GOLDEN PLAINS SHIRE COUNCIL

LEVEL TWO AND THREE BRIDGE ASSESSMENT REPORT FOR FEDERATION BRIDGE LOCATED IN INVERLEIGH OVER LEIGH RIVER

BRIDGE ID: BRG1000283

Our Reference: 23-0327
Date: 15 June, 2023

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1. INTRODUCTION

Aussie Bridges Pty. Ltd. ('Aussie Bridges') was awarded a contract by Golden Plain Shire Council ('GPSC') subsequent to its consideration of Aussie Bridges' submission in response to *Request for Quotation Assessment of bridge for Flood Damage- dated 08 February 2023*, to variously undertake:

- Level 3 bridge assessments, as per VicRoads Bridge Inspection Manual, incorporating:
  - Thorough site inspection / investigation to determine bridge condition and identify defects;
  - Submit separate bridge inspection report for each bridge;
  - Determine the nature and extent of repairs works required to ensure that the structure is safe for use; and
  - determination of its load capacity and estimation of the asset's remaining life expectancy;
- determine and report any damage to the structure(s) due to recent floods (October- November 2022).

Federation Bridge ('the bridge') located in Inverleigh crosses Leigh River on the North edge of Inverleigh. Refer aerial image below:

Bridge Location

The bridge is a single span cable suspension pedestrian walkway with timber deck and suspended South approach walkway.

This report describes / details Aussie Bridges combined Level 2 inspection, Level 3 assessment, structural analysis, and our recommended bridge repair options for GPSC consideration.

2. ASSESSMENT

2.1 Objectives

Bridge investigation / assessment objectives were:

- Inspect structure to determine its current condition;
- Identify specific defects / concerns;
- Ascertain the structure's present load carrying capacity;
- Recommend required remedial work / repair;
- Advise on expected life of the repaired structure; and
- Identify potential flood damage.

2.2 Methodology

The inspection involved visual examination and measurement(s) of major bridge components and elements to determine / report on condition, and identify any defects requiring repair or alternative action and their potential relation to the flood event(s) in October- November 2022.

In the absence of drawings and design information, it was not possible to undertake a design/ load analysis. Consequently, Aussie Bridges has conducted a general assessment based on inspection observations and our knowledge and experience of this type of bridge construction.

3. BRIDGE INSPECTION

Aussie Bridges Directors John Grewar and Ron Trimble traveled to the bridge site on 16 April, 2023 and conducted a comprehensive inspection which included:

- Above water and ground level visual inspection of bridge components;
- Examination and measurement(s) of major structural components;
- Review and recording of relevant movement, damage and deterioration of bridge elements; and
- Taking appropriate digital records of the structure and individual bridge elements / components.

Aussie Bridges observations of the bridge structure, approaches and in-vicinity environment are provided in the 'Bridge and Major Culvert Level Two Inspection Report' (and photos) included at Appendix 1. Considerations / repair actions arising from the inspection are also included in the Level Two report.

A Condition of Components table is included at Appendix 2.

4. DESIGN CRITERIA

4.1 Leigh River

The Leigh River, one of the major tributaries of the Barwon River, rises near Ballarat as the Yarrowee River and flows South, before joining the Barwon River in Inverleigh, approximately 500m downstream (East) of Federation Bridge.

4.2 Design Loading

No drawings were made available by GPSC however, it is believed that the footbridge would have been designed to 5 kPa imposed load.

5. BRIDGE STRUCTURE - DESIGN & OBSERVATIONS

For the purpose of this report, Aussie Bridges was not provided with any drawings and/ or design materials relating to Federation bridge. Consequently, this report and analysis are based exclusively on information collected during our site inspection combined with knowledge and experience of similar structures.

The construction date is unknown but the structure is believed to be approximately 25+ year old.

The general design details are:

- A single span cable suspension structure, preceded on the South approach by a suspended walkway,
- Overall length from centreline to centreline of the towers of approximately 35.3m,
- Overall width of approximately 1.28m,
- Width between handrails of approximately 1.17m,
- Approximate height of handrails 1.01m, and
- South approach suspended walkway framing combines RHS and SHS to timber deck and kerbs.

5.1 Substructure

5.1.1 Foundations

Aussie Bridges did not access or review geotechnical information regarding the general site location. No exposures or footing investigation were carried out during our site inspection. Consequently, it is not known how and to what depth the foundations of the towers (2x) and suspended walkway columns have been constructed.

We note the following details in relation to the founding of the catenary cable:

- Concrete foundation pads were not noted/ reached by scraping of superficial soils,
- Specifics of concrete founding pads are unknown,
- Cables appear to have been embedded directly into the concrete pads which have in turn been covered by soils,
- Catenary cables were noted to be in direct contact and embedded into soils and vegetation, and
- Durability of the cables is compromised due to the above exposure, as evidenced by the presence of corrosion/ rust on cable(s) at ground level.

5.1.2 Abutments and embankments

The structure does not specifically exhibit constructed abutments and/or wingwalls due to its suspended design.

However, we note:

- Bitumen/ asphalt footpath to bridge deck at North elevation with significant presence of vegetation (bushes and small trees) in very close proximity and through the structure,
- Suspended/ elevated walkway on South elevation,
- Significant scouring under walkway as a result of the flood event, and
- Flood debris build up under and around South walkway.

5.2 Superstructure

5.2.1 Deck

- Longitudinal timber deck boards screwed on to timber crossbeams supports,
- Lightweight "farming/ chicken" wire has been laid onto timber deck, likely in an effort to obtain an "anti- slip" surface, with an undetermined fixing process. This method is both non-compliant, substandard and unsuccessful as the deck surface remains slippery when wet. The "chicken wire" represents a tripping hazard in places,
- Timber deck and supporting beams are deteriorating and moisture damaged, significantly in places,
- Moss and lichen growth on timber deck and crossbeams,
- Uneven timber deck boards due to deterioration process, and
- The deck visibly appears to twist/ deflect to the upstream face of the structure as evidenced by levels that were recorded at both towers and midspan, as follows:
    - South elevation: 4mm,
    - Midspan: 60mm,
    - North elevation: 10mm.

  It is likely the damage identified is a result of floodwater and debris catching on the upstream catenary cable and stretching it causing elongation of the cable itself and the structure to noticeably sag on the upstream side.

The above comments apply to both the bridge and the suspended walkway at South elevation.

5.2.2 Kerb and Guardrails

- Timber kerbs to walkway and bridge, screwed and/ or bolted to timber deck,
- Deterioration of timber kerbs matches deterioration of timber deck due to moisture,
- Timber guardrail of diagonal and vertical sections topped with steel handrail,
- Timber guardrail fixings have moved/ loosened in places indicating on-going and as well as potentially event (flood) related movement and stresses,
- Steel handrail is in fair to poor condition, exhibiting scratches, corrosion and varied dints,
- Loose and/ or missing screws and bolts,
- Horizontal wires (x6) supported by vertical timber droppers located behind the diagonal elements are non-compliant as they provide footholds and considered a climbing hazard, and
- Horizontal wires have broken under stress (from weight applied to wires, i.e. from climbing) in some sections (particularly on South walkway).

5.2.3 Cables and suspenders

- Cable suspension bridge formed with two (2x) catenary cables fixed at either abutment into concrete pads (assumed) and through towers,

- Cables appear to have been directly embedded into footings and do not present any adjustment mechanism,
- At ground level, cables have been exposed to/ buried into soils and vegetation creating durability concerns evidenced by the presence of rust and corrosion of the cable(s),
- Visibly noticeable cable creep/ elongation, likely as the result of long- term progress,
- Droppers/ suspenders (12mm bars) are missing and/ or damaged in several places,
- Adjustable heads of droppers/ suspenders appear to have previously been treated for corrosion and painted, and
- The towers appear in good condition.

6. CONCLUSION AND RECOMMENDATIONS

Our Level 3 inspection and assessment of the structure established that:

- The bridge cable suspension footbridge is in fair to poor condition with several non-compliance concerns and hazards,
- The cables and related supports are severely out of adjustment and are considered to be visually concerning to the public due to the amount of deformation that can be identified by eye sighting,
- The absence of adjustment mechanism to the cables prevents easy and efficient remediation. While it is potentially possible to cut and adjust the cables, the process is complex, cannot be warranted and expensive,
- Previous repairs/ maintenance efforts to the threaded adjustment heads of the suspenders/ droppers may have hindered future adjustment efforts,
- Non-compliant horizontal guardrail is a climbing hazard which requires replacement as a matter of urgency (supply and install ARC roll top mesh or similar),
- Non-compliant "chicken wire" affixed to timber deck requires removal as a matter of urgency as it presents a tripping hazard and does not provide a suitably non-slip walkway (supply and install mini mesh FRP decking or similar),
- The deck is visibly out-of-plumb and twisting upstream,
- Scouring under the abutment of the South suspended walkway and along banks of the waterway. While the scouring at the South abutment is to be rectified, the embankment scouring is not at this stage affecting the bridge structure and can be referred to the catchment authority for remediation, and
- Presence of trees and vegetation in immediate proximity of the structure, to be removed/ cleared, in particular at South elevation.

In the context of this Level 3 report following the October- November 2022 flood event, we believe that the below damage may be related, to some degree, to the floods:

- Flood debris build up at abutments and under structure,
- Scouring at South abutment (and to a lower degree to embankment(s)),
- Creep/ elongation of catenary cables (partial),
- Twist of deck (partial), and
- Loosening/ movement of some fixings/ screws/ bolts,

It is the professional opinion of Aussie Bridges that:

- This structure requires a number of repairs and upgrades, in part due the stresses created by the flood event of October- November 2022,
- Due to construction details and bridge specifications, the relevant authority may consider replacement as a more cost effective and suitable option rather than repairs and/ or upgrades, and
- The bridge should remain closed to public until repairs and/ or replacement has been completed.

7. BRIDGE REPAIR AND MAINTENANCE

Aussie Bridges' suggested repairs / maintenance to address the defects / issues identified during our site inspection, are included in our 'Bridge and Major Culvert Level Two Inspection Report' (Appendix 1) and the above Conclusion and Recommendations.

7.1 Life expectancy

If the recommended work detailed in our Level Two report and above Conclusion and Recommendations are undertaken on the structure, it is Aussie Bridges' opinion that the bridge will have a further useful life of 25 years without significant maintenance interventions.

It is imperative that future routine maintenance is scheduled and completed. A failure to undertake routine maintenance will have a detrimental effect on both achieving the optimum remaining useful life and ongoing safety of the structure.

If there are any queries regarding the content of this report, please contact the undersigned by telephoning 03 5443 7793 or email admin@aussiebridges.com.au.

Kind Regards

John Grewar
Managing Director / Senior Structural Engineer
BE (Civil) Hons, MIE Aust. CPEng NER, Adv. Dip Engineering (Mech), MAGS, MACSEV, MASI

APPENDIX 1

Overview from North abutment (above) & South (below)

Profile views- note flood debris and vegetation growing next to and through structure- refer above and below

Suspended South walkway- refer above and below

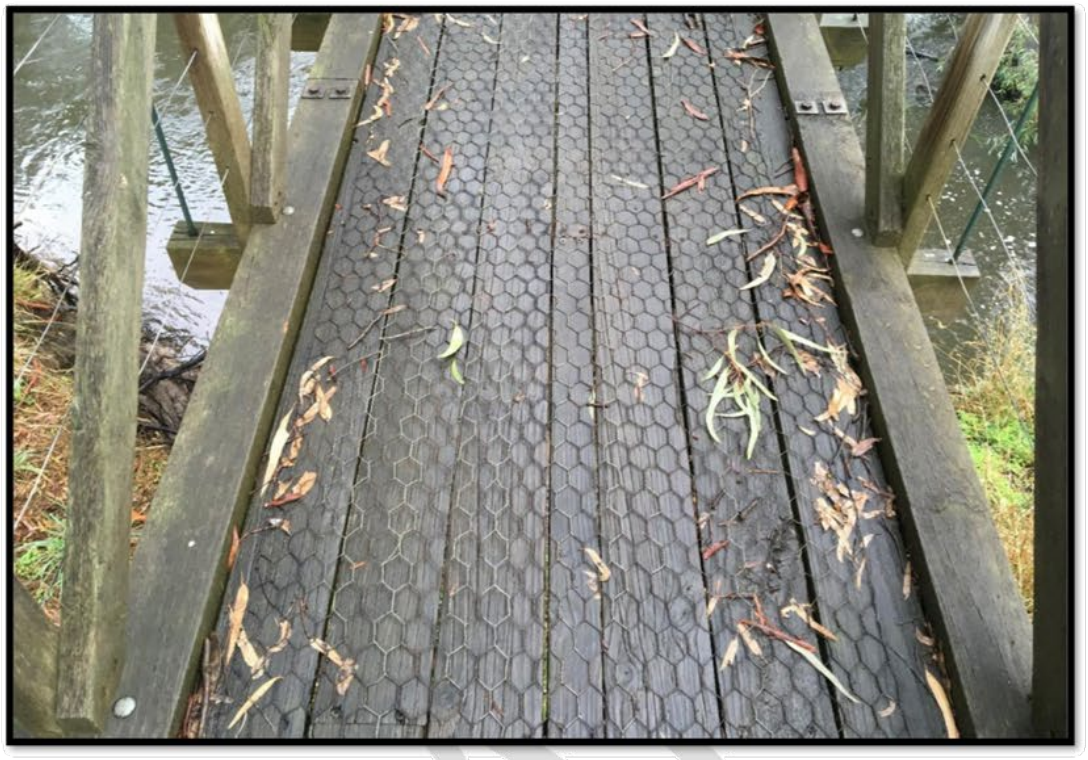
Flood debris build- up – refer above and below

South abutment/ walkway: flood debris caught under deck indicating height of flood waters. Note deterioration and moss/ growth underneath planks.

South abutment: tree growing under structure and through cable/ railing. Note deterioration, mould, lichen and moss underneath timber planks and beams

South- Catenary cables assumed to be directly embedded into concrete pad- note absence of adjustment mechanism and durability concerns (rust) - refer above and below

North- Catenary cables assumed to be directly embedded into concrete pad- note absence of adjustment mechanism and durability concerns - refer above and below



Non-compliant “chicken wire” installed on deck planks

Deck is noticeably twisting towards upstream

Missing suspender/ dropper

Example of bent droppers/ suspenders

Example of corrosion to droppers

Example of corrosion and loosened fixings

Guardrail deterioration and replaced fixings

Signs of movement at deck/ railing joint

Broken strands of non-compliant horizontal wire fence

Significant scour to waterway does not affect bridge structure at this stage. To be referred to catchment authority for repairs

APPENDIX 2

FOOT BRIDGE
LEVEL TWO INSPECTION REPORT

BRIDGE IDENTIFICATION / INSPECTION INFORMATION		
Structure ID: BRG1000283	**Bridge Name:** Federation Bridge **Road / Street:** Inverleigh	**Waterway / Crossing Name:** Leigh River
Inspectors: John Grewar and Ron Trimble	**Inspection Date(s):** 16 April 2023	**Location Details:** Latitude: -38.097816 Longitude: 144.054393

BRIDGE PROPERTIES / DIMENSIONS		
Description	**Item**	**Detail**
Single span catenary cable suspension pedestrian walkway with timber deck and suspended approach walkway	Length	35.3m centreline to centreline of towers
	Width	1.28 overall
		1.03 between kerbs
		1.17 between handrails

STRUCTURAL CONDITION		
Component / Bridge Element	**Condition / Defect(s)**	**Action(s)**
Substructure		
Abutments and embankments	• Scour at base of South walkway • Scour along banks/ waterway	• Repair/ remediate • Monitor/ refer to catchment authority
Piles	Flood debris build up	Remove/ clear
Superstructure		
Deck	• Deteriorating/ decaying timber planks (moss) • Non-compliant non-slip wire • Uneven deck/ rotating towards upstream	• Remove moss and treat planks, replace where required • Remove and replace with FRP mini mesh decking • Remove and rebuild suspension elements to achieve level/adjust system
Kerb	Deteriorating	Treat and monitor
Towers	Satisfactory	
Suspension cable	• Cable creep/ elongation • Durability/ rusting concerns • Absence of adjustment mechanism to catenary cable • Cable embedded into concrete footing	• Remove and replace cable • Investigate footings and design changes to allow for adjustable cable
Suspenders	• Bent and/ or missing bars • Corroded and painted over, impeding adjustment	• Straighten and/ or replace bars • Investigate and replace bars as required • Adjust as necessary
Fixings	Missing and/ or loosened screws	Tighten and/ or replace screws over entire structure as required

FOOT BRIDGE

LEVEL TWO INSPECTION REPORT

Crossbeams/ floor beams	• Some water damage • Some deterioration	Asses, treat and/ or replace as required
Barrier / Guardrail	• Non-compliant horizontal wire allowing footholds and absence of vertical break • Broken and/ or damaged horizontal wire	Remove, supply and install ARC roll top mesh or equivalent
Approaches and Signage		
Signage	Satisfactory	
Approach(es)	Scouring at South end	Repair
Aspect Maintenance		
Clean and Paint	Deteriorating timber railing and fencing	Clean, treat and paint handrail and approach fencing
Debris	Flood debris build up under and around structure	Remove/ clean
Vegetation	• Tree growing under structure at South end • Bushes impeding access as North end	• Remove • Trim/ clear

INSPECTION SUMMARY	
Recommendation	Refer to Level 3 Report

FOOT BRIDGE
LEVEL TWO INSPECTION REPORT

Condition of components – VicRoads Rating

Component(s)	Steel (S)	Precast Concrete (P)	Cast-In- Situ Concrete (C)	Timber (T)	Other (O)	Exposure**	Condition			
							1	2	3	4
Superstructure										
Cable/ hangers	6S					2		50%	30%	20%
Crossbeams/ floorbeams	9 S					2	60%	40%		
Longdecking/ Crossdecking/ running planks				10 T		2	60%	40%		
Substructure										
Column or pile extensions	22 S					2	100%			
Abutment					24O	2	90%	10%		
Miscellaneous										
Bridge kerb / Footways				50 T		2	90%	10%		
Bridge railing / Barriers	51 S			51T	51O	2	80%	10%	10%	
Bridge approaches					52 O	2	80%		20%	
Waterway					54 O	1	80%		20%	

*** Exposure**
1. Relatively benign
2. Mildly aggressive
3. Aggressive
4. Most aggressive

**** Condition**
1. Good condition with little or no sign of deterioration
2. Shows minor deterioration with primary supporting material showing first signs of being affected
3. Shows advance deterioration and loss of protection to the supporting material which is showing deterioration and minor loss of section (preventative maintenance required)
4. Shows advance deterioration and loss of protection to the supporting material which is showing effective loss of section (significate maintenance or replacement required)

Federation Bridge Inverleigh
Rehabilitation Works

Scenario 1: Replace decking with timber, repair other items in report

Cost Estimate

	STRUCTURAL CONDITION									
	Component / Bridge Element	**Condition / Defect(s)**	**Action(s)**	**Quantity**	**Unit of Measure**	**Unit Rate**	**Subtotal**	**Wear & tear**	**Flood Damage**	**Assumptions/comments**
0.00	**Site Establishment**									
0.02	Site establishment		Establish works site, site office, toilets, fencing etc	1	item	33,600.00	33,600.00	50%	50%	
1.00	***Substructure***									
1.01	Abutments and embankments	Scour at base of South walkway	Repair/ remediate with CL3 cement treated crushed rock	1	item	300.00	296.00	0%	100%	
		Scour along banks/ waterway	Monitor/ refer to catchment authority	0	item	0.00	0.00	0%	100%	Estimate created, awaiting confirmation from CCMA re: funding and timing
1.02	Piles	Flood debris build up	Remove/ clear, dispose legally	1	item	1,280.00	1,280.00	0%	100%	Mulch onsite?
2.00	***Superstructure***									
2.01	Deck	Deteriorating/ decaying timber planks (moss)	Remove moss and treat planks, replace where required	35	Lin m	560.00	19,600.00	100%	0%	Assume full deck replacement with Fibreglass Reinforced Plastic
2.02		Uneven deck/ rotating towards upstream	Remove and rebuild suspension elements to achieve level/adjust system	35	Lin m	282.00	9,870.00	50%	50%	Estimated only level adjusment
2.03	Kerb	Deteriorating	Treat/replace timber as required	102	Lin m	33.73	3,440.00	100%	0%	Replace all kerbing
2.04	Towers	Satisfactory		N/A						
2.05	Suspension cable	Cable creep/ elongation	Remove and replace cable	N/A				50%	50%	Would require full-reconstruction of bridge
2.06		Absence of adjustment mechanism to catenary cable	Investigate footings and design changes to allow for adjustable cable	N/A				100%	0%	Would require full-reconstruction of bridge
2.07		Cable embedded into concrete footing creating durability/ rusting concerns	Investigate extent of corrosion	N/A				100%	0%	Add to annual asset inspection program ie level 2 bridge inspections
2.08	Suspenders	Bent and/ or missing bars	Straighten and/ or replace bars Add individual lengths	1	item	5,500.00	5,500.00	0%	100%	Bent bars are replaced also, each new bar is made onsite
2.09		Corroded and painted over, impeding adjustment	Adjust as necessary	1	item	10,500.00	10,500.00	50%	50%	Includes cleaning and repainting
2.10	Fixings	Missing and/ or loosened screws	Tighten and/ or replace screws over entire structure as required	1	item	280.00	280.00	100%	0%	
2.11	Crossbeams/ floor beams	Some water damage & deterioration	Assess, treat and/ or replace as required	1	item	9,380.00	9,380.00	50%	50%	Assume approx 1/3 require replacement, high lin. m rate for it includes installation/other materials/fastenings
2.12	Barrier / Guardrail	Broken and/ or damaged horizontal wire	Repair horizontal wire	1	item	2,040.00	2,040.00	50%	50%	
3.00	***Approaches and Signage***									
3.01	Approach(es)	Scouring at South end	Fill in scour with clean fill	1	item	670.00	670.00	0%	100%	Assume 5 cubic m of fill is used
4.00	***Aspect Maintenance***									
4.01	Clean and Paint	Deteriorating timber railing and fencing	Clean, treat and paint handrail and approach fencing	1	item	5,860.00	5,860.00	100%	0%	
4.02	Debris	Flood debris build up under and around structure	Clean/remove and legally dispose debris	1	item	1,000.00	1,000.00	0%	100%	
4.03	Vegetation	Tree growing under structure at South end	Remove and legally dispose	1	item	280.00	280.00	100%	0%	Disposal costs included in 4.02
4.04		Bushes impeding access as North end	Trim/ clear and legally dispose	1	item	280.00	280.00	100%	0%	Disposal costs included in 4.02
P	***Provisional***									
P.01	Fixings		Replace broken fixings	1	item	500.00	500.00	100%	0%	Notional amount
P.02	Crossbeams/ floor beams		Assess, treat and/ or replace as required	10	Lin m	670.00	6,700.00	75%	25%	Assume an extra third require replacing
P.03	Barrier / Guardrail		Replace wire barrier with ARC roll top mesh	70.6	Lin m	96.99	6,847.50	100%	0%	
P.04	Design		1 week to verify structure can support roll mesh	1	item	8,000.00	8,000.00	100%	0%	

Totals

Design				8,000.00	8,000.00	0.00
Site Establishment				33,600.00	16,800.00	16,800.00
Subtotal				70,276.00	45,635.00	24,641.00
Provisionals				14,047.50	12,372.50	1,675.00
Contingency			20%	25,184.70	16,561.50	8,623.20
Project Estimate				143,108.20	91,369.00	51,739.20
Betterment/Flood Repair					64%	36%

Federation Bridge Inverleigh

Rehabilitation Works

Scenario 2: Replace decking with fibreglass reinforced plastic, repair other items in report

Cost Estimate

	STRUCTURAL CONDITION									
	Component / Bridge Element	**Condition / Defect(s)**	**Action(s)**	**Quantity**	**Unit of Measure**	**Unit Rate**	**Subtotal**	**Wear & tear**	**Flood Damage**	**Assumptions/comments**
0.00	**Site Establishment**									
0.02	Site establishment		Establish works site, site office, toilets, fencing etc	1	item	35,200.00	35,200.00	50%	50%	
1.00	***Substructure***									
1.01	Abutments and embankments	Scour at base of South walkway	Repair/ remediate with CL3 cement treated crushed rock	1	item	300.00	296.00	0%	100%	
		Scour along banks/ waterway	Monitor/ refer to catchment authority	0	item	0.00	0.00	0%	100%	Estimate created, awaiting confirmation from CCMA re: funding and timing
1.02	Piles	Flood debris build up	Remove/ clear, dispose legally	1	item	1,280.00	1,280.00	0%	100%	Mulch onsite?
2.00	***Superstructure***									
2.01	Deck	Non-compliant non-slip wire	Remove and replace with FRP mini mesh decking	51	Lin m	1,002.75	51,140.00	100%	0%	Instead of replacing timber deck
2.02		Uneven deck/ rotating towards upstream	Remove and rebuild suspension elements to achieve level/adjust system	35	Lin m	282.00	9,870.00	50%	50%	Estimated only level adjusment
2.03	Kerb	Deteriorating	Treat/replace timber as required	102	Lin m	33.73	3,440.00	100%	0%	Replace all kerbing
2.04	Towers	Satisfactory		N/A				0%	0%	
2.05	Suspension cable	Cable creep/ elongation	Remove and replace cable	N/A				50%	50%	Would require full-reconstruction of bridge
2.06		Absence of adjustment mechanism to catenary cable	Investigate footings and design changes to allow for adjustable cable	N/A				100%	0%	Would require full-reconstruction of bridge
2.07		Cable embedded into concrete footing creating durability/ rusting conceerns	Investigate extent of corrosion	N/A				100%	0%	Add to annual asset inspection program ie level 2 bridge inspections
2.08	Suspenders	Bent and/ or missing bars	Straighten and/ or replace bars Add individual lengths	1	item	5,500.00	5,500.00	0%	100%	Bent bars are replaced also, each new bar is made onsite
2.09		Corroded and painted over, impeding adjustment	Adjust as necessary	1	item	10,500.00	10,500.00	50%	50%	Includes cleaning and repainting
2.10	Fixings	Missing and/ or loosened screws	Tighten and/ or replace screws over entire structure as required	1	item	280.00	280.00	100%	0%	
2.11	Crossbeams/ floor beams	Some water damage & deterioration	Assess, treat and/ or replace as required	1	item	9,380.00	9,380.00	50%	50%	Assume approx 1/3 require replacement; high lin. m rate for it includes installation/other materials/fastenings
2.12	Barrier / Guardrail	Broken and/ or damaged horizontal wire	Repair horizontal wire	1	item	2,040.00	2,040.00	50%	50%	
3.00	***Approaches and Signage***									
3.01	Approach(es)	Scouring at South end	Fill in scour with clean fill	1	item	670.00	670.00	0%	100%	Assume 5 cubic m of fill is used
4.00	***Aspect Maintenance***									
4.01	Clean and Paint	Deteriorating timber railing and fencing	Clean, treat and paint handrail and approach fencing	1	item	5,860.00	5,860.00	100%	0%	
4.02	Debris	Flood debris build up under and around structure	Clean/remove and legally dispose debris	1	item	1,000.00	1,000.00	0%	100%	
4.03	Vegetation	Tree growing under structure at South end	Remove and legally dispose	1	item	280.00	280.00	100%	0%	Disposal costs included in 4.02
4.04		Bushes impeding access as North end	Trim/ clear and legally dispose	1	item	280.00	280.00	100%	0%	Disposal costs included in 4.02
P	***Provisional***									
P.01	Fixings		Replace broken fixings	1	item	500.00	500.00	100%	0%	Notional amount
P.02	Crossbeams/ floor beams		Assess, treat and/ or replace as required	10	Lin m	670.00	6,700.00	75%	25%	Assume an extra third require replacing
P.03	Barrier / Guardrail		Replace wire barrier with ARC roll top mesh	70.6	Lin m	96.99	6,847.50	100%	0%	
P.04	Design		1 week to verify structure can support roll mesh	1	item	8,000.00	8,000.00	100%	0%	

Totals

Design				8,000.00	8,000.00	0.00
Site Establishment				35,200.00	17,600.00	17,600.00
Subtotal				101,816.00	77,175.00	24,641.00
Provisionals				14,047.50	12,372.50	1,675.00
Contingency			20%	31,812.70	23,029.50	8,783.20
Project Estimate				182,876.20	130,177.00	52,699.20
Betterment/Flood Repair					71%	29%

Federation Bridge Inverleigh
Rehabilitation Works

Scenario 3: Retain towers, replace deck with FRP, cables and affected crossbeams

Cost Estimate

	STRUCTURAL CONDITION									
	Component / Bridge Element	**Condition / Defect(s)**	**Action(s)**	**Quantity**	**Unit of Measure**	**Unit Rate**	**Subtotal**	**Wear & tear**	**Flood Damage**	**Assumptions/comments**
0.00	**Site Establishment**									
0.02	Site establishment		Establish works site, site office, toilets, fencing etc	1	item	32,400.00	32,400.00	50%	50%	
1.00	***Substructure***									
1.01	Abutments and embankments	Scour at base of South walkway	Repair/ remediate with CL3 cement treated crushed rock	1	item	300.00	296.00	0%	100%	
		Scour along banks/ waterway	Monitor/ refer to catchment authority	0	item	0.00	0.00	0%	100%	Estimate created, awaiting confirmation from CCMA re: funding and timing
1.02	Piles	Flood debris build up	Remove/ clear, dispose legally	1	item	1,280.00	1,280.00	0%	100%	Mulch onsite?
2.00	***Superstructure***									
2.01	Deck	Deteriorating/ decaying timber planks (moss)	Remove moss and treat planks, replace where required	35	Lin m	560.00	19,600.00	100%	0%	Assume full deck replacement with Fibreglass Reinforced Plastic
2.02		Uneven deck/ rotating towards upstream	Remove and rebuild suspension elements to achieve level/adjust system	35	Lin m	282.00	9,870.00	50%	50%	Estimated only level adjusment
2.03	Kerb	Deteriorating	Treat/replace timber as required	102	Lin m	33.73	3,440.00	100%	0%	Replace all kerbing
2.04	Towers	Satisfactory		N/A				0%	0%	
2.05	Suspension cable	Cable creep/ elongation	Remove and replace cable	N/A				50%	50%	Would require full-reconstruction of bridge
2.06		Absence of adjustment mechanism to catenary cable	Investigate footings and design changes to allow for adjustable cable	1	item	50,000.00	50,000.00	100%	0%	Would require full-reconstruction of bridge
2.07		Cable embedded into concrete footing creating durability/ rusting concerns	Investigate extent of corrosion	N/A				100%	0%	Add to annual asset inspection program ie level 2 bridge inspections
2.08	Suspenders	Bent and/ or missing bars	Straighten and/ or replace bars Add individual lengths	1	item	5,500.00	5,500.00	0%	100%	Bent bars are replaced also, each new bar is made onsite
2.09		Corroded and painted over, impeding adjustment	Adjust as necessary	1	item	10,500.00	10,500.00	50%	50%	Includes cleaning and repainting
2.10	Fixings	Missing and/ or loosened screws	Tighten and/ or replace screws over entire structure as required	1	item	280.00	280.00	100%	0%	
2.11	Crossbeams/ floor beams	Some water damage & deterioration	Assess, treat and/ or replace as required	1	item	6,700.00	6,700.00	50%	50%	Assume approx 1/3 require replacement, high lin. m rate for it includes installation/other materials/fastenings
2.12	Barrier / Guardrail	Broken and/ or damaged horizontal wire	Repair horizontal wire	1	item	2,040.00	2,040.00	50%	50%	
3.00	***Approaches and Signage***									
3.01	Approach(es)	Scouring at South end	Fill in scour with clean fill	1	item	670.00	670.00	0%	100%	Assume 5 cubic m of fill is used
4.00	***Aspect Maintenance***									
4.01	Clean and Paint	Deteriorating timber railing and fencing	Clean, treat and paint handrail and approach fencing	1	item	5,860.00	5,860.00	100%	0%	
4.02	Debris	Flood debris build up under and around structure	Clean/remove and legally dispose debris	1	item	1,000.00	1,000.00	0%	100%	
4.03	Vegetation	Tree growing under structure at South end	Remove and legally dispose	1	item	280.00	280.00	100%	0%	Disposal costs included in 4.02
4.04		Bushes impeding access as North end	Trim/ clear and legally dispose	1	item	280.00	280.00	100%	0%	Disposal costs included in 4.02
P	***Provisional***									
P.01	Fixings		Replace broken fixings	1	item	500.00	500.00	100%	0%	Notional amount
P.02	Crossbeams/ floor beams		Assess, treat and/ or replace as required	10	Lin m	670.00	6,700.00	75%	25%	Assume an extra third require replacing
P.03	Barrier / Guardrail		Replace wire barrier with ARC roll top mesh	70.6	Lin m	96.99	6,847.50	100%	0%	
P.04	Design		1 week to verify structure can support roll mesh	1	item	16,000.00	16,000.00	100%	0%	

Totals

Design				16,000.00	16,000.00	0.00
Site Establishment				32,400.00	16,200.00	16,200.00
Subtotal				117,596.00	94,295.00	23,301.00
Provisionals				14,047.50	12,372.50	1,675.00
Contingency			20%	36,008.70	27,773.50	8,235.20
Project Estimate				216,052.20	166,641.00	49,411.20
Betterment/Flood Repair					77%	23%