# Planning for the Hopkins River Bridge Project.

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**Abstract**
If we knew the work that goes into the planning and pre-construction activities of a new bridge project; specifically those projects that involve the creation of a new bridge; how quickly would we accept alternative tenders from the construction industry? This was a question that occurred to the author after he had worked through the at times convoluted process to replace the two defunct bridges over the Hopkins River at Rossbridge in Western Victoria; only to have at the last minute an 'Alternative tender' accepted. There may some who agree with the industrialist John Harvey-Jones who felt that planning takes all the fun out of a project, but I haven't met many 'construction engineers' who liked being given a blank sheet from which to start – the opposite is usually true in fact and yet organizations such as VicRoads regularly put in inordinate effort into the planning and then throw it out when someone else submits an apparently 'better idea'. The following paper summarises the efforts of the Engineers, Archaeologists, Environmental Scientists (aka 'the Planners') etc; to develop a coherent project to replace two defective bridges with a single one only to then have the whole effort pushed to one side when an alternative tender was submitted.

*The nicest thing about not planning is that failure comes as a complete surprise rather than being preceded by a period of worry & depression.* **John Harvey-Jones**

**Keywords**: Planning, Construction, Bridge, Cultural Heritage, Environment.

## 1. Introduction

The Hopkins River runs through a small locality known as Rossbridge and is located 24km south of Ararat in Western Victoria. The river is crossed by the Mortlake to Ararat Road and is bridged by two small structures completed in 1954 and separated by less than 20m; the main structure over the Hopkins River is a 4 span u-slab structure 24.5m long and the smaller bridge is a 3 span u-slab 18.4m long[1].


**Figure 1. Location of Works and picture of site**

In August 2014 the project to replace these two bridges had its genesis[2] not through VicRoads' regimented inspection regime but through a lucky sighting of the profile of the main bridge by a Statutory Planner having lunch by the Hopkins River; he noted that the main structure was developing into ‘arch-like’ one.


**Figure 2. The developing arch like profile of the main bridge**

## 2. Discussion

As can be seen in the preceding images the main structure was developing an almost arch-like form that was definitely not in the original design. On closer inspection it was determined that both abutments had subsided considerably – estimated to be up to 200mm in places; this displacement at either end of the structure placed undue stress on the 1950’s era u-slabs, crossheads etc with some obvious displacement visible in the soffit of the u-slab beams[3].

**Figure 3.** Picture of the author during a closer inspection where discrepancies in u-slab beam levels due were immediately obvious and due to abutment subsidence on the main bridge.

The observations from this first inspection made it clear that the main structure and to a lesser extent the smaller bridge to the north had severe structural issues beyond what a Region within VicRoads could deal with. We’re lucky enough in VicRoads to still have a considerable amount of in-house knowledge in the form of our Technical Services division and so the region asked them to complete a more detailed inspection of both of the bridges.  As such a level 3 Inspection for both structures was completed and the settlement was most striking in the larger, river bridge[4].

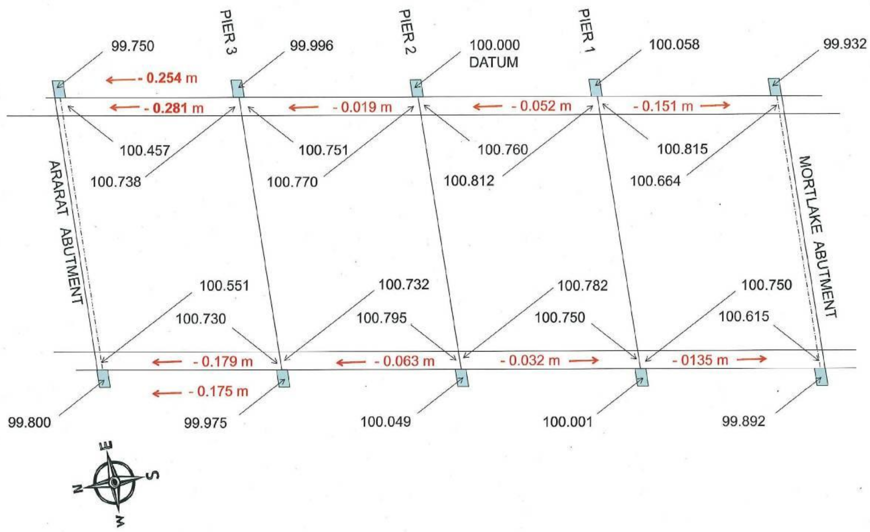


**Figure 4.** The level 3 Inspection confirmed the observed occurrence of settlement at the abutments of the main structure; 281mm on the northern end and 151mm on the southern end.

The conclusion of the Level 3 Inspection for the main bridge was emphatic – '*The structure has failed, and it is not considered to be in a structurally sound enough condition to be worth strengthening'.* For the second structure the Level 3 inspection was only moderately more favourable – *'a Monitor Inspection was carried out on the floodway bridge SN4162. It was found to be in better condition than the river bridge, but still in relatively poor condition. It was given an S1 Strengthening Priority'*. An S1 Strengthening Priority in VicRoad's 'speak' indicates that the structure is thought to be at risk in requiring a load limit applied within 12 months.  Other recommendations for the short term to ensure the continued safety of the main structure were put in place.  These were a reduction in speed limit from 100 to 40kmh; a load limit to prevent 'over-mass permit' vehicles and temporary strengthening of the 2 failed abutments.  Temporary strengthening of the main bridge was achieved with steel c-section beams bolted through to the massive concrete abutments[5].

**Figure 5.** Steel c-section bolted through to the abutment, bracing it and preventing further subsidence

Once these steps were completed the longer term remediation options could be discussed and developed. One of the most striking conclusions of the Level 3 Inspection was that the main structure was beyond rehabilitation and it needed to be replaced. But this presented problems that don't normally present themselves in a bridge replacement project. Namely the floodway bridge a mere 20m to the north that although in poor condition did not need immediate replacement. Replacing the river bridge meant a new structure would be built to a higher load design standard, SM1600, which meant that the superstructure elements would be larger, the structure wider to accommodate modern traffic demands. This in turn meant raising and widening the road approaches but with only 20m between the two we were concerned with how to facilitate safe vehicle movements from a 1950's era, narrow bridge to a 2017 modern structure. How to do this and yet produce a safe enough road design that would facilitate traffic movements between the two bridges at 100kmh? Another issue we were forced to consider was the VicRoads' requirement to keep the road open at all times – no road closures during construction were to be allowed. With all of the above in mind several options were canvassed:

1. Replace the river bridge and upgrade the floodway structure so that the two would be complimentary of each other;
2. Replace the river bridge with a substandard structure that would fit in with the smaller floodway bridge;
3. Replace both with two new, single span bridges; or
4. Replace both with a single larger, two span structure.

Very quickly the first two options were discounted as being either undesirable from the VicRoads perspective or being unnecessarily complex. We spent a long time discussing the two remaining options putting forward various positives and negatives related to them both. At the same time we had commissioned Geotechnical drilling, a Feature survey, a Flora & Fauna survey and a Cultural Heritage survey. We hoped that these would also shed light on which approach would be best but it was at this stage that the projects complexity increased; geotechnical results indicated saturated clays sitting over jointed schists; flora & fauna surveys confirmed the presence of two Environment Protection & Biodiversity Conservation Act (EPBC) listed species; the Growling Grass Frog[6] and the Striped Legless Lizard[7] and confirmed suitable habitat for the EPBC listed Australasian Bittern[8] as well as other flora.

Once the various Surveys, Reports and the CHMP were completed the planning for the project had taken more than 700 human hours across 35 individuals and still with no design or contract!

**Figure 6.** Grrr! A Growling Grass Frog pictured in the reeds at the pond in the Hopkins River – photo supplied by Biosis.

**Figure 7.** Not a snake! But a Striped Legless Lizard – photo supplied by Biosis.


**Figure 8.** An Australasian Bittern, not found on site but thought likely to frequent the area – photo courtesy of Richard Hall Photography.

But thankfully (from a project delivery perspective at least), despite exhaustive works and active involvement with the Martang, nothing of Cultural significance was identified. A positive approach with and by the Martang contributed to this[9]; they were involved in the archaeological survey, picked out the sites they were interested in, were involved in the surveying of the area and even did some of the digging! In some ways both the consulting archaeologists and the Martang were not surprised that they didn't turn anything up as from their perspective the site was significantly disturbed by years of European activity. But an interesting perspective was also put forward by the Martang involving the concrete pile caps that remained from the previous timber structure in the Hopkins River and the current structures bluestone spill through abutments. We had assumed that both of these would be of no interest to the Martang but they asked that the concrete pile caps be retained as they were now 'part of the story' of the site and that the bluestone rocks that made of the beaching be returned as they could use these to educate their following generations in how to prepare eel traps; all part of their efforts to keep their heritage alive.

**Figure 9.** The Martang were actively involved in the planning works to help advance the progress of the project.

Some further research by the VicRoads Regional Environmental Team had also uncovered information that indicated that during the summer months the Hopkins River could become quite saline[10] – averaging 1/3 of seawater but at its worst half the salinity of the sea - another design aspect to consider for the new bridge!

| | | | | | | |
|---|---|---|---|---|---|---|
| Hopkins River | Back Bolac Road | 12200 | 13800 | 23200 | 2200 | 11039 |
| Hopkins River | Delacombe Way (Edgarley Bridge) | 10400 | 15300 | 16400 | 2200 | 9531 |
| Hopkins River | Rossbridge (bridge) | 8600 | 12000 | 13700 | 820 | 7911 |

**Figure 10.** The average salinity of the Hopkins River was 1/3 that of seawater or 9531ppm!

Time for the design! Admittedly VicRoads had not been sitting idle waiting for all the elements to come together but we now had all the information we required to finalise our design[11].

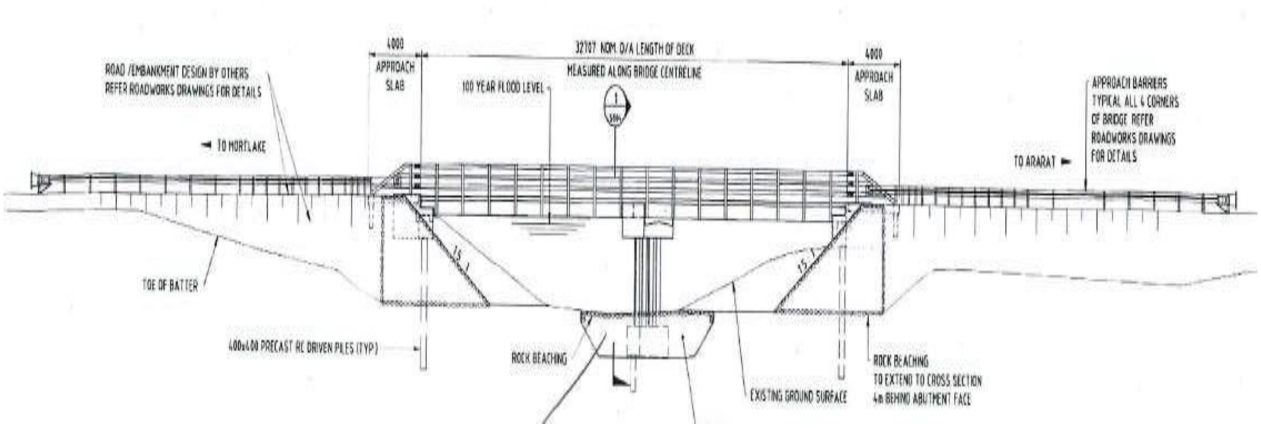


**Figure 11.** A beautiful thing and a joy to behold. A brand new 32.7m long bridge made up of 2 spans, with each span consisting 16 x 600mm x 600mm pre-cast concrete planks.

But with a complete design now sitting on the table the pressing question became – how to build it? At Rossbridge the geotechnical drilling that we had commissioned identified 9.5m of saturated clays over another 20m of weathered schists – some of the clays despite being drilled during a drought period were still recording moisture contents of nearly 50%! These clays despite having low to medium plasticity still represented an expected (and proven by the current bridges) subsidence of 200mm plus for the road approaches and the only way to deal with this was to prepare the site for 2 months of surcharging whilst keeping the road open which even at this stage was still a key requirement. An issue with surcharging was how to do this underneath the floodway structure? With normal surcharging the structure would need to be removed to allow it to take place but then the road would not be open to traffic; a suggestion early on by our geotechnical engineers was to stack Expanded Polystyrene Blocks (EPS) under the structure which could keep both road and bridge open to traffic. When the time came we could remove the bridge in halves, thus keeping one lane open at a time and construct the appropriate amount of road pavement[12].

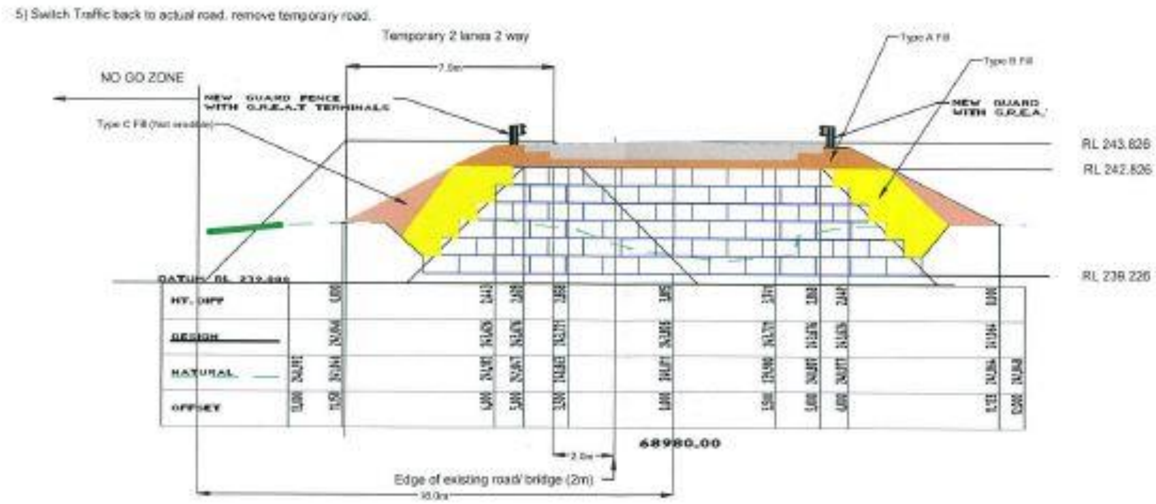


**Figure 12.** Innovative design at its simplest best. Expanded PolyStyrene (EPS) blocks are to be used under the floodway structure as there is no acceptable way to remove the structure for surcharging and keep the road open.

With all the surveys, inspections, reports, designs and construction programs planned and completed the contract could be prepared and advertised mid-December 2016. Contract awarded in February 2017 with the first of the surcharging due March 2017. From this point it is expected that construction can start in June and the entire project wrapped up by mid-2018. Despite the 1000 plus hours of documented work that has been completed so far VicRoads left the contract open for 'non-conforming' tenders; that is if a contractor felt that they had a better solution to some or all parts of the project as long as the overall intent was still met they could submit a non-conforming tender for consideration.

With this in mind we should not have been surprised that an alternative tender was submitted – the construction industry did not feel that our solutions were practical and this combined with a change of thinking from VicRoads has meant that despite everything that has been developed over nearly two years the alternative tender, including closing the road has been accepted.

## 3. Conclusions

If we knew the work that goes into the planning and pre-construction activities of a new bridge project; specifically those projects that involve the creation of a new bridge; how quickly would we accept alternative tenders from the construction industry? This was a question that occurred to the author after he had worked through the at times convoluted process to replace the two defunct bridges over the Hopkins River at Rossbridge in Western Victoria; only to have at the last minute an 'Alternative tender' accepted. Now that the contract for the project has been awarded and works started with the surcharging in place it has proven to be an interesting exercise in going back through the steps and determining the total effort that went into the planning for the project. In preparing this paper the author determined that at least 50 people and 1000 plus hours went into the development of the project only for the direction to be changed at the last minute when an alternative tender was submitted.

Admittedly, just because an alternative tender has been accepted does not mean that all the previous work is for naught but the author questions if the planning process and the work involved was properly understood if alternative tenders would be so readily accepted or would it be better for all if external consultants and contractors to be asked earlier for their alternatives before designs drawn up and contracts written?

## 4. Acknowledgements

A paper focused on the efforts of all the different people in the planning of a small to medium sized bridge replacement project wouldn't be complete without acknowledging them; they are (in no particular order): Andrew Bourke (dec), Sat Satkunam (the curious Statutory Planner), Grant Deeble, Bradley Pryor, Brian Wright, Frank Carland, Natasha Kennedy, Laurie Watson, Paul Sheridan, Amy Wood and the team at Biosis Pty Ltd, Ron Hawken and the Structures team from VicRoads Technical Services, the unknown truck driver who sped past and told the author 'fix the road ya dickhead!', Kee Ho Kong and the Geotechnical team from VicRoads Technical Services, Tim Chatfield and the Martang, Richard Hall Photography, Ewen Nevett - VicRoads Regional Director Western Victoria, Troy Berry, Marinko Vojvodic and Richard Fugiel and the VicRoads Roads Services team.