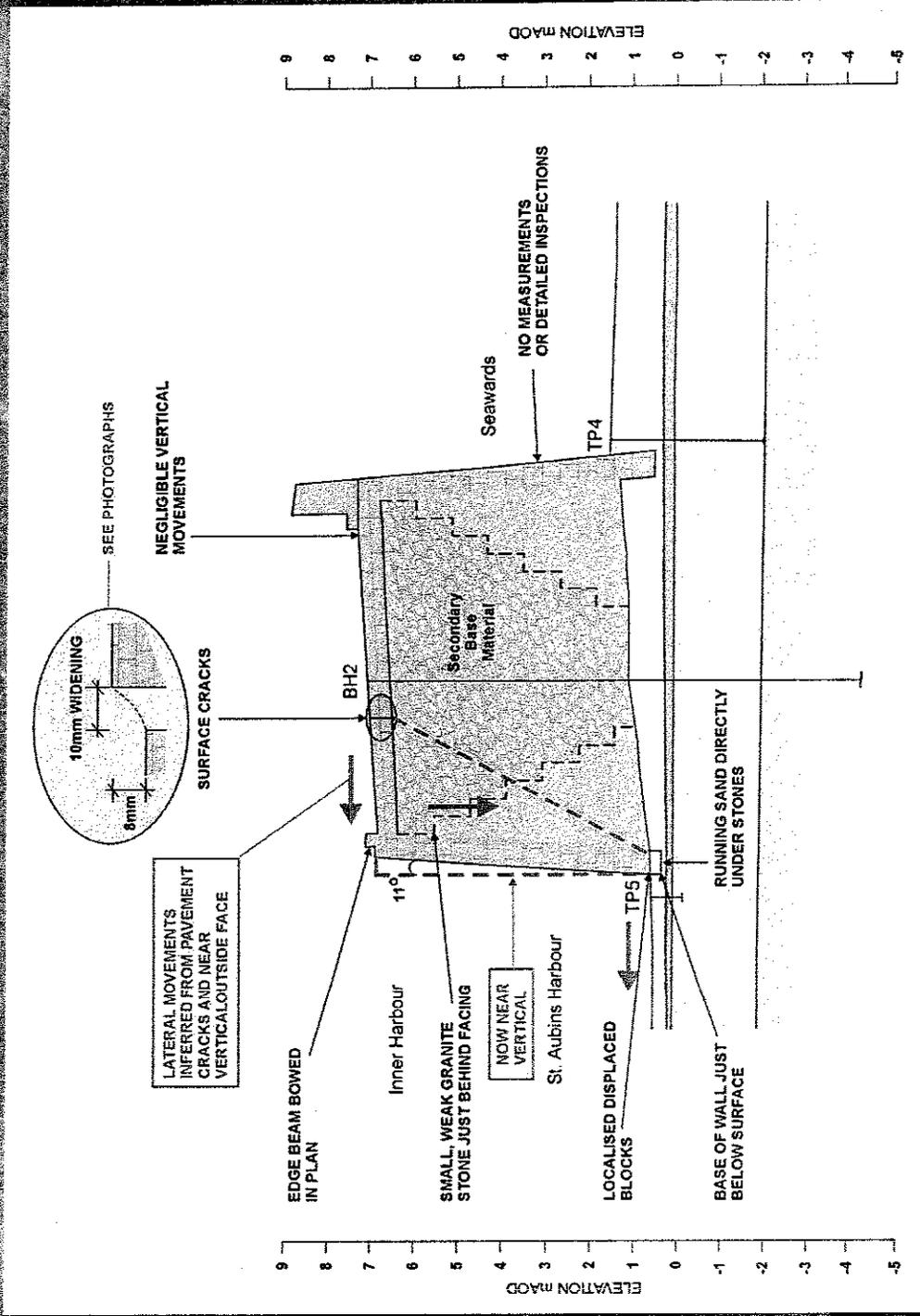


# Jersey Harbours

## St. Aubins North Pier Repairs

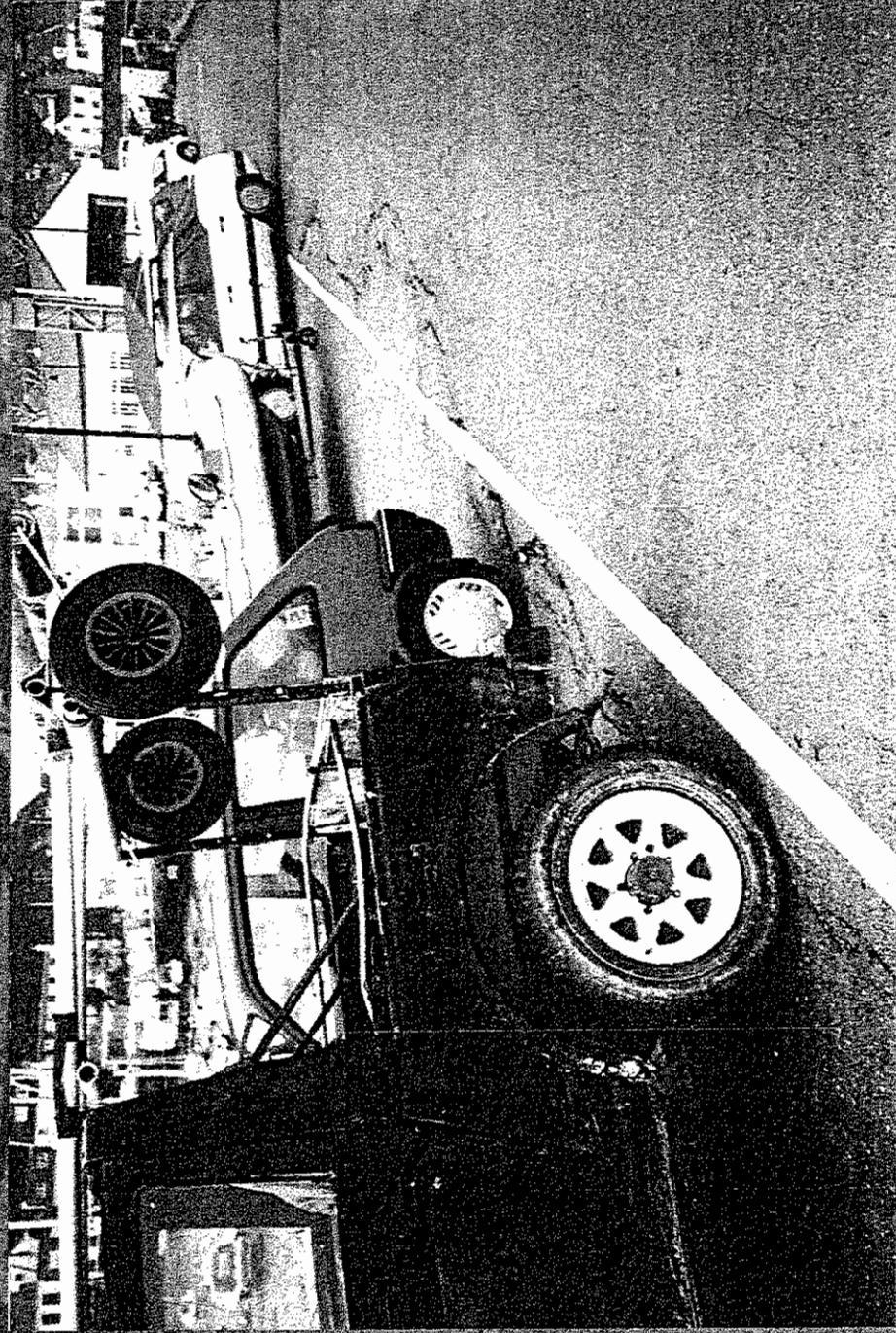


- Overturning
- Wedge failure
- Base sliding

## Summary of observations of failure of North Pier

# Jersey Harbours

## St. Aubins North Pier Repairs



Spread of cracking and movement

**Time constraints – getting worse**

After monitoring the settlement and movement of the pier over the last five years in conjunction with Jersey Harbours and Public Services, we have concluded that there are three engineering elements that have resulted in the current localised 'failure' of the inner face of the wall. In recent years (from 2001), it has settled (10 mm), moved outward (7 mm) and rotated to be now vertical because:-

- 1) As a result of previous over dredging, the level of the sea bed of the harbour is at, or very near, the base of the stones on the inner face and this poses a risk of horizontal sliding, ie no key into sea bed.
- 2) The outward rotation of the wall from being constructed leaning inwards to now being vertical (view the middle lamp posts along the pier – they now lean at approximately 11° outwards and would have been placed vertically) presents a risk of overturning. This is partly due to the base stones being founded on the sea bed of softer sands and marine debris with approximately 1.5 m of this material before the harder Jersey shale is reached beneath.
- 3) The loss of material over the years (wash-out), combined with the problems in 1) and 2), means that there is a possibility of a sliding wedge failure where a triangle of masonry and fill, approximately from the back line of the car park markings to the toe of the inner face of the wall, can slide into the harbour.

It must be highlighted that these are relatively 'very recent' events in the life of such a significant structure and therefore we have concerns that the damage is accelerating.

We have been asked by Jersey Harbours to provide a statement on the safety, or otherwise, of the current state of the pier and have produced a Risk Assessment. Despite satisfying us with a 12 tonne load test in 2003, the ongoing movement and the 7 mm settlement during one incident in October 2003 (thought to be triggered by a boat lift) has resulted in us advising Jersey Harbours that the technical failure of the inner face of the wall could result in a catastrophic collapse during a storm or significant loading event. These probabilities will increase as a result of global warming and as sea levels rise.

During the construction and excavations for the café on Mr Battrick's old boat yard site, there were significant opportunities to observe the type of fill material behind the main walls, and at one or two stages the piling excavation was too close to the main wall and daylight could be seen through the masonry. This is in an area of the pier that had not failed but did provide us with the opportunity to view the core materials.

Since 2003 and specifically during 2004 and 2005, we have considered many options for stabilising the wall including stitching, sheet piling and tying internally etc. All of the options have some merit but also pose risks to the pier, and the main principal of any repair option was to provide a sound foundation. By constructing a new foundation outside the existing wall and rebuilding the wall on top of a new foundation provides a cost effective engineering solution. The principle of rebuilding such walls with mass concrete backing was established in 1967 when the end of Gorey Pier collapsed and was rebuilt in this manner. Our design that went to tender with seven experienced marine engineering contractors also tried to reduce the amount of concrete needed by placing a pipe in the concrete foundation section which 'could' in future be used as a culvert. Jersey Harbours have studies which indicate two causes of the silting in the Harbour, one is deposition from material entering the Harbour mouth and the other is deposition from the stream. It may, therefore, be possible to reduce future dredging, if the void formed in the concrete was used to channel the stream out of the Harbour. This proposition is not part of this project.

Our tender process allowed the experienced marine contractors to also consider alternative proposals to our own, and one proposal was not only less costly but was programmed to take 10 weeks to achieve. Yes, we have all considered the fact that there are two tides to work around and the contract documents included tide tables.

Finally, the rebuilding or stabilising of the failed inner section of the wall is totally unrelated to any improvement or betterment ideas for the area, and should therefore be viewed on its engineering merits only, ie securing or stabilising the 'failed' section of the North Pier. Any future reclamation schemes on the outside of the North Pier would not be helped or hindered by this stabilisation of the inner face of the North Pier Wall.