

Rose City Yacht Club Breakwater Report

November 27, 2023

Background

Rose City Yacht Club has a breakwater structure on the north side of its leasehold. The breakwater has calmed the waters within the marina caused by wakes of small boats and those generated by winds from the north. This has been accomplished by the mass of the breakwater as well as its depth and width. There is, however, a limit to the waves that can be attenuated by the breakwater. Long period waves such as those generated by large boats and tows will not be calmed by the breakwater. The stronger winter winds generally come from the east and are attenuated by walk one. The current design of the breakwater has accomplished its calming task with reasonable success.

The breakwater also provides additional moorage space for transiting boats from reciprocal clubs as well as additional moorage for members as needed.

The original breakwater which appears to predate the purchase of the marina lot in circa 1977, consisted of 6 logs in cross section fastened together by 4 X 10's. A deck was laid over the top of the breakwater. At that time the positioning piling consisted of three-piling wooden tripods.

Repairs over time changed the cross members to 6 X 8's and reduced the deck width to 6'. In 1993 member Tom Stringfield did an extensive survey and recommended a project that resulted in what you see today. The stringers were replaced with new 6 X 8's, the pile hoops were replaced with the square pile collars as well as new walers and a handrail. That repair project was projected to have a 30 year life span.

In 2005 the wooden tripod piling was replaced with steel pipe piling. The wooden pilings holding the Club breakwater in place began showing signs of failure the previous summer. While the permit process was underway, contracts were written and signed with Hickey Marine. Permits were received on February 8, and the breakwater was completed March 3. Steve Barrett indicates the piling was installed with the objective of supporting a dock similar to that on Walk 1.

Current Breakwater

The current configuration consists likely of the 6 original logs with encapsulated Styrofoam blocks underneath. In addition, there are Styrofoam cylinders at various locations along the breakwater that provide additional floatation. These cylinders are for the most part not encapsulated but are not currently showing signs of disintegration. No small particles of Styrofoam were observed floating away.

The logs are fastened with 6 X 10 cross members mentioned above. The 6 X 10 cross members are fastened with $\frac{3}{4}$ in (?) spikes driven into the logs. The 2 X 6 deck planks form a deck that is full width, about 12' wide. The deck is supported by 2 x 6 joists placed on the stringers running down the length of the breakwater. The 2 X 6 joists are fastened via toe-nailed galvanized nails to the

stringers. The deck planks are fastened with nails and screws to the joists. In addition, there is a handrail on the northside of the breakwater and tie up beams on the south side of the breakwater.

Survey Results

On Saturday September 16, 2023, a survey was conducted by Christian Steinbrecher, Ian Cannon, Ron Moran and George Kapllani. The purpose of the survey was to develop a general overview of the current state of the breakwater and develop repair/replacement scenarios based on random examinations of the various breakwater elements. The survey included removal of deck planks at random locations and removing cores from the logs using a Djos 200 coring tool. In addition, visible stringers were sounded with a 2# telephone pole.

On October 23, 2023, Martin Foster, a member diver, assisted by Christian Steinbrecher, dove under the breakwater to provide an underwater perspective of the facility.

Condition of the Breakwater Elements

Logs – Many of the logs appear to be in relatively good shape from the splash zone down. The upper portions of most logs have deteriorated and show extensive rot. Core samples were taken to verify conditions. Some logs were in good condition while others were severely deteriorated. It is estimated that about 25% of the logs exhibit severe deterioration.

Styrofoam Floatation - There are encapsulated Styrofoam blocks under the logs at regular intervals. In addition, at irregular intervals there are unencapsulated Styrofoam cylinders under the logs. These cylinders are intact and do not evidence release of Styrofoam particles into the environment. However, it should be noted that unencapsulated Styrofoam is no longer permitted. Without this floatation it is likely that the current breakwater would not float much above the water level.

Piling – Steel piling were installed in 2005 and show only minor surface rust. There is no extensive deterioration in the splash zone, the area of greatest concern. An ultrasound would verify the wall thickness but has not been done. It is not likely that there has been any significant reduction in thickness.

Stringers – three locations were chosen to pull up deck planks to do a close examination. These locations, at walk one, in the middle and at the Donaldson end resulted in the following:

At walk one deterioration in the outer 1 – 4 inches was observed.

In the middle, deterioration throughout was observed.

At the Donaldson end half of the stringer was deteriorated.

In addition, a floating examination was conducted on the southside of the breakwater from a work boat and each visible stringer was sounded with a 2# telephone pole sounding tool. Those not considered sound were marked with yellow paint. About 2/3 were marked. However not all stringers were accessible from the work boat. The

northside of the breakwater was also examined at the workboat level and most stringers showed extensive end deterioration.

Joists – these are the members that are on top of the stringers and support the deck planks. They are in reasonable condition.

Deck Planks – they all exhibit extensive splintering and sun related damage.

Handrail – About half is deteriorated.

Walers – All are sun damaged.

Tieup beams – All are sun damaged.

This survey however has made no attempt to determine the ability of the breakwater to withstand a major weather event such as higher than normally expected winds or high-water levels. While the breakwater was able to handle the high-water event of '96, it had likely been recently renovated. Whether or not it could handle a similar or abnormal event in its current condition has not been evaluated.

Breakwater Replacement Objectives

The possible replacement of the breakwater gives RCYC a singular opportunity to review what the breakwater might do.

1. The breakwater might provide the following amenities for RCYC:
 - a. Provide wave attenuation for moored boats inside the marina basin.
 - b. Be a walkable facility.
 - c. Provide some seating and a staging area.
 - d. Be a committee staging area for races.
 - e. Should the breakwater have some lighting for nighttime use?
 - f. Provide additional moorage for RCYC members or reciprocal moorage.
 - g. Have a fence or handrail on the north side.
 - h. Should the breakwater have some power outlets for moorage use?
 - i. Should the breakwater have some water outlets for moorage use?
 - j. Provide wave attenuation for resident members.
 - k. Limit wave attenuation to north winds and small boat wakes.
 - l. Be located in its current location.
2. The current breakwater needs replacement as a regular replacement of a significant element of the club infrastructure. As noted in the condition report there are a number of components that have reached the end of their useful lives.
3. Most of the options presented below may be beyond the capabilities of the club to self-perform and should be contracted out. They require specialized equipment and are performed in a marine construction environment with hazards consistent with working over open water. Club volunteers are not construction workers with day-to-day experience in working under these conditions. However, to the extent that there are willing

volunteers and limited competing projects some elements could be self-performed. These might include the handrails and boat tie up beams.

4. The work will most likely be performed in the spring, summer or early fall months. In the late summer and fall months the river levels are low, and currents are minimal, making self-performance of selected tasks safer and more efficient.
5. Budget will be determined by available funding based on the priorities set in the long-term financing plan.

Breakwater Replacement Options

Based on the conditions observed and reasonable assumptions by the breakwater committee the following options are being offered to the board for its consideration:

- A. All new wood logs throughout and elimination of unencapsulated Styrofoam floatation.
- B. Partial wood log replacement (25%).
- C. New wood stringers on full or partial wood log replacement.
- D. Steel stringers (instead of wood) on full or partial wood log replacement.
- E. Replace decking with wood decking independent of stringers and log replacement options selected.
- F. Replace decking with composite open grid material independent of stringer and log replacement options selected.
- G. Reduce width of deck independent of stringer and log replacement options selected.
- H. Replace the wood structure with used concrete floats. Bellingham Marine, the constructors of many of RCYC's floats has stated that the state of Washington has determined that concrete floats are no longer acceptable in Washington waters. They went on to say that used concrete floats might be available at substantial discounts. It is likely that any used concrete floats may require modifications to meet RCYC's programmatic requirements.

Illustrations



Figure 1 - Growth on Logs



Figure 2 Deteriorated End Condition of Logs



Figure 3 Deteriorated Stringers

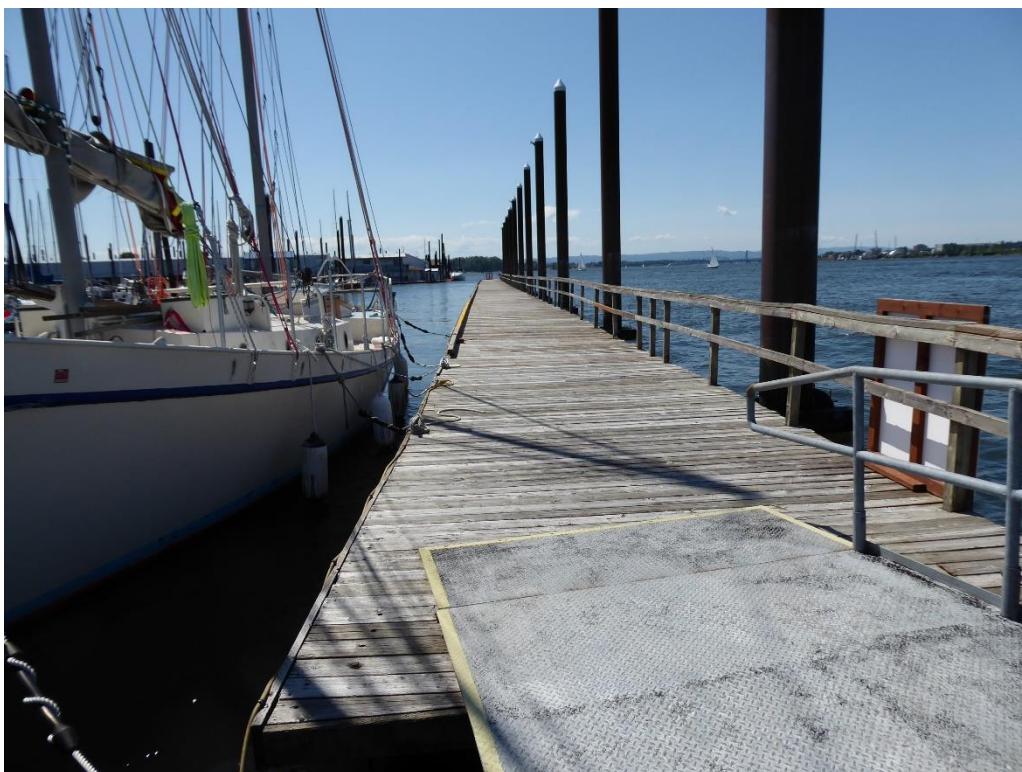


Figure 4 General View of Breakwater

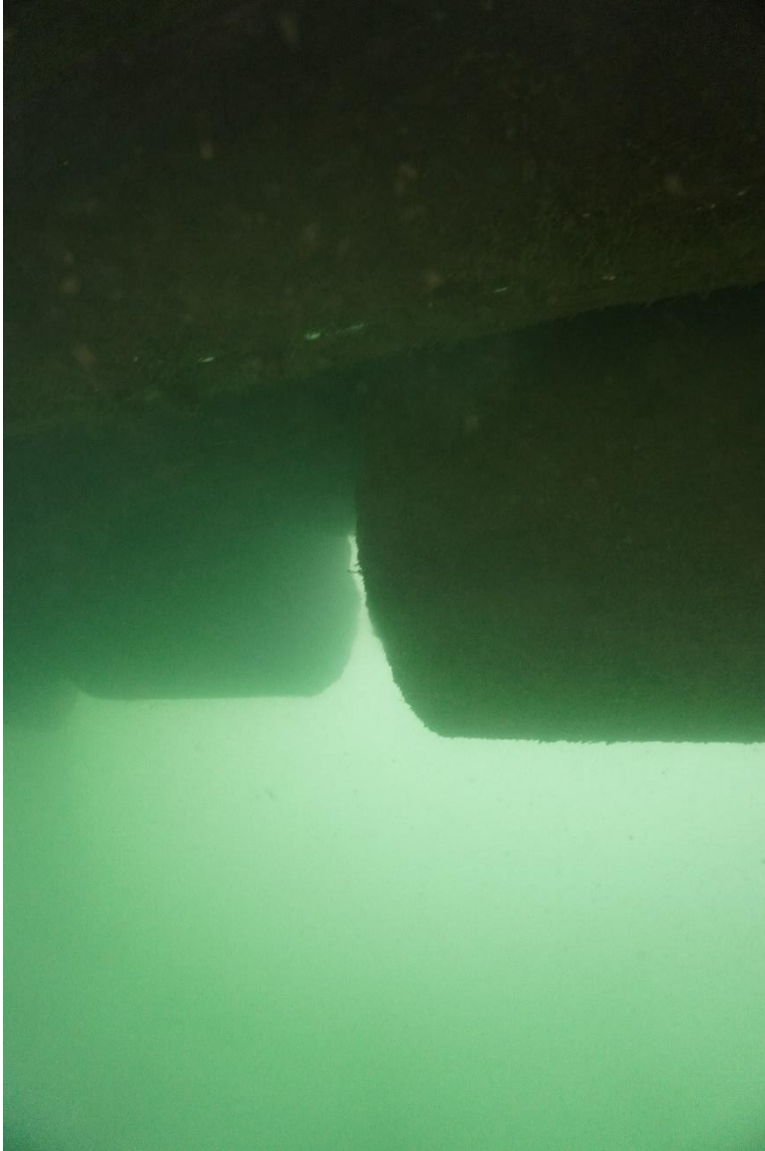


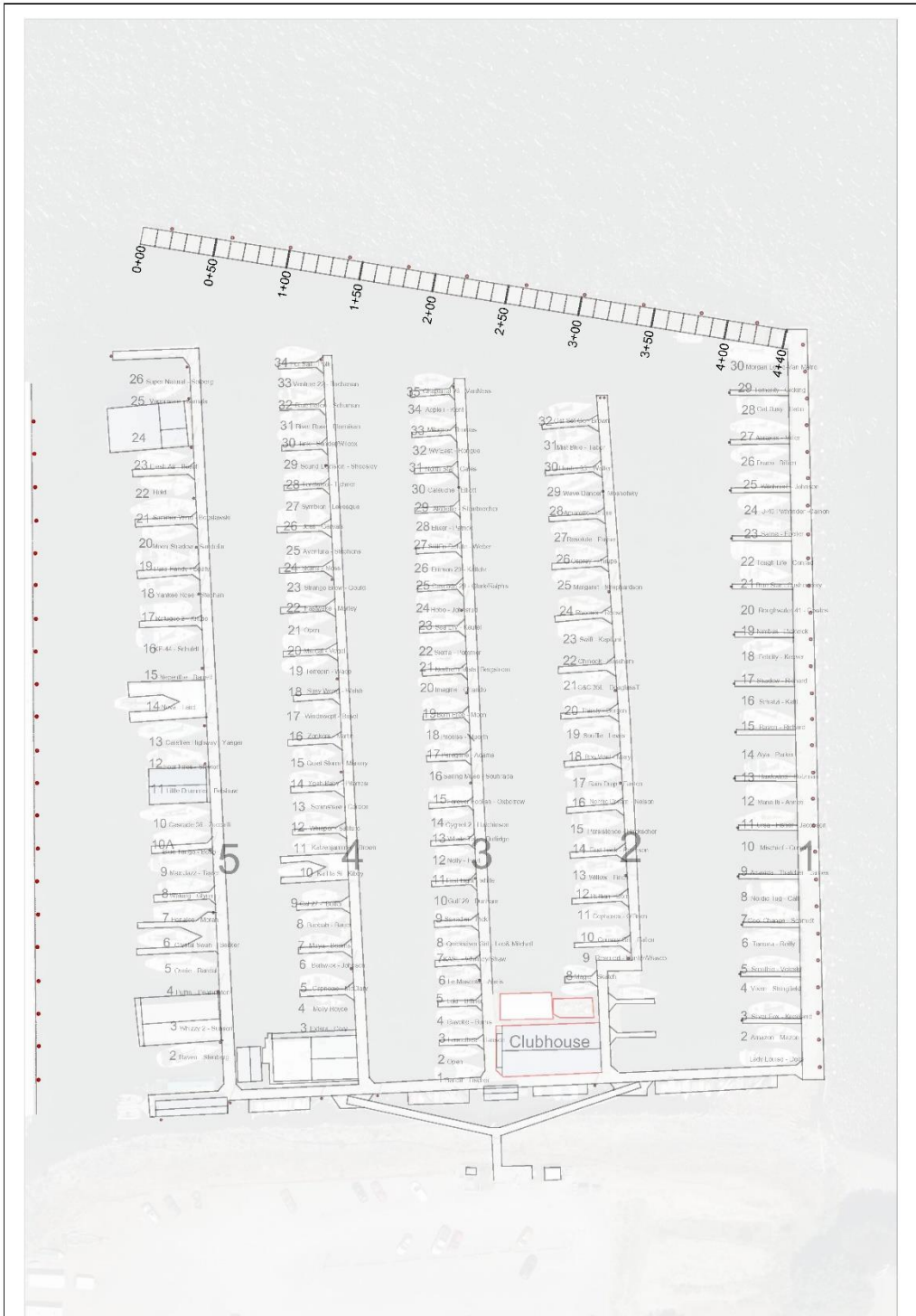
Figure 5 Styrofoam Cylinders Under Breakwater



Figure 6 Deteriorated Logs with Coring Tool



Figure 7 Handrails, Walers and Mooring Beam



Rose City Yacht Club

Figure 8 Breakwater Layout