MC SQUARED
INCORPORATED

1235 EAST 4TH AVE
SUITE 101
OLYMPIA, WA 98506
(360) 754-9339
FAX (360) 352-2044
E-mail: eng@mc2-inc.com

May 3, 2013

Port of Port Townsend
Post Office Box 1180
Port Townsend, WA 98368
Attn: Mr. Jim Pivarnik

RE: Port Hudson Breakwater, Structural Condition, Port Townsend, Washington

Dear Jim:

At the request of Tike Hillman representing you, I visited the site on Monday April 29th, 2013 in Port Townsend, Washington. The purpose of the visit was to assess the structural condition of the breakwaters at the entrance to Port Hudson Boat Basin. I viewed the northern and southern breakwaters from alongside and above.

You should understand that this report and the conclusions contained herein are the results of a visual examination of the property. No calculations, measurements, test, etc. other than those described below have been made. No finishes were removed to view any hidden framing. As a result, the report and its conclusions are circumscribed by the inherent limitations of the methods used. If you wish a more detailed investigation, we will be pleased to submit a proposal and cost estimate.

BREAKWATER DESCRIPTION AND HISTORY

The original breakwater was constructed in the late 1930's or early 1940's. The best known date for its construction is 1938. The original bulkhead consisted of two parallel rows of creosote treated piles driven with slight batters with the pile tops about 8' to 10' apart. The piles are approximately 3' to 4' on center along each row. At every third or fourth pile pair, there are diagonal wood cross braces.
The space between the piles wall filled with large rock to add mass to the breakwater. There may have been a horizontal waler added to the exterior of the rows of piles about mid height of the breakwater piles above the mudline.

The southern breakwater has a leg that starts at shore and runs northward for about 100' then turns eastward for about 150'. The first leg of the breakwater appears to be part of the walkway that parallels the beach. The breakwater then turns northward and continues for another 150'. The northern breakwater starts at shore and runs eastward for about 160'. The breakwater then turns south and continues for about another 100'.

In 1972, the original piles of the breakwater were starting to deteriorate and new rows of piles were added outboard of the original piles. The new piles returned the breakwater to its original strength.

In 1995, new horizontal steel cable ties between the tops of all of the 1972 piles were added. The cable ties included a galvanized steel strap to prevent the cable tie from rubbing into the steel pile. On the southern breakwater on the northern leg, there are additional steel cable ties running in both directions to tie the newer breakwater piles together.

At the northern breakwater on the leg that runs south, there are a double row of steel cable ties. The lower cable ties are at the level of the horizontal waler beam.

The public timber framed walkway on the southern breakwater was also added during the 1995 repairs.

CURRENT CONDITION

The original portion of the breakwater is approximately 75 years old. The structural strengthening repair work is also 41 years old. The timber structure is placed in a very severe and hostile marine environment. It is nearing the end of its useful life. The repair work completed in 1972 is holding the breakwater together.

Some of the original interior row of piles are severely deteriorated to the point of offering no structural support. Along the southern breakwater near shore, some of the original piles have 1" thick shells remaining for approximately 8" of the original 36" circumference. The newer piles in the same area have been rubbed and eroded more than likely due to a floating log that was along side the piles for an extended length of time.

On the northern breakwater, north side, it appears that every original pile is severely deteriorated wherever a bolted connection of the horizontal waler beam was connected to the pile.

The horizontal waler beam in many places is non-existent. The waler beam has actually rotted to nothing.

At the far end of the southern breakwater, some of the newer piles have shifted to allow the large rocks to fall out of the breakwater. The boat harbor side of the

southern breakwater at the beach appears that it has been over-topped by waves that have shifted piles and allowed the rock to fall out.

The timber framed walkway on the southern breakwater has shifted from movement of the piles below. The movement has allowed the rail to pull apart from the raial posts tops. The walkway is uneven and twisted over its' length.

The steel cable ties that were added 18 years ago have severe rust and the individual cable wires are breaking.

STRUCTURAL ASSESSMENT AND SUGGESTED REPAIRS

The existing breakwater will be able to exist for a few more years until a long term repair or replacement plan can be implemented. The planning for the repairs/replacement should begin now. The statement also assumes that only "normal" storms will occur in that time period.

In its current condition, a normal storm could damage the worst areas of the breakwater causing partial collapses of the breakwater. The partial collapses would be due to pile breakage and the loss of the rock fill between the piles. A very large storm could collapse large portions of the breakwater. A large earthquake could also cause damage similar to a very large storm.

The first repairs would be to re-establish the integrity of the walkway rail system. The rail posts and top rails should be repaired to a safe condition.

A repair to extend the life of the breakwater would be to replace the deteriorating steel cable ties between piles with new ones. This will force the piles to act together in holding the rock fill in.

At the end of the southern breakwater where the piles have shifted, new horizontal timbers should be added to provide members that can hold the large rock in place. New large rocks should be added to replace the ones that have fallen through the gaps.

A long term repair option would be to drive new piles in the outer row of piles between the existing piles to add strength to the breakwater. The piles may need to be steel as creosote is generally no longer allowed. The steel piles could be driven with known lengths allowing them to be galvanized and have brackets attached to the piles before driving for connecting brace beams between the new piles.

CONCLUSION

The breakwater is nearing the end of its useful life. Repairs or replacement will be needed to extend its life as a breakwater. The planning of the repairs/replacement should start now. There are repairs that can be completed

that would make the breakwater safer and extend its' life. A very large storm could destroy large portions of the breakwater. Normal storms could damage localized portions of the breakwater.

If you have any questions, or if I may be of further help, please call me at (360) 754-9339.

Sincerely yours,
MC Squared, Inc.

Mike Szramek P.E. S.E.
Principal Engineer

attachments

File M:\Michael Szramek\\My Documents\Reports\PORT-TOWNSEND-BREAKWATER-CONDITION-MAY-2013.wpd

Southern breakwater

Northern breakwater

Inner pile holes at bolted connections

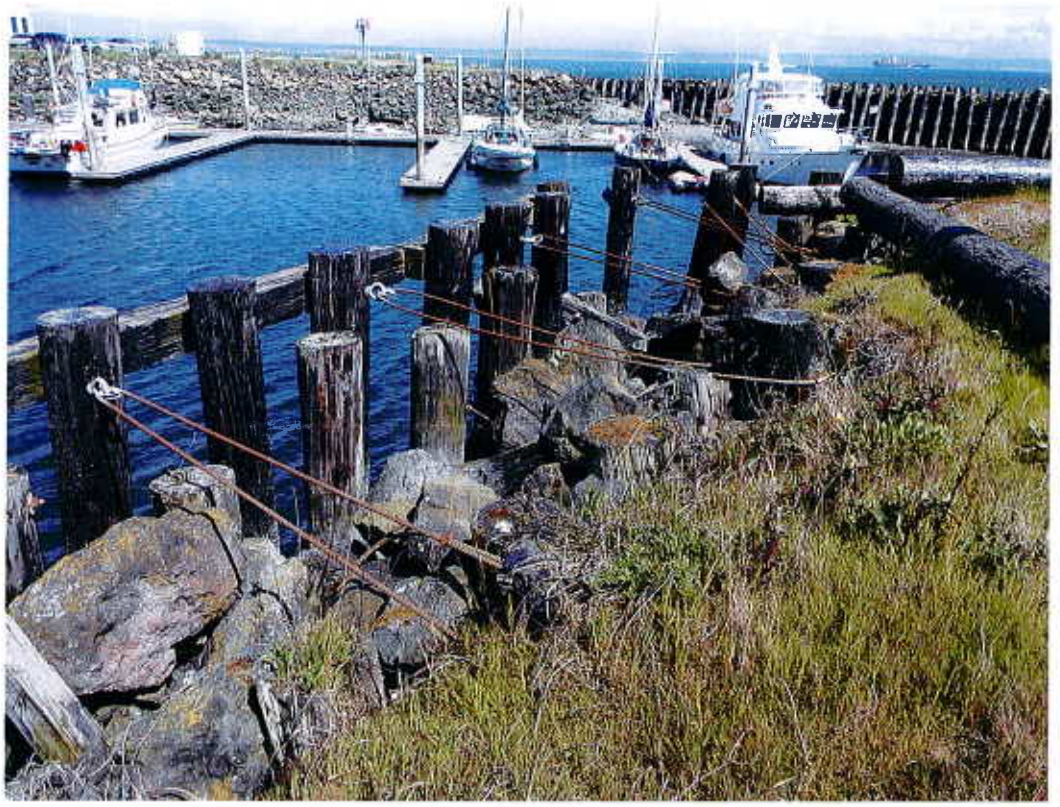
Worn piles and minimal original piles

Rusting cable ties

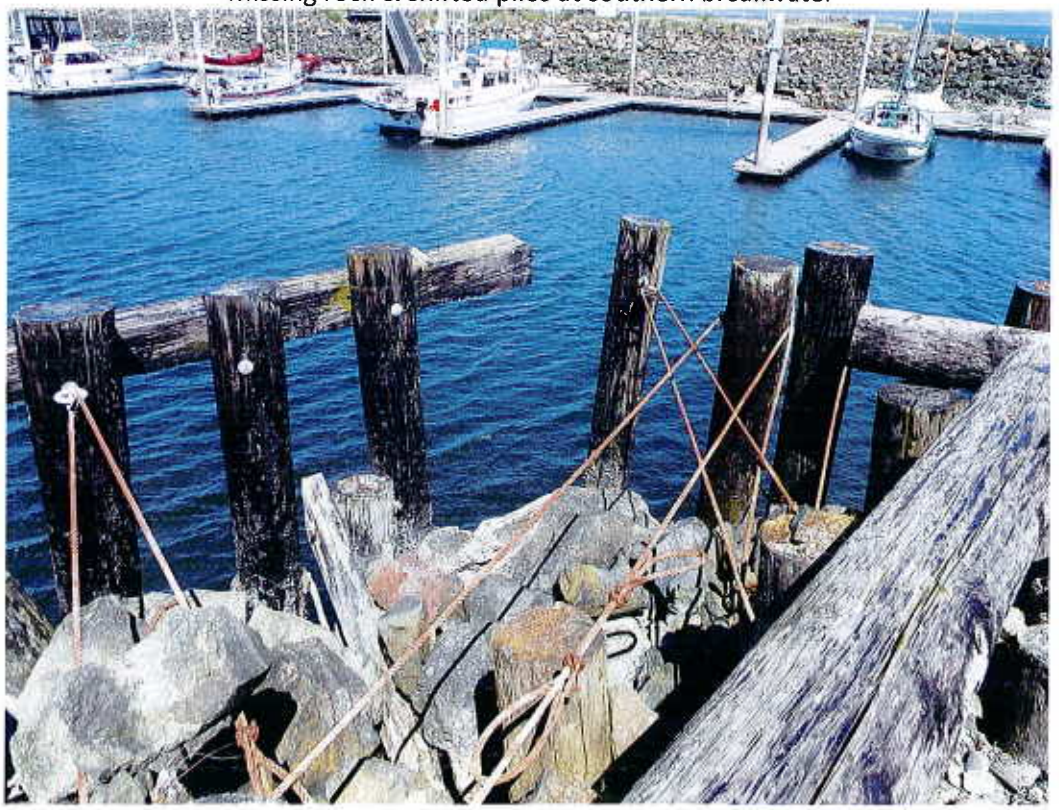
Many rusting cable ties

Rail shift at southern breakwater walkway

Shifted piles at southern breakwater end



Missing rock & shifted piles at southern breakwater



Missing rock & shifted piles at southern breakwater

Walkway support

Tilt of walkway

Rotted waler at northern breakwater

Northern breakwater with rotted horizontal waler

Northern breakwater with rotted horizontal waler