			Top / MDL	<1% Biological Degradation

F. Marsh Park Pier

Description of Structure

The Marsh Park Pier is a relatively short structure. Based on the information provided in the previous structure assessment report by others conducted in 2014, the pier extends perpendicular from the shore, to the west for approximately 95 LF. The Approachway is 12 feet in width and the Pierhead is 20 feet wide. The piles are identified by a conventional bent and row grid system, with the bents numbered 1 through 10 from the east (shore) and the rows identified alphabetically A and B in the Approach section and A - C in the Pierhead. The structure also contains two driven piles which extend above the deck with one acting as a light post and the other as a sign post. The piles have an average diameter of approximately 12 -14 inches and are treated. The pile caps are 12x12 treated members. The stringers are 3x10 treated timbers and the deck planks are 2x8's which also appear to be treated.

Observed Conditions

The inspection of the Marsh Park Pier was limited to a sample investigation of representative members. Given the time constraints dictated by the scope of the investigation, the members were subjected primarily to Level I visual inspection with limited Level II cleaning and hammer sounding of suspect areas. Based on the inspection the overall condition of the structure is fair to good. The findings of the inspection are as follows:

Piles

21. The shoreward bent or sill was not accessible to inspection due to the presence of shore protection rip rap. Refer to Photo No. 4.

22. The accessible portion of the pier is supported by a total of 23 treated timber piles. It also contains two timber posts that extend above the deck. These two posts are driven piles. The overall condition of the piles within the pier was found to be good.

23. Fourteen piles (56.0%) have been rated in the 100% classification with no evidence of any significant biological or mechanical damage or deterioration identified. Refer to Photo No. 3.

24. Nine piles (36.0%) have been rated in the 90% rating category due to minor biological deterioration. Refer to Photo Nos. 6 – 8.

25. Two piles (8.0%) have been rated in the 0% category due to gaps between the pile top and the cap rendering them non- bearing. Both of these piles could be restored to full or near full capacity by the addition of shims or other method to restore bearing. Refer to Photo Nos. 3 and 5.

Superstructure

26. The overall condition of the pile caps was found to be fair to good. These members are treated timbers and were found to be primarily free of gross damage. No evidence of significant mechanical damage, fungal decay or other significant deterioration was identified. Refer to Photo No. 3. However, localized areas of weathering and minor fungal decay of the member surfaces and cut ends, was visible.

27. The overall condition of the stringers was found to be fair to good. These members are treated timbers and were found to be primarily free of gross damage. No evidence of significant mechanical damage, fungal decay or other significant deterioration was identified. Refer to Photo No. 3 and 4. However, localized areas of weathering and minor fungal decay of the member surfaces and cut ends, was visible.

28. Visual inspection was inconclusive, however, it is believed that the deck planks are treated members. The overall condition of the under-surface of the timber decking was found to be fair with weathering and minor fungal decay of the members bottom surface.

PHOTO No. 1: Marsh Park Pier, Looking Southeast - The structure is supported by treated timber piles and treated superstructure members. Note the two piles which extend above the deck. These are driven piles which act as a light post and sign post.

PHOTO No. 2: Marsh Park Pier, Looking West - Note the lower level portion of the deck which provides easier access from moored vessels. Also note the sign post and light pose, as well as the weathered timber deck planks.

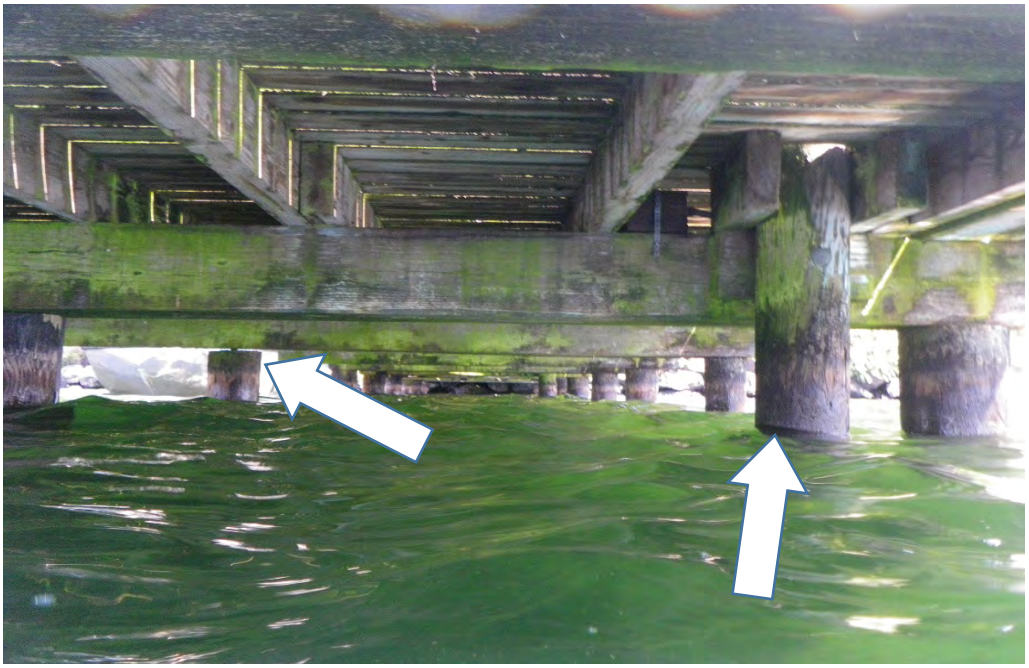


PHOTO No. 3: Bent 10, Looking East- Note the overall good condition of the piles and superstructure members, with minor water staining and algae growth. Also note the right arrow indicating the Bent 9.1 light post and the left arrow indicating the non-bearing condition of the Bent 8, Row B pile.

PHOTO No. 4: Bent 1-2, Looking Southeast - Inspection of the shore support was limited due to the rip rap along the shore. The accessible stringers and undersurface of the deck timbers were found to be in overall good condition with minor algae growth and water staining.

PHOTO No. 5: Bent 8, Row B Pile - Note the gap between the pile top and the cap, as well as the drift pin which is visible. Also note the algae growth on the pile top and cap. Level II cleaning of representative areas found the underlying timber to be in overall good condition with weathering and minor biological degradation.

PHOTO No. 6: Bent 10, Row C Pile - Note the insect damage which was found to extend from the top of the pile down to low water. Minor biological degradation of the pile surface was also noted. This deterioration was found to extend from the pile top to the mudline. Also note the swim ladder to the left of the pile which is attached to the end of the pier.

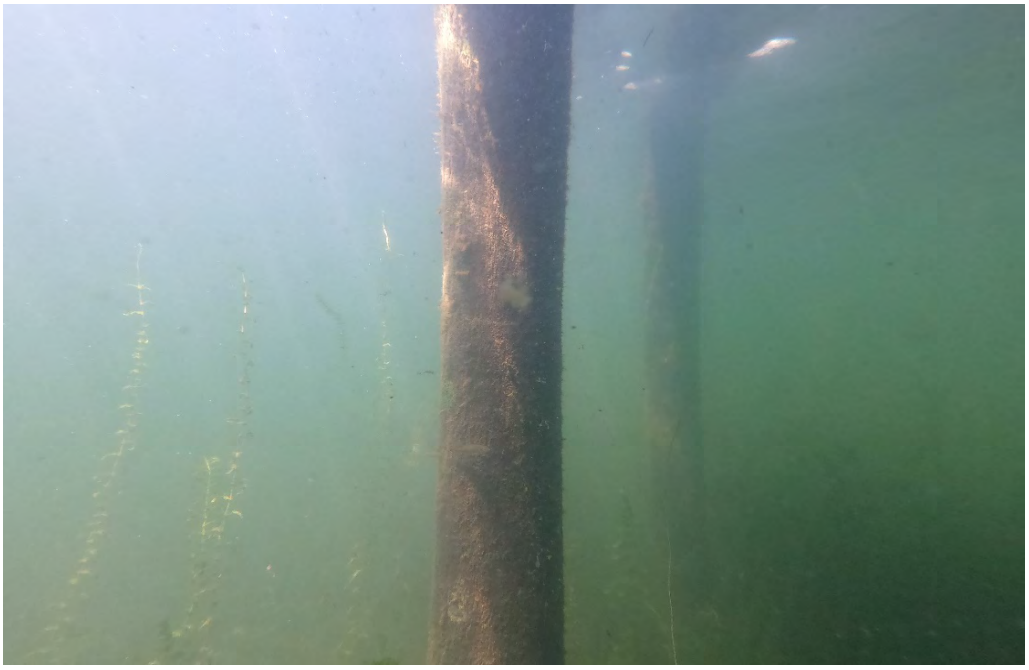
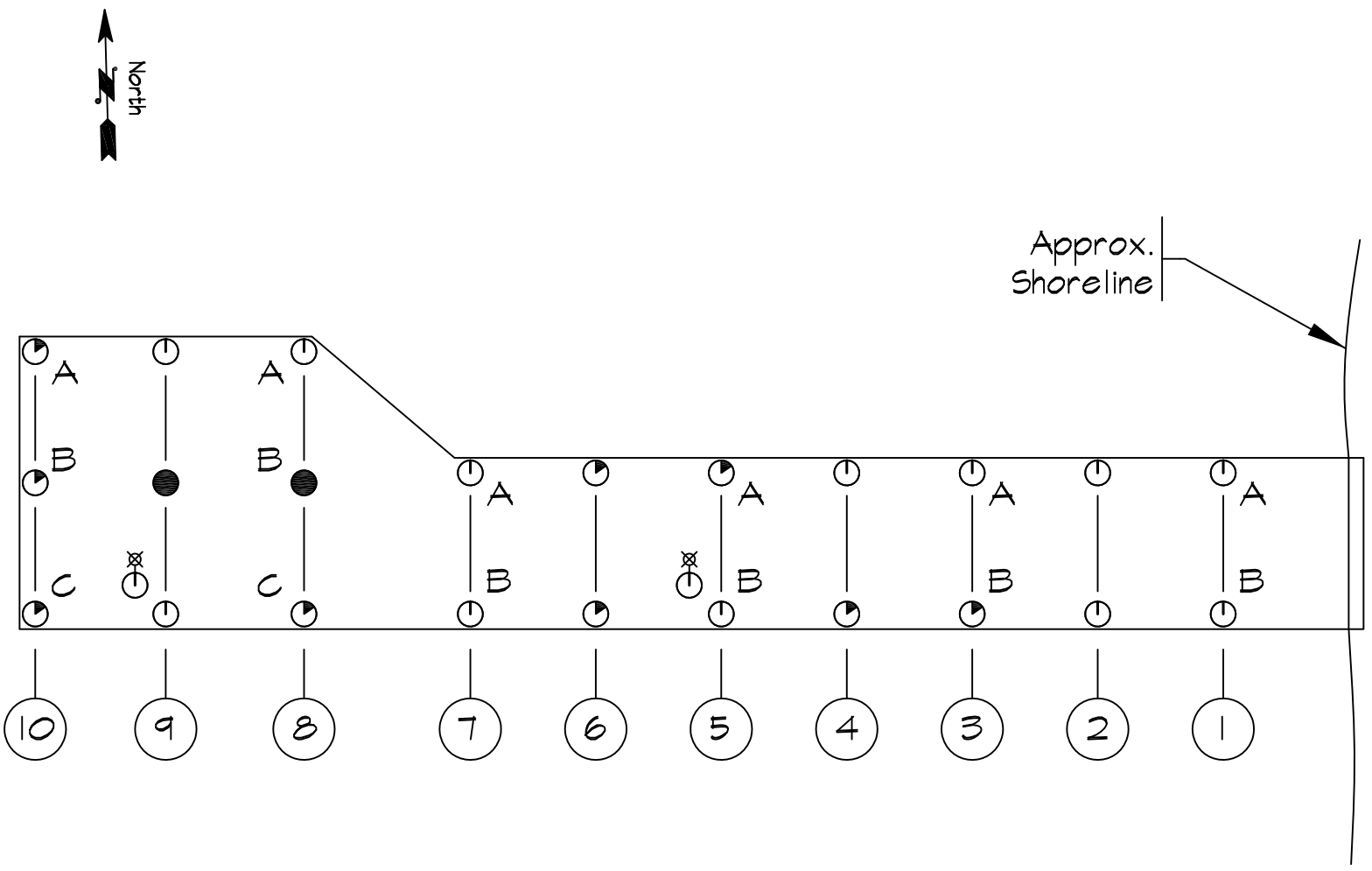


PHOTO No. 7: Bent 10, Row B Pile - Note the overall good condition and light algae growth on the pile in the submerged zone. This was found to be typical of the piles supporting the structure.

PHOTO No. 8: Bent 9, Row B Pile - Note the overall good condition of the pile with light algal growth. Level II cleaning of the pile found the timber to be in overall good condition with minor biological degradation of the surface. Also note the fresh water clam shells and the soft, silty sand which comprises the lake bottom in the vicinity of the pier.



LEGEND

- Bent Number
- Pile/Row ID
- Timber Pile
- Pile Cap
- Light / Sign Post (Driven Pile)

- 100% Remaining Cross Sectional Area
- 90% Remaining Cross Sectional Area
- 75% Remaining Cross Sectional Area
- 50% Remaining Cross Sectional Area
- 25% Remaining Cross Sectional Area
- 0% Remaining Cross Sectional Area

PLAN

SCALE: Not To Scale

Reid Middleton, Inc.

PILE PLAN

City of Kirkland Parks
Marsh Park Pier

DATE: July 2019
PROJECT: 19-2565P
SHEET: 1 of 1
DRAWN: SDS / JDS

DATE	REVISION

ECHELON ENGINEERING, INC.
Civil/Marine Consulting Engineers
Lynnwood, Washington
Tel: (425) 672-8424

TABLE F-1 Marsh Park Pier
PILE INSPECTION DATA

PILE LOCATION		MEMBER RATING	CONDITION / DAMAGE	
			Elevation (Chart Datum)	Details / Remarks
Bent	Row			
1	A	100	Top / MDL	<1% Biological Degradation
	B	100	Top / MDL	<1% Biological Degradation
2	A	100	Top / MDL	<1% Biological Degradation
	B	100	Top / MDL	<1% Biological Degradation
3	A	100	Top / MDL	<1% Biological Degradation
	B	90	Top / MDL	1% Biological Degradation
4	A	100	Top / MDL	<1% Biological Degradation
	B	90	Top / MDL	1% Biological Degradation
5	A	90	Top / MDL	1% Biological Degradation
	B	100	Top / MDL	<1% Biological Degradation
5.1	A.8	100		Sign Post (Driven Pile)
			Top / MDL	<1% Biological Degradation
6	A	90	Top / MDL	1% Biological Degradation
	B	90	Top / MDL	1% Biological Degradation
7	A	100	Top / MDL	<1% Biological Degradation
	B	100	Top / MDL	<1% Biological Degradation
8	A	100	Top / MDL	<1% Biological Degradation
	B	0	Top	Non-Bearing (100% Remaining Area)
			Top / MDL	<1% Biological Degradation
	C	90	Top / MDL	1% Biological Degradation
9	A	100	Top / MDL	<1% Biological Degradation
	B	0	Top	Non-Bearing (100% Remaining Area)
			Top / MDL	<1% Biological Degradation
	C	100	Top / MDL	<1% Biological Degradation
9.1	B.8	100		Lamp Post (Driven Pile)
			Top / MDL	<1% Biological Degradation
10	A	90	Top / MDL	1% Biological Degradation
	B	90	Top / MDL	1% Biological Degradation
	C	90	Top Dn 3'	Insect Damage
			Top / MDL	2% Biological Degradation

G. Houghton Beach Park Pier

Description of Structure

The Houghton Beach Park facility is comprised of a fixed pier structure. The Park's fixed swim platform, which was noted in the previous consultant's report, has apparently been removed and was therefore not included in this investigation. Based on the information provided in the previous structure assessment report by others conducted in 2014, the pier extends perpendicular from the shore, to the west for approximately 250 LF. The shoreward end of the pier is irregularly shaped and provides a deck platform for shallow water access. The Approachway extends to a small irregularly shaped Pierhead at the west, offshore end. The piles are identified by a conventional bent and row system, with the bents numbered 1 through 33 from the east (shore) and the rows identified alphabetically from the north or west end of the bent. The piles have an average diameter of approximately 12 -14 inches and are treated. The pile caps are 10x12 treated members. The stringers are 4x10 treated timbers and the deck is a composite plastic grate system.

Observed Conditions

The inspection of the Houghton Beach Pier was limited to a sample investigation of representative members. Given the time constraints dictated by the scope of the investigation the members were subjected primarily to Level I visual inspection with limited Level II cleaning and hammer sounding of suspect areas. Based on the inspection the overall condition of the structure is fair to poor. The findings of the inspection are as follows:

Piles

29. One of the two piles in the shoreward most bent, was not accessible to inspection due to limited access conditions.

30. The pier is supported by a total of 83 treated timber piles. The overall condition of these piles was found to be poor.

31. Twenty-seven piles (32.9%) have been rated in the 90% classification due to minor biological degradation or mechanical damage.

32. Six piles (7.3%) have been rated in the 75% rating category. One of these piles has sustained moderate levels of biological degradation with the loss of 15% of its cross section. The remaining five piles have been down rated due to partial bearing issues under the cap.

33. Six piles (7.3%) have been rated in the 50% rating category. All of these piles have been down rated due to partial bearing issues under the cap. Shimming of these piles would restore them to full or near full capacity.

34. Six piles (7.3%) have been rated in the 25% rating category. One of these piles has sustained heavy levels of biological degradation with the loss of 75% of its cross section. The remaining five piles have been down rated due to partial bearing issues under the cap. With the exception of the pile that has sustained heavy damage, shimming of these piles would restore them to full or near full capacity.

35. Thirty-seven (45.2%) piles have been rated in the 0% category. Nine of these piles have sustained heavy biological degradation with 50-90% loss of section, these piles are located in the two western most Bents 32 and 33. The remaining 28 piles have sustained minor to moderate biological degradation and/or fungal decay. Many of them have been down rated due to partial or non-bearing conditions under the cap. Shimming of these partial or non-bearing piles with minimal damage, would restore near full capacity. Refer to Photo Nos. 3 and 9.

Diagonal Braces

36. Two sets of longitudinal braces were found spanning Bents 14 to 15 and Bents 24 to 25. The overall condition of these diagonal members was found to be good. These braces are treated timbers and were found to be undamaged with minor biological degradation. Investigation of the attachment hardware that secure them to the piles found the thru-bolts to be in generally good condition with light to moderate surface corrosion. Refer to Photo Nos. 5 and 6.

Superstructure

37. The overall condition of the pile caps was found to be fair. These members are treated timbers and were found to be primarily free of gross damage. However, several cap timbers were noted to have sustained significant damage. Refer to Photo Nos. 7 and 8. They are as follows:

    - Bent 6, West End – 50% Fungal in to Row A.1
    - Bent 11, West End – 25-30% Fungal
    - Bent 13, North End – 75-90% Fungal in to Row A
    - Bent 14, North End – 10% Mechanical @ Row A
    - Bent 32, South End – 50% Fungal
    - Bent 33, South End – 25-50% Fungal

    No other evidence of significant mechanical damage, fungal decay or other significant deterioration was identified. Refer to Photo No. 3. However, localized areas of weathering and minor fungal decay of the member surfaces and cut ends, was visible.

38. The overall condition of the stringers was found to be good. These members are treated timbers and were found to be primarily free of gross damage. However, one stringer was noted to have sustained moderate damage.

- Bent 7-8, Interior Stringer – 10% Mechanical / Fungal @ Row 7.2

No other evidence of significant mechanical damage, fungal decay or other significant deterioration to the stringers was identified. Refer to Photo Nos, 9 and 10.

39. The original deck on the pier has been replaced by a composite or plastic grating. The original deck on the pier has been replaced by a composite or plastic grating. The under-surface of the grate was observed to be in good condition with no evidence of deterioration or damage found. Additionally, no significant damage was noted to the multiple treated framing timbers or attachment hardware used to secure the grate and match the original deck height. Refer to Photo No. 2.

PHOTO No. 1: Houghton Beach Pier, Looking Southeast - Note the swim ladder located on the north side of the on the Pierhead. The structure is constructed using timber substructure piles, caps and stringers with a plastic grate decking.

PHOTO No. 2: Approachway, Looking East - Note that use of plastic grate decking and the differing colors. Also note the overall good condition of the deck.

PHOTO No. 3:

Bent 33, Row A Pile - Inspection identified an number of piles in the outer portion of the structure which have sustained significant fungal decay at their tops which has contributed to non-bearing conditions. Note the deteriorated 2x4 shim which is providing minimal bearing at this connection. Also note the drift pin and the irregular surface of the pile top.

PHOTO No. 4: Bent 33, Row A Pile - Note overall good condition of the pile in the submerged zone. Also note the light algae growth on the pile's surface. This was found to be typical of the piles supporting the structure.

PHOTO No. 5: Bent 15, Row A Pile - Note the 3x10 treated diagonal brace timber attached to the pile at the mudline. Inspection found the brace timbers to be in generally good condition with minor biological degradation of the timber surface and minor to moderate corrosion on the attachment hardware.

PHOTO No. 6: Bent 15, Row A Pile - Note the overall good condition of the timber pile and diagonal brace. Also note the arrow indicating the end of the thru-bolt securing the brace to the pile which was note to have minor to moderate surface corrosion.

PHOTO No. 7: Bent 33, Row E Pile - Note the screwdriver inserted into a fungal cavity in the end of the pile cap. Inspection estimated a loss of 50% of the member's cross sectional area due to the damage which extends in to the pile top.

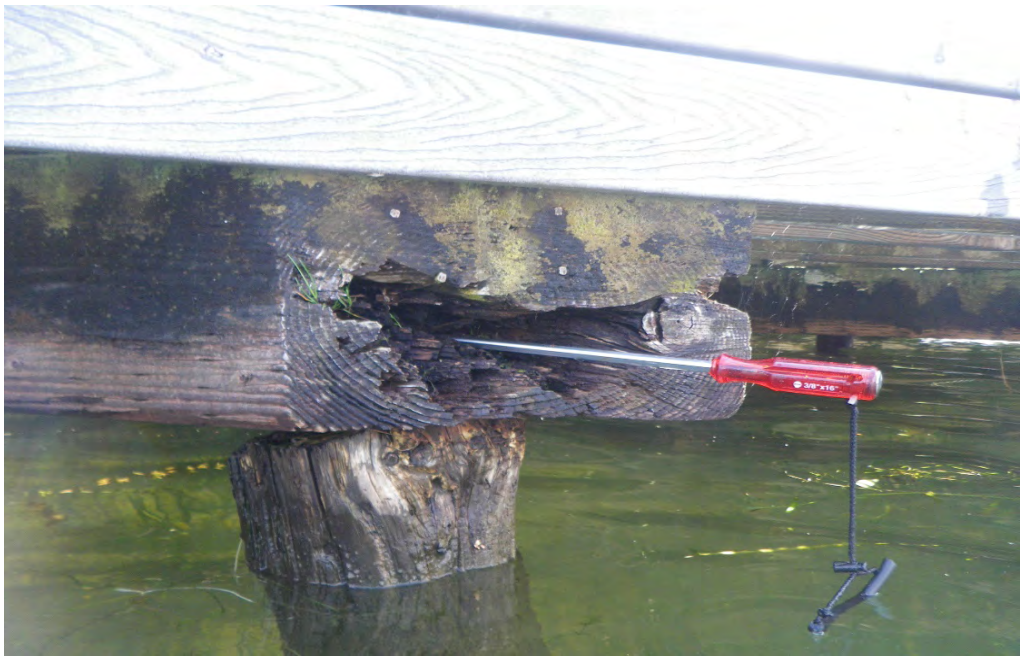


PHOTO No. 8: Bent 6, Row A Pile - Note the screwdriver inserted into the end of this cap timber. Inspection found the pile top and the cap to have sustained significant deterioration due to fungal damage resulting in an estimated 50% loss of section to the cap and a non-bearing condition at the pile top connection.

PHOTO No. 9: Bent 32, Looking Southeast - Note the multiple bearing issues at the pile top / cap connections for the substructure piles in this bent. Inspection noted significant deterioration of the tops of these piles. Inspection also noted that shims in several locations are missing or are providing only partial bearing. Also note the generally good condition of the superstructure members with weathering, algae, and water staining.

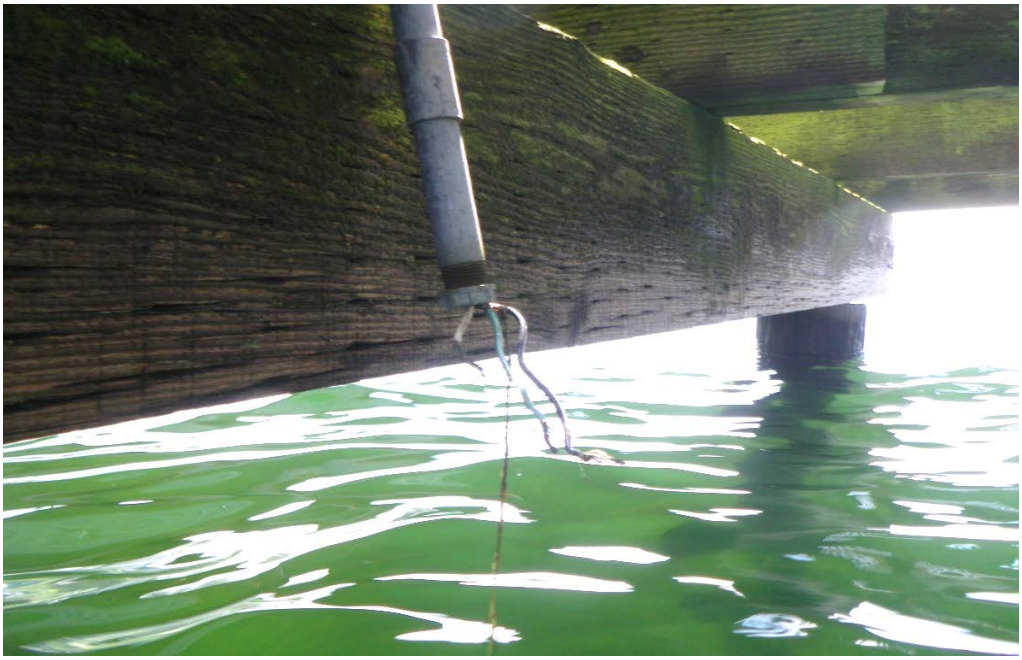
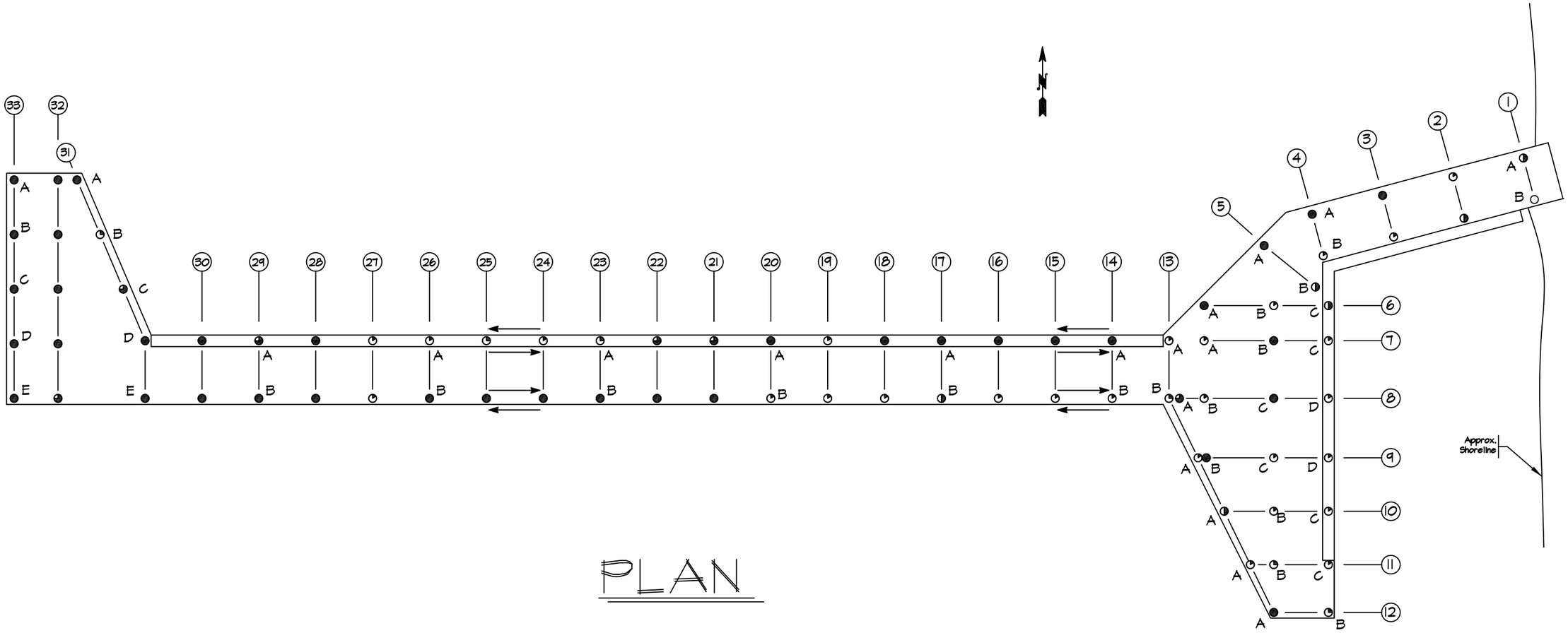


PHOTO No. 10: Bent 26, West Side, Looking South - Note the typical good condition of the treated cap and stringers in the central portion of the structure. Also note the broken electrical conduit hanging down with exposed wires.



PLAN

LEGEND

- Bent Number
- Pile/Row ID
- Timber Pile
- Diagonal Brace (Arrowhead @ Bottom)
- 100% Remaining Cross Sectional Area
- 90% Remaining Cross Sectional Area
- 75% Remaining Cross Sectional Area
- 50% Remaining Cross Sectional Area
- 25% Remaining Cross Sectional Area
- 0% Remaining Cross Sectional Area

SCALE: Not To Scale

Reid Middleton, Inc.

PILE PLAN

City of Kirkland Parks
Houghton Beach Pier

DATE: July 2019
PROJECT: 19-25656
SHEET: 1 of 1
DRAWN: SDS / JDS

DATE	REVISION

ECHELON ENGINEERING, INC.
Civil/Marine Consulting Engineers
Lynnwood, Washington
Tel: (425) 672-8424

TABLE G-1 Houghton Beach Pier
PILE INSPECTION DATA

PILE LOCATION		MEMBER RATING	CONDITION / DAMAGE	
Bent	Row		Elevation (Chart Datum)	Details / Remarks
1	A	50	Top	50% Bearing (100% Remaining Area)
	B	---		Buried
2	A	90	Top / MDL	5% Biological Degradation
	B	50	Top	50% Bearing (90% Remaining Area)
			Top / MDL	5% Biological Degradation
3	A	0	Top	10% Bearing (90% Remaining Area)
			Top / MDL	5% Biological Degradation
	B	90	Top / MDL	5% Biological Degradation
4	A	0	Top	Non-Bearing (90% Remaining Area)
			Top / MDL	5% Biological Degradation
	B	90	Top / MDL	2% Biological Degradation
5	A	0	Top	Non-Bearing (90% Remaining Area)
			Top / MDL	5% Biological Degradation
	B	50	Top	50% Bearing (90% Remaining Area)
			Top / MDL	2% Biological Degradation
6	A	0	Top	10% Bearing (75% Remaining Area);
				15% Fungal
			Top / MDL	5% Biological Degradation
	B	90	Top / MDL	2% Biological Degradation
	C	50	Top	50% Bearing (90% Remaining Area)
			Top / MDL	2% Biological Degradation
7	A	90	Top / MDL	5% Biological Degradation
	B	0	Top	5% Bearing (90% Remaining Area)
			Top / MDL	2% Biological Degradation
	C	90	Top / MDL	5% Biological Degradation
8	A	25	Top Dn 3'	75% Fungal; Offset From Cap-Side Bolted
	B	90	Top / MDL	5% Biological Degradation
	C	0	Top	Non-Bearing (90% Remaining Area)
			Top / MDL	5% Biological Degradation
	D	90	Top / MDL	10% Biological Degradation
9	A	90	Top / MDL	1% Biological Degradation
	B	0	Top	10% Bearing (90% Remaining Area)
			Top / MDL	2% Biological Degradation
	C	90	Top / MDL	5% Biological Degradation
	D	90	Top / MDL	1% Biological Degradation

TABLE G-1 Houghton Beach Pier
PILE INSPECTION DATA

PILE LOCATION		MEMBER RATING	CONDITION / DAMAGE	
			Elevation (Chart Datum)	Details / Remarks
Bent	Row			
10	A	50	Top	50% Bearing (90% Remaining Area)
			Top / MDL	2% Biological Degradation
	B	90	Top / MDL	2% Biological Degradation
	C	90	Top / MDL	2% Biological Degradation
11	A	90	Top / MDL	2% Biological Degradation
	B	75	Top	75% Bearing (90% Remaining Area)
			Top / MDL	5% Biological Degradation
	C	90	Top / MDL	5% Biological Degradation
12	A	0	Top	10% Bearing (90% Remaining Area)
			Top / MDL	5% Biological Degradation
	B	75	Top	75% Bearing (90% Remaining Area)
			Top / MDL	2% Biological Degradation
13	A	90	Top / MDL	1% Biological Degradation
			MDL	5% Abrasion
	B	75	Top / MDL	15% Biological Degradation
14	A	0	Top	5% Bearing (90% Remaining Area)
			Top / MDL	2% Biological Degradation
	B	90	Top / MDL	5% Biological Degradation
15	A	0	Top	5% Bearing (90% Remaining Area);
				5% Biological Degradation
			Top / MDL	1% Biological Degradation
	B	90	Top / MDL	1% Biological Degradation
16	A	0	Top	10% Bearing (90% Remaining Area);
			Top / MDL	1% Biological Degradation
	B	90	Top	10% Biological Degradation
			Top / MDL	1% Biological Degradation
17	A	0	Top	5% Bearing (90% Remaining Area)
			Top / MDL	2% Biological Degradation
	B	50	Top	50% Bearing (75% Remaining Area);
				25% Fungal
			Top / MDL	1% Biological Degradation
18	A	0	Top	10% Bearing (90% Remaining Area)
			Top / MDL	2% Biological Degradation
	B	90	Top / MDL	2% Biological Degradation

TABLE G-1 Houghton Beach Pier
PILE INSPECTION DATA

PILE LOCATION		MEMBER RATING	CONDITION / DAMAGE	
Bent	Row		Elevation (Chart Datum)	Details / Remarks
19	A	90	Top / MDL	2% Biological Degradation
	B	90	Top / MDL	2% Biological Degradation
20	A	0	Top	10% Bearing (75% Remaining Area);
				25% Biological Degradation
			Top / MDL	1% Biological Degradation
	B	90	Top / MDL	2% Biological Degradation
21	A	25	Top	25% Bearing (90% Remaining Area)
			Top / MDL	2% Biological Degradation
	B	0	Top	10% Bearing (90% Remaining Area)
			Top / MDL	1% Biological Degradation
22	A	25	Top	25% Bearing (90% Remaining Area)
			Top / MDL	2% Biological Degradation
	B	0	Top	10% Bearing (90% Remaining Area)
			Top / MDL	1% Biological Degradation
23	A	75	Top	75% Bearing (90% Remaining Area)
			Top / MDL	2% Biological Degradation
	B	0	Top	Non-Bearing (90% Remaining Area)
			Top / MDL	2% Biological Degradation
24	A	90	Top / MDL	2% Biological Degradation
	B	0	Top	10% Bearing (90% Remaining Area)
			Top / MDL	2% Biological Degradation
25	A	75	Top	75% Bearing (90% Remaining Area)
			Top / MDL	5% Biological Degradation
	B	0	Top	Non-Bearing (90% Remaining Area)
			Top / MDL	1% Biological Degradation
26	A	90	Top / MDL	2% Biological Degradation
	B	0	Top	5% Bearing (90% Remaining Area)
			Top / MDL	5% Biological Degradation
27	A	90	Top / MDL	2% Biological Degradation
	B	90	Top / MDL	1% Biological Degradation
28	A	0	Top	10% Bearing (90% Remaining Area)
			Top / MDL	5% Biological Degradation
	B	0	Top	Non-Bearing (90% Remaining Area)
			Top / MDL	2% Biological Degradation

TABLE G-1 Houghton Beach Pier
PILE INSPECTION DATA

PILE LOCATION		MEMBER RATING	CONDITION / DAMAGE	
			Elevation (Chart Datum)	Details / Remarks
Bent	Row			
29	A	25	Top	25% Bearing (90% Remaining Area)
			Top / MDL	2% Biological Degradation
	B	0	Top	5% Bearing (90% Remaining Area)
			Top / MDL	2% Biological Degradation
30	A	0	Top	10% Bearing (90% Remaining Area)
			Top / MDL	1% Biological Degradation
	B	0	Top	5% Bearing (90% Remaining Area);
				5% Biological Degradation
			Top / MDL	1% Biological Degradation
31	A	0	Top	Non-Bearing (90% Remaining Area)
			Top / MDL	2% Biological Degradation
	B	75	Top	75% Bearing (90% Remaining Area)
			Top / MDL	1% Biological Degradation
	C	25	Top	25% Bearing (90% Remaining Area)
			Top / MDL	1% Biological Degradation
	D	0	Top	10% Bearing (90% Remaining Area)
			Top / MDL	2% Biological Degradation
	E	0	Top	10% Bearing (90% Remaining Area)
			Top / MDL	2% Biological Degradation
32	A	0	Top	Non-Bearing (25% Remaining Area);
				50-90% Fungal; Shims Missing
			Top / MDL	2% Biological Degradation
	B	0	Top	Non-Bearing (25% Remaining Area);
				50-90% Fungal; Shims Missing
			Top / MDL	2% Biological Degradation
	C	0	Top	Non-Bearing (25% Remaining Area);
				50-90% Fungal; Shims Missing
			Top / MDL	2% Biological Degradation
	D	0	Top	Non-Bearing (25% Remaining Area);
				50-90% Fungal; Shims Missing
			Top / MDL	2% Biological Degradation
	E	25	Top	25% Bearing (25% Remaining Area)
				50-90% Fungal; Shims Missing
			Top / MDL	2% Biological Degradation

TABLE G-1 Houghton Beach Pier
PILE INSPECTION DATA

PILE LOCATION		MEMBER RATING	CONDITION / DAMAGE	
Bent	Row		Elevation (Chart Datum)	Details / Remarks
33	A	0	Top	Non-Bearing (25% Remaining Area);
				50-90% Fungal; Shims Missing
			Top / MDL	2% Biological Degradation
	B	0	Top	Non-Bearing (25% Remaining Area);
				50-90% Fungal; Shims Missing
			Top / MDL	2% Biological Degradation
	C	0	Top	Non-Bearing (25% Remaining Area);
				50-90% Fungal; Shims Missing
			Top / MDL	2% Biological Degradation
	D	0	Top	Non-Bearing (25% Remaining Area);
				50-90% Fungal; Shims Missing
			Top / MDL	2% Biological Degradation
	E	0	Top	Non-Bearing (25% Remaining Area);
				50-90% Fungal; Shims Missing
			Top / MDL	2% Biological Degradation

SUMMARY

This investigation provided for an under-deck inspection of the overwater structures located in seven of the City of Kirkland's waterfront Parks. The Marina Park facility received full scale inspection. The remaining six park structures were limited to a sample inspection protocol. The following summarizes the findings at each of the facilities.

A. Juanita Beach Park Waterwalk (Sample Inspection)

- The overall condition of the piles is good. Of the 126 piles inspected, five were identified with significant damage.
- The overall condition of the steel tension rod bracing is fair to poor. Evidence of moderate to heavy corrosion of the steel pile bracket attachments was noted.
- The overall condition of the superstructure caps is fair. Fourteen cap locations were found to have sustained damage.
- The overall condition of the under-surface of the concrete deck panels is fair to good condition with the majority of the steel hold down hardware noted to be loose.
- The structure has a number of wavebreak systems. The overall condition of these systems is poor. Generalized deterioration of these systems and the individual components was observed throughout the structure.

B. Waverly Park Pier (Sample Inspection)

- The overall condition of timber piles is good. Of the 95 piles inspected, three were identified with significant damage.
- The overall condition of the timber bracing was found to be good. No evidence of significant deterioration or damage was found.
- The overall condition of the superstructure caps and stringers is fair to good. Evidence of weathering and minor fungal decay to the members and cut ends was evident throughout the structure.
- The deck was found to be a combination of newer generation plastic/composite grate and older treated timber planks. Overall the condition of the under-surface of the plastic/composite decking was found to be good and the condition of the under-surface of the timber planks was found to be fair. Evidence of weathering and minor fungal decay was evident on the timber planks throughout the structure.
- One failed utility hanger was also noted.

C. Marina Park (Full Scale Inspection)

C.1 Main Pier

- The overall condition of timber piles is good. Of the 247 piles inspected, eleven were identified with significant damage.
- The overall condition of the timber bracing system within the elevation of the superstructure was found to be good. No evidence of significant deterioration or damage was found.
- The overall condition of the timber diagonal bracing was fair with five braces found to have sustained significant damage.
- The overall condition of the superstructure caps and stringers was found to be fair to good condition.
- The deck was found to be a combination of newer generation plastic/composite grate and older treated timber planks. Overall the condition of the under-surface of the plastic/composite decking was found to be good and the condition of the under-surface of the timber planks was found to be fair to good. Evidence of weathering and minor fungal decay was evident on the timber planks throughout the structure.
- The overall condition of the firewalls found them to be in fair to poor condition with three of the five firewalls noted to have sustained damage and missing boards.
- The overall condition of the submerged steel bracing located near the mudline of piles in the center and eastern moorage finger, was found to be good.

C.2 Small Pier

- The overall condition of the timber piles is good. Of the 39 piles inspected, four members were identified with moderate damage.
- The overall condition of the superstructure caps and stringers is good. No evidence of significant deterioration or damage was found.
- The overall condition of the under-surface of the timber deck is good. No evidence of significant deterioration or damage was found.
- The overall condition of the perimeter fender system is fair with a number of boards noted to be missing.
- The overall condition of the concrete storm sewer outfall is good. No evidence of significant deterioration or damage was found.

D. Second Avenue South Pier (Sample Inspection)

- The overall condition of the piles is good. The pier is supported by an estimated 115 piles, 25 of which were inspected in the sample inspection. No evidence of any significant deterioration or damage was found.
- The overall condition of the diagonal timber braces is good. No evidence of significant deterioration or damage was found.
- The cap timbers were found to be in fair condition. Ten cap timbers were found to have sustained significant deterioration or damage.
- The overall condition of the stringers is good. No evidence of significant deterioration or damage was found.
- The overall condition of the under-surface of the poured in-place concrete deck is good. No significant damage was identified to the undersurface of the concrete. However, an estimate 20 – 25% of the galvanized sub-pan was noted to have sustained significant corrosion.
- The overall condition of the firewalls is good condition. No evidence of any significant damage or deterioration was found.
- Several safety ladders were noted to be loose or damaged.
- The overall condition of the diagonal wave break baffle walls is fair. A number of the units were observed to have loose or missing timbers. And compromised connections.

E. Settler's Landing Pier (Sample Inspection)

- The overall condition of the piles is fair to good. Of the 54 piles inspected, five were identified with significant damage.
- The overall condition of the superstructure caps and stringers is good. No evidence of significant damage or deterioration was found. However, evidence of weathering and minor fungal decay to the members and cut ends was evident throughout the structure.
- The overall condition of the under-surface of the timber deck is fair. Evidence of weathering and minor fungal decay to the members was evident throughout the structure.

F. Marsh Park Pier (Sample Inspection)

- The overall condition of the piles is good. Of the 23 piles inspected, two were noted to be non-bearing. No evidence of any other significant deterioration or damage was found.
- The overall condition of the superstructure caps and stringers is fair to good. No evidence of significant damage or deterioration was found. However, evidence of weathering and minor fungal decay to the members and cut ends was evident throughout the structure.

- The overall condition of the timber decking is fair. Evidence of weathering and minor fungal decay to the members was evident throughout the structure.

G. Houghton Beach Park Pier (Sample Inspection)

- The overall condition of the piles is poor. Of the 83 piles inspected, forty-nine were found to have sustained significant damage.
- The overall condition of the diagonal timber braces is good. No evidence of significant deterioration or damage was found.
- The cap timbers were found to be in fair condition. Six cap timbers were found to have sustained significant deterioration or damage.
- The overall condition of the stringers is good. However, one stringer was noted to have sustained moderate damage.
- The deck was found to be a newer generation plastic/composite grate. Overall the condition of the under-surface of the plastic/composite decking was found to be good. No evidence of any significant damage or deterioration of the grating or of the associated framing timbers was noted.

As summarized above, the sample inspection protocol carried out on six of the facilities identified a number of deficiencies. We recommend that further full scale inspection of these facilities be considered to provide more comprehensive data on which to base future maintenance decisions. We also recommend that periodic repeat inspections of the structures be carried out. Per ASCE guidelines, structures such as the City of Kirkland's overwater structures should be inspected at approximate five to six year intervals. Such inspections will monitor the condition of the structures and will as in the case of the current inspection identify specific members that have sustained significant damage or deterioration and may require preventative or restorative maintenance. This will assist in ensuring the structural integrity and safe usage of the facility.

Once again, it has been a pleasure to have been of service to you. Should you have any questions concerning this report, or if we can assist you further in your inspection and maintenance program for these structures, please do not hesitate to contact our office.

Yours Truly,
Echelon Engineering, Inc.

SDS:jds
Enclosures

Ms. Shelley D. Sommerfeld, P.E.
President

APPENDIX B: PHOTOS

Photo 1. Riprap Bank Slope, Facility Location (1) Looking West, Houghton Beach Park.

Photo 2. Riprap Bank Slope (1) Slightly Eroded, Houghton Beach Park.

Photo 3. Beach (2) Looking North, Houghton Beach Park.

Photo 4. Riprap Bank Slope (3) Looking North, Houghton Beach Park.

Photo 5. Voids behind Riprap (3), Houghton Beach Park.

Photo 6. A Large Void behind Riprap (3), Houghton Beach Park.

Photo 7. Concrete Steps and Sidewalk (4) Looking North, Houghton Beach Park.

Photo 8. Cracked and Undermined Sidewalk (4), Houghton Beach Park.

Photo 9. Cracked Steps (4), Houghton Beach Park.

Photo 10. Curved Concrete Steps and Sidewalk (5), Houghton Beach Park.

Photo 11. Conc. Crack and Spall damage on Curved Conc. Steps (5), Houghton Beach Park.

Photo 12. Conc. Crack and Spall damage on Conc. Steps (6), Houghton Beach Park.

Photo 13. Beach (7) Looking North, Houghton Beach Park.

Photo 14. Beach (7), Houghton Beach Park.

Photo 15. Concrete Revetment (8) Looking North, Houghton Beach Park.

Photo 16. Cracked Concrete Revetment (8), Houghton Beach Park.

Photo 17. Concrete Revetment (8) Looking South, Houghton Beach Park.

Photo 18. Concrete Steps and Sidewalk (8) Looking North, Houghton Beach Park.

Photo 19. Handrail on Concrete Steps and Sidewalk (8), Houghton Beach Park.

Photo 20. Pier (8), Looking West, Houghton Beach Park.

Photo 21. Pier (8), Looking Southwest, Houghton Beach Park.

Photo 22. Warped Plastic Timber Fascia on Pier (8), Houghton Beach Park.

Photo 23. Deteriorated Piles and Pile Caps (8), Houghton Beach Park.

Photo 24. Beach (1) Looking South, Marsh Park.

Photo 25. Beach (1) Looking North, Marsh Park.

Photo 26. Riprap Bank & Asphalt Pathway (2) Looking North, Marsh Park.

Photo 27. Evidence of Erosion on Riprap Bank & Asphalt Pathway (2), Marsh Park.

Photo 28. A Void below Concrete Bench Foundation (2), Marsh Park.

Photo 29. Beach (3) Looking North, Marsh Park.

Photo 30. Riprap Bulkhead (4) Looking North, Marsh Park.

Photo 31. Concrete Sidewalk/Slab/Steps (4), Marsh Park.

Photo 32. Deteriorated Handrail (4), Marsh Park.

Photo 33. Cracked Concrete Steps (4), Marsh Park.

Photo 34. Riprap Bulkhead (5), Marsh Park.

Photo 35. Displaced Rocks from Riprap Bulkhead (5), Marsh Park.

Photo 36. Large Voids Behind Riprap Bulkhead (5), Marsh Park.

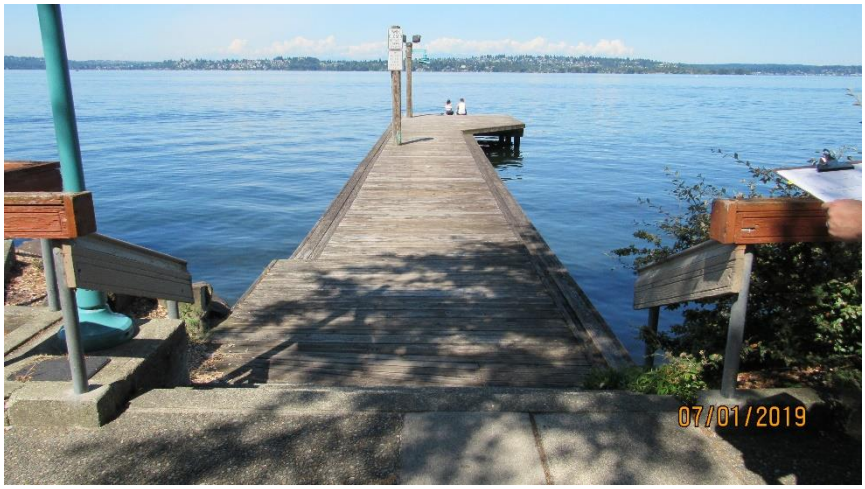


Photo 37. Pier (6) Looking West, Marsh Park.

Photo 38. Deteriorated Step Down on Pier (6), Marsh Park.

Photo 39. Damaged Light Fixture on Pier (6), Marsh Park.

Photo 40. Deteriorated Decking and Fascia Board on Pier (6), Marsh Park.

Photo 41. Pier (6) Looking West, Settlers Landing.

Photo 42. Deteriorated Decking and Fascia Boards on Pier (6), Settlers Landing.

Photo 43. Damaged Light Fixture on Pier (6), Settlers Landing.

Photo 44. Pier (1) Looking West, 2nd Ave. South Dock.

Photo 45. Riprap Bulkhead (1) Looking East, 2nd Ave. South Dock.

Photo 46. Deteriorated Pile Cap and Bull Rail on Pier (1), 2nd Ave. South Dock.

Photo 46. Deteriorated Pile Cap and Fascia Boards on Pier (1), 2nd Ave. South Dock.

Photo 46. A Loose Cleat on Pier (1), 2nd Ave. South Dock.

Photo 47. Pay Kiosk and Light Fixture on Pier (1), 2nd Ave. South Dock.

Photo 48. Fire Standpipe on Pier (1), 2nd Ave. South Dock.

Photo 49. Mooring Bollard on Pier (1), 2nd Ave. South Dock.

Photo 50. Riprap Bank Slope (1) Looking Southwest, Marina Park.

Photo 51. Riprap Bank Slope (2) Looking North, Marina Park.

Photo 52. Conc. Steps & Sidewalk (3) and Beach (4) Looking North, Marina Park.

Photo 53. Conc. Steps & Sidewalk (3) Showing Undermining at Toe, Marina Park.

Photo 54. Conc. Steps & Sidewalk (3) Showing Undermining at Toe, Marina Park.

Photo 55. Beach (4) and Conc. Steps & Sidewalk (5) Looking East, Marina Park.

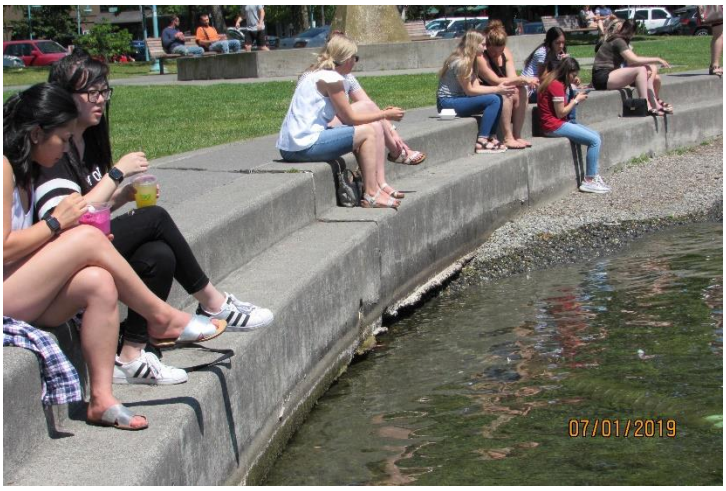


Photo 56. Conc. Steps & Sidewalk (5) Undermining at Toe, Marina Park.

Photo 57. Conc. Steps & Sidewalk (5) Undermining at Toe, Marina Park.

Photo 58. Differential Settlement along Conc. Steps & Sidewalk (5), Marina Park.

Photo 59. Riprap Bank Slope (6) Looking Southeast, Marina Park.

Photo 60. Boat Ramp (7) Looking Southwest, Marina Park.

Photo 61. Boat Ramp Pier (7) Looking North, Marina Park.

Photo 62. Deteriorated Decking on Boat Ramp Pier (7), Marina Park.

Photo 63. Deteriorated Pile Top on Boat Ramp Pier (7), Marina Park.

Photo 64. Conc. Boat Ramp (7), Marina Park.

Photo 65. Conc. Boat Ramp Panels (7), Marina Park.

Photo 66. Pier (8) Entrance Looking Southwest, Marina Park.

Photo 67. Pier (8) Superstructure, Marina Park.

Photo 68. Deteriorated Pile Top on Pier (8), Marina Park.

Photo 69. Damaged Fascia Board at a Mooring Cleat Mount Location on Pier (8), Marina Park.

Photo 70. Deteriorated and Damaged Fascia Board and Decking on Pier (8), Marina Park.

Photo 71. Deteriorated and Damaged Bull Rails and Decking on Pier (8), Marina Park.

Photo 72. Deteriorated and Damaged Fascia Board and Decking on Pier (8), Marina Park.

Photo 73. Safety Ladder, Cleat, and Fire Standpipe on Pier (8), Marina Park.

Photo 74. Fire Standpipe Missing Caps and Handles on Pier (8), Marina Park.

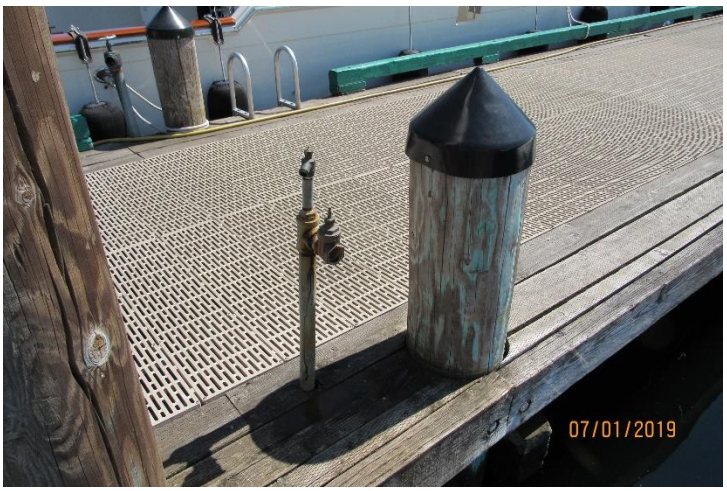


Photo 75. Hose Bib for Potable Water without Handles on Pier (8), Marina Park.

Photo 76. Power Pedestal on Pier (8), Marina Park.

Photo 77. Benches and Bull Rails on Pier (8), Marina Park.

Photo 78. Light Poles on Pier (8), Marina Park.

Photo 79. Riprap Bulkhead (1) and Beach (2) Looking South, Waverly Park.

Photo 80. Beach (2) Looking South, Waverly Park.

Photo 81. Concrete Pier (3) Looking West, Waverly Park.

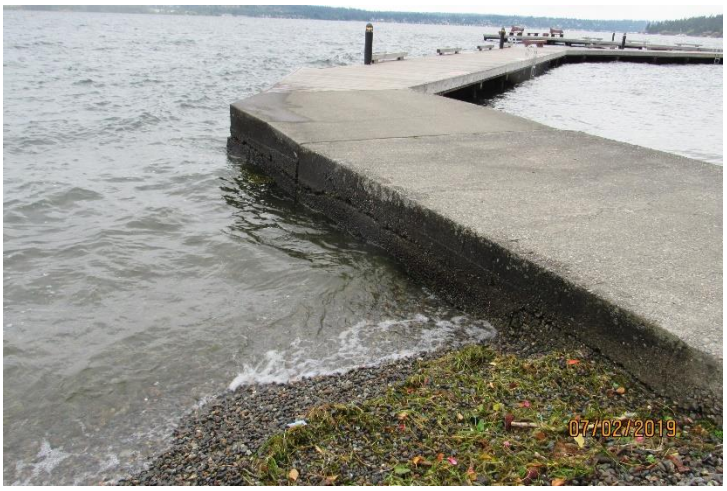


Photo 82. Concrete Pier Cracked (3), Waverly Park.

Photo 82. Concrete Steps & Sidewalk (4) Looking South, Waverly Park.

Photo 83. Concrete Steps & Sidewalk Cracked (4), Waverly Park.

Photo 84. Ecology Block Bulkhead (5) Looking North, Waverly Park.

Photo 85. Ecology Block Bulkhead (5) and Pier (6) Looking Southwest, Waverly Park.

Photo 86. Pier (6) Looking Northwest, Waverly Park.

Photo 87. Appurtenances on Pier (6), Waverly Park.

Photo 88. West End of the Pier (6), Waverly Park.

Photo 89. Pier (1) East Entrance, Juanita Beach Park.

Photo 90. Safety Ladder and Handrails on Pier (1), Juanita Beach Park.

Photo 91. Missing Screws on a Steel Plate at an Expansion Joint on Pier (1), Juanita Beach Park.

Photo 92. Concrete Swim Float on Pier (1), Juanita Beach Park.

Photo 93. Concrete Swim Float on Pier (1), Juanita Beach Park.

Photo 93. Light Pole on Pier (1), Juanita Beach Park.

Photo 93. Deteriorated Post of Light Fixture on Pier (1), Juanita Beach Park.

Photo 93. Deteriorated Light Fixture on Pier (1), Juanita Beach Park.

Photo 94. Beach (2) Looking West, Juanita Beach Park.

APPENDIX C: OPINION OF PROBABLE CONSTRUCTION COSTS

Shoreline Structures Assessment
City of Kirkland
Opinon of Probable Construction Costs
2019 Dollars

August 2019
24-09-009

Location:	Houghton Beach Park	Quantity	Units	Unit Price	Total
High Priority					
Location 3	Fill voids in riprap and behind riprap slope	1	LS	$5,000	$5,000
Location 11	Replace 10 timber piles	10	EA	$10,000	$100,000
Location 11	Replace 3 timber pile caps	3	EA	$2,000	$6,000
Location 11	Shim piles	39	EA	$1,000	$39,000
					$150,000
Medium Priority					
Location 9	Repaint handrails at steps	1	LS	$500	$500
Location 10	Repaint handrails at bulkhead	1	LS	$1,000	$1,000
					$1,500
Low Priority					
Location 1	Fill voids in riprap and behind riprap slope	1	LS	$5,000	$5,000
Location 4	Repair sidewalk corner	1	LS	$1,000	$1,000
Locations 4-6, 8-10	Repair cracks and spalls	1	LS	$2,000	$2,000
Location 11	Remove vegetation from swim step timbers, replace plastic lumber fascia boards	300	LF	$40	$12,000
					$20,000

Houghton Beach Park Construction Cost (All Items, Rounded)	**$172,000**
Sales Tax (10%)	**$17,200**
Mobilization / Demobilization (10%)	**$17,200**
Planning & Design Contingency (20%)	**$34,400**
Permitting & Engineering (20%)	**$34,400**
Construction Contingency (20%)	**$34,400**
Houghton Beach Park TOTAL Cost (All Items, Rounded)	**$309,600**

Location:	Marsh Park	Quantity	Units	Unit Price	Total
High Priority					
Location 4	Replace timber handrails with new plastic handrails, Apply new Zn coating on posts	1	LS	$4,000	$4,000
Locations 4,5	Fill voids in riprap and behind riprap slope	1	LS	$5,000	$5,000
Location 5	Grout under concrete step slab	1	LS	$3,000	$3,000
Location 6	Shim piles	2	EA	$1,000	$2,000
					$14,000
Medium Priority					
					$0
					$0
Low Priority					
Location 2	Patch & seal asphalt pathway	3000	SF	$3	$9,000
Location 2	Install geotextile fabric and additional quarry spalls or granular material behind riprap	10	CY	$250	$2,500
Location 2	Grout under concrete bench, repair concrete cracks	1	LS	$1,000	$1,000
Location 6	Replace pier decking with grated decking	1450	SF	$40	$58,000
Location 6	Fix swim ladder and light fixture	1	LS	$500	$500
					$71,000

Marsh Park Construction Cost (All Items, Rounded)	**$85,000**
Sales Tax (10%)	**$8,500**
Mobilization / Demobilization (10%)	**$8,500**
Planning & Design Contingency (20%)	**$17,000**
Permitting & Engineering (20%)	**$17,000**
Construction Contingency (20%)	**$17,000**
Marsh Park TOTAL Cost (All Items, Rounded)	**$153,000**

Shoreline Structures Assessment
City of Kirkland
Opinon of Probable Construction Costs
2019 Dollars

Location:	Settlers Landing Park	Quantity	Units	Unit Price	Total
High Priority					
Location 1	Replace fire standpipe supports	1	LS	$1,000	$1,000
Location 1	Shim piles	5	EA	$1,000	$5,000
Location 1	Replace light fixtures	2	EA	$250	$500
					$6,500
Medium Priority					
Location 1	Replace pier decking with grated decking	2100	SF	$40	$84,000
					$84,000
Low Priority					
					$0

Settlers Landing Park Construction Cost (All Items, Rounded)	**$91,000**
Sales Tax (10%)	**$9,100**
Mobilization / Demobilization (10%)	**$9,100**
Planning & Design Contingency (20%)	**$18,200**
Permitting & Engineering (20%)	**$18,200**
Construction Contingency (20%)	**$18,200**
Settlers Landing Park TOTAL Cost (All Items, Rounded)	**$163,800**

Location:	2nd Avenue South Dock	Quantity	Units	Unit Price	Total
High Priority					
Location 1	Replace damaged timber pile caps	10	EA	$2,000	$20,000
					$20,000
Medium Priority					
Location 1	Replace timber fascia and bull rails (10)	1	LS	$25,000	$25,000
Location 1	Replace missing fire standpipe caps & handles	1	LS	$500	$500
Location 1	Repair rust and repaint kiosk	1	LS	$500	$500
					$26,000
Low Priority					
Location 1	Repair cracks and spalls	1	LS	$2,000	$2,000
Location 1	Replace damaged ladders	2	EA	$250	$500
					$2,500

2nd Avenue South Dock Construction Cost (All Items, Rounded)	**$49,000**
Sales Tax (10%)	**$4,900**
Mobilization / Demobilization (10%)	**$4,900**
Planning & Design Contingency (20%)	**$9,800**
Permitting & Engineering (20%)	**$9,800**
Construction Contingency (20%)	**$9,800**
2nd Avenue South Dock TOTAL Cost (All Items, Rounded)	**$88,200**

Shoreline Structures Assessment
City of Kirkland
Opinon of Probable Construction Costs
2019 Dollars

Location:	Marina Park	Quantity	Units	Unit Price	Total
High Priority					
Locations 3 & 5	Install quarry spalls and granular material to fill undermined areas of steps (diver / in-water). Placement of additional granular material in front of toe of steps to maintain step embedment (diver / in-water).	30	CY	$500	$15,000
Location 8	Replace damaged timber piles (main pier)	9	EA	$10,000	$90,000
Location 8	Replace damaged timber pile caps (main pier)	2	EA	$2,000	$4,000
Location 8	Replace failed timber stringers and braces (main pier)	5	EA	$500	$2,500
Location 8	Repair damaged NE lateral pier step-down (main pier)	1	LS	$5,000	$5,000
Location 8	Replace missing fire standpipe caps and handles, replace damaged hose bibs (main pier)	1	LS	$1,000	$1,000
Location 8	Shim piles to restore bearing capacity (main pier)	3	EA	$1,000	$3,000
					$120,500
Medium Priority					
Location 8	Replace timber decking w/ grating (main pier & laterals)	11650	SF	$40	$466,000
Location 8	Replace timber fascia (main pier & laterals)	3000	LF	$9	$27,000
Location 8	Replace bull rails (main pier & laterals)	500	LF	$30	$15,000
Location 8	Replace timber finger piers, including piles (main pier)	17	EA	$32,000	$544,000
Location 8	Repair timber firewall loose / missing boards (main pier)	2	EA	$2,000	$4,000
					$1,056,000
Low Priority					
Location 7	Replace decking with grated decking (boat ramp pier)	11650	SF	$40	$466,000
Location 7	Replace deformed plastic pile caps	2	EA	$500	$1,000
					$467,000

Marina Park Construction Cost (All Items, Rounded)	**$1,644,000**
Sales Tax (10%)	**$164,400**
Mobilization / Demobilization (10%)	**$164,400**
Planning & Design Contingency (20%)	**$328,800**
Permitting & Engineering (20%)	**$328,800**
Construction Contingency (20%)	**$328,800**
Marina Park TOTAL Cost (All Items, Rounded)	**$2,959,200**

Location:	Waverly Park	Quantity	Units	Unit Price	Total
High Priority					
					$0
Medium Priority					
Location 3	Install granular material to fill undermined areas (pier)	2	CY	$500	$1,000
Location 3	Repair concrete cracks (pier)	1	LS	$2,000	$2,000
Location 4	Install granular material to fill undermined areas (steps)	2	CY	$500	$1,000
Location 4	Repair concrete cracks (steps & sidewalk)	1	LS	$2,000	$2,000
Location 6	Shim piles to restore bearing capacity	3	EA	$1,000	$3,000
					$9,000
Low Priority					
					$0

Waverly Park Construction Cost (All Items, Rounded)	**$9,000**
Sales Tax (10%)	**$900**
Mobilization / Demobilization (10%)	**$900**
Planning & Design Contingency (20%)	**$1,800**
Permitting & Engineering (20%)	**$1,800**
Construction Contingency (20%)	**$1,800**
Waverly Park TOTAL Cost (All Items, Rounded)	**$16,200**

Shoreline Structures Assessment
City of Kirkland
Opinon of Probable Construction Costs
2019 Dollars

August 2019
24-09-009

Location:	Juanita Beach Park	Quantity	Units	Unit Price	Total
High Priority					
Location 1	Replace light poles	4	EA	$2,000	$8,000
Location 1	Replace damaged piles	5	EA	$10,000	$50,000
Location 1	Replace damaged pile caps	27	EA	$2,000	$54,000
Location 1	Repair and/or secure hold-down hardware	1	LS	$3,000	$3,000
					$115,000
Medium Priority					
					$0
					$0
Low Priority					
Location 1	Repair concrete panel cracks and spalls	1	LS	$3,000	$3,000
Location 1	Install screws in expansion joint steel plates	1	LS	$1,000	$1,000
Location 1	Replace swim float expansion joint material	1	LS	$500	$500
Location 1	Remove rust and repaint handrails w/ zinc rich paint	1	LS	$5,000	$5,000
					$9,500

Juanita Beach Park TOTAL (All Items, Rounded)	**$125,000**
Sales Tax (10%)	**$12,500**
Mobilization / Demobilization (10%)	**$12,500**
Planning & Design Contingency (20%)	**$25,000**
Permitting & Engineering (20%)	**$25,000**
Construction Contingency (20%)	**$25,000**
Waverly Park TOTAL Cost (All Items, Rounded)	**$225,000**

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