



# PROJECT SHEET

## HERBERT RIVER RAIL BRIDGE STRENGTHENING

### PROJECT SUMMARY

**Client:** Queensland Rail

**Location:** Ingham

**Duration:** 3 Months

**Value:** \$1.5M

**Major Challenges Overcome:**

- Shallow water
- Design changes
- Access
- Tight programme

### HERBERT RIVER RAIL BRIDGE



Over time, washouts along the riverbed had compromised the integrity of the piers. This, coupled with severe cracking on the unreinforced piers, meant that structural rehabilitation and strengthening was urgently required.

### *The Project*

Queensland Rail (QR) engaged Dynaciv to carry out the structural strengthening and scour protection of the concrete piers supporting a rail bridge crossing the Herbert River near Ingham. The bridge is located 1458.62km on the North Coast Line, approximately 10km northeast of Ingham, Queensland. This single-track bridge is part of the North Coast Network linking Townsville and Cairns and it is critical that it remains open.

Reports by engineering consultancies had identified two major issues: (1) Scouring adjacent to and beneath 3 piers; and (2) severe cracking in the piers.

### **Design changes**

On site, Dynaciv investigated the piers and noted that the proposed remediation design might not provide QR with the best value for money. Drawing on specialist knowledge in structural strengthening and remediation, Dynaciv raised the issue of cracks re-appearing, and proposed replacing the suggested crack remediation with an alternate solution of suitable Carbon Fibre Reinforced Polymer (CFRP) strengthening.

The proposed solution comprised of CFRP wraps at three sections of the piers. The concept was forwarded to designers to prepare construction drawings.

### **Project Scope**

The revised project scope comprised of the following work:

- Provide safe access
- Strategic placement of 2080 tonnes of 750 mm rock adjacent to Pier 5,6 and 7
- Strengthening of all 7 piers by the application of over 150m<sup>2</sup> of 600g/m<sup>2</sup> CFRP wraps

### **Completed Works**

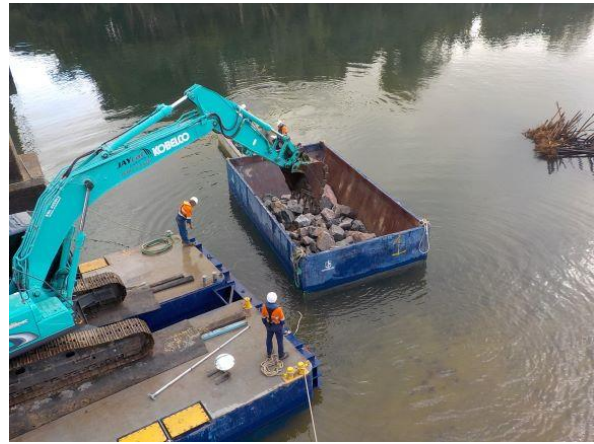
The following works were successfully carried out:

#### **Scour protection**

Following underwater inspections, 2080 tonnes (1300 m<sup>3</sup>) of 750mm rock were successfully transported by barge and strategically placed around the 3 piers. A rock pad was constructed on the river bank to allow an excavator access to the river. 12 tonne tipper trucks shifted the locally sourced rock into a stockpile for loading. A no-fines bucket was used to load rock barges, which were later manoeuvred by a workboat.



The workboat moved the rock barges to a pontoon carrying a 20-tonne excavator. The excavator removed the rock from the rock barge and deposited it in the required locations around the piers.



Depth readings were taken from a smaller vessel to ensure that the rock layer was the correct thickness. The rock encased the piers bases to protect them from further scour.

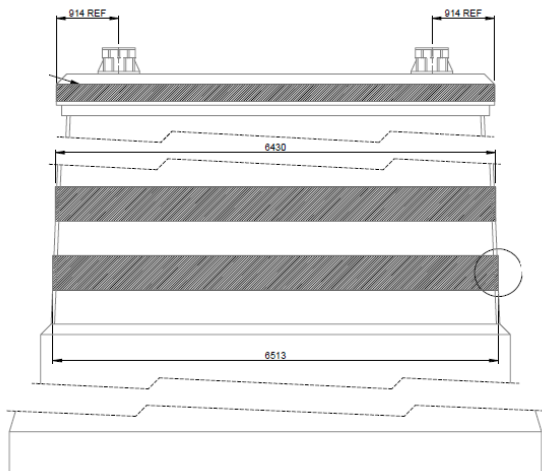
*Below: Some of the rock placed adjacent to the piers*



#### **Structural strengthening**

Dynaciv collaborated with a design consultant to optimise the proposed carbon fibre system that would strengthen the piers. The design consultant furthered the concept and completed the design. The new design from this joint working approach provided an innovative solution with added strengthening benefits.

Below: The optimised design. The hatched bands represent 250mm and 500mm CFRP wrap. A heavy wrap of 600g/m<sup>2</sup> was used.

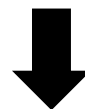
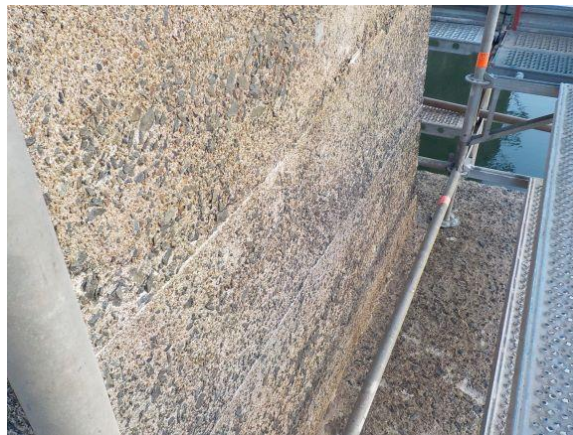


As there were 7 piers, over 150 m<sup>2</sup> of the heavy-duty wrap was applied over the very roughened surfaces of the 80-year-old piers.

Onto each pier we needed to construct a hanging scaffold to safely access all the piers. This was achieved by first building a catwalk to each of the piers and then building a 4-level tower around each pier.

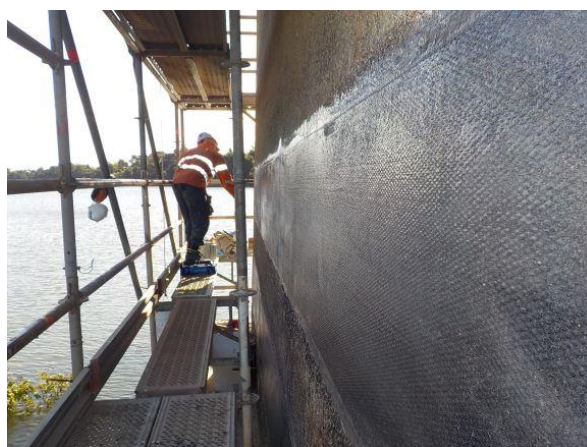


The dirty surfaces were first high pressure washed to remove all surface laitance, debris and loose particles. A high strength epoxy mortar was then applied to smooth the surfaces in preparation for the application of CFRP wrap. This was challenging, as the CFRP wrap has tight tolerances.



The remediated surface was triple checked to ensure the profile and evenness met the design and product requirements.

The 600 g/m<sup>2</sup> CFRP fabric was then applied in a tight form to construct two bands around the base of the pier and a single band around the headstock.





The bands were later coated with a UV protective coating.

*Below: UV coating applied*

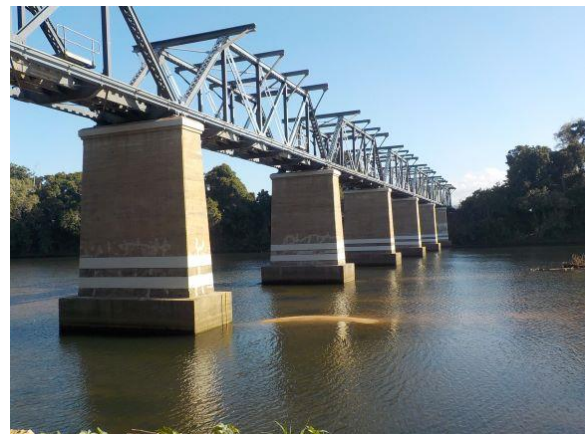


*Below: CFRP adhesion test*



Dynaciv carried out numerous quality tests to ensure the finished product exceeded required standards.

*Below: The completed bridge*



*Below: Environmental test*