MetroParks Tacoma

DASH POINT PARK
Pier Condition Assessment
Tacoma, Washington

September 2021

PREPARED BY

ReidMiddleton

Metro Parks Tacoma
Dash Point Pier Condition Assessment
Tacoma, Washington

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

9/24/2021

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EXECUTIVE SUMMARY

An above-water structural condition assessment was performed at the Dash Point Pier for Metro Parks Tacoma located in Tacoma, Washington. The assessment was conducted August 6, 2021, by Reid Middleton in accordance with the signed services agreement dated July 26, 2021.

The assessment and evaluation of the Dash Point Pier included the structural components and utilities. The intent of the routine structural assessment was to provide an evaluation of the general physical condition of the facility, develop a condition plan for each pier component based on observed conditions, identify operational restrictions, estimate remaining facility life, provide recommendations for repairs or replacement, and provide an opinion of probable construction cost.

The components comprising the Dash Point Pier covered by this assessment included: pre-stressed concrete piles (above water surfaces only), pile caps, pre-stressed concrete beams, concrete topping slab, aluminum grating, timber guardrails, and utility lines.

The overall condition of the facility is provided in summary below.

Condition Assessment:
The Dash Point Pier received an overall rating of **Critical** based on approximately 70% of the precast pre-stressed concrete tee and channel beams exhibiting major to severe deterioration that includes concrete section loss, heavy cracking, rust staining, and broken pre-stressing strands.

Summary of Repair Recommendations:
It is recommended that the pier be partially or completely replaced.

Due to the extensive section loss, cracking, and corroded reinforcing observed in most of the concrete beams throughout the pier, at a minimum, it is recommended that the pre-stressed concrete beams and topping slabs be replaced at this time.

It is also recommended that deteriorated navigational lighting system be updated using solar powered lights at the corners of the pier instead of the current PVC conduit design system.

Operational Restrictions:
The pier is unsafe for pedestrian and vehicular traffic due to significant deterioration in the concrete beams. Access to the pier for the general public is currently prohibited and should continue to be prohibited until the recommended repairs or rehabilitation have been completed. Marine traffic should also be kept away from the pier and not be allowed to go underneath the structure. It is highly recommended to use extreme caution if access by Metro Parks Tacoma personnel is required. Access should be limited to foot traffic only; no Metro Parks Tacoma vehicles should be allowed onto the pier.

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References

1. ASCE Manuals and Reports on Engineering Practice No. 130, *Waterfront Facility Inspection and Assessment*, Waterfront Facility Inspection Committee, 2015
2. Report – Dash Point Pier Letter Report, Reid Middleton, 2014
3. Report – Dash Point Pier Concrete Beams, 2021

1.0 INTRODUCTION & BACKGROUND

1.1 Project Background

The purpose of the above-water condition assessment of the Dash Point Pier for Metro Parks Tacoma located in Tacoma, Washington, was to: (1) develop a condition plan for each pier component based on the findings from the field observation, (2) evaluate load-carrying capacities based on the degree of deterioration, (3) predict the remaining life of the facility, (4) recommend repair/rehabilitation/modification methods, and (5) provide an opinion of the probable construction costs for any repairs/rehabilitation/modifications.

A map with an approximate location of the facility inspected is shown below in Figure 1.1-1. The pier is located at 1500 Beach Drive NE along the southern shoreline of Puget Sound and approximately four miles north of Tacoma, Washington. Refer to Appendix B Photographs 1 and 2 for overall views of the Dash Point Pier.

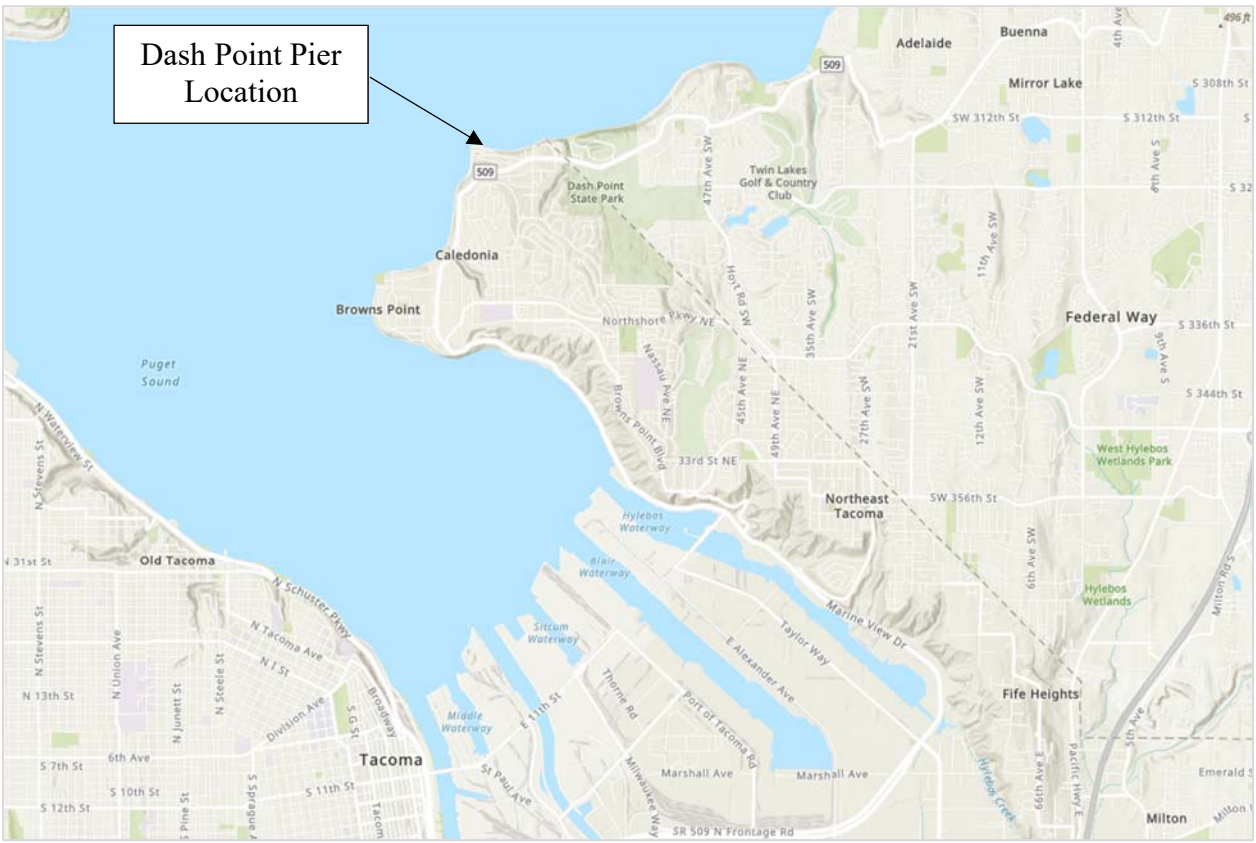


Figure 1.1-1. Dash Point Pier Vicinity Map.

1.2 Assessment Procedures

The objective of the structural assessment was to document the overall condition of the above-water portions of the Dash Point Pier in order to facilitate an assessment of the structural components and prepare recommendations for repair and/or rehabilitation.

The structural condition assessment of the pier was conducted on August 6, 2021. The investigation included the above-water portions of the pre-stressed concrete piles, concrete pile caps, pre-stressed concrete tee, and channel beams, fiber-reinforced concrete topping slab, aluminum deck grating and supports, timber handrails, and utility lines. A small inflatable boat was used to perform the above-water assessment of the superstructure condition of the Dash Point Pier. The boat was able to maneuver through the pile and bents and allowed an unobstructed view of the piles, pile caps, and beams. The top of the Dash Point Pier was accessed by foot after Metro Parks Tacoma staff unlocked a security gate.

The Reid Middleton team used basic hand-held measuring and inspection tools (hammer, scraper, wire brush, scale, measuring wheel, and tape measure) to determine the locations and sizes of observed damage or deterioration. Observed damage or deficiencies were recorded and used to evaluate the overall condition of the structural components and pier. Damage was quantified according to the American Society of Civil Engineers' (ASCE) Manual and Reports on Engineering Practice No. 130, *Waterfront Facilities Inspection and Assessment* (ASCE Manual No. 130). Refer to Appendix D for descriptions of the various component deterioration levels. Photographs were taken of observed significant deficiencies and to document the typical structural condition.

The Reid Middleton team conducted the assessment of the pier and its components in accordance with ASCE Manual No. 130. In accordance with the manual, a routine structural condition assessment was performed on all accessible above-water surfaces of the pier. Based on the criteria in ASCE Manual No. 130, listed in Table 1.3-1, an overall condition assessment rating was assigned to the pier.

Table 1.3-1. Condition Assessment Ratings.

Rating	Description
6 Good	No visible damage or only minor damage is noted. Structural elements may show very minor deterioration, but no overstressing is observed. No repairs are required.
5 Satisfactory	Limited minor to moderate defects or deterioration observed. No repairs are required.
4 Fair	All primary structural elements are sound, but minor to moderate defects or deterioration are observed. Localized areas of moderate to advanced deterioration may be present but do not significantly reduce the load-bearing capacity of the structure. Repairs are recommended, but the priority of the recommended repairs is low.
3 Poor	Advanced deterioration or overstressing is observed on widespread portions of the structure but does not significantly reduce the load-bearing capacity of the structure. Repairs may need to be carried out with moderate urgency.
2 Serious	Advanced deterioration, overstressing, or breakage may have significantly affected the load-bearing capacity of primary structural components. Local failures are possible, and loading restrictions may be necessary. Repairs may need to be carried out on a high-priority basis with urgency.
1 Critical	Very advanced deterioration, overstressing, or breakage has resulted in localized failure(s) of primary structural components. More widespread failures are possible or likely to occur, and load restrictions should be implemented as necessary. Repairs may need to be carried out on a very-high-priority basis with strong urgency.

2.0 PREVIOUS CONDITION ASSESSMENT

The Reid Middleton team had access to the previous condition assessment letter report titled *Engineer's Review & Condition Assessment Report Dash Point Pier (1500 Beach Drive NE)*, which was previously performed by Reid Middleton and is dated August 2014. The results of the inspection performed in 2014 were that the pre-stressed double tee beams and channels were typically in poor condition overall, with one location of Serious deterioration between Bents 7 and 8. The bottom of the beams typically exhibited widespread cracking and rust bleed-through, likely due to inadequate concrete cover over the reinforcing steel. The remainder of the structural components (structural piles, pile caps, topping slab, steel supports and grating, guardrails, and utilities) all ranged from Good to Fair condition, with only minor structural deficiencies observed throughout the pier.

On July 23, 2021, the Reid Middleton team performed an urgent field engineering observation and condition assessment specifically on the pre-stressed double tee beam and topping slabs. The report found severe deterioration in the steel reinforcement, along with heavy cracking and spalling damage in several of the beams. As a result, the pier was given an overall rating of Serious to Critical and the recommendation that the pier be closed to the public.

Design plans, titled "Dash Point Dock Replacement" dated December 1994 were made available to the Reid Middleton team prior to the field observation.

3.0 CONDITION ASSESSMENT - DASH POINT PIER

3.1 Dash Point Pier Description

The Dash Point Pier is primarily oriented south to north, extending out into the Puget Sound approximately 384 feet before turning east and extending another 100 feet. The primary use of the Dash Point Pier is to allow fishing and pedestrian access to the Puget Sound waterfront. The pier substructure consists of 10 pile-bents comprised of precast pre-stressed concrete vertical and battered octagonal piles with reinforced concrete pile caps of varying lengths. Three different types of concrete beams span from pile cap to pile cap with a fiber-reinforced topping slab protecting the top flange of the beams. Electrical and water utility lines extend out from shore, providing six electrical outlets and five water receptacles for the public's use. Figure 3.1-1 shows the Dash Point Pier.

Figure 3.1-1. Overall view of the Dash Point Pier, looking north.

The components comprising Dash Point Pier are defined in Table 3.1-1, below.

Table 3.1-1. Dash Point Pier Components.

Component	Qty.	Units	Material*	Shape	Size (in)	Length (ft.)	Width (in)	Depth (in)
Piles								
Piles - Vertical	10	EA	PSC	OCT	18			
Piles - Battered	12	EA	PSC	OCT	18			
Pile Caps								
Pile Cap 1	3	EA	RC	RECT		7.5	42	47
Pile Cap 2	4	EA	RC	RECT		9.5	42	47
Pile Cap 3	3	EA	RC	RECT		15.5	42	47
Beams								
Type A Tee Beams	210	LF	PSC	TEE		Varies	96	29
Type B Tee Beams	96.5	LF	PSC	TEE		48.25	192	29
Channel Beam	156	LF	PSC	CHAN		Varies	48	29
Deck								
Topping Slab	4454	SF	RC	RECT		370	Varies	2.25
Grating & Supports	952	SF	ALUM	RECT		322	36	
Handrail								
Railing & Posts	960	LF	TMB	Varies				
Utility Lines								
Potable Water	430	LF	Varies	RND	1			
Navigational	484	LF	PVC	RND	0.75			
Electrical	484	LF	PVC	RND	1			

*Materials: PSC – Pre-Stressed Concrete, RC – Reinforced Concrete, ALUM – Aluminum, TMB – Timber, PVC – Poly Vinyl Chloride Piping

3.2 Condition Assessment

3.2.1 Piles

The precast pre-stressed concrete piles were assigned a rating of Good. The condition rating is based on the observed above-water conditions only; no underwater surfaces of the structural piles were observed during this assessment. The component was rated for the 22 structural piles distributed into two component types as follows:

- 18-inch octagonal vertical piles – 10 piles
- 18-inch octagonal batter piles – 12 piles

Condition Assessment: There was only 1 defect observed on the pre-stressed piles, which was a vertical crack at Pile 5:B. The pile exhibited a vertical crack on its southeast face, extending from the top of the pile down approximately 2 feet and measuring up to 1/32 inches wide.

Of the 22 piles that comprise Dash Point Pier, deterioration was observed in only 1 pile (4.5%).

Above water, a layer of marine growth consisting of soft algae, mollusks, and barnacles up to 2 inches thick was observed on all pile surfaces, extending from the waterline to approximately 2 feet from the top of the pile. Select areas of the piles were cleaned, which revealed that the surfaces were typically hard, smooth, and sound with no notable defects. No heavy areas of section loss were observed.

Refer to Figures 3.2.1-1 and 3.2.1-2 and Appendix B Photographs 3 and 4 for a view of the typical condition observed on the precast pre-stressed concrete piles.

Repair Recommendations: The precast pre-stressed concrete piles are considered fit-for-purpose. No defects were found of sufficient size or severity to warrant remedial action at this time. For routine maintenance, it is recommended that any cracking, delamination, or section loss be patched by removing any loose and unsound concrete, cleaning any exposed reinforcing steel, and a marine-approved concrete mortar be reapplied.

Remaining Service Life: 24 years (without repairs)
25+ years (with repairs)

Figure 3.2.1-1. View of typical structural pile condition, Pile 3:A shown, looking East.

Figure 3.2.1-2. View of typical structural pile configuration, Bent 4 shown, looking North.

3.2.2 Pile Caps

The reinforced concrete pile caps were assigned a rating of Satisfactory. The component was rated for the 10 total pile caps distributed into 3 different component types, based on the dimensions of the pile cap, as follows:

- Pile Cap Type 1 – A two-pile pile cap located at Bents 1 through 3, measuring 7.5 ft. long by 42 in. wide by 47 in. deep.
- Pile Cap Type 2 – A two-pile pile cap located at Bents 4 through 7, measuring 9.5 ft. long by 42 in. wide by 47 in. deep.
- Pile Cap Type 3 – A pile cap that bears on up to 4 battered piles, located at Bents 8 through 10, measuring 15.5 ft. long by 42 in. wide by 47 in. deep.

Condition Assessment: There were a total of 9 defects observed on the pile caps. Defects observed in the pile caps included 6 cracks (23 ft. total) and 3 areas of heavy rust staining (4.5 ft. total).

Of the 10 total pile caps that comprise Dash Point Pier, deterioration was observed on 7 pile caps (70%).

Vertical and horizontal cracking measuring up to 1/32 inches wide was observed on the pile caps at Bents 1 (two areas), 6, 7, 8, and 10. Rust staining was observed on the pile caps at Bents 2, 3, and 6, typically on the underside of the pile cap at the interface with the structural pile.

Refer to Appendix A for specific locations and details of the pile cap defects.

Refer to Figures 3.2.2-1 and 3.2.2-2 and Appendix B Photographs 5 through 6 for views of the typical condition and significant deficiencies observed on the pile caps.

Repair Recommendations: The concrete pile caps are considered fit-for-purpose. No defects were found of sufficient size or severity to warrant remedial action at this time. For routine maintenance, it is recommended that any cracking, delamination, or section loss be patched by removing any loose and unsound concrete, cleaning any exposed reinforcing steel, and a marine-approved concrete mortar be reapplied.

Remaining Service Life: 20 years (without repairs)
24+ years (with repairs)

Figure 3.2.2-1. View of the typical pile cap condition, Bent 10 pile cap shown, looking west.

Figure 3.2.2-2. View of vertical cracking in the west face of the Bent 1 pile cap, looking east.

3.2.3 Beams

The precast pre-stressed tee and channel beams were assigned a rating of Critical. The component was rated for the longitudinal beams spanning from pile cap to pile cap and distributed into 3 component types, based on the configuration, as follows:

- Type A Double Tee Beams – Comprised of 2 webs with a top slab that overhangs the exterior web face approximately 1 foot. These beams are located from the Abutment to Bent 4, each beam measuring 8 ft. wide by 2.5 ft. deep with varying lengths.
- Type B Double Tee Beams – Comprised of 2 Type A Double Tee Beams connected to each other at the top flange, located from Bents 8 through 10, measuring 48.25 ft. long by 6 ft. wide by 2.5 ft. deep.
- Channel Slabs – Comprised of 2 webs with a top slab, located from Bents 5 through 7, each beam measuring 4 ft. wide by 2.5 ft. deep with varying lengths.

Condition Assessment: There were a total of 64 defects noted on the beams. Defects observed in the beams included 22 open corrosion spalls (177.5 ft.), 23 closed corrosion spalls (190.5 ft.), 16 longitudinal cracks (102 ft.), and 3 areas of heavy rust staining (41 ft.).

Of the total 728 linear feet of the concrete beam that comprises Dash Point Pier, deterioration was observed on 511 linear feet (70%).

The majority of the defects observed were located from Bents 4 through 10, with sporadic defects in the first four spans. There are three beams that exhibited heavy deterioration and spalling with broken pre-stressing strands, whose locations and defect dimensions are as follows:

- Bent 4.5, west beam, 54 ft. long by 5 in. wide by 6 in. deep, 3 broken strands
- Bent 5.2, west beam, 12 ft. long by 7 in. wide by 3 in. deep, 2 broken strands
- Bent 6.8, west beam, 30 ft. long by 5 in. wide by 4 in. deep, 3 broken strands

Deterioration is also prevalent throughout the structure near the bearings at each pile cap, typically within the first and last 10 feet of the beams. Spalling and heavy cracking at these locations were observed in the bottom face and extending partly up the sides of the beams

Refer to Appendix A for specific locations and details of the beam defects.

	Refer to Figures 3.2.3-1 and 3.2.3-2 and Appendix B Photographs 7 through 16 for views of the typical condition and significant deficiencies observed on the beams.
Recommendations:	It is recommended that the concrete beams be replaced given the deterioration and failure of the prestressing strands and the condition of the concrete.
Remaining Service Life:	0 years (without repairs) 50+ years (with replacement)

Figure 3.2.3-1. View of typical concrete beam configuration, Span 2 shown, looking south.

Figure 3.2.3-2. View of severe spalling and broken pre-stressing strand in beam, Bent 6.5 shown, looking north.

3.2.4 Deck (Topping Slab and Aluminum Grating and Supports)

The deck was assigned a rating of Good. The component was rated for the 2.5-inch-thick, fiber-reinforced concrete topping slab, which protects the top of the pre-stressed beam top flanges, and the aluminum grating and supports, which extend over the water to give pedestrians fishing access.

Condition Assessment: There were a total of 7 defects noted on the deck. Defects observed in the deck included 3 transverse cracks (22 ft.) in the concrete topping slab, 3 gaps/deflections in the aluminum grating (36 ft.), and approximately 10% of the aluminum grating clips were broken.

Of the 5,407 square feet of concrete topping slab and aluminum grating that comprises Dash Point Pier, deficiencies were observed on 59 square feet (1%).

The transverse cracking in the concrete topping slab was located at Bents 2.1, 2.9, and 3.1, and the cracking width at all locations measured approximately 1/32-inch-wide.

Deflections in the aluminum grating were observed in the west grating at Bents 4.2 and 4.7 and in the east grating at the expansion joint between Bents 7 and 8. Deflections in grating at the aforementioned areas measuring up to 1/2 inch above the topping slab when the grating was unloaded, and 1/4 inch below the topping slab when loaded.

Refer to Appendix A for specific locations and details of the deck defects.

Refer to Figures 3.2.4-1 and 3.2.4-2 and Appendix B Photographs 17 through 20 for views of the typical condition and deficiencies observed on the deck.

Repair Recommendations: It is recommended that any missing or broken aluminum grating tie-down clips be reinstalled and properly secured.

Figure 3.2.4-1. View of typical concrete topping slab and aluminum grating condition, near Bent 6, looking north.

Figure 3.2.4-2. View of transverse cracking in the top slab at Bent 2, looking south.

3.2.5 Guardrails

The guardrails were assigned a rating of Satisfactory. The component was rated for the 42-inch-high timber handrails, 36-inch-high timber fishing rails, and the timber posts that run along the exterior of the Dash Point Pier.

Condition Assessment: There were a total of 9 defects noted on the handrails. Defects observed in the guardrails included 2 areas of decay (4 ft.), 3 areas of broken top railing (9 ft.), 2 areas of loose connections (2 ft.), 2 gaps in the handrail, which is over 4 inches wide (2 ft.), and significant weathering of the railing (100 ft.).

Of the 960 linear feet of timber railing that comprises Dash Point Pier, significant deterioration was observed on approximately 114 linear feet (12%) of the pier.

There are 2 areas of decay in the east top railing boards, located at Bent 3.4 and 6.8. Both areas of decay measured up to 2 feet long by full width and up to 1 inch deep. There are 3 missing/broken top railing boards, 1 at the northwest corner of Bent 8, and 2 on the east and west railings at Bent 4, where the aluminum grating starts.

The timber handrails are also weathered throughout, with more significant weathering on the top surfaces of the timbers.

Refer to Appendix A for specific locations and details of the handrail defects.

Refer to Figures 3.2.5-1 and 3.2.5-2 and Appendix B Photographs 21 through 25 for views of the typical condition and significant deficiencies observed on the timber handrails.

Repair Recommendations: It is recommended that the defects in the guardrails be corrected and that the top rail and any damaged or broken timbers be replaced with new timbers.

Figure 3.2.5-1. View of the typical timber railing and post condition, near Bent 1 shown, looking east.

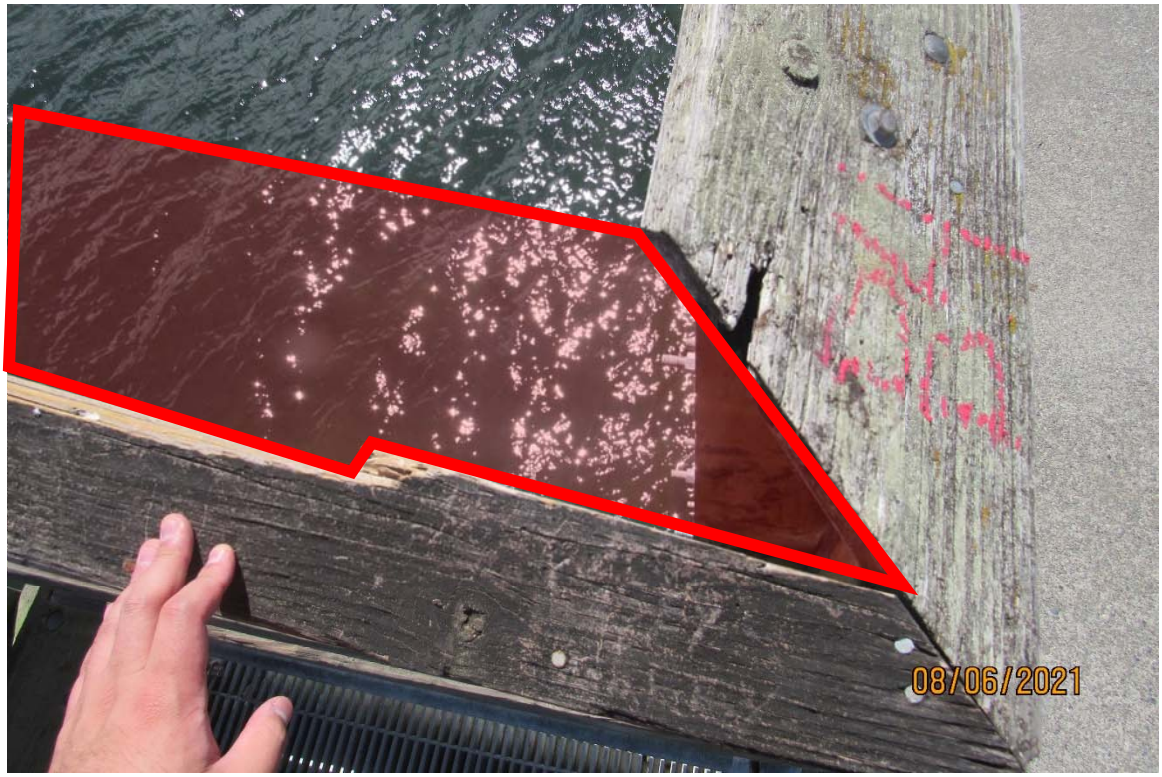


Figure 3.2.5-2. View of the east broken top railing at Bent 4, looking south.

3.2.6 Utilities

The utilities were assigned a rating of Fair. The component was rated for the 3 polyvinyl chloride (PVC) utility lines, which are distributed into 3 different component types, based on their purpose, as follows:

- Potable Water Utility line – approximately 430 linear feet of 1-inch round PVC and galvanized steel with 8 hose bibs located throughout the pier.
- Navigational Utility line – approximately 484 linear feet of 0.75-inch round PVC with 2 lights at the outboard end of the pier
- Electrical Utility line – approximately 484 linear feet of 1-inch round PVC with 4 electrical outlets located throughout the pier.

Condition Assessment: There were a total of 9 defects observed on the utility lines. Defects observed in the utilities included 1 broken water hose bib handle, 4 deficient electrical outlets, 2 missing tie-down connections, and 2 areas of disconnected piping.

The potable water utility line is composed of the older PVC section and a newer galvanized steel section. Starting at the abutment, the PVC line is attached to the upper half of the web of the east beam and runs to Bent 1, where it ties in with the newer galvanized steel section. The new section turns and heads to the outboard edge of the east rail, where it runs the length of the pier. The abandoned section of the PVC line is still in place but broken in several places.

Of the 8 potable water hose bibs, the hose bib at Bent 8.5 exhibited a broken handle but was still able to be opened and closed. There was no water flow through the utility line when tested.

The navigational and electrical utility lines run along the west face of the outboard beam webs, from the abutment to the north corner of Bent 10. Both original systems are still in place and exhibited a broken hanger connection at Bent 8.2.

The navigational utility line also exhibited 4 areas of disconnected PVC with exposed wires, at Bent 0.5, Bent 2.1, Bent 8.1, and the northeast corner of the Bent 10 pile cap.

The electrical outlets throughout the pier exhibited heavy staining and discoloration. The electrical system was not tested during this assessment.

Refer to Appendix A for specific locations and details of the utility line defects.

Refer to Figures 3.2.6-1 and 3.2.6-2 and Appendix B Photographs 26 through 28 for views of the typical condition and significant deficiencies observed on the utilities.

Repair Recommendations: It is recommended that the navigation light systems be high priority. Replacing the current pvc conduit system with a new solar powered lights at the corners of the pier is recommended at this time.

Also, prior to the pier reopening to the public, it is recommended that the electrical and potable water lines be considered a less of a priority while the pier is closed to the public. The electrical system should be inspected for code compliance and tested by an electrical engineering firm and replaced if necessary. The potable water line be pressure tested and any leakage locations be repaired. The PVC line from shore should be replaced with galvanized or high-density polyethylene (HDPE) piping and the broken hose bib handle replaced.

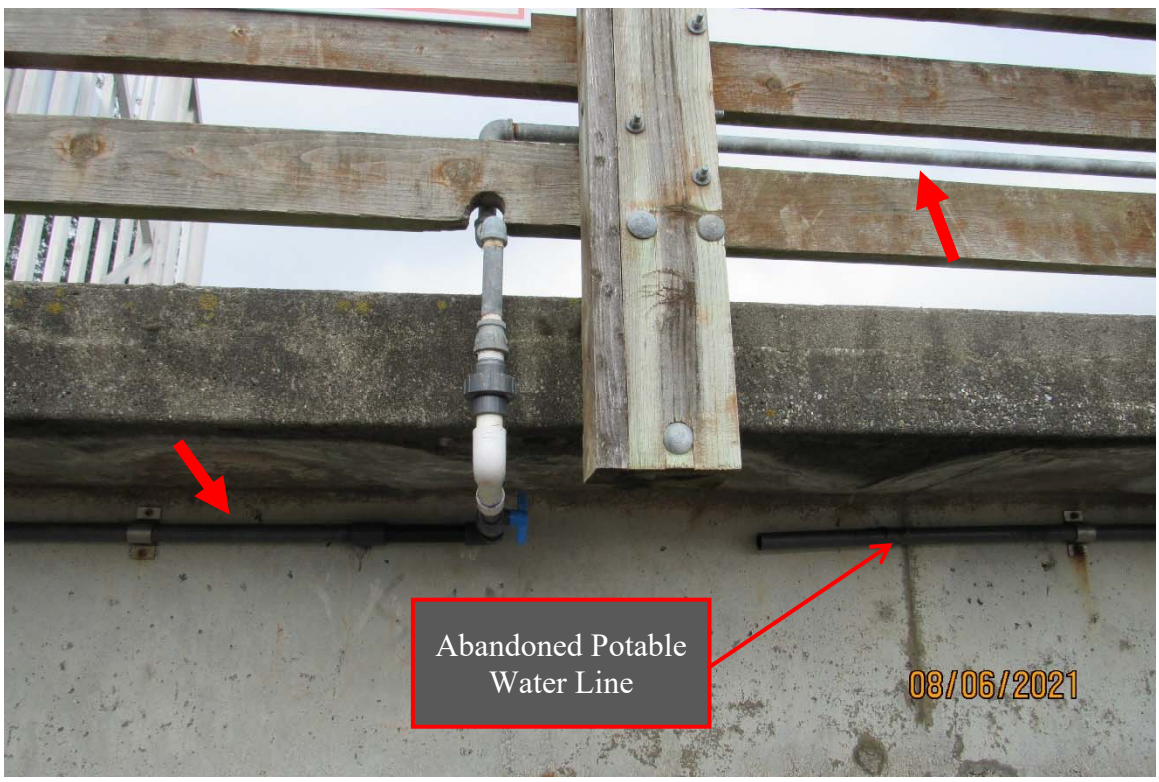


Figure 3.2.6-1. View of the potable water line and the abandoned utility line typical condition, looking west.

Figure 3.2.5-2. View of the electrical (upper) and navigational (lower) utility line typical condition, looking northeast.

4.0 RECOMMENDED REPAIRS AND TIMELINES

4.1 Recommended Repairs – High Priority

The components comprising the Dash Point Pier have high-priority repairs recommended where elements have failed or have significant deterioration and are no longer functional. These elements are detailed in Table 4.1-1, along with recommendations for repair, probable construction costs, and recommended repair timelines.

Table 4.1. Summary of Pier Rehabilitation & Replacement Options.

Option #	Recommendation	Probable Construction Cost	Recommended Timeline*	Service Life
Option 1	Rehabilitation – Replace Pier Superstructure, Including Beams, Deck, Railings, and Utilities	$1.9 Million	Immediate	24+ years (Remaining)
Option 2	Complete Pier Replacement – Concrete Structure (Similar to the existing)	$2.6 Million	Immediate	50+ years
Option 3	Complete Pier Replacement – Steel Structure (with FRP grated decking)	$2.6 Million	Immediate	50+ years

The Opinion of Probable Construction Costs includes a construction contingency, sales tax, and contractor's general conditions and overhead and profit but does not include any design contingency, escalations, permitting, engineering, etc. See Appendix C for the detailed Opinion of Probable Construction Costs. The Opinion of Probable Construction Costs is based on RS Means, bid tab results from recent projects, and correspondence with suppliers, manufacturers, and contractors. Refer to Appendix E – Proposed Replacement Pier Layout for a view of the proposed layout for a steel membered pier.

4.2 Ongoing Maintenance Recommendations

Periodic inspections should be performed in accordance with the ASCE Manual No. 130. Given the construction material, observed deterioration, and assigned condition rating, it is recommended a routine inspection be conducted every 6 months. It is recommended therefore that the Dash Point Pier receive another structural condition assessment on or before February 6, 2022.

4.3 Material Comparison

With consideration of the long-term cost-performance-effectiveness of the pier, Option #3, Replacement with Steel Structure, was estimated with materials intended to maximize the pier's lifespan, provides the lowest maintenance costs, and is based on current permitting regulations. It is recommended that the proposed new fishing pier be constructed primarily with steel structural components, considering high durability with proper corrosion protection and relatively low life-cycle costs.

This concept design also allows for FRP grated decking, which is a preferred option by permitting agencies that allows light through the deck and minimizes the shading of vegetation and wildlife while within the footprint of the pier. Appendix E shows the concept design of the Option #3 pier plan.

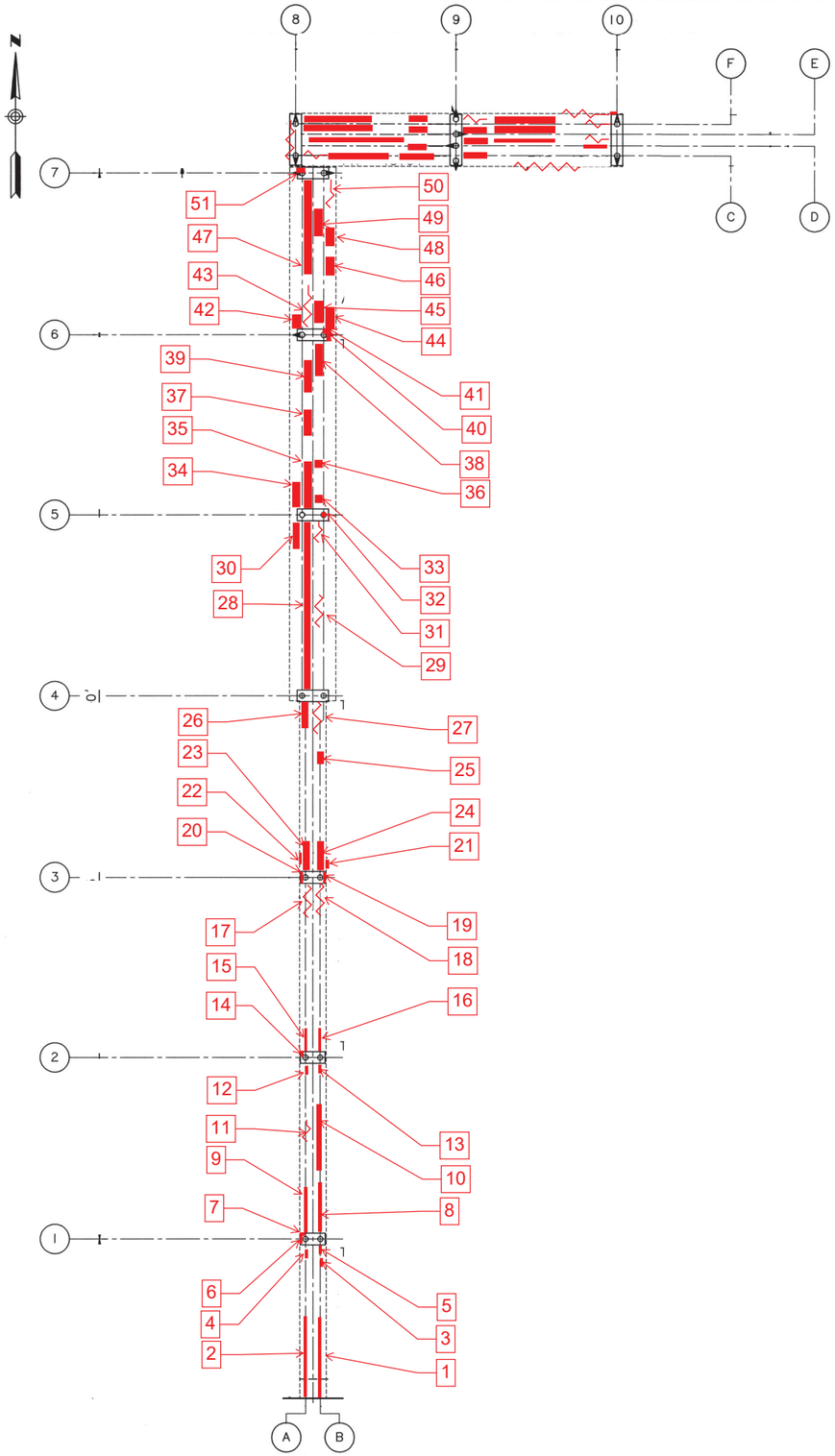
5.0 SUMMARY

The Dash Point Pier received an overall rating of Critical based on approximately 70% of the pre-stressed precast concrete tee and channel beam lengths exhibiting major to severe deterioration that includes pre-stressed concrete section loss, heavy cracking, rust staining, and broken pre-stressing strands. Aside from the generally severe deterioration of the Dash Point Pier's beams, the remainder of its construction was typically in satisfactory to fair condition.

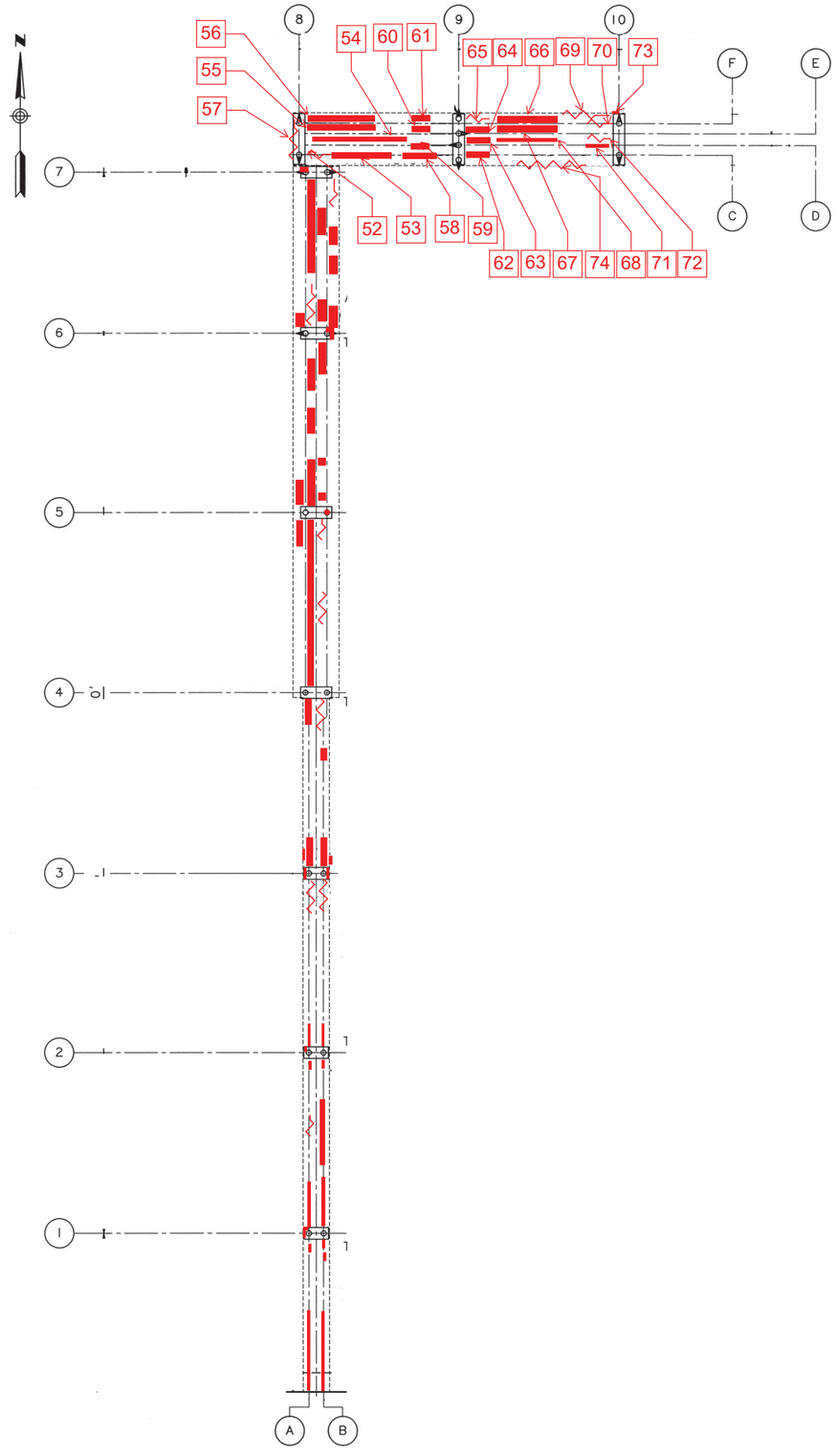
It is recommended that the pier be partially or completely replaced.

The pier is unsafe for traffic due to significant deterioration in the concrete beams. Access to the pier is currently prohibited and should continue to be prohibited for the general public until repair or rehabilitation has been completed. Marine traffic should also be kept away from the pier and not be allowed to go underneath the structure. It is highly recommended to use extreme caution if access by Metro Parks Tacoma personnel is required. Access should be limited to foot traffic only; no vehicles should be allowed onto the pier.

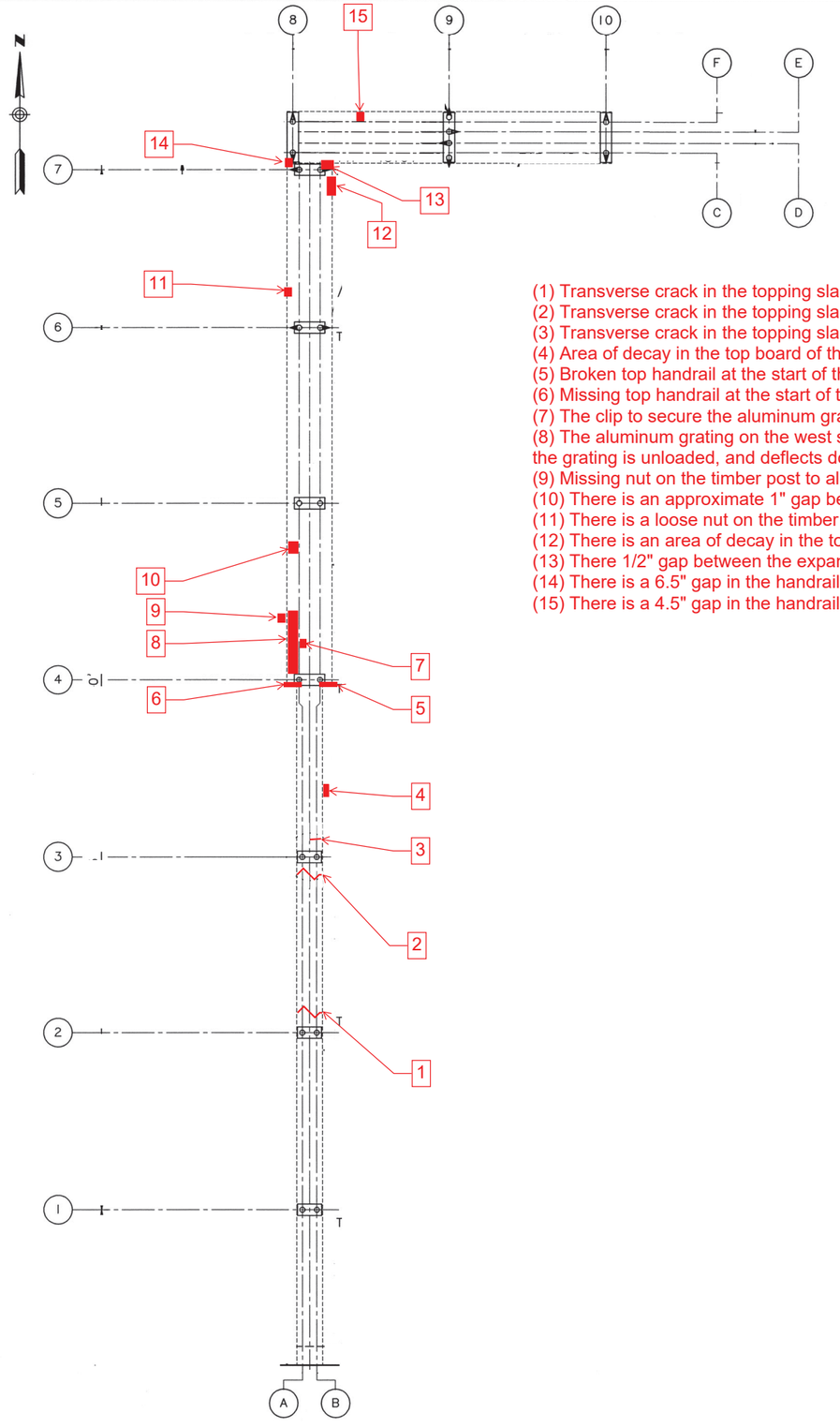
APPENDIX A: CONDITION PLAN



(1) Multiple edge spalls on the bottom east corner of the web, measuring up to 4'L x 2"W x 2"D with rust staining
(2) Multiple edge spalls on the bottom east corner of the web, measuring up to 4'L x 2"W x 2"D with rust staining.
(3) Two spalls on the east face of the web, measuring 1'L x 4"W x 1/2"D with exposed bars
(4) Two spalls on the east face of the web, each measuring 1'L x 4"W x 1/2"D with exposed bars
(5) Closed corrosion spall on bottom east face of web, measuring 1'L x 2"H
(6) Vertical crack on west face of pile cap, measuring 2'L x 1/32"W
(7) 1/32" wide map cracking on northwest corner of pile cap, measuring 2'L x 1'W
(8) Open corrosion spalling on the west, bottom and east faces of the web, measuring 9'L x 12"W x 4"D with 1 prestressing strand exposed with 10% section loss
(9) Open corrosion spalling on the west, bottom and east faces of the web, measuring 8'L x 12"W x 4"D, one prestressing strand exposed with 10% section loss
(10) Closed corrosion spalling with cracks up to 1/8"W on the bottom and east faces of the web, area measures 20'L x 1'W
(11) Crack on the west face of the beam, measuring 1'L x 1/8"W
(12) Closed corrosion spalling with cracks up to 3/4"W on the east and bottom faces of the beam, measuring 4'L x 4"W
(13) Closed corrosion spalling with cracks up to 1/2"W on the bottom and east faces of the web, area measuring 3'L x 1'W
(14) Area of rust staining on the bottom of the cap
(15) Closed corrosion spalling on the west, bottom and east faces of the beam, measuring 6'L x 16"W
(16) Open corrosion spalling on the west, bottom and east faces of the beam, measuring 6'L x 16"W x 3"D with three exposed bars with up to 10% section loss.
(17) Cracking on the bottom face of the beam, measuring 6'L x 1/8"W (typical) and up to 3/4"W (maximum)
(18) Cracking on the bottom face of the beam, measuring 6'L x 1/8"W (typical) and up to 3/4"W (maximum)
(19) Rust staining on the east face of the pile cap, area measures 2.5'L x 2.5'H
(20) Rust staining on the west face of the pile cap, area measures 2.5'L x 2.5'H
(21) Closed corrosion spalling on the bottom of the top flange, area measures 1.5'L x 1.5'W
(22) Closed corrosion spalling on the bottom of the top flange, area measures 1.5'L x 1.5'W
(23) Closed corrosion spalling with cracks up to 1/2"W on the west and bottom faces of the beam, measuring 6'L x 4"W
(24) Open corrosion spalling with cracks up to 1/2"W on the west, bottom, and east faces of the beam, measuring 6'L x 4"W x 2"D
(25) Closed corrosion spalling on the east and bottom faces, measuring 1.5'L x 2"H x 4"W
(26) Open corrosion spalling on the west, bottom and east faces of the beam, measuring 6'L x 4"W x 2"D with 3 bars exposed with up to 10% section loss
(27) Cracking on the east and bottom faces of the beam, measuring 5'L x 3/4"W
(28) Open corrosion spalling on the inside web, measuring 54'L x 5"W x 6"D and up 3 bars exposed with 100% section loss
(29) Cracking on the bottom face of the inside web measuring 5'L x 1/2"W
(30) Open corrosion spalling on the east face of the outboard web, measuring 12"L x 12"W x 2" D with 1 bar exposed.
(31) Cracking on the bottom face of the inside web measuring 3'L x 1/4"W
(32) Area of cracking and rust staining at the top of the pile measuring 2'L x 1/32"W
(33) Open corrosion spalling on the bottom face of the inside web, measuring 2.5'L x 4"W x 3"D with 1 bar exposed.
(34) Open corrosion spalling on the bottom face of the outboard web, measuring 6'L x 4"W x 2"D with 1 bar exposed.
(35) Open corrosion spalling on the west, bottom and east faces of the inside web, measuring 12'L x 7"W x 3"D with 2 bars exposed and 100% section loss.
(36) Closed corrosion spalling on the bottom face of the inside web, measuring 3'L x 4"W
(37) Open corrosion spalling on the bottom face of the inside web, measuring 4'L x 5"W x 3"D
(38) Closed corrosion spalling on the bottom face of the inside web, measuring 1'L x 5"W
(39) Crack on the bottom face of the inside web, measuring 10'L x 3/4"W
(40) Vertical crack on the east face of the pile cap measuring 2'L x 1/32"W
(41) Rust staining on the bottom of the pile cap, area measuring 1'L x 6"W
(42) Open corrosion spalling on the bottom face of the outboard web, measuring 3'L x 5"W x 3'D with 2 exposed bars
(43) Cracking on the bottom face of the inboard web, measuring 8'L x 1"W
(44) Open corrosion spalling in the bottom face of the outside web, measuring 3'L x 4"W x 2"D with one exposed bar
(45) Open corrosion spalling in the east face of the inside web, measuring 2' diameter x 2"D with 1 exposed bar
(46) Closed corrosion spalling on the bottom face of the inside web, measuring 3'L x 4"W
(47) Open corrosion spalling on the bottom face of the inboard web, measuring 30'L x 5"W x 5"D with 3 exposed bars and up to 100% section loss
(48) Closed corrosion spalling on the bottom face of the outside web, measuring 2'L x 4"W
(49) Closed corrosion spalling on the bottom face of the inside web, measuring 3'L x 4"W
(50) Crack on the bottom face of the inside web, measuring 4'L x 1/4"W
(51) Rust staining on the bottom of the pile cap, area measuring 1'L x 1"W



(52) Cracking on the bottom face of the outboard web, measuring 5'L x 1/4"W
(53) Closed corrosion spalling on the bottom face of the outboard web, measuring 24'L x 5" W
(54) Closed corrosion spalling and cracking up to 1/8"W on the bottom of the top flange, measuring 24'L x 8"W
(55) Closed corrosion spalling on the bottom face of the inboard web, measuring 24'L x 5"W
(56) Closed corrosion spalling on the bottom face of the outboard web, measuring 24'L x 5"W
(57) Horizontal crack in the pile cap, measuring up to 8'L x 1/8"W
(58) Open corrosion spalling in the outboard web, measuring 10'L x 5"W x 3"D, with one exposed bar
(59) Open corrosion spalling in the inboard web, measuring 10'L x 5"W x 3"D, with one exposed bar
(60) Closed corrosion spalling in the inboard web, measuring 5'L x 8"W
(61) Closed corrosion spalling in the north, bottom, and south faces of th outboard web, measuring 5'L x 8"W
(62) Closed corrosion spalling in the north, bottom, and south faces of the inboard web, measuring 8'L x 7"W
(63) Closed corrosion spalling in the north, bottom, and south faces of the inboard web, measuring 8'L x 7"W
(64) Open corrosion spalling in the north, bottom, and south faces of the inboard web, measuring 10'L x 7"W x 4"D with 3 exposed bars and 10% section loss
(65) Cracking in the bottom face of the outboard web, measuring 10'L x 1"W
(66) Rust staining along the bottom face of the web, area measures 20'L x 5"W
(67) Rust staining along the bottom face of the web, area measures 20'L x 5"W
(68) Closed corrosion spalling in the underside of the top flange, area measures 10'L x 4"W
(69) Longitudinal cracking in the underside of the top flange, measuring 15'L x 1/8"W
(70) Cracking in the bottom face of the outboard web, measuring 5'L x 1/8"W
(71) Rust staining in the north face of the inboard web, measuring 3'L x 3'W
(72) Longitudinal cracking in the bottom of the top flange, measuring 3'L x 1/16"W
(73) Vertical crack on the north face of the pile cap, measuring 1'L x 1/8"W
(74) Longitudinal cracking on the vertical face of the top flange, measuring 10'L x 1/8"W



(1) Transverse crack in the topping slab, measuring 8'L x 1/32" W
(2) Transverse crack in the topping slab, measuring 8'L x 1/32" W
(3) Transverse crack in the topping slab, measuring 4'L x 1/32" W
(4) Area of decay in the top board of the east handrail, area measured 2'L x 6"W x 1/2"D
(5) Broken top handrail at the start of the aluminum grating section, measuring 3'L x 12"W
(6) Missing top handrail at the start of the aluminum grating section on the west side, measuring 3'L x 12"W
(7) The clip to secure the aluminum grating to the the aluminum I-beam is broken
(8) The aluminum grating on the west side of the pier deflects up 1/2" above the adjacent concrete topping slab when the grating is unloaded, and deflects down 1/4" below the concrete slab when loaded.
(9) Missing nut on the timber post to aluminum walkway connection plate.
(10) There is an approximate 1" gap between the second and third aluminum walkway panels on the west side.
(11) There is a loose nut on the timber post to aluminum walkway connection plate
(12) There is an area of decay in the top timber board in the east handrail, measuring 2'L x 12"W
(13) There 1/2" gap between the expansion joint plate and the top of the concrete topping slab
(14) There is a 6.5" gap in the handrail between the timber posts at Bents 7 and 8 on the west handrail
(15) There is a 4.5" gap in the handrail between the timber posts on the north handrail

APPENDIX B: PHOTOGRAPHS

Photograph 1 – Overall view of the Dash Point Pier, looking north

Photograph 2 – View of the Dash Point Pier configuration, Bents 1 through 7, looking south

Photograph 3 – View of marine growth on the precast prestressed concrete pile, Pile 6;B shown, looking southwest

Photograph 4 – View of the typical concrete pile condition, Pile 5:B shown, looking west

Photograph 5 – View of the typical concrete pile cap condition, Bent 1 pile cap shown, looking north

Photograph 6 – View of the rust staining typical condition, Bent 3 pile cap shown, looking west

Photograph 7 – View of the typical beam condition, near Bent 1.5 shown, looking west

Photograph 8 – View of a typical closed corrosion spall, near Bent 1 shown, looking east

Photograph 9 – View of a typical crack in the bottom face of the beam web, near Bent 2 shown, looking south

Photograph 10 – View of an open corrosion spall with exposed steel, near Bent 1 shown, looking south

Photograph 11 – View of an open corrosion spall at the bearing, Bent 2N shown, looking southwest

Photograph 12 – View of an open corrosion spall and three broken prestressing strands, Bent 4.5 shown, looking north

Photograph 13 – View of an open corrosion spall with two broken prestressing strands, Bent 5.2 shown, looking west

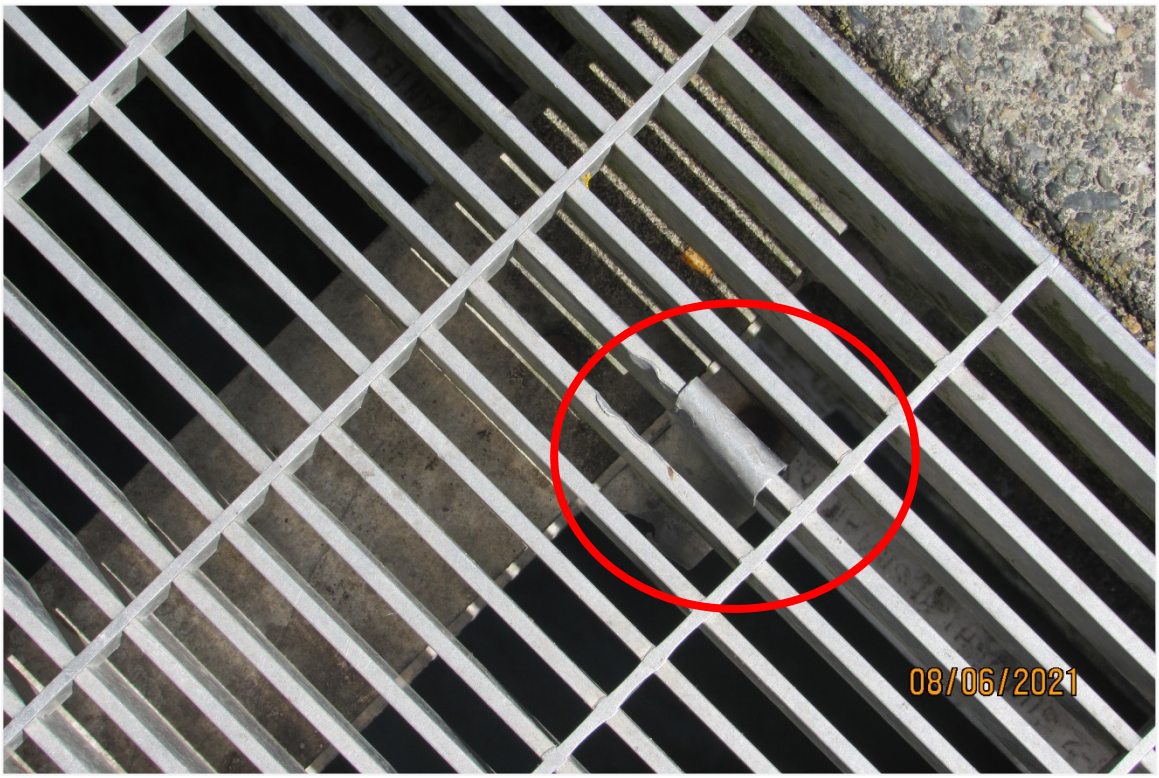
Photograph 14 – View of an open corrosion spall with a broken prestressing strand, Bent 6.8 shown, looking north

Photograph 15 – View of delamination and staining in the beam top flange, near Bent 8 shown, looking northwest

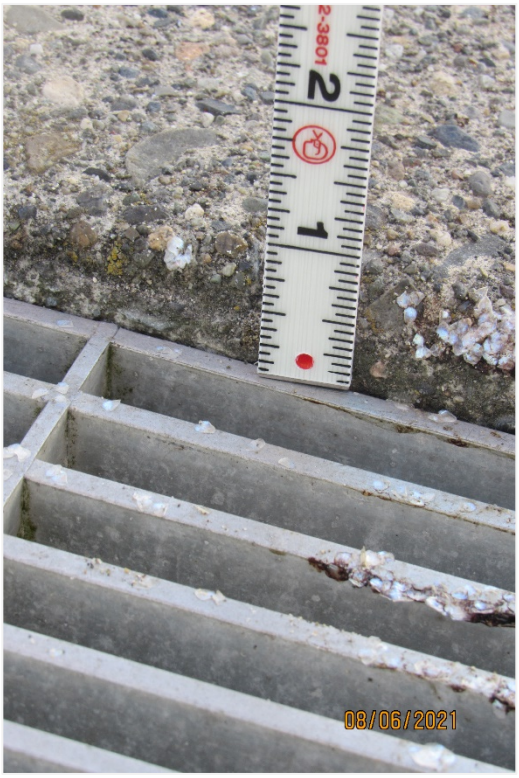
Photograph 16 – View of a longitudinal crack in the beam top flange, near Bent 9 shown, looking north

Photograph 17 – View of the typical concrete topping slab condition, near Bent 2 shown, looking north

Photograph 18 – View of the typical aluminum grating condition, near Bent 4.2 shown, looking west



Photograph 19 – View of a typical broken clip that secures the aluminum grating, looking north



Photograph 20 – View of the misalignment of the aluminum grating and the concrete topping slab, looking east

Photograph 21 – View of the typical timber rail condition, looking southeast

Photograph 22 – View of decay in the east top railing board, near Bent 3.4 shown, looking northeast

Photograph 23 – View of typical checking in the timber rail posts, looking southwest

Photograph 24 – View of the west missing top railing at Bent 4, looking southwest

Photograph 25 – View of the broken top rail at the northwest corner of Bent 8, looking north

Photograph 26 – View of the disconnected navigational utility line at Bent 10, looking east

Photograph 27 – View of the typical heavy staining and discoloration on the electrical outlet, looking northwest

Photograph 28 – View of the potable water receptacle bib at Bent 8.5, looking south

APPENDIX C: OPINION OF PROBABLE CONSTRUCTION COSTS

ReidMiddleton
728 134th Street SW, Suite 200
Everett, WA 98204

Option 1: Dash Point Pier Repair & Rehabiltation

Dash Point Pier
Metro Parks Tacoma August 25, 2021
Initial Estimate 24-2021-005

PROJECT INFORMATION	
Submittal Status:	Initial Estimate
Estimator:	BGM
Project manager:	WWA
Q/A checker:	WWA
File name/path:	H:\24Wf\2021\005 MPT Dash Point Pier Inspection\Cost & Quant\Dash Pt Pier - Option 1 - Repair

Item No.	Description	Unit	Quantity	Unit Price	Total Cost
1.0	**MOBILIZATION / DEMOBILIZATION & EROSION CONTROL**				
1.01	Mobilization and Demobilization	LS	1	$68,000	$68,000
1.02	Temporary Erosion & Sedimentation Control	LS	1	$10,000	$10,000
	MOBILIZATION / DEMOBILIZATION & EROSION CONTROL SUBTOTAL				**$78,000**
2.0	**DEMOLITION**				
2.01	Remove and Dispose of Prestressed Beams - Type A (incl. Topping Slab)	LF	210	$120	$25,200
2.02	Remove and Dispose of Prestressed Beams - Type B (incl. Topping Slab)	LF	97	$240	$23,160
2.03	Remove and Dispose of Prestressed Beams - Channel (incl. Topping Slab)	LF	156	$120	$18,720
2.04	Remove and Dispose of Timber Railing	LF	960	$5	$4,800
2.05	Disconnect, Remove, and Dispose of Utility Lines & Appurtenances	LS	1	$5,000	$5,000
2.06	Remove and Salvage Aluminum Grating and Supports	LS	1	$10,000	$10,000
2.07	Remove and Salvage Benches	EA	4	$200	$800
	DEMOLITION SUBTOTAL				**$87,680**
3.0	**REPLACEMENT**				
3.01	Furnish and Install New Type A Prestressed Beams	LF	210	$1,500	$315,000
3.02	Furnish and Install New Type B Prestressed Beams	LF	97	$3,000	$289,500
3.03	Furnish and Install New Channel Prestressed Beams	LF	156	$1,500	$234,000
3.04	Furnish and Install New Concrete (Deck) Topping Slab (3")	SF	4,544	$15	$68,160
3.05	Furnish and Install New Railing	LF	960	$175	$168,000
	REPLACEMENT SUBTOTAL				**$1,074,660**
4.0	**REPAIR & REINSTALL**				
4.01	Repair Approx. 28 SF of Cracking and Rust Stain in Pile Caps	SF	28	$100	$2,750
4.02	Repair Approx. 1 SF of Cracking in Pile	EA	1	$250	$250
4.03	Reinstall Aluminum Grating and Supports	LS	1	$10,000	$10,000
4.04	Reinstall Benches	EA	4	$250	$1,000
	REPAIR & REINSTALL SUBTOTAL				**$14,000**
5.0	**UTILITIES**				
5.01	Furnish and Install Potable Water System	LS	1	$50,000	$50,000
5.02	Furnish and Install Electrical System	LS	1	$125,000	$125,000
5.03	Furnish and Install Solar Powered Navigational Lights	EA	4	$500	$2,000
	UTILITIES SUBTOTAL				**$177,000**

BASE CONST. COST (2021 DOLLARS)	**$1,431,340**
CONSTRUCTION CONTINGENCY @ 20%	**$286,300**
SALES TAX @ 10%	**$171,800**
COST (ROUNDED)	**$1,889,000**

NOTES:

1. THE ABOVE COST ESTIMATE DOES NOT INCLUDE ESCALATIONS, DESIGN CONTINGENCIES, PERMITTING, DESIGN, OR CONSTRUCTION ADMINISTRATION. CONTRACTOR OVERHEAD AND PROFIT ARE INCLUDED IN UNIT PRICES.

ReidMiddleton
728 134th Street SW, Suite 200
Everett, WA 98204

Option 2: Dash Point Pier Replacement

Dash Point Pier
Metro Parks Tacoma
Initial Estimate

August 25, 2021
24-2021-005

PROJECT INFORMATION	
Submittal Status:	Initial Estimate
Estimator:	BGM
Project manager:	WWA
Q/A checker:	WWA
File name/path:	H:\24Wf\2021\005 MPT Dash Point Pier Inspection\Cost & Quant\Dash Pt Pier - Option 2 - Replacement

Item No.	Description	Unit	Quantity	Unit Price	Total Cost
1.0	**MOBILIZATION / DEMOBILIZATION & EROSION CONTROL**				
1.01	Mobilization and Demobilization	LS	1	$93,000	$93,000
1.02	Temporary Erosion & Sedimentation Control	LS	1	$10,000	$10,000
	MOBILIZATION / DEMOBILIZATION & EROSION CONTROL SUBTOTAL				**$103,000**
2.0	**DEMOLITION**				
2.01	Remove and Dispose of Prestressed Piles (18" dia)	EA	22	$1,000.00	$22,000
2.02	Remove and Dispose of Concrete Pile Caps (3'-6" thick)	EA	10	$1,000.00	$10,000
2.03	Remove and Dispose of Prestressed Beams - Type A (incl. Topping Slab)	LF	210	$120	$25,200
2.04	Remove and Dispose of Prestressed Beams - Type B (incl. Topping Slab)	LF	97	$240	$23,160
2.05	Remove and Dispose of Prestressed Beams - Channel (incl. Topping Slab)	LF	156	$120	$18,720
2.06	Remove and Dispose Aluminum Grating and Supports	LS	1	$5,000	$5,000
2.07	Remove and Dispose of Timber Railing and Posts	LF	960	$7	$6,720
2.08	Disconnect, Remove, and Dispose of Utility Lines & Appurtenances	LS	1	$5,000	$5,000
2.09	Remove and Dispose of Benches	EA	4	$250	$1,000
	DEMOLITION SUBTOTAL				**$116,800**
3.0	**REPLACEMENT**				
3.01	Furnish New Steel Piles, 18" dia x 0.5" thk x 65'	EA	22	$12,000	$264,000
3.02	Install New Steel Piles, 18" dia x 0.5" thk	EA	22	$4,000	$88,000
3.03	Furnish and Install New Steel Pile Cap	EA	10	$5,000	$50,000
3.04	Furnish and Install New Type A Prestressed Beams	LF	210	$1,500	$315,000
3.05	Furnish and Install New Type B Prestressed Beams	LF	97	$3,000	$289,500
3.06	Furnish and Install New Channel Prestressed Beams	LF	156	$1,500	$234,000
3.07	Furnish and Install New Concrete (Deck) Topping Slab (3")	SF	4,544	$15	$68,160
3.08	Furnish and Install New Railing	LF	960	$175	$168,000
3.09	Furnish and Install New Aluminum Grating incl. supports at Channel Beams	SF	936	$75	$70,200
3.10	Furnish and Install New Benches	EA	4	$1,500	$6,000
	REPLACEMENT SUBTOTAL				**$1,552,860**
4.0	**UTILITIES**				
4.01	Furnish and Install Potable Water System	LS	1	$50,000	$50,000
4.02	Furnish and Install Electrical System	LS	1	$125,000	$125,000
4.03	Furnish and Install Navigational Light System	EA	4	$500	$2,000
	UTILITIES SUBTOTAL				**$177,000**

BASE CONST. COST (2021 DOLLARS)	**$1,949,660**
CONSTRUCTION CONTINGENCY @ 20%	**$389,900**
SALES TAX @ 10%	**$234,000**
COST (ROUNDED)	**$2,574,000**

NOTES:

1. THE ABOVE COST ESTIMATE DOES NOT INCLUDE ESCALATIONS, DESIGN CONTINGENCIES, PERMITTING, DESIGN, OR CONSTRUCTION ADMINISTRATION. CONTRACTOR OVERHEAD AND PROFIT ARE INCLUDED IN UNIT PRICES.

ReidMiddleton

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

Option 3: Dash Point Pier Replacement with Steel & Grating

Dash Point Pier
Metro Parks Tacoma September 3, 2021
Initial Estimate 24-2021-005

PROJECT INFORMATION	
Submittal Status:	Initial Estimate
Estimator:	BGM
Project manager:	WWA
Q/A checker:	WWA
File name/path:	H:\24Wf\2021\005 MPT Dash Point Pier Inspection\Cost & Quant\Dash Pt Pier - Replacement 2021_0914

Item No.	Description	Unit	Quantity	Unit Price	Total Cost
1.0	**MOBILIZATION / DEMOBILIZATION & EROSION CONTROL**				
1.01	Mobilization and Demobilization	LS	1	$93,000	$93,000
1.02	Temporary Erosion & Sedimentation Control	LS	1	$10,000	$10,000
	MOBILIZATION / DEMOBILIZATION & EROSION CONTROL SUBTOTAL				**$103,000**
2.0	**DEMOLITION**				
2.01	Remove and Dispose of Prestressed Piles (18" dia)	EA	22	$1,000.00	$22,000
2.02	Remove and Dispose of Concrete Pile Caps (3'-6" thick)	EA	10	$1,000.00	$10,000
2.03	Remove and Dispose of Prestressed Beams - Type A (incl. Topping Slab)	LF	210	$120	$25,200
2.04	Remove and Dispose of Prestressed Beams - Type B (incl. Topping Slab)	LF	97	$240	$23,160
2.05	Remove and Dispose of Prestressed Beams - Channel (incl. Topping Slab)	LF	156	$120	$18,720
2.06	Remove and Dispose Aluminum Grating and Supports	LS	1	$5,000	$5,000
2.07	Remove and Dispose of Timber Railing and Posts	LF	960	$7	$6,720
2.08	Disconnect, Remove, and Dispose of Utility Lines & Appurtenances	LS	1	$5,000	$5,000
2.09	Remove and Dispose of Benches	EA	4	$250	$1,000
	DEMOLITION SUBTOTAL				**$116,800**
3.0	**REPLACEMENT**				
3.01	Furnish New Steel Piles, 18" dia x 0.5" thk x 65'	EA	18	$12,000	$216,000
3.02	Install New Steel Piles, 18" dia x 0.5" thk	EA	18	$4,000	$72,000
3.01	Furnish New Steel Piles, 24" dia x 0.5" thk x 65'	EA	26	$12,000	$312,000
3.02	Install New Steel Piles, 24" dia x 0.5" thk	EA	26	$4,000	$104,000
3.03	Furnish and Install New Steel Pile Cap	LF	528	$175	$92,400
3.04	Furnish and Install New Steel Beam	LF	2,450	$175	$428,750
3.05	Furnish and Install 8' long Expansion Joint & Transition Plate	EA	1	$1,000	$1,000
3.06	Furnish and Install 14' long Expansion Joint & Transition Plate	EA	1	$1,500	$1,500
3.07	Furnish and Install Grated Decking	SF	5,408	$30	$162,240
3.08	Furnish and Install New Railing	LF	946	$175	$165,550
3.09	Furnish and Install New Benches	EA	4	$1,500	$6,000
	REPLACEMENT SUBTOTAL				**$1,561,440**
4.0	**UTILITIES**				
4.01	Furnish and Install Potable Water System	LS	1	$50,000	$50,000
4.02	Furnish and Install Electrical System	LS	1	$125,000	$125,000
4.03	Furnish and Install Navigational Light System	EA	4	$500	$2,000
	UTILITIES SUBTOTAL				**$177,000**

BASE CONST. COST (2021 DOLLARS)	**$1,958,240**
CONSTRUCTION CONTINGENCY @ 20%	**$391,600**
SALES TAX @ 10%	**$235,000**
COST (ROUNDED)	**$2,585,000**

NOTES:

1. THE ABOVE COST ESTIMATE DOES NOT INCLUDE ESCALATIONS, DESIGN CONTINGENCIES, PERMITTING, DESIGN, OR CONSTRUCTION ADMINISTRATION. CONTRACTOR OVERHEAD AND PROFIT ARE INCLUDED IN UNIT PRICES.

APPENDIX D: DEFINITIONS

Damage Ratings for Prestressed Concrete Elements

Damage Rating		Description
NI	Not Inspected	Not inspected, inaccessible, or passed by
ND	No Defects	Good original hard surface, hard material, sound
MN	Minor	Minor mechanical or impact spalls up to 0.5 in. deep
MD	Moderate	Structural cracks up to 1/32 in. wide Chemical deterioration: random cracks up to 1/32 in. wide
MJ	Major	Structural cracks 1/32 in. to 1/8 in. wide Any corrosion cracks generated by strands or cables Chemical deterioration: cracks wider than 1/8 in. "Softening" of concrete up to 1 in. deep.
SV	Severe	Structural cracks wider than 1/8 in. and at least partial breakage or loss of bearing Corrosion spalls over any prestressing steel Partial spalling and loss of cross section due to chemical deterioration

Source: ASCE Manuals and Reports on Engineering Practice No. 130; *Waterfront Facilities Inspection and Assessment, 2015*

Damage Ratings for Reinforced Concrete Elements

Damage Rating		Description
NI	Not Inspected	Not inspected, inaccessible, or passed by
ND	No Defects	Good original hard surface, hard material, sound
MN	Minor	Mechanical abrasion or impact spalls up to 1 in. deep
		Occasional corrosion stains or small pop-out corrosion spalls
		General cracks up to 1/16 in. wide
MD	Moderate	Structural cracks up to 1/16 in. wide
		Corrosion cracks up to 1/4 in. wide
		Chemical deterioration: Random cracks up to 1/16 in. wide; "Soft" concrete and/or rounding of corners up to 1 in. deep
		Mechanical abrasion or impact spalls greater than 1 in. deep
MJ	Major	Structural cracks 1/16 in. to 1/4 in. wide and partial breakage (through section cracking with structural spalls)
		Corrosion cracks wider than ¼ in. and open or closed corrosion spalls (excluding pop-outs)
		Multiple cracks and disintegration of surface layer due to chemical deterioration
		Mechanical abrasion or impact spalls exposing the reinforcing
SV	Severe	Structural cracks wider than ¼ in. or complete breakage
		Complete loss of concrete cover due to corrosion of reinforcing steel with more than 30% of diameter loss for any main reinforcing bar
		Loss of bearing and displacement at connections
		Loss of concrete cover (exposed steel) due to chemical deterioration
		Loss of more than 30% of cross section due to any cause

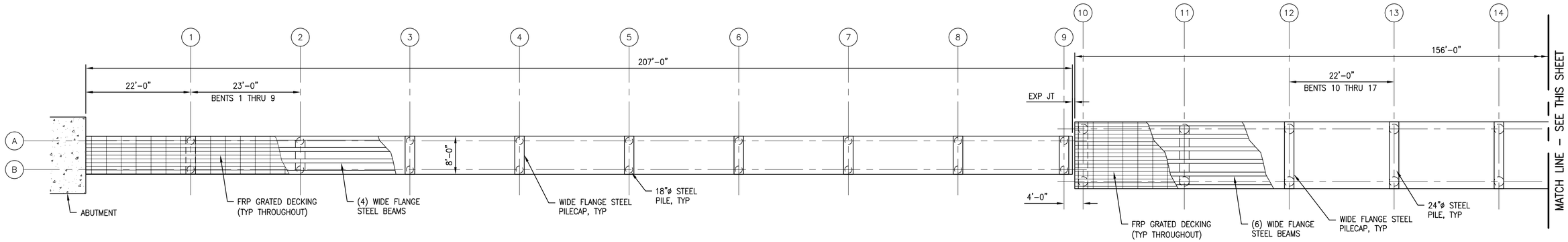
Source: ASCE Manuals and Reports on Engineering Practice No. 130; *Waterfront Facilities Inspection and Assessment, 2015*

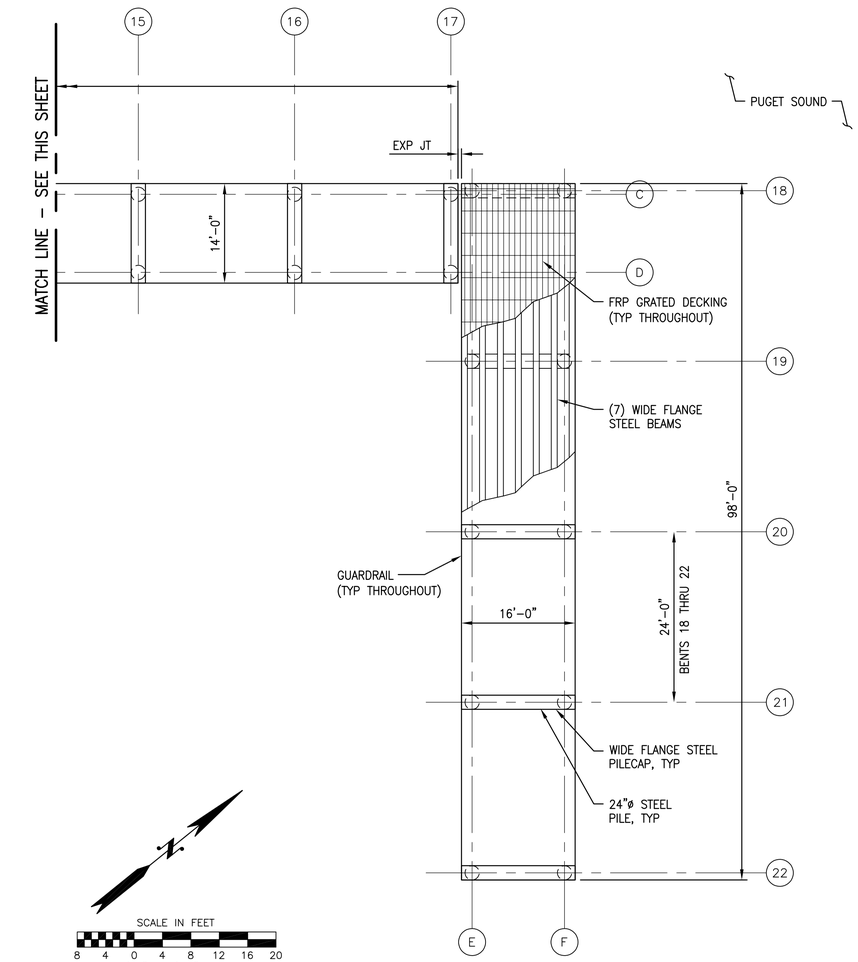
Damage Ratings for Timber Elements

Damage Rating		Description
NI	Not Inspected	Not inspected, inaccessible, or passed by
ND	No Defects	Sound surface material
MN	Minor	Checks, splits, and gouges less than 0.5 in. wide Evidence of marine borers of fungal decay
MD	Moderate	Remaining diameter loss up to 15% Checks and splits wider than 0.5 in. Cross section area loss up to 25% Corroded hardware Evidence of marine borers or fungal decay, with loss of section
MJ	Major	Remaining diameter loss 15 to 30% Checks and splits through full depth of cross section Cross-section area loss 25 to 50% heavily corroded hardware Displacement and misalignments at connections
SV	Severe	Remaining diameter loss more than 50% Loss of connections and/or fully nonbearing condition Partial or complete breakage

Source: ASCE Manuals and Reports on Engineering Practice No. 130; *Waterfront Facilities Inspection and Assessment, 2015*

APPENDIX E: PROPOSED REPLACEMENT PIER LAYOUT, OPTION #3





REVISIONS				
NO.	DATE	BY	DESCRIPTION	APP'D

DESIGNED BY: W. AHN
DRAWN BY: D. OLSEN
CHECKED BY:
DATE: 09/4/2021
PROJECT NO: 24-21-005

SCALE:
HORIZ AS NOTED
VERT
NOTE: "L"
IF "L" DOES NOT MEASURE 1" ADJUST SCALES ACCORDINGLY

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Everett, Washington 98204
Ph: 425 741-3800

METRO PARKS TACOMA
DASH POINT PIER CONDITION ASSESSMENT

SHEET TITLE:
NEW PIER PLAN CONCEPT
OPTION 3

SHEET NO.
S1.0

ReidMiddleton

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