

External Memo – Catherine Hill Bay Jetty – Summary Report

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1 Introduction

BG&E Pty Ltd (hereafter BG&E) was engaged by the Department of Planning and Environment to conduct a thorough structural condition assessment of Catherine Hill Bay Jetty. From the early 1870's this bay has provided shipping access to the local collieries. In 1974 the concrete and steel structure, currently standing, replaced the historic timber jetty. In 2003, mining operations ceased, and in 2019 the holder of a mining purposes lease over the jetty disclaimed the lease and discontinued maintenance activities. The condition of the jetty has since deteriorated, with engineering inspections finding that the jetty exhibits significant deterioration where high-risk items pose a public safety concern. There were two key drivers for this assessment, one, being adaptive reuse opportunities following previous private developer interest, and two, being demolition opportunities.

2 Scope of Works Completed

BG&E, alongside various subcontractors, including access teams, dive teams, concrete drilling experts, and materials testing laboratories, conducted a structural engineering and durability assessment of the jetty. This work involved extensive site works conducting reality modelling and high-resolution imaging via UAV, cleaning of steel piles in the tidal zone, thickness testing of steel elements, and strength and integrity testing of concrete elements. Following the on-site data collection phase extensive structural engineering modelling and calculations were undertaken to determine the current load capacity of the jetty and whether strengthening was required. Durability modelling to determine if there was any remaining life of structural elements was also conducted. This assessment explored three options:

1. Partial demolition of the jetty over the land portion.
2. Full demolition of the jetty to the seabed.
3. Rectification of the full jetty.

3 Findings

3.1 High-Risk Items

BG&E conducted an initial high-risk inspection to identify immediate public safety concerns. The following items are a few examples of what was highlighted in this assessment.

 <p>Photo 1 - Example of Corroding Steel Elements</p>	 <p>Photo 2 - Example of Corroding Retaining Wall Bracing</p>	 <p>Photo 3 - Example of Concrete Spalling and Exposed Reinforcement</p>
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3.2 General Comments on the Condition of the Jetty

The following key findings were established as part of the onsite works and following analysis phase:







<p><u>Exposed reinforcement in the soffit.</u></p>  <p>Photo 4 Several instances of spalled concrete because of corroding/expanding reinforcement were observed. It is likely the chloride ions have penetrated to the depth of reinforcement and initiated corrosion.</p>	<p><u>Concrete encasement of steel columns.</u></p>  <p>Photo 5 The concrete encasements are no longer fit for purpose. Large cracks, voids, and significant spalls were observed.</p>	<p><u>Primary beam connections to main columns in water</u></p>  <p>Photo 6 Where primary beams connect to other elements i.e., columns, base plates, secondary beams etc, corrosion has initiated and section loss occurring.</p>
<p><u>Nut and bolt connections</u></p>  <p>Photo 7 Typically, nut and bolt connections are no longer fit for purpose with significant corrosion and section loss observed.</p>	<p><u>Bracing</u></p>  <p>Photo 8 In most instances the diagonal bracing had completed corroded, failed, or fallen from the structure.</p>	<p><u>Circular hollow section columns in water</u></p>  <p>Photo 9 Once cleaned, the pile outer surface showed evidence of local blistering and coating deterioration.</p>
<p><u>Land-side columns</u></p>	<p><u>Over-sea bracing connections</u></p>	<p>General primary beams and connections</p>



Photo 10

Connections of bracing to columns were also heavily corroded. Stiffener plates were showing section loss and braces also had visible section loss.



Photo 11

The connections between circular hollow section braces exhibited corrosion between the circular plates, at stiffeners, and on the nuts.



Photo 12

The primary beams along their extent, away from connections, are generally in good condition.

4 Recommendations & Options

4.1 Partial Demolition

The first option explored, partial demolition, was proposed based off the initial high-risk report whereby the land portion of the jetty would be demolished, and the over-water portion would be retained and maintained. The cost estimate to conduct a partial demolition of the jetty is \$803,000.

This concept involves removing one or multiple spans of the jetty so that it is no longer connected to land at the access road. This would further restrict access to the retained portion of the jetty and remove the section of the jetty that is in the poorest condition.

The key advantage of this strategy is that all works could be completed without the need for a marine contractor or barge rental, which we understand to be a costly exercise.

A large reach mobile crane would be stationed at the location shown on the extract to the right. This crane would be used to lift off as many of the precast deck planks as could be reached. The precast planks have a mass of approximately 2,500kg each. The remaining planks that could not be reached from the large crane could be lifted down and moved to within reach of the large crane using a 12-tonne spider crane, EWP, and excavator.

Once all the precast deck planks had been removed, steel members could be cut and removed with the use of the two cranes and EWP.

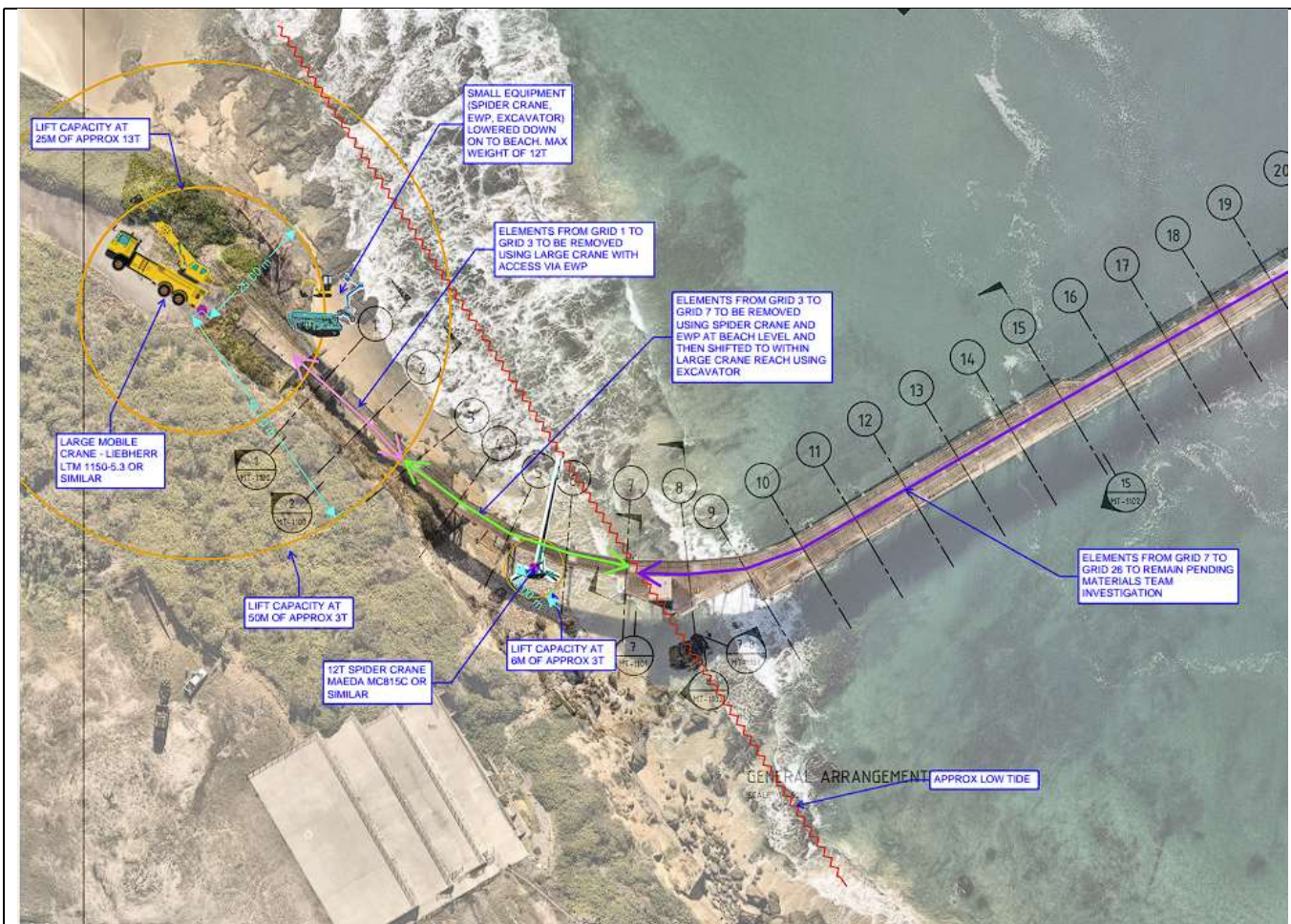


Photo 13 - Extract of the Partial Demolition Concept

4.2 Full Demolition

The second option explored was to fully demolish the jetty. The jetty would be removed in small sections utilising both landside and marine plant. The cost estimate to conduct a full demolition of the jetty is \$8,903,000.

From bents 1-20, the jetty structure is suspended over the ocean, with the original drawings indicating an approximate height above low tide of 10m and a low tide depth of 10m at the eastern end of the jetty. We anticipate that this section of the jetty would be removed using a combination of different barges. The primary barge would be a jack up barge that has an approximate total payload capacity of around 200 tonnes and suitable to work in waters up to 15m deep. The jack up barge would be used to support a crawler crane and EWP's to undertake the demolition. The crawler crane would then be used to remove the jetty in small sections and transfer the removed materials to secondary barge(s). The secondary barge(s) would be a shallow draft landing barge with an approximate payload capacity of 75-100 tonnes that can transfer the removed material to the beach and then using excavators the materials can be moved along the beach to within reach of the mobile crane.

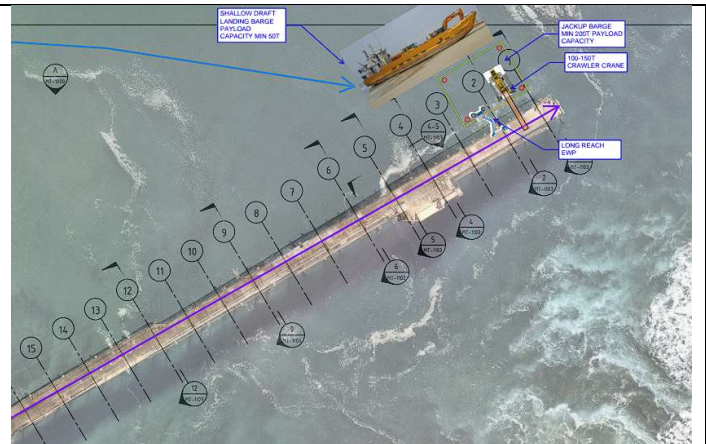


Photo 14 - Extract of the Full Demolition Concept

4.3 Full Rectification

The third option explored involves the full remediation of the jetty, both land and over-sea portions. This work would be extensive, involving the demolition and replacement of many steel elements including landside columns, secondary steel framing and bracing, and involve replacement of many connections. The primary steel beams are in reasonable condition and could be retained with a thorough clean as well as most of the concrete deck panels. This work would also involve the introduction of a coating system, maintenance plan, and on-deck safety rails. The cost estimate to complete the full rectification works is \$15,544,000.

4.4 Ongoing Maintenance

Ongoing maintenance activities for this asset, if retained fully or partially, would be significant involving annual visual inspections and upkeep of structural connections, 5-yearly durability testing and condition assessments, and reapplication of coating systems. Ongoing maintenance costs are estimated at approximately \$350,000 per annum. This estimate figure is based on the \$200,000/annum maintenance cost by the previous operator in 2002 which was adjusted for CPI, and the "\$3.5 million over 10 years to maintain" comment cited in an ABC article of 2010. A significant portion of this cost would be attributed to site mobilisation and scaffolding.