MARINE STRUCTURES CONDITION ASSESSMENT AND REPAIR RECOMMENDATIONS REPORT, HERRON ISLAND, WA

Prepared for HMC Management

By:

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KPFF Project No. 109086
September 24, 2010

BACKGROUND AND SCOPE OF WORK

KPFF is working with Herron Island HMC Management on the Waterfront Engineering Marine Structures Project. The objective of the project is to evaluate the existing marine structures owned by HMC Management, identify and prioritize deficiencies in need of repair, provide an estimate of remaining service life, and provide possible repair concepts.

The field work for the project was performed on April 29th, 2010 with the purpose of gathering enough information about the current structural condition of the marine structures to establish an opinion of remaining service life and to identify deficiencies in need of repair. This work did not include an evaluation of code compliance of the structures or recommendations for retrofit to meet current building code requirements.

Additional information was gathered from records kept by HMC. The records kept included construction documents, permitting documents and reports from previous inspections. The most recent inspection reports were by Sargent Engineers dated February 17, 2010, and KPFF dated September 26, 2005.

NORTH BEACH MARINA

Description of Structure: The North Beach Marina includes a community dock for small water craft and a small swim dock. North Beach Marina structures that were included with this work are a fixed timber trestle supported by 10 timber piles and a total of 29 additional timber guide piles that support the floating boat dock and swim dock. See **Figure A** in **Appendix A**.

The North Beach Marina is used seasonally by island residents for short term moorage for small water craft. Access to the dock is by use of a fixed timber trestle. The upland end of the trestle is supported on grade. The trestle consists of 2x decking spanning across three 4x12 stringers. The stringers bear on 8x8 bents which are supported by a timber pile at each end. A 2x framed railing runs the full length of the trestle. The two upland piles appear to be directly set on the ground. The next two sets of piles down slope are set in large diameter concrete pipe. The last two sets of piles that support the trestle are partially encased in concrete. Verbal information provided by Herron Island residents indicates that the piles supporting the timber trestle are not embedded into the ground, but rather were installed on grade. The floating dock is accessible by an aluminum truss ramp that pivots at the trestle to adjust for the change in tide. Evaluation of the aluminum ramp is not included as a part of this report.

Directly offshore of the trestle are 27 timber guide piles that provide lateral support for a floating dock. Sections of dock have been fabricated to fit the layout of the timber piles. Each dock section is made of a plastic float with a 2x timber walking surface. Each float is trimmed with steel hardware and is attached to the timber piles with U-shaped tube that is bolted to the hardware. Evaluation of the dock floats is not included as a part of this report. Approximately 200 feet to the East of the trestle and boat dock are two

additional vertical timber guide piles that have been used for a swim dock in the past. It is our understanding that the swim dock no longer uses the timber piles.

Approach and Methods to Observations: KPFF performed visual field observations of the above-water portions of the structures at a tide ranging from approximately +8.0 to -2.5. Observations of the North Beach Marina timber piles were made by walking on shore where accessible and by walking on the floats to observe the piles that were inaccessible from shore. The piles supporting the fixed approach trestle at the North Beach Marina are partially encased in concrete. Only the portions of the piles that were not encased in concrete were accessible for observation. The lower portions of some of the piles were underwater and not accessible for observation.

Methods used to observe and record the condition of the timber structures included visual observation, hammer sounding, probing with an awl, and core sampling. All piles that were accessible were hammer sounded and probed with the awl. Piles that were visually observed to have a reduced section were hammer sounded to observe the extent of the section loss. Piles that were visually in good condition but found to sound as though they were likely to have a reduced section were core drilled to observe the condition of the interior of the pile. All holes that were created by taking the core sample were plugged with preservative treated hard-wood dowels.

Digital photos were taken of conditions observed and can be found in **Appendix B**. The intent of the photos is to illustrate typical conditions observed as well as to identify more severe conditions. Photo identification numbers correspond to the location at which they were taken in the field as indicated in **Figure A**. Not all photos taken are included in the Appendix.

Observed Conditions: A summary of observed conditions is provided below by location. Observed areas of distress are also noted on **Figure A**.

- **North Beach Marina Timber Trestle:** The timber framing of the fixed trestle is generally in good condition. See **Photo #1 and #2.** Wood members were observed to be sound from probing and hammer sounding. All of the timber piles supporting the trestle were also observed to be sound. Two of the four concrete pipes that the trestle piles are cast in are deteriorated and breaking apart. See **Photo #3**. The other two concrete pipes are covered with marine growth. See **Photo #4**.

- **North Beach Marina Timber piles:** Of the 29 piles, six piles were visually observed to have significant deterioration. See **Photos #5, #6, and #7** for examples of such conditions. An additional five piles were observed by hammer sounding to have some interior deterioration. At these five piles core samples were taken to observe the interior condition of the timber. In some of the core samples, the timber was observed to show signs of decay. In some instances, clear water flowed freely from the hole created from taking the core sample indicating that a void exists at the interior. Similar conditions were observed at the two piles to the East of the boat dock. Due to tide conditions at the time of the field work, KPFF

was not able to observe the entire exposed length of all piles. The observed conditions are considered typical. If further investigation was performed, it is likely that more examples of deterioration would be identified. Overall, the North Beach Marina piles are in poor to very poor condition.

In our opinion, some of the piles and the North Beach Marina are at risk of failure at any time due to the severity of section loss. However, it was observed that not all of the piles were attached to the dock floats. Piles noted to be in the most severe condition, and therefore at the greatest risk of failure, should not be relied upon. Immediate remediation may be accomplished by attaching the floating dock to the most sound piles available. Additionally, it is our understanding that the dock floats are removed during the stormy winter months. The period of time that floats are not attached to the piles, the risk to the structure is negligible.

So long as the floats are removed during the storm season, and while the floats are in service they are attached to the best piles available, we are not concerned about the immediate condition of the structure. We do, however, strongly recommend that HMC begin planning for repair or replacement of the North Beach Marina piles to occur as soon as is practical.

Repair/Replacement Options: Repair options are shown in the **HMC Marine Structures Repair / Replacement Concepts Matrix, Fig E** in **Appendix A**. Cost estimates are in 2010 dollars, are preliminary and include 10% for contractor mobilization, 9.5% for sales tax, 10% for design services and 20% for contingencies. We have not included replacement options with timber piles as it is our understanding that the permitting agencies prefer that materials other than treated timber be used in the Puget Sound. A description of each option follows:

NB-1A: The scope of option NB-1A includes removing the ten timber piles identified as the most severely deteriorated, including the two swim dock piles, and installing eight composite piles. It is our understanding that the two swim dock piles are no longer used and need not be replaced. The construction cost for this option is estimated to be $169,000 and the construction duration is estimated to be one month. An estimated cost of $21,000 may be assumed for each additional pile replaced, if replaced at the same time as the others.

The most significant benefit of composite piles is the expected life span and the low maintenance of the material. As reported by the composite pile manufacturer, Trelleborg: "while composite piling is a relatively new material, case studies of piles in marine conditions have been in place for 25 years. The owners at facilities with the case study piles have reported that the piles are performing well. Replacement of piles due to impact damage has been minimal as compared to steel and concrete piling. Deterioration due to exposure to marine water and sun has not been reported. And finally, maintenance is limited to pressure washing to remove marine growth."

There are several additional benefits to this option over the other options. Permitting agencies are concerned that sound transmission of driving steel piles is detrimental to marine life. It is our understanding that this is not a concern when driving composite piles. This lower ecological impact may simplify, and therefore shorten, the permitting process. Construction costs and duration for this option will be less than replacement of all piles.

The main disadvantage to composite piling, in general, is cost. In addition to a higher material cost compared to steel or timber, composite piles tend to have a higher delivery cost since they are typically shipped from the East Coast. An additional disadvantage to this option is that if only a portion of the piles are replaced, the remaining timber piles will continue to deteriorate requiring additional replacement work.

NB-1B: The scope of option NB-1B includes removing the ten timber piles identified as the most severely deteriorated, including the two swim dock piles, and installing eight steel piles. This option is essentially the same as option NB-1A, except for the use of steel replacement piles. The construction cost for this option is estimated to be $123,000 and the construction duration is estimated to be one month. An estimated cost of $15,000 may be assumed for each additional pile replaced if replaced the same time as the others.

The most significant benefit of this option is the cost difference as compared to composite piling. Steel piles are consistently stocked in the Puget Sound area. Additionally, steel piles have been widely used in Puget Sound and have a well established history. Similar to the previous option, this option will be less expensive and have a shorter construction period than replacing all of the piles. However, also similar to option NB-1A, a downfall of this option is that the remaining timber piles will continue to deteriorate requiring additional replacement work. Also, installation of steel piles in marine water may necessitate additional ecological requirements, such as a bubble curtain during driving to dissipate sound transmission through the water.

NB-2A: The scope of option NB-2A involves removing all 29 timber piles at the North Beach Marina and installing 22 composite piles. It is our understanding that the two swim dock piles are no longer used and need not be replaced. Additionally, the double piles to be removed may be replaced with single piles, further reducing the number of piles to be installed. The construction cost for this option is estimated to be $425,000 and the construction duration is estimated to be two months.

As is the case for option NB-1A, the benefits of this option include a possible shorter permitting process, long service life, and low maintenance. An additional benefit of this option is that if all of the piles are removed or replaced, the entire structure will have a significantly increased service life. Also as is the case for option NB-1A, the most significant downfall of this option is the higher cost when compared to a system of steel piles.

NB-2B: The scope of option NB-2B involves removing all 29 timber piles at the North Beach Marina and installing 16 steel piles. (See **Fig B** in **Appendix A**) This option is essentially the same as option NB-2A except for the use of steel replacement piles. The construction cost for this option is estimated to be $250,000 and the construction duration is estimated to be two months.

The disadvantage of possibly more stringent permitting requirements remains with this option. However, with all new piling, the marina will have a significantly increased service life. The benefits of option NB-2B include lower cost compared to composite piles and a proven system. An additional benefit of this option is that fewer steel piling may be required than composite piles.

Repair Recommendations: Using the benefits and disadvantages listed above together with our understanding of the financial constraints of HMC Management, we recommend that HMC Management begin planning for option NB-2B. We are recommending the use of steel piles as the lower cost option with a proven system. When properly detailed and installed, this option should provide a service life of around 50 years, with a minimal amount of maintenance.

Our understanding of the North Beach Marina small boat dock construction history is taken from the HMC record drawings. Of the (27) guide piles, the original (17) timber piles were installed in 1958. The ten double piles were installed in 1977.

The majority of the piles in most need of replacement are approximately 52 years old. With exception to the eight piles indicated to have specific evidence of deterioration, we estimate the remaining service life of the oldest nine piles to be between three and five years. The newest piles are 34 years old. With exception to the single pile indicated to have specific evidence of deterioration, we estimate the remaining service life of the newest nine piles to be between ten and twenty years. Considering that one of the 33 year old piles already shows signs of deterioration, it is reasonable to assume that a limited number of the newer piles will show signs of deterioration in less than ten years. If only a portion of the existing timber piles are replaced, HMC should plan to replace the remaining timber piles accordingly at a future time.

FERRY TERMINALS

Description of Structures: Both ferry terminals are very similar facilities. See **Figure F** in **Appendix C** and **Aerial Photos #1 and #2** in **Appendix D** of the island ferry terminal and the mainland terminal respectively. A concrete fixed approach structure is supported by octagonal concrete piles and supports the upland end of a steel ramp. The opposite end of the ramp is hung from steel cables that are supported by steel framing and steel towers on pipe piles. The height of the ramp is controlled by electric motors to adjust to the tide. Each terminal includes four cluster-pile dolphins, (two on each side) used to guide the ferry into its docked position and to keep it in position while at the terminal. Each dolphin is made up of a cluster of timber piles lashed together with steel cable. The timber dolphins are the only structures at each ferry terminal that are included in the

scope of work for this condition assessment. Condition assessment of the terminal concrete and steel structures was performed by Sargent Engineers, earlier this year under a separate contract.

Records provided by HMC indicate that the original cluster pile dolphins were installed in 1958. A contract for replacement and repair of some of the ferry terminal dolphins was executed in 1999. The repair work included installing polymer rub strips to the surfaces that come in contact with the ferry and replacing damaged piles. Additionally, verbal information was provided by Herron Island residents that the mainland terminal Northwest dolphin was replaced entirely between 1977 and1999 due to severe damage from impact of the ferry.

Approach and Methods to Observations: KPFF performed visual field observations of the above-water portions of the dolphins at a tide ranging from approximately +8.0 to -2.5. The timber cluster pile dolphins at the island ferry terminal and the mainland ferry terminal were observed from a small boat. Most of the piles were able to be directly observed, however, some of the piles in the middle of the clusters were not accessible for complete investigation. The lower portions of he dolphin piles were underwater and not accessible for observation.

Methods used to observe and record the condition of the timber structures included visual observation, hammer sounding, probing with an awl, and core sampling. All piles that were accessible were hammer sounded and probed with the awl. Piles that were visually observed to have a reduced section were hammer sounded to observe the extent of the section loss. An attempt was made to take core samples. From the deck of the ferry a core sample were taken from a pile in the Southwestern dolphin at the island terminal. Although the pile from which the sample was taken sounded to be in good condition, it was the only pile that was within reach. The sample further proved that the pile was in good condition. A core sample was taken from the small boat out of a pile in the Northwestern dolphin at the mainland terminal that was hammer sounded to be in questionable condition. The core sample taken did not have evidence of deterioration. Due to the extreme difficulty in obtaining the sample from the small boat, no further samples were taken. All holes that were created by taking the core sample were plugged with preservative treated hard-wood dowels.

Digital photos were taken of conditions observed and can be found in **Appendix D**. The intent of the photos is to illustrate typical conditions observed as well as to identify more severe conditions. Not all photos taken are included in the Appendix.

Observed Conditions: A summary of observed conditions is provided below by location.

- **Mainland Ferry Terminal Dolphins:** Observations indicate that the outermost piles that were added in 1999 are mostly in good condition, with exception of two of the piles in the Northwest dolphin. It is our understanding that the Northwest dolphin receives the most impact from the ferry and from observation the two piles in question are the first to come in contact with the incoming ferry. These two piles were observed to deflect due to impact from the incoming ferry to such

an extent that they are considered to have little remaining strength. See **Photo #8**. However, the dolphin as a whole was observed to be solid.

In all of the dolphins, deteriorated piles were observed. In most instances the deteriorated piles were at the interior of the cluster. See **Photos #9 and #10**. With the exception stated previously, the perimeter piles were observed to be in good condition by means of hammer sounding and probing.

- **Island Ferry Terminal Dolphins:** Similar conditions to those observed at the Mainland dolphins were observed at the Island Terminal. Cluster piles were observed to have deteriorated interior piles.

- **Conditions observed by Sargent Engineers at the Ferry Terminals:** For a complete review of all conditions observed by Sargent Engineers, see the inspection report dated February 17, 2010. The condition of the painted steel draw span is noteworthy for the purpose of this report. From the Sargent report:

  "The painted steel stringer has rust stains washing down from the seam between stringers and the deck. Vehicle traffic is most likely causing the deck planks to wear the paint from the tops of the stringers. Several stringers have dark rust stains along their weld connections to the floor beams. No significant corrosion was observed in these joints or on the stringers. There are many local paint failures throughout the stringers, allowing surface corrosion. There are two main girders in this span. These girders are considered fracture critical because they are steel and there is no load path redundancy. I.E., if one girder were to fail, the entire span would fail. The girders appear to receive more salt spray than the stringers and girders, as a result there are several areas of blistering paint and surface corrosion. Most blistering is along the bottom flange of the girders." (pg. 3), (See **Photo #11)**

  The inspection report by KPFF dated September 26, 2005, which included an inspection of the mainland ferry terminal, states:

  "The transfer ramp structure, timber deck, and guardrails appear to be in good condition. However, the paint on the underside of the transfer ramp is beginning to deteriorate and some rust is visible." (pg. 2)

  Comparing the condition description from the KPFF report to the Sargent report, it may be extrapolated that the paint has been deteriorating for more than 5 years. See the report by KPFF For a complete review of all conditions observed by KPFF in 2005.

Repair/Replacement Options: Repair options are shown in the **HMC Marine Structures Repair / Replacement Concepts Matrix, Fig I** in **Appendix C**. Cost estimates are in 2010 dollars, are preliminary and include 10% for contractor mobilization, 9.5% for sales tax,

10% for design services and 20% for contingencies. We have not included replacement options with timber piles as it is our understanding that the permitting agencies prefer that materials other than treated timber be used in the Puget Sound. A description of each option follows:

FT-1: The scope of option FT-1 includes removing and replacing all of the timber cluster piles within a dolphin and installing a cluster pile dolphin with composite piles. Each dolphin would require an estimated sixteen composite piles. The construction cost for this option is estimated to be $377,000 per dolphin, or $1.5 Mil per ferry terminal. The construction duration is estimated to require the terminal to be shut down for three weeks per terminal.

As discussed previously, the benefits of using composite piling include possible shorter permitting process, long service life, and low maintenance. Additionally, the new structure would react much the same way that the existing timber structure does when the ferry is brought in to dock. The most significant disadvantage of the composite structure is that it is estimated to be the highest construction cost of all of the options considered.

FT-2: The scope of option FT-2 includes removing all of the timber cluster piles and installing a steel monopole with a floating rubber donut fender. See **Fig F** and **Fig G** in **Appendix C**. The construction cost for this option is estimated to be $96,000 per dolphin, or $384,000 per ferry terminal. The construction duration is estimated to require the terminal to be shut down for two weeks per terminal.

The main benefit to this option is the simplicity. After the existing timber piles are removed, the contractor will install only one pile at each dolphin and install the floating donut fender at each pile. Therefore, the construction time should be very short and the cost is the least of all of the options considered.

A possible disadvantage to this system is that the system may feel different to the ferry captains. Installation of steel piles may require more stringent permitting requirements. Also, this option will not be feasible if clay is present in the surrounding soils. The presence of clay can only be determined by a geotechnical investigation, which would be completed in the next phase of project development.

FT-3: The scope of option FT-3 includes removing all of the timber cluster piles and installing a steel tripod dolphin with a fender pile. See **Fig H** in **Appendix C**. The construction cost for this option is estimated to be $170,000 per dolphin, or $680,000 per ferry terminal. The construction duration is estimated to require the terminal to be shut down for one month per terminal.

One of the benefits of this option is that it is a system that is widely used for vessels. It is a very durable, reliable structure. Additionally, this structure is suitable for use in soils with clay if such conditions are discovered at the terminals.

The downfalls of this option include the construction time. Due to the complexity of the system and the multiple materials, (I.E. pile driving, concrete placement, welding, fender piling) the construction time is estimated to be the longest of the options considered. And, while this option is less expensive than FT-1, it is estimated to be a higher cost than FT-2.

FT-4: The scope of option FT-4 includes spot cleaning the deteriorated areas of paint on the steel draw span and repainting the entire draw span (does not include stripping of paint is good condition). This would require the removal of the timber decking and the galvanized guardrail. In order to minimize the impact to island residence, the work for this option would be scheduled to coincide with the ferry maintenance schedule. Therefore, the contractor would be required to deliver all materials to the island before the ferry is taken out of service. The contractor would then have to access the island by use of a small boat. This access restriction will increase the cost. Therefore, the cost estimate for this work is separated by the Mainland terminal and the Island terminal. The estimated cost for this option at the Mainland side terminal is $91,000. The estimated cost for this option at the island side terminal is $121,000. The cost estimates include overtime costs to limit the work period to two weeks.

FT-5: The scope of option FT-5 includes stripping all of the paint from the steel draw span and re-painting the structure. This would require the removal of the timber decking and the galvanized guardrail. As discussed above, the access restriction at the island terminal will increase the cost for this work as well. Therefore, the cost estimate for this work is also separated by the Mainland terminal and the Island terminal. The estimated cost for this option at the Mainland side terminal is $163,000. The estimated cost for this option at the island side terminal is $194,000. The cost estimates include overtime costs to limit the work period to two weeks.

Repair Recommendations: We recommend that the HMC Management begin planning for option FT-4. As discussed in the Sargent Engineers report, the paint system is intended to protect the steel material from deterioration. There are sections of the paint system that have failed, leaving the steel at risk of corrosion and section loss. We believe that this is a critical repair that should be scheduled as soon as is practical.

The condition of the cluster pile dolphins at the ferry terminals does not warrant immediate action. The dolphins appear to have enough structural integrity to resist the loads imparted by the ferry during daily operations. Some of the piles within the dolphins were installed as much as 52 years ago; the newest piles have been in place 10 years. Of greatest concern is that the older interior piles will deteriorate to a point that they will be crushed by the perimeter piles allowing the steel cable to become loose. Such a condition would reduce the group-action that is created by the cable, forcing the piles to act individually as opposed to acting together. However, due to the redundancy of multiple piles, the dolphins should not fail catastrophically, but rather deflect more over time. We estimate that the remaining service life of the dolphins to be between 10 and 15 years.

Using the benefits and disadvantage listed above together with our understanding of the financial constraints of the HMC Management, we recommend that the HMC Management plan to replace the existing timber cluster pile dolphins with steel mono pile dolphins within the next 10 years. FT-2 is recommended as the option with the lowest cost and shortest construction time with a proven system.

PERMITTING

The permits required for all of the options throughout this report are the same. Some of the requirements of the permits will vary based on the type of materials, number of piles, and type of construction. The cost estimate for permitting is between $4,000 and $10,000 depending on noise impacts and includes Pierce County application fees. The time estimate for permitting is between five and ten months, the majority of which is regulatory agency review time. Permits should be in-hand before the project is advertised for bid. The Marina work and the Ferry Terminal work may be permitted at the same time so long as the work may be completed before the permit expires. If the painting work were permitted separately, the cost estimate is between $4,000 and $6,000, and the time estimate is between three and six months. See the **HMC Marine Structures Repair / Replacement Concepts Matrix,** in **Appendix A and C** and the **Permitting Strategy**, **Herron Island Regulatory Process and Contacts**, and the **HMC Marine Structures Permitting Timeline** in **Appendix E** for additional information.

CONCLUSIONS

While portions of all of the HMC owned marine structures show signs of distress and deterioration, the greatest risk of failure is at the North Beach Marina and the painting system at the steel draw spans of the ferry terminals. We recommend that the HMC Management plan for the repair work discussed above to occur as soon as practical.

We recommend that maintenance schedules of all of the marine structures be followed consistently without regard to future replacement. All recommendations within the Sargent Engineers report should also be followed.

LIMITATIONS TO STRUCTURAL CONDITION ASSESSMENT

The structural condition assessment, estimates of remaining service life and recommendations for repair made herein are based, in part on visual observations made above the waterline at the time field work was performed. The condition of piling below the mud-line or water-line is unknown at this time. An exploratory excavation of the piles and dive inspection, which is beyond this scope of work, is required to evaluate the piling further. Also unknown is the condition of timber piling within the concrete encasing. Assessment of the condition of the timber piling can not be inferred by the condition of the concrete coating. More sophisticated inspection techniques that are beyond this

scope of work are required to further evaluate the condition of the timber piling. We do not feel that a dive inspection, exploratory excavation, or implementation of more sophisticated inspection techniques is necessary to complete the scope of work for phase one of this project.

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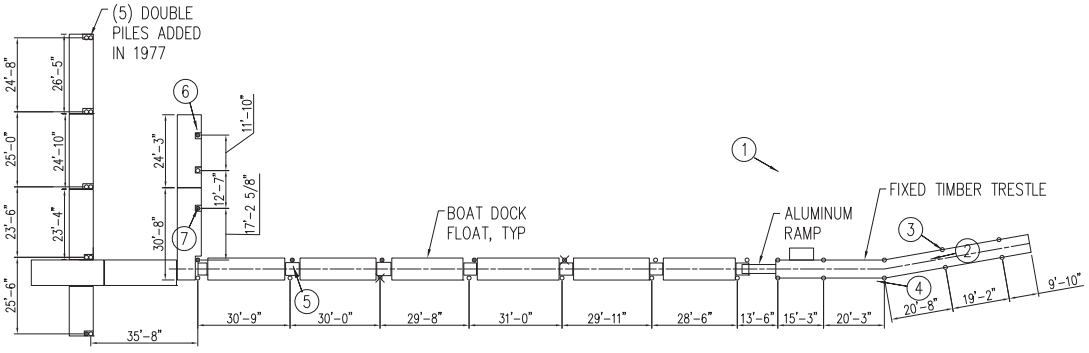
APPENDIX A
NORTH BEACH MARINA FIGURES

NOTES:

1. CONDITIONS AS OBSERVED ON APRIL 29, 2010.
2. ALL DIMENSIONS ARE APPROXIMATE.
3. (1) INDICATES PHOTOGRAPH REFERENCE.
4. ○ INDICATES TIMBER PILE
5. ⊗ INDICATES TIMBER PILE SUSPECTED OF DETERIORATION
6. ● INDICATES TIMBER PILE WITH VISIBLE DETERIORATION



NORTH BEACH MARINA
OBSERVED CONDITIONS

1

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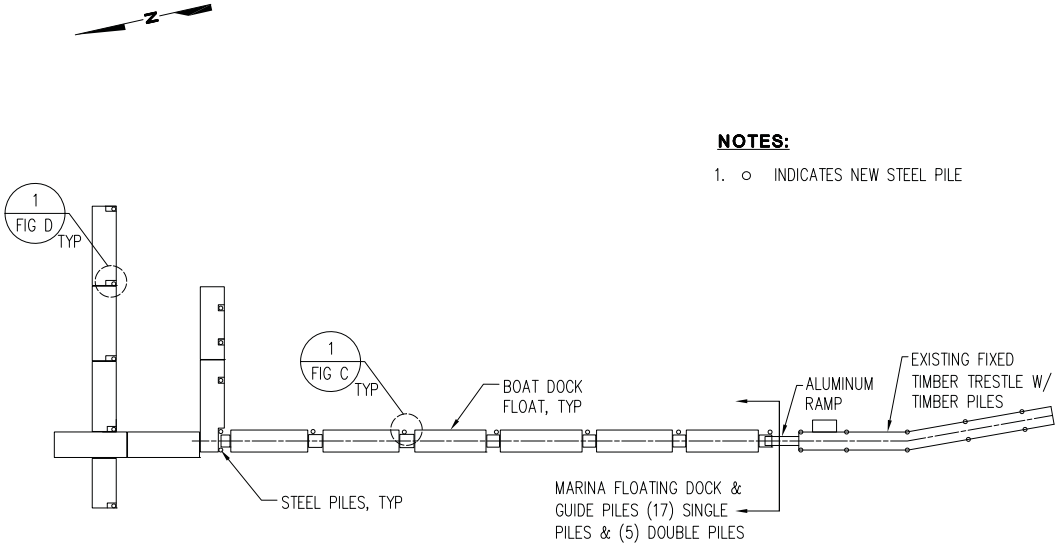
REVISION | DATE | NO.

HERRON ISLAND
MARINE STRUCTURES

NORTH BEACH MARINA
OBSERVED CONDITIONS

PROJECT NO.: 109086
SCALE: 1/16" = 1'-0"
DATE: 9/10
SHEET NO.

FIG. A



NOTES:

1. ○ INDICATES NEW STEEL PILE

NORTH BEACH MARINA
RECOMMENDED REPAIR PLAN

1

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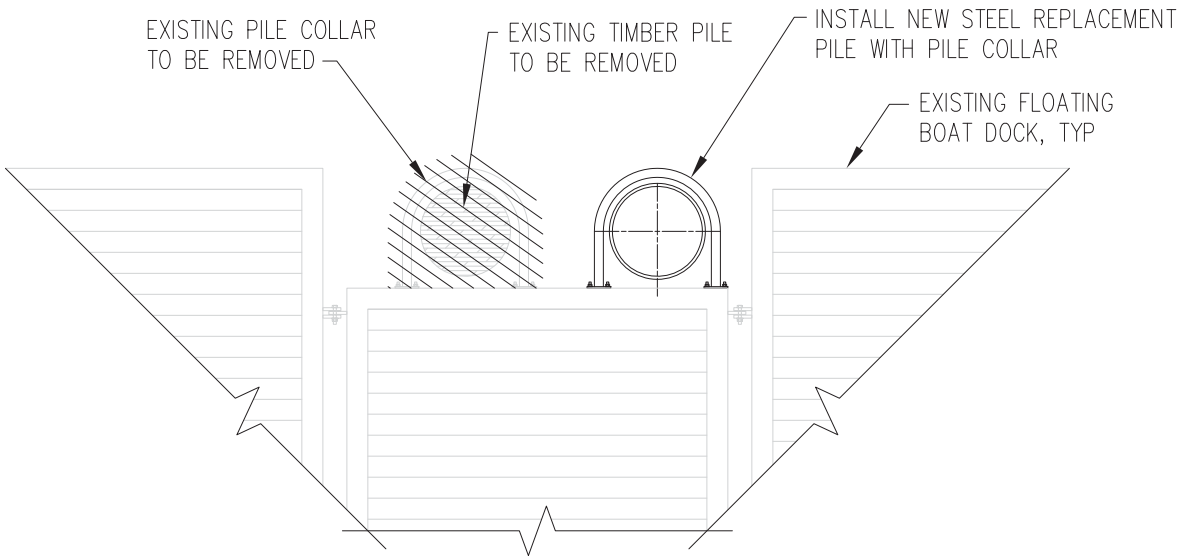
NO.	DATE	REVISION

HERRON ISLAND
MARINE STRUCTURES

NORTH BEACH MARINA
RECOMMENDED REPAIR PLAN (NB-2B)

PROJECT NO.: 109086
SCALE: 1/16" = 1'-0"
DATE: 9/10
SHEET NO.

FIG. B



1 **ENLARGED PLAN - NORTH BEACH MARINA**

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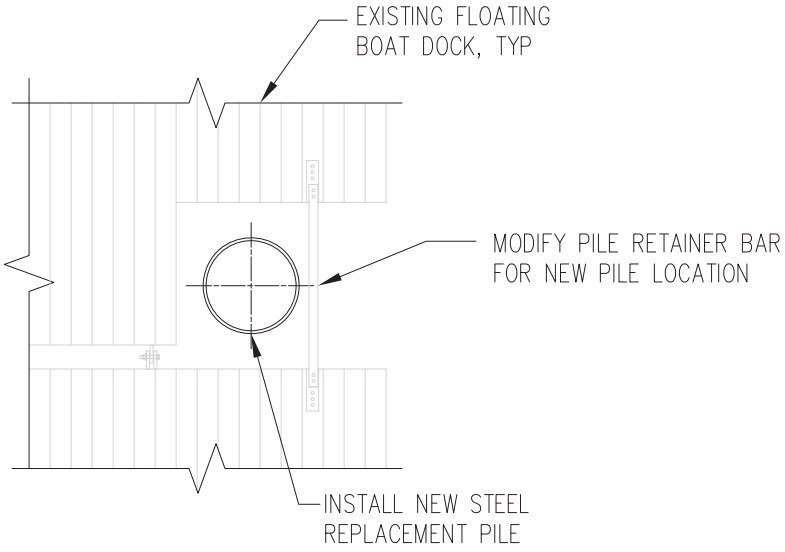
NO.	DATE	REVISION

HERRON ISLAND DOCK

REPLACEMENT PILE CONNECTION DETAILS

PROJECT NO.: 109086
SCALE: NTS
DATE: 9/10
SHEET NO.

FIG C



1 **ENLARGED PLAN - NORTH BEACH MARINA**

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NO.	DATE	REVISION

HERRON ISLAND DOCK

REPLACEMENT PILE CONNECTION DETAILS

PROJECT NO.: 109086
SCALE: NTS
DATE: 9/10
SHEET NO.
FIG D

HMC Marine Structures Repair / Replacement Concepts Matrix
North Beach Marina

Option	Description	Permitting Cost Estimate	Permitting Time Estimate	Construction Cost Estimate	Construction Time Estimate	Pros	Cons	Priority Ranking
NB-1A	Remove and replace deteriorated timber piles with composite piles. (Approx 8 piles)	Pierce County application fees $720; consultant permitting work range $3K to $5K depending on noise impacts (cost includes ferry terminal work permitting)	5 to 10 Months majority of the time is regulatory agency reviews**	$169,000	1 Month	Possible shorter permitting time period than replacing all piles, shorter construction period, lower initial cost than replacing all piles, little maintenance.	Timber piles will continue to deteriorate requiring future maintenance and or replacement of remaining timber piles.	2
	Remove and replace an additional timber pile with a composite pile			$21,000				
NB-1B	Remove and replace deteriorated timber piles with steel piles. (Approx 8 piles)	Pierce County application fees $720; consultant permitting work range $3K to $5K depending on noise impacts (cost includes ferry terminal work permitting)	5 to 10 Months majority of the time is regulatory agency reviews**	$123,000	1 Month	Possible shorter permitting time period than replacing all piles, shorter construction period, lower initial cost than replacing all piles, and lower cost than composite piles.	Timber piles will continue to deteriorate requiring future maintenance and or replacement of remaining timber piles., requires maintenance, requires bubble curtain for installation, may have additional permitting requirements	1
	Remove and replace an additional timber pile with a steel pile			$15,000				
NB-2A	Remove and replace all timber piles with composite piles. (Approx 22 piles)	Pierce County application fees $720; consultant permitting work range $7K to $9K depending on noise impacts (cost includes ferry terminal work permitting)	5 to 10 Months majority of the time is regulatory agency reviews**	$425,000	2 Months	New structure (re-set service life of guide piles), long service life, little long term maintenance.	Higher Initial cost than partial replacement, possibly full permit time period, longer construction period	3
NB-2B	Remove and replace all timber piles with steel piles. (Approx 16 piles)	Pierce County application fees $720; consultant permitting work range $7K to $9K depending on noise impacts (cost includes ferry terminal work permitting)	5 to 10 Months majority of the time is regulatory agency reviews**	$250,000	2 Months	New structure (re-set service life of guide piles), long service life.	Higher Initial cost than partial replacement, possibly full permit time period, longer construction period, requires maintenance, requires bubble curtain for installation, may have additional permitting requirements	3
	Recommendation:	Repair the damaged pile concrete encasements at the timber trestle (NB-3). Plan for repair of deteriorated dock guide piles (NB-1B) as soon as possible and attach floating dock to the best piles available in the mean time. Continue to remove the dock floats from the water during the storm season. See "FIG A"						

* Assumes all in-water work can be done during low tide with proper protection (BMPs) of near shore habitat and a letter of "No Effect" will suffice for Endangered Species consultation.

** Assumes some in-water work will be done while water is physically present. Also assumes the project qualifies for a programmatic BE issued for replacement of less than 100 pilings.

Pierce County Fees: Shoreline Exemption $500.00; SEPA exemption $220.00

All cost estimates are in 2010 dollars. Construction cost estimates are preliminary and include 10% contractor mobilization, 9.5% sales tax, 10% design services estimate, and 20% contingency.

NOTE: North Beach Marina and Ferry Terminal permitting work would be ONLY ONE submittal.

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FIG. E

September 24, 2010
KPFF Job # 109086

APPENDIX B
NORTH BEACH MARINA PHOTOS

Photo 1 Timber Trestle at North Beach Marina at low tide

Photo 2 Underside view of Timber Trestle

Photo 3 Broken concrete trestle piles set in broken concrete pipe

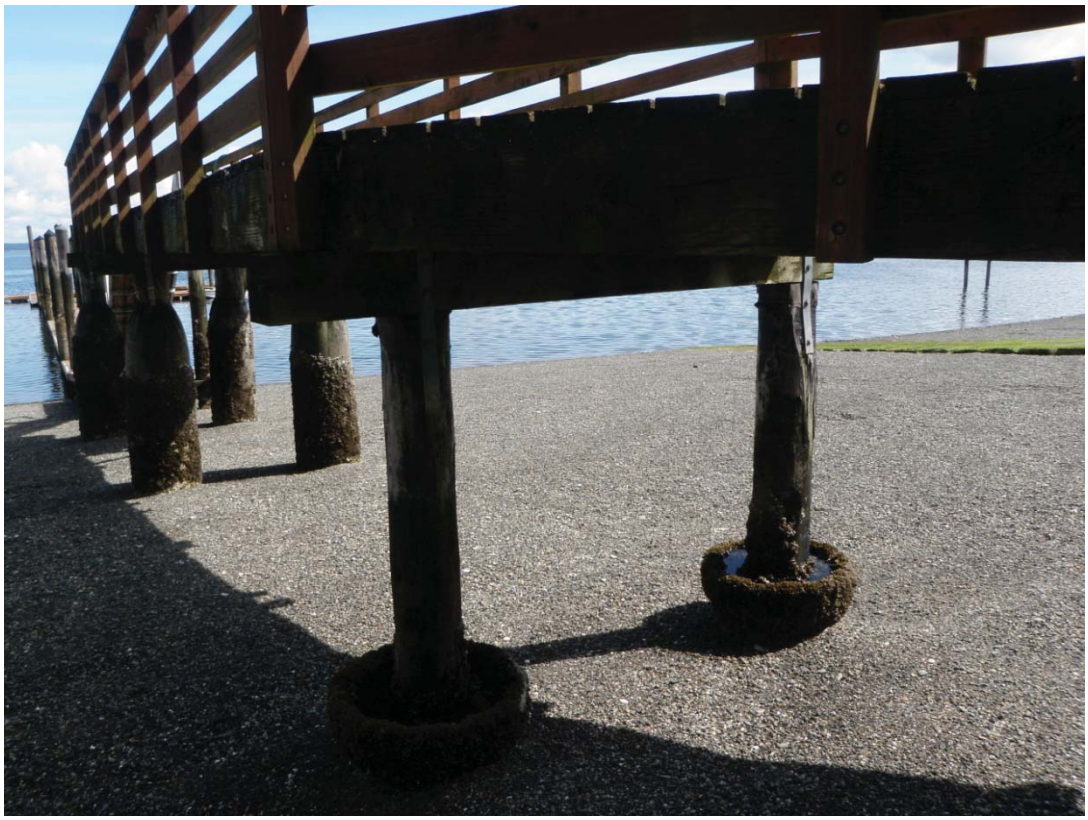


Photo 4 Timber Trestle

Photo 5 North Beach Marina Boat Dock example of deteriorated Pile

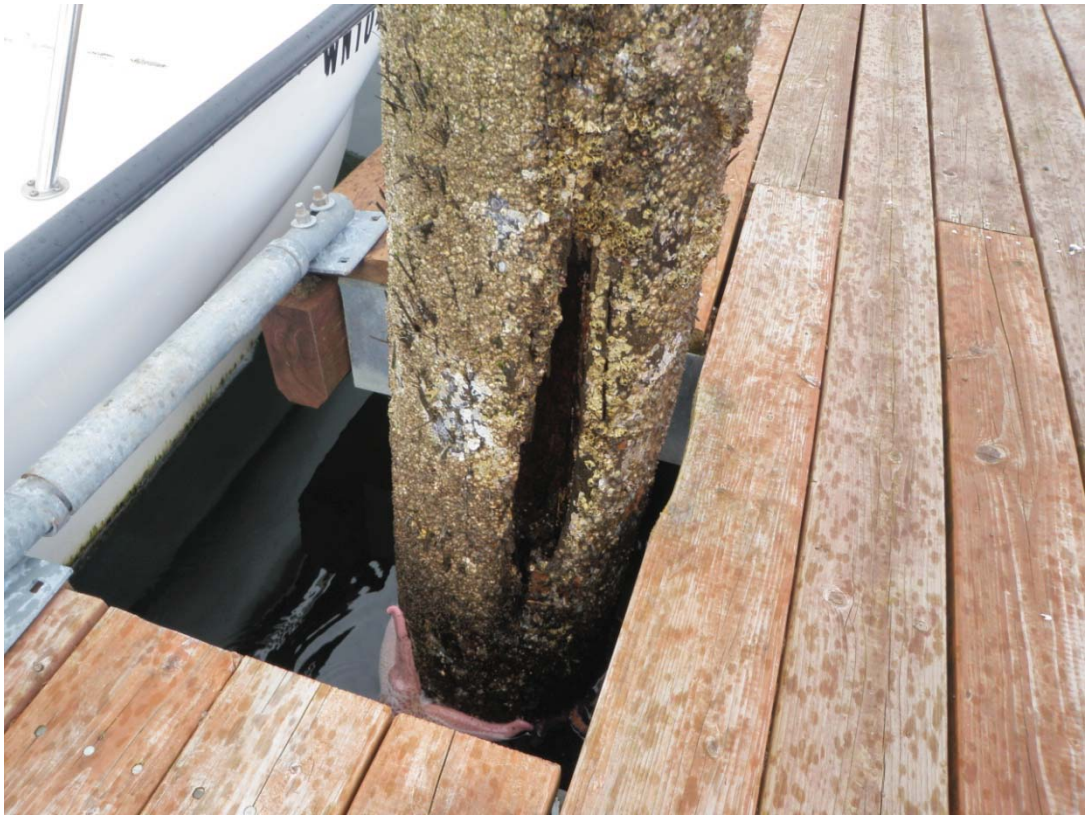


Photo 6 North Beach Marina Boat Dock example of deteriorated Pile

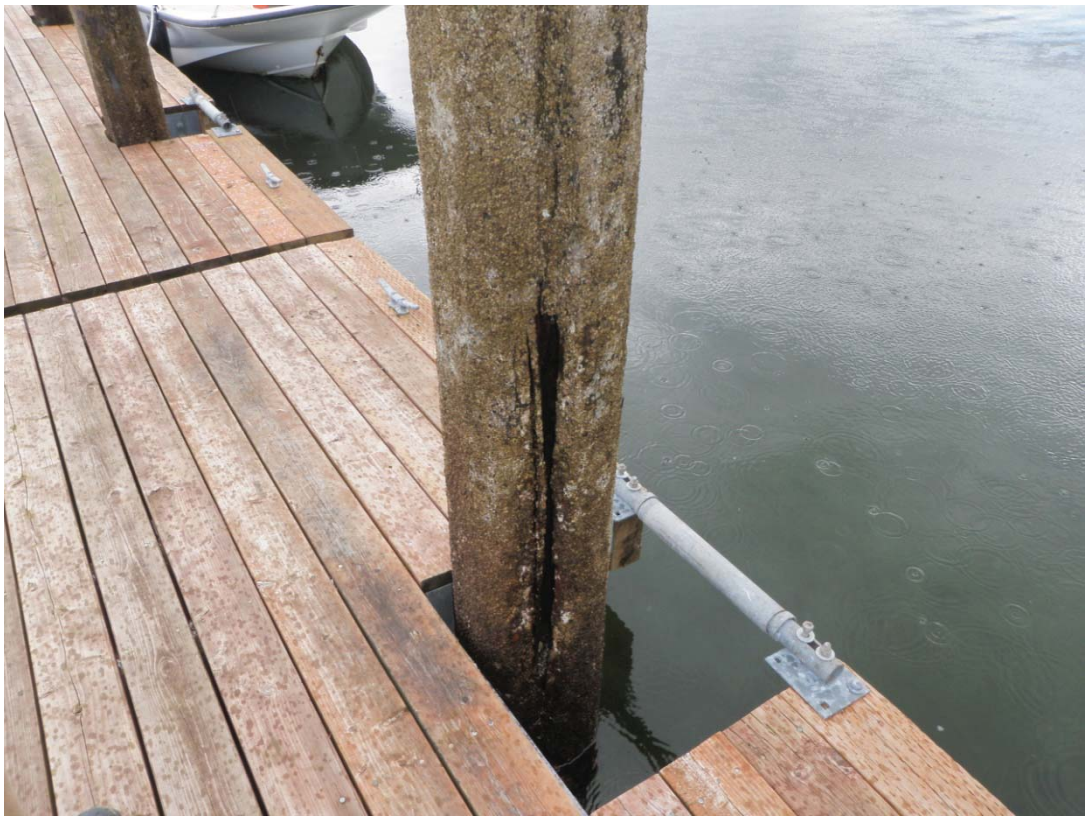
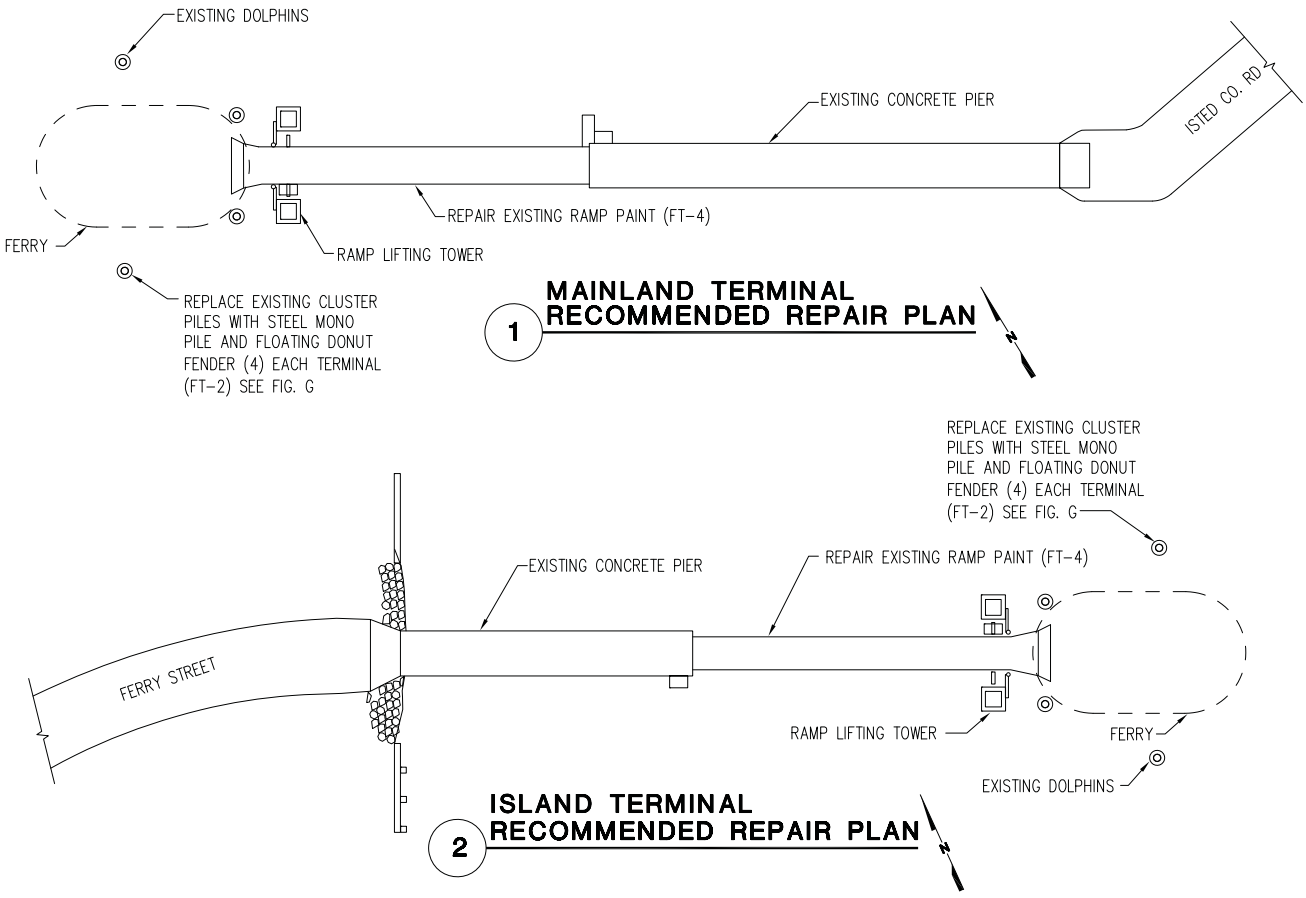


Photo 7 North Beach Marina Boat Dock example of deteriorated Pile

APPENDIX C
FIGURES FOR FERRY TERMINALS



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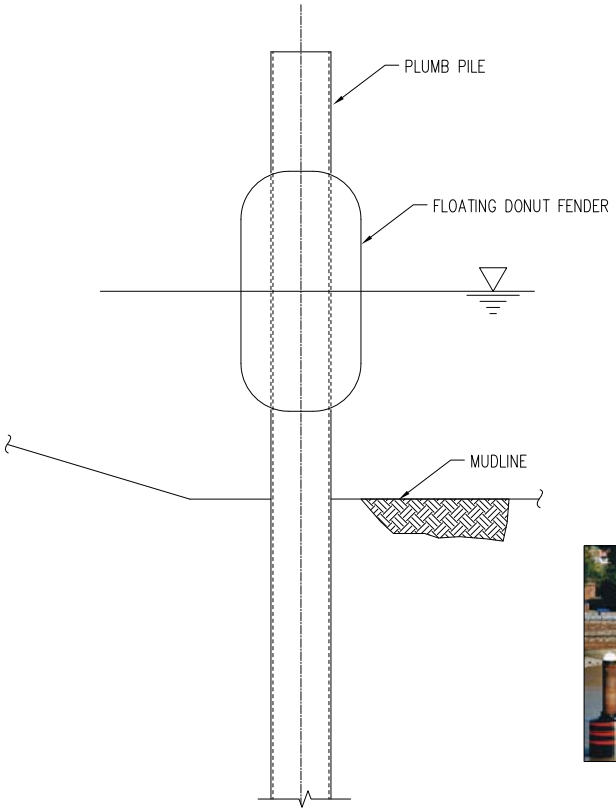
NO.	DATE	REVISION

HERRON ISLAND DOCK

FERRY TERMANALS
RECOMMENDED REPAIR PLAN

PROJECT NO.: 109086
SCALE: NTS
DATE: 9/10
SHEET NO.

FIG F



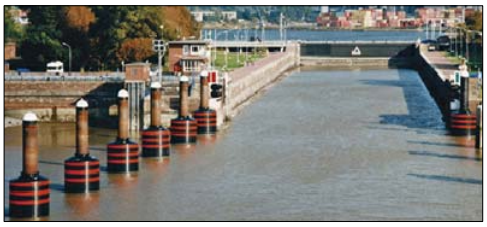


PHOTO IS FOR REFERENCE OF STRUCTURE TYPE, NOT PROPOSED CONFIGURATION

1 MONOPILE BREASTING DOLPHIN - (FT-2)

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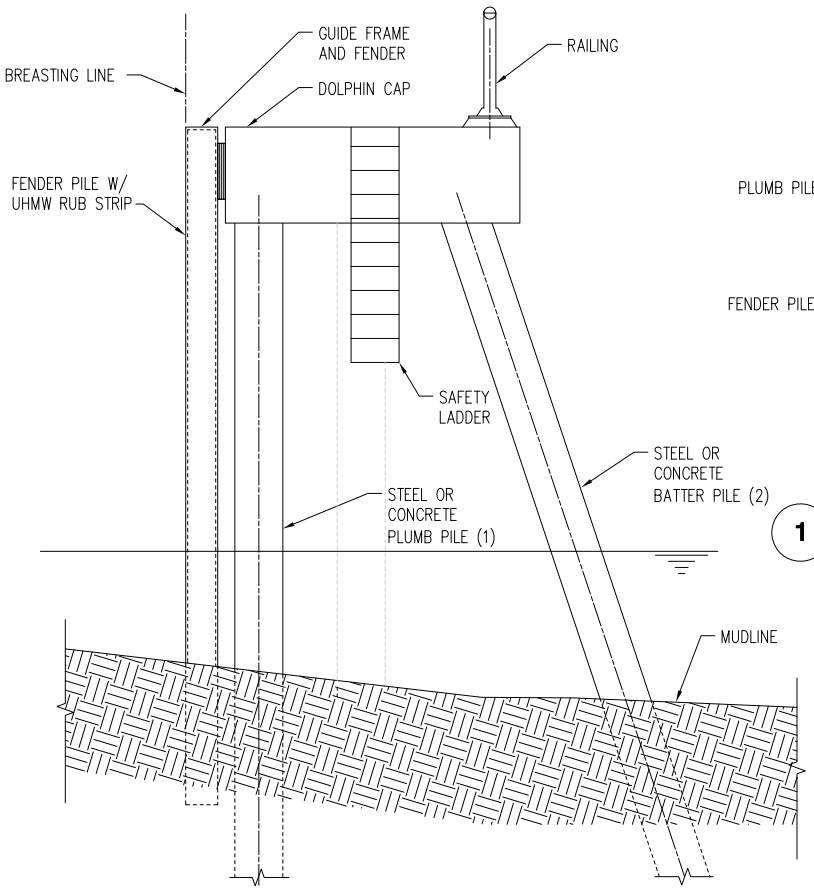
NO.	DATE	REVISION

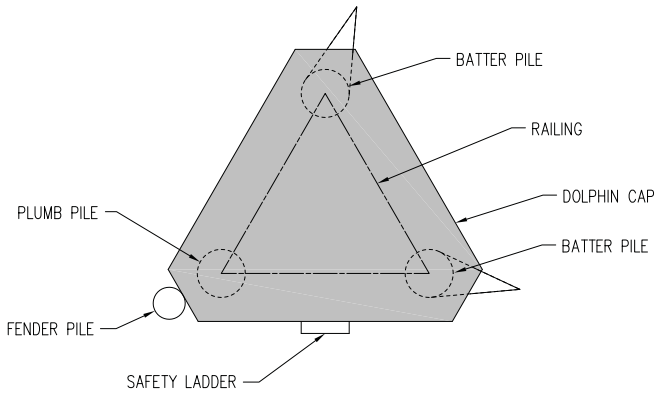
HERRON ISLAND DOCK

MONOPILE WITH FLOATING FENDER (FT-2)

PROJECT NO.: 109086
SCALE: NTS
DATE: 9/10
SHEET NO.
FIG G



2 **ELEVATION - TRIPOD DOLPHIN (FT-3)**



1 **PLAN - TRIPOD DOLPHIN (FT-3)**

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NO. | DATE | REVISION

HERRON ISLAND DOCK
TRIPOD DOLPHIN (FT-3)

PROJECT NO.: 109086
SCALE: NTS
DATE: 9/10
SHEET NO.
FIG H

HMC Marine Structures Repair / Replacement Concepts Matrix.
Ferry Terminals

Option	Description	Permitting Cost Estimate	Permitting Time Estimate	Construction Cost Estimate	Construction Time Estimate	Pros	Cons	Priority
FT-1	Remove and replace all timber piles within a breasting dolphin and replace with a composite cluster pile dolphin (per dolphin)	Pierce County application fees $720; consultant permitting work range $7K to $9K depending on noise impacts (cost includes marina permitting)	5 to 10 Months**	$377,000 per dolphin / $1.5 Mil. Per terminal	3 Weeks per Terminal	Similar structure as existing, long service life, good results from case studies, short construction period	Relatively new material for use in Puget Sound, highest initial cost.	3
FT-2	Remove timber cluster pile dolphin and replace with steel mono-pile with floating donut fender (per dolphin)	Pierce County application fees $720; consultant permitting work range $7K to $9K depending on noise impacts (cost includes marina permitting)	5 to 10 Months**	$96,000 per dolphin / $384,000 per terminal	2 Weeks per Terminal	Lowest cost, proven system, approx 50 year service life, short construction period	Unfamiliar structure to ferry operators, may have additional permitting requirements, may not be appropriate if clay soils are present.	1
FT-3	Remove timber cluster pile dolphin and replace with steel pile tripod dolphin with fender pile (per dolphin)	Pierce County application fees $720; consultant permitting work range $7K to $9K depending on noise impacts (cost includes marina permitting)	5 to 10 Months**	$170,000 per dolphin / $680,000 per terminal	1 Month per Terminal	Proven system, 50 year service life, possible alternate to FT-2 if clay soils are present.	High initial cost, unfamiliar structure to ferry operators, longer period that terminal is shut-down, may have additional permitting requirements.	2
FT-4	Repair steel draw span paint with spot clean and re-paint entire structure (per sq ft)	Pierce County application fees $720; consultant permitting work range $3K to $5K depending on noise impacts (cost includes marina permitting)	3 to 6 Months*	Mainland $91,000 Island $121,000	2 Weeks per Terminal	lower cost than full re-paint	Maintenance needs will need to be regularly evaluated and performed	1
FT-5	Strip all existing paint from steel draw span and re-paint (each ramp)	Pierce County application fees $720; consultant permitting work range $3K to $5K depending on noise impacts (cost includes marina permitting)	3 to 6 Months*	Mainland $163,000 Island $194,000	2 Weeks per Terminal	Greater extension of service life of structure	Ferry landing will be out of service for a longer time period.	2
Recommendation:		Plan for paint repair (FT-4) of steel ramps as soon as possible. Plan for replacement of cluster pile dolphins with steel mono-pile and floating donut fender (FT-2) within the next 10 years. See "FIG C".						

* Assumes all in-water work can be done during low tide with proper protection (BMPs) of near shore habitat and a letter of "No Effect" will suffice for Endangered Species consultation.
** Assumes some in-water work will be done while water is physically present. Also assumes the project qualifies for a programmatic BE issued for replacement of less than 100 pilings.
Pierce County Fees: Shoreline Exemption $500.00; SEPA exemption $220.00
All cost estimates are in 2010 dollars. Construction cost estimates are preliminary and include 10% contractor mobilization, 9.5% sales tax, 10% design services estimate, and 20% contingency.
NOTE: North Beach Marina and Ferry Terminal permitting work would be ONLY ONE submittal.

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FIG. I

September 24, 2010
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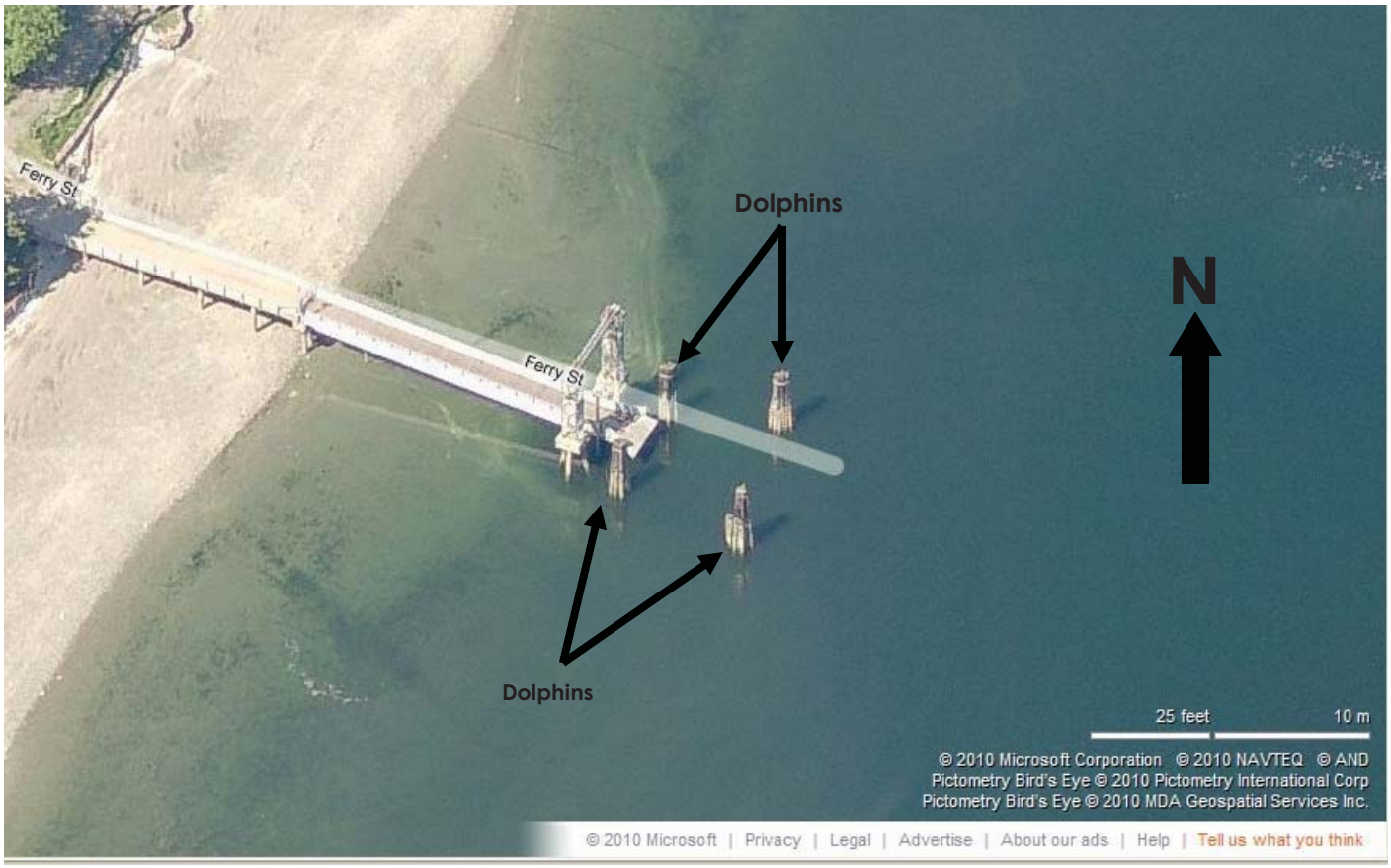
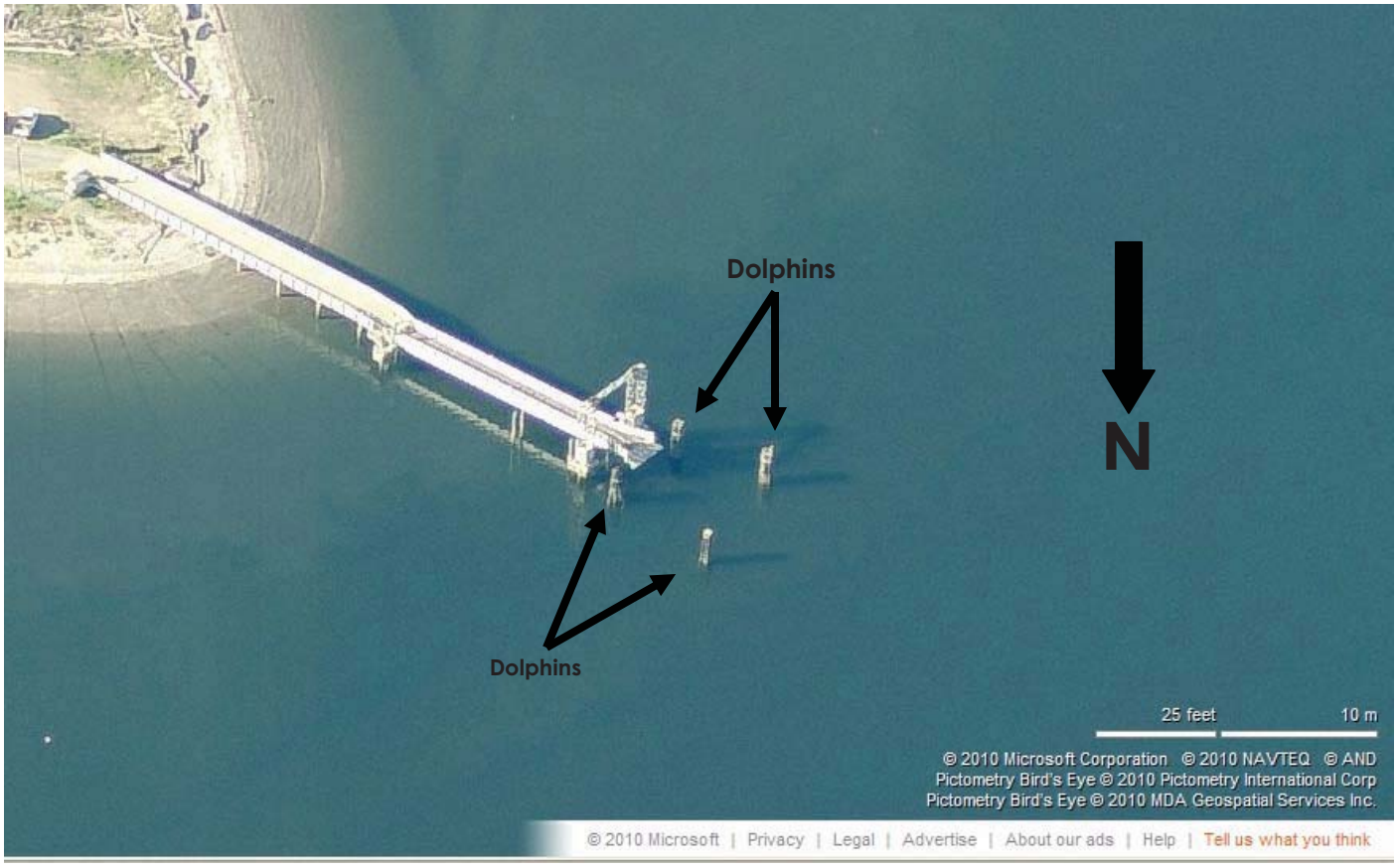
APPENDIX D
PHOTOS OF FERRY TERMINALS



Ariel Photo 1 Island Ferry Terminal



Ariel Photo 2 Mainland Ferry Terminal

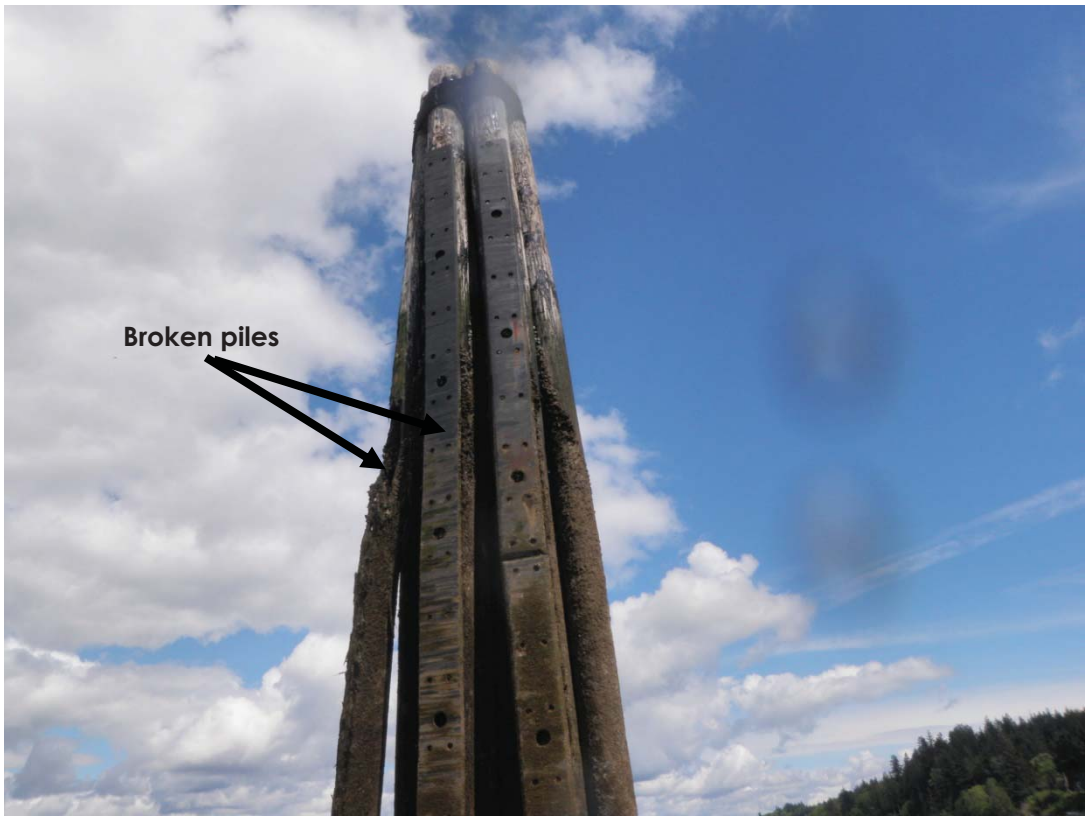


Photo 8 North-West timber dolphin at the Mainland Ferry Terminal

Photo 9 Typical example of timber dolphins with deteriorated interior pile

Photo 10 Typical example of timber dolphins with deteriorated interior pile

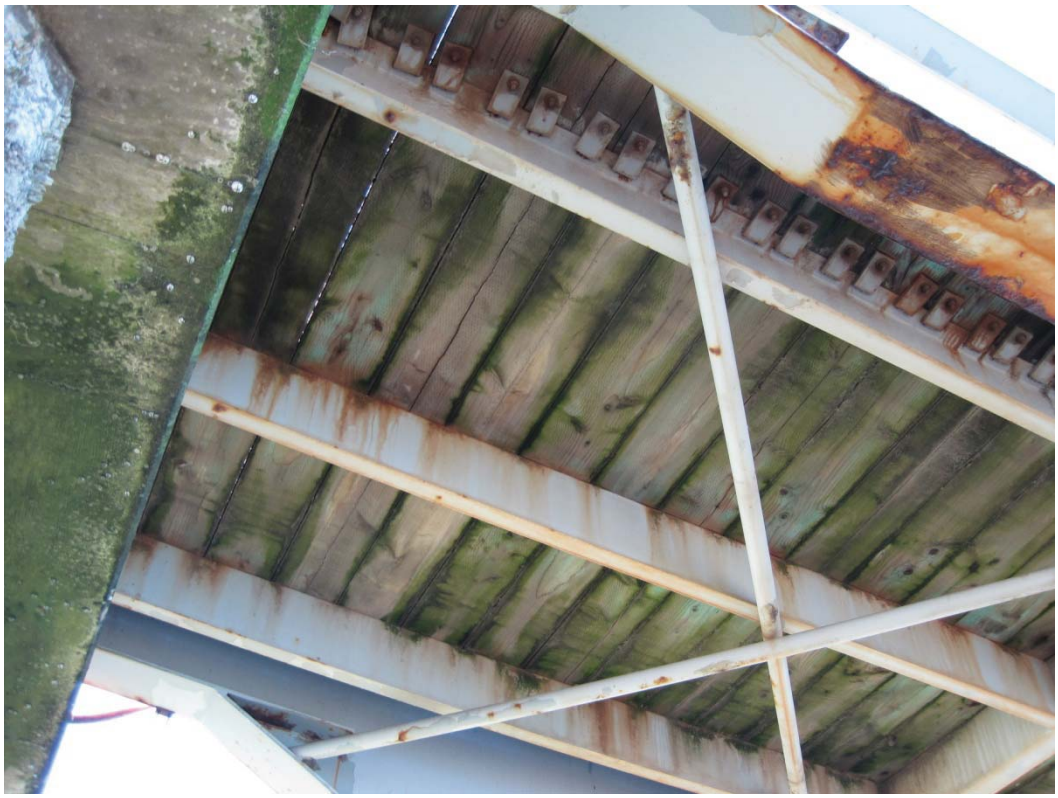


Photo 11 Underside view of steel draw span

APPENDIX E
PERMITTING

Required Permits

All work is anticipated to be in-water work, meaning that although the work site may not be inundated with water during low tidal events, all the work will be below the Ordinary High Water Line which is considered in-water work by the regulatory agencies. The permitting regulations applicable to the proposed project include:

- Compliance with the Pierce County Shoreline Master Program – shoreline exemption and State Environmental Policy Act (SEPA) exemptions
- US Army Corps of Engineers (USACE) - Section 10 Rivers and Harbors Act for work in a navigable waterway
- US Fish and Wildlife Service (USFWS) and National Oceanic and Atmospheric Administration (NOAA) Fisheries review will potentially be a programmatic Biological Evaluation (BE) for removal/replacement of less than 100 pilings
- Ecology review of the shoreline exemption and SEPA exemption
- Washington Department of Fish and Wildlife (WDFW) Hydraulic Project Approval (HPA)
- The Squaxin Island Tribe will review applications
- Department of Archaeology and Historic Preservation (DAHP) may require review, however some work can qualify for an EZ review using specific DAHP forms.

Strategy

Permit coordination will begin early especially with Pierce County, WDFW and the USACE. This will identify any issues they may have and will provide an opportunity to determine if mitigation is required. By removing creosote pilings from the marine waters the project is technically self mitigating. However sometimes the agencies require additional mitigation and it is good to coordinate with them to find out what their preferred mitigation might be. For example, there may be a specific project close to the site, where Pierce County is working on habitat restoration and there might be the opportunity to provide assistance on their habitat restoration site.

Pierce County and USACE typically require the most amount of time for their permit reviews. Therefore it will be good to meet with them early, provide submittals to them for their review as early as possible to keep the project moving forward. Permit reviews from Pierce County include issuing the letters of exemption for the shoreline work and for the SEPA. USACE will require submitting a completed Joint Aquatics Resource Permit Application (JARPA) and will provide the section 10 permit

and will coordinate the review of the programmatic BE with USFWS and NOAA Fisheries. The Squaxin Island Tribe will also review the project through both the USACE and any Pierce County permits.

Once there is a letter from Pierce County stating the project is exempt under SEPA, the JARPA will then be submitted to WDFW for review and Hydraulic Project Approval (HPA). The typical review time for the approval from WDFW is 45 days.

Our strategy is to coordinate early with the regulatory agencies, especially those with issues that might delay any projects and work towards resolving issues as quickly as possible in order to keep the project moving forward.

Herron Island Regulatory Process and Contacts

Agency	Regulations	Letter or application(s)	Anticipated length of time	Contact
United States Army Corps of Engineers (USACE)	Section 10 (work in navigable water way) Squaxin Island Tribe, Natural Resources Dept., 2952 Old Olympic Highway, Shelton, Wa 98584 (306) 426-9781 Possibly Section 404 of the Clean Water Act (CWA) and Endangered Species Act (ESA) compliance,	Joint Aquatic Resource Permit Application (JARPA) and Biological Evaluation or Assessment (ESA Compliance)*	USACE initiates consultation with USFWS and NOAA - therefore the length of time ranges from 8 to 14 months after submittal is received.	Per web site Jess Jordan/Catherine Blackwell or Jim Green (left messages to determine whom would be reviewing)
*Biological Evaluation/Assessment (Possibly a Programmatic BE)	USACE will forward the Biological Evaluation/Assessment to United States Fish and Wildlife Service (USFWS) and to National Oceanic and Atmospheric Association (NOAA) Fisheries for concurrence.	Bioloigical Evaluation demonstrating project is Not Likely to Adversely Affect (NLAA) federally listed plant, animal and fish species.	See above	All coordination is through the USACE.
Department of Archaeology and Historic Preservation (DAHP).	Section 106 or the National Historic and Preservation Act (NHPA) or Executive Order (EO) 05-05.	May be able to demonstrate compliance using one of the EZ forms on the DAHP web site. If that will not work, a cultural assessment will be required.	EZ form is typically within 30 days; Cultural Resource Assessment can take 4 to 8 months after submittal is received.	Dept of Archaeology and Historic Preservation, 1063 So. Capitol Way, Suite 106, Olympia, WA 98501; 360-586-3065
Ecology Review	Shoreline Master Program, Coastal Zone Management Act, Possibly Section 401 of the CWA	JARPA or approval of the Shoreline Permit	Ecology by WAC has 180 days after USACE issues the decision, however typically they respond within 30 days after receiving information from USACE.	Alex Callendar (360) 407 - 6167 acal461@ecy.wa.gov
Washington State Department of Fish and Wildlife (WDFW)	Hydraulic Code RCW 77.55	JARPA and either SEPA determination or letter of exemption.	WDFW has a 45 day level of service but cannot provide approval without proof that SEPA has been issued.	Theresa Mitchell (360) 895 - 6123 Theresa.Mitchell@dfw.wa.gov
Washington State Department of Natural Resources (DNR)	The project occurs on DNR State Owned Aquatic Lease lands (checking with DNR) authorization needs to be obtained from DNR.	Application for Authorization to use State Owned Aquatic Lands. Currently Herron Island has a year to year lease with DNR, this permit would require a new lease, including an updated survey (recommend coordination with the land survey) and upgrade to insurance and security.	From discussions with DNR the work would not be delayed, the requirement would be to update the current year to year lease.	Wynnae Wright (206) 909-1304 Wynnae.wright@DNR.wa.gov
Pierce County Planning and Land Services (PALS)	Shoreline exemption, SEPA exemption, habitat review	Shoreline exemption submittal Sepa exemption submittal to Pierce County Planning and Landuse Services (much of the information will be duplicate of the USACE submittal.	Depends on work load, however anticipate approvals within 30 days after the submittal is received.	Mojgan Carlson (253) 798- 7234 mcarlso@co.pierce.wa.us

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September 24, 2010
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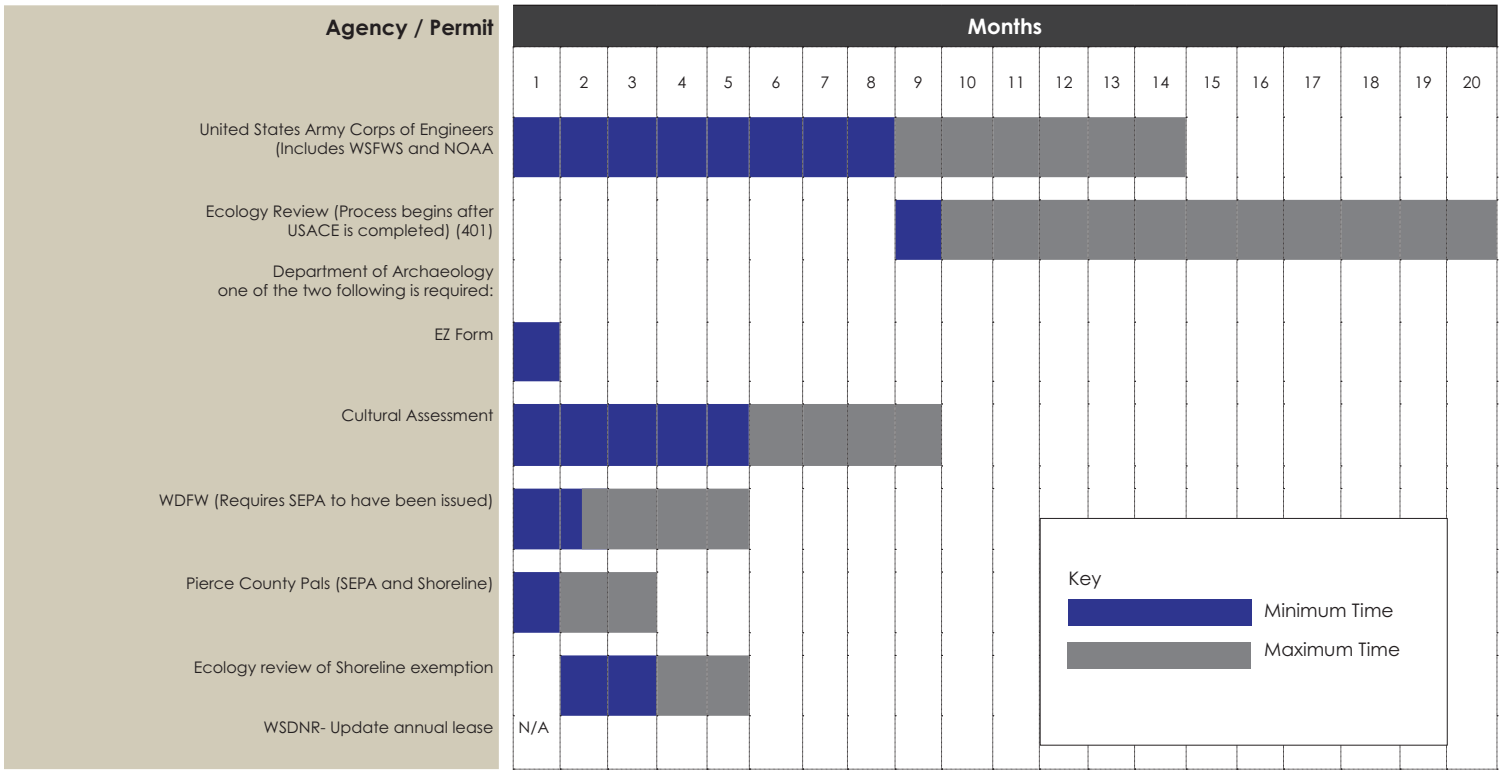
HMC Marine Structures Permitting Timeline



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