

Structure Id Name

Overview

Structure Type

Construction Type
Construction Material

Owner
SW Region
SW District

Risk Threshold Level
Risk Index Threshold

Location

Code	Id	Road Section Description	S	Cway	S	Tdist Start	End

Order By

	Column Name	Asc	Desc
1	<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>

Bridge Information System
Structure Level Report

Structure Id	Name	SW District	Road Id	Tdist	COF	PSF	MDF	DSR	Risk	CS2 Risk	Risk Index	No. Groups	Components not included No.	%	Condition State	Rank
7799	Barron River	403	32A	12.54	15.0	140	1.65	21	2105	1009.1	2.1	15	7	7	4	1

Released under RTI - DTMR

Structures Management Plan SMP1



Queensland Government

Structure Id 7799	Name Barron River
Crossing Name 	Alt. Name Post #255
Structure Type Bridge	Owner Transport and main Roads
Construction Type Girder/Beam	District 403 Far North
Construction Material Steel	LGA Id

Defective Components
Form A2/3

Attachment ☒

Date 9/01/2017

Interim Plan ☐

Final Plan ☐

Departure ☐

Road Section					Start		End		TDist	
Id	Description	S	Cway	S	RPC	Dist	RPC	Dist	Start	End
32A	Cairns – Mareeba	C	1	C	5	0.000	5	0.527	12.792	0.257

Deficiencies	
Location	Details (Nature, Extent, Severity)
Superstructure	Refer to Life Interim Extension Report and Assessment of Short-term Risks and Investigation Scope
Substructure	Refer to Life Interim Extension Report and Assessment of Short-term Risks and Investigation Scope
Bridge Function	

Programmed Remedial Measure (Repair, Rehabilitate, Strengthen or Replace)				
Substructure	Superstructure	Bridge	Estimate (\$)	Fin. Year

Interim Management Measures Yes ☐ No ☐ Attachments ☐

	Comments
Weight Restriction <input type="checkbox"/>	<p>The bridge should be restricted to vehicles that comply with general mass limits and concessional mass limits as defined in Schedules 1 and 2 of the Heavy Vehicle (Mass, Dimension and Loading) National Regulation. Vehicles loaded to higher mass limits as defined in Schedule 5 of the Heavy Vehicle (Mass, Dimension and Loading) National Regulation are not permitted</p> <p>No Class 1 heavy vehicles are permitted to cross the bridge except:</p> <ul style="list-style-type: none"> • Special purpose vehicles operating under the national Class 1 Special Purpose Vehicle Notice 2016 (No 1) issued by the NHVR <p>The heaviest vehicles permitted are the following:</p> <ul style="list-style-type: none"> • 20m long, 50.5t truck and dogs • 19m long, 50.5t B-doubles • 19m long, 43.5t semi-trailers
Lane Width Restriction <input type="checkbox"/>	
One Way Working <input type="checkbox"/>	

Structures Management Plan SMP1



Queensland Government

Prop Structure	<input type="checkbox"/>	
Close Structure	<input type="checkbox"/>	
Construct Sidetrack	<input type="checkbox"/>	
Sign Detour	<input type="checkbox"/>	
Install Height Bars	<input type="checkbox"/>	
Monitor Structure	<input type="checkbox"/>	Refer to Life Interim Extension Report and Assessment of Short-term Risks and Investigation Scope
Load Testing	<input type="checkbox"/>	
Other (e.g. Inspection Freq.)	<input checked="" type="checkbox"/>	Refer to Life Interim Extension Report and Assessment of Short-term Risks and Investigation Scope

Approval of Structures Management Plan

District Director (FMD)

Signature: NR

Date: 28/10/19
Click to enter date

Deputy Chief Engineer (Structures)

Signature: NR

Date: 28/10/2019
Click to enter date

Departures

Reasons

Alternative Interim Measures

Yes ☐

No ☐

Attachments ☐

		Comments
Weight Restriction	<input type="checkbox"/>	
Lane Width Restriction	<input type="checkbox"/>	
One Way Working	<input type="checkbox"/>	
Prop Structure	<input type="checkbox"/>	
Close Structure	<input type="checkbox"/>	
Construct Sidetrack	<input type="checkbox"/>	
Sign Detour	<input type="checkbox"/>	
Install Height Bars	<input type="checkbox"/>	
Monitor Structure	<input type="checkbox"/>	
Load Testing	<input type="checkbox"/>	
Other (e.g. Inspection Freq.)	<input type="checkbox"/>	

Approval of Departures



Comments		
District Director ()	Signature:	Date: Click to enter date
Comments		
Regional Director ()	Signature:	Date: Click to enter date
Copy forwarded to DDG	<input type="checkbox"/>	Date: Click to enter date
Copy forwarded to DCE (Structures)	<input type="checkbox"/>	Date: Click to enter date

Life Extension Interim Report

Barron River Bridge (7799)

Version No: 0.2
Date: 30/11/2018

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TMR OnQ Template Version 3.0 (06/09/2017)

Project Summary

Region/District	North Queensland Region Far North District
Road Name/Location/Local Government	32A Kennedy Highway Bridge over Barron River at Kuranda Mareeba Shire Council
Program	Structures Rehabilitation Program (Element 19)
Project Number	364373
Project Description	Barron River Bridge Investigation

Document Control

Prepared by:	NR
Title:	Contract Engineer
Branch:	Engineering & Technology Structures
Division/Region:	Infrastructure Management & Delivery
Location:	313 Adelaide Street, Brisbane
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Status:	Approved Document
DMS ref. no:	450/08757
File/Doc no:	

Version history

Version no.	Date	Changed by	Nature of amendment
	29 June 2018	NR	Initial draft.
0.1	23 Nov 2018		Final draft
0.2	30 Nov 2018		Approved document

Endorsement and Approval

Customer

I accept that this project has been completed and handed over to my organisation:

Name	<input type="text" value="NR"/>		
Position	Manager (Delivery & Operations)		
Signature		Date	
Comments			

The following officers have **endorsed** this document:

Name	<input type="text" value="NR"/>		
Position	Principal Engineer (Civil)		
Signature		Date	

Name	<input type="text" value="NR"/>		
Position	Engineer (Civil)		
Signature		Date	

Name	<input type="text" value="NR"/>		
Position	Contract Engineer		
Signature		Date	

Sponsor

This project has been completed and this report hands it over to the project customer:

Name	<input type="text" value="NR"/>		
Position	Deputy Chief Engineer (Structures)		
Signature		Date	
Comments			

The following officers have **endorsed** this document:

Name	<input type="text" value="NR"/>		
Position	Director, Structures Management		
Signature		Date	

Name	<input type="text" value="NR"/>		
Position	Manager, Structures Stewardship		
Signature		Date	

Name	<input type="text" value="NR"/>		
Position	Manager, Structures Stewardship		
Signature		Date	

Project manager & Technical lead:

Name	<input type="text" value="NR"/>		
Position	Contract Engineer		
Signature		Date	

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Executive summary



Figure 1 Barron River Bridge¹

The 256 m long Barron River Bridge at Kuranda is an iconic major bridge on a strategic route that services Kuranda, the Atherton Tablelands and areas further to the west of Cairns. The expectation is that this high long bridge will remain in-service for the foreseeable future.

The bridge was designed for the H20S16 design load (33 t truck) and featured tall concrete piers and fabricated steel girders with spans of 45.7m (150 feet) and 36.6 m (120 feet). The superstructure is continuous over the piers with drop-in spans and steel halving joints. The deck wearing surface is concrete.

The unverified Tier 1 assessment indicates that the girders and the headstock cantilevers are operating at margins less than current Australian standards for general access semi-trailers (42.5 t) and the 50.5t 19m B-doubles / truck and dogs that can access the route. This assessment is consistent with other long span bridges designed to the H20S16 design load and with long spans such as this bridge.

The drawings for the Barron River Bridge at Kuranda were progressively released over a period of 18 months between December 1960 and June 1962 with the steel for the girders pre-purchased by the Department of Transport and Main Roads and supplied to the successful tenderer for the superstructure. This accelerated construction program appears related to the construction of the Barron Gorge Hydro scheme, which was commissioned in 1963 and flooded the previous low-level bridge.

Significantly, the steel girders were retrofitted with stressed Macalloy bars before the bridge was opened. The drawings for the retrofit were signed in March 1963 – more than 18 months after the drawings for the steel girders were signed. The reason for the retrofit has not been identified, but it was possibly in response to the

1

https://www.bing.com/images/search?view=detailV2&ccid=5544Gh%2fu&id=28145F45A3E467CAADD3E06CADECCD55CEC5EBF9&thid=OIP_5544Gh_udJvDieVnnl6qwHaEJ&medi aurl=http%3a%2f%2fstatic.panoramio.com%2fphotos%2flarge%2f6209518.jpg&exph=573&expw=1024&q=barron+river+bridge+at+kuranda&simid=608040102999623168&selectedIndex=0&ajaxhist=0

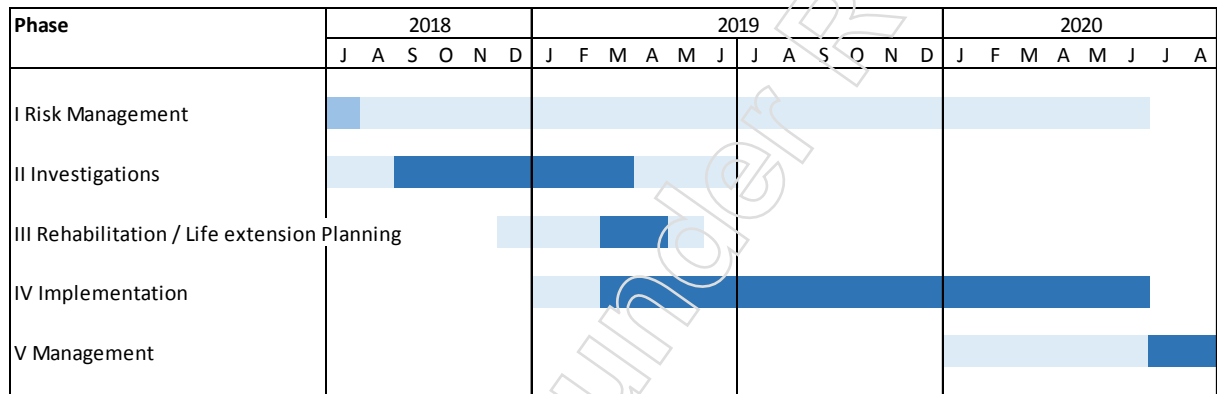
failure by brittle fracture² of the steel girder Kings Bridge in Melbourne in July 1962. An alternative hypothesis is that an independent review recommended strengthening. This retrofit is now compromised through both pitting corrosion and wear of the stressing bars vibrating against the girders raising concerns of brittle failure in the bars.

There are also concerns about stability of bearings due to the inclination of the rockers, wear, and corrosion with total loss of section in some of the bolts that provide the stability of the bearings. Leaking deck joints contributes both to the deterioration of the bearings and the steelwork in general. There is some suggestion that the protective coating may be reaching the end of its economic life and if access is required for other actions then repainting may be appropriate at the same time.

The abutment deck joints are now noisy and expensive to maintain, and issues have been identified with the guardrails.

After 55 years of service, it is considered timely to develop and implement a detailed Life Extension Plan for the Barron River Bridge to manage the identified risks and prepare the bridge for its remaining life. The purpose of the Life Extension Plan is to ensure that the operation, capacity and condition of a specific structure is systematically managed and monitored to ensure; safety of the road user, network efficiency, and prevent occurrences (load or condition) which may lead to severe structural damage or collapse.

An indicative timeline for the development and implementation of the Life Extension Plan follows:



² Brittle fracture is uncommon in Queensland but can occur. Factors that mitigate against brittle fracture at Barron River include the moderate temperatures at Kuranda and the detailing of the welding to avoid transverse fillet welds.

1. Purpose of this document

The purpose of this document is to hand over the completed deliverables to the customer with details of the investigations necessary to safely manage and extend the life of the Barron River Bridge at Kuranda.

2. Governance

2.1 Key Roles

The key project management roles were:

Project Customer	NR	Manager (Delivery & Operations)
Project Sponsor	NR	Deputy Chief Engineer (Structures)
Project Manager	NR	Contract Engineer
Advisory Group	NR	

2.2 Related documents

Documents related to the Barron River Bridge at Kuranda include:

- TMR Structures, November 2018, "Assessment of Short-term Risks and Investigation Scope – Barron River Bridge (7799)"
- TMR Structures Management, November 2018, "Life Extension Interim Report – Barron River Bridge (7799)". Note: The initial 29 June 2018 draft of this report titled "Structure Management Plan – Barron River Bridge (7799)". It was renamed at the time of issue. This document.
- RoadTek, May 2017, "Inspection Report -- Barron River Inspection BIS ID 7799: Defect Repair options Report #1"³
- RoadTek, May 2017, "Level 2 Inspection"⁴
- TMR BCM&AM, Dec 2015, "Level 3 Inspection – Barron River Bridge BIS IS 7799"⁵

3. Objectives and scope

3.1 Objectives

- Develop a framework for the life extension of the bridge.

³ A copy of this report is included as Appendix C of "Life Extension Investigation – Interim Report – Barron River Bridge (7799)"

⁴ A copy of this report is included as Appendix B of "Life Extension Investigation – Interim Report – Barron River Bridge (7799)"

⁵ A copy of this report is included as Appendix A of "Life Extension Investigation – Interim Report – Barron River Bridge (7799)"

3.2 In scope

- Review existing inspection reports and drawings.
- Identify and recommend the appropriate investigations necessary to safely manage and extend the life of the bridge.

3.3 Out of scope

- Risk assessments
- Conduct of detailed investigations.
- Development of a Structure Management Plan for the bridge.

4. Background

The Barron River Bridge at Kuranda is the first high level bridge built at this location and carries the Kennedy Highway across the Barron River.

The Kennedy Highway serves Kuranda, the Atherton Tablelands and areas to the west of Cairns. The highway has high strategic significance to the State road network and is generally used by industry and tourists. Traffic volumes are AADT (2017) = 8871 vehicles per day with 12.23% HV = 1085 heavy vehicles per day.

The road is a General Access Route. Vehicles such as semi-trailers and truck and dogs access the route. The road geometry of the Kuranda Range is restrictive in terms of access by longer heavier vehicles such as B-doubles and road trains, however the increased power and manoeuvrability of modern trucks is enabling larger trucks to access the route.

The two-lane fabricated steel girder bridge is long (840 feet or 256 m) and high (deck up to 66 feet or 20 m above the top of the concrete spread footings).

The bridge was constructed during 1961 to 1963:

- The design drawings were released progressively over 18 months between December 1960 and June 1962.
- The steel for the bridge was pre-ordered and supplied by the then Department of Main Roads to the steel fabrication contractor.
- It appears the accelerated construction was related to the construction of the Barron River hydro scheme, which flooded the existing lower level bridge.
- The steel girders in the Kings Bridge in Melbourne collapsed via brittle fracture on the 10th July 1962 – prior to the opening of the bridge Barron River Bridge at Kuranda. The report of the Royal Commission into the failure of the Kings Bridge was published in 1963.
- Drawings detailing the “Prestressing of the lower flange” were signed 15 March 1963 – 8 months after the collapse of the Kings Bridge and more than 18 months after the girder drawings were signed. One hypothesis is that concerns over the potential brittle fracture of the Barron River Bridge led to the strengthening on the tension flange via external post-tensioning.

5. Overview of Bridge

5.1 Bridge Details

Table 1 Details of the Barron River Bridge at Kuranda

Route Type:	General Access
Loading Level (HML/GML)	GML
Route MCV:	GA (semi-trailer, 19 m B-double)
Design Class	H20S16 (1960's).
Superstructure Description	<p>Continuous welded steel I Girder (4) with cantilevers and drop-in spans acting compositely (shear studs) with RC deck.</p> <p>Span 1 & 6 120 ft 36.58 m</p> <p>Span 2, 3, 4 & 5 150 ft 45.69 m</p> <p>Span 2 & 5 drop-in spans 90 ft 27.43 m</p> <p> cantilevers 30 ft 9.14 m</p> <p>Overall length: 256 m</p>
Substructure Description	<p>Abutments: Concrete sill beam</p> <p>Pier: Reinforced Concrete column with cantilevered headstocks on spread footings.</p>
Carriageway width (m):	8.195 m (28' 0") between kerbs
No. marked lanes:	2 marked lanes offset for a footway on the Cairns bound shoulder
Skew:	0°

5.2 Bridge Location

The location of the bridge is illustrated in Figure 2.

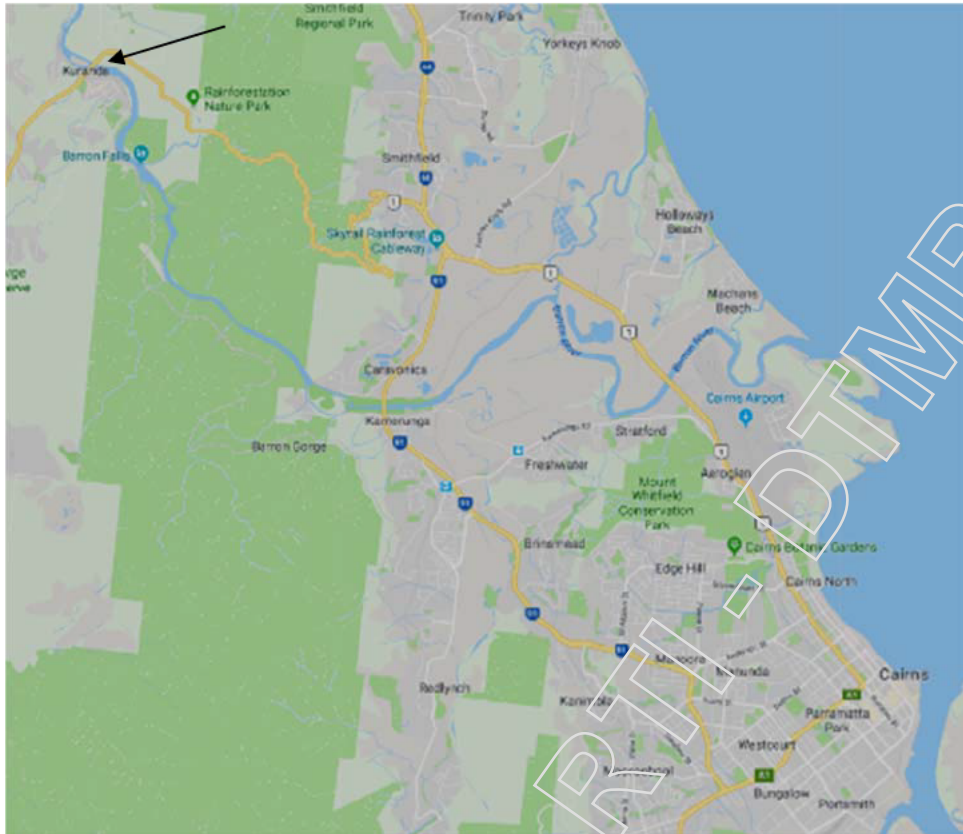


Figure 2 Barron River Bridge location (arrow)

5.3 Drawing Summary

Selected extracts from the drawings follow:

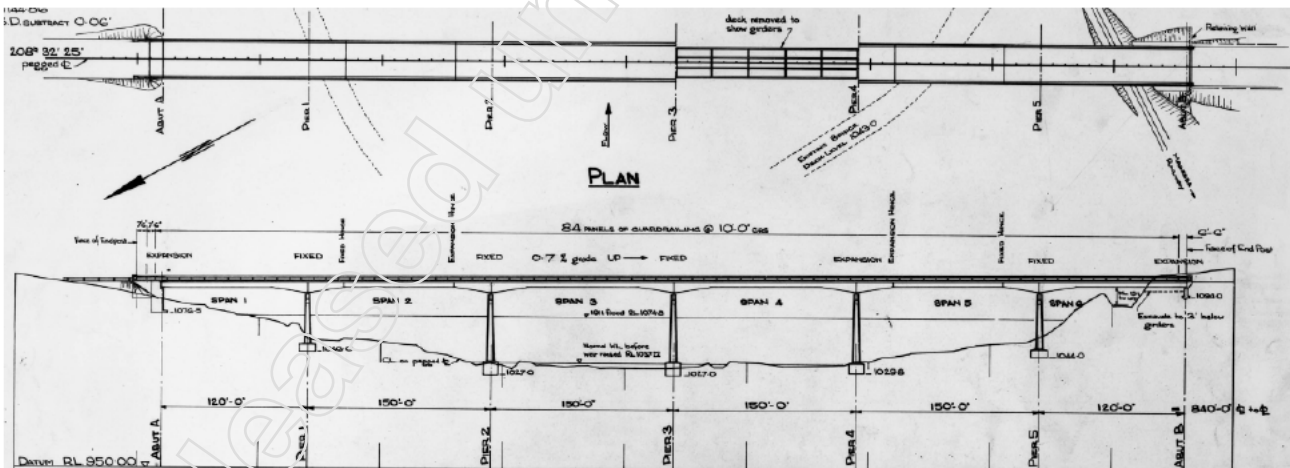


Figure 3 General Arrangement

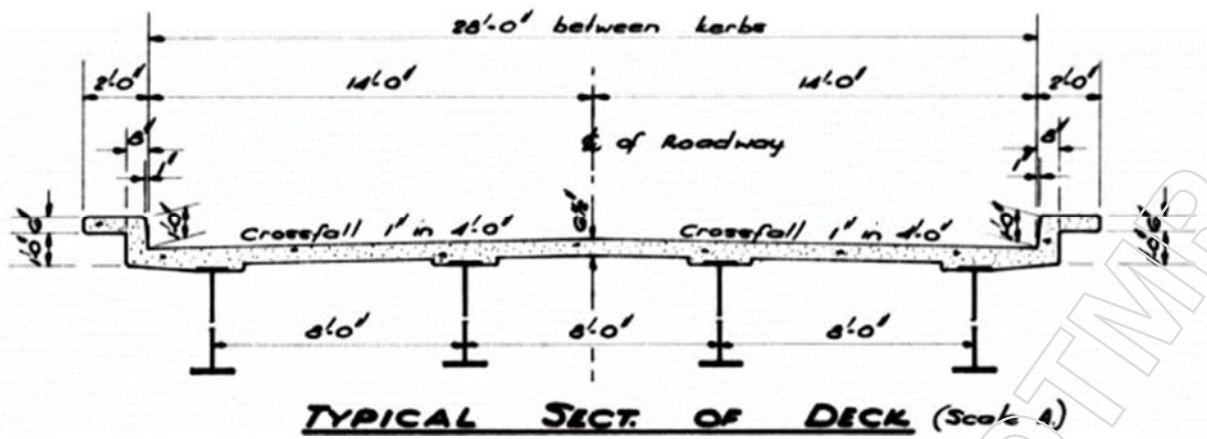


Figure 4 Deck cross-section

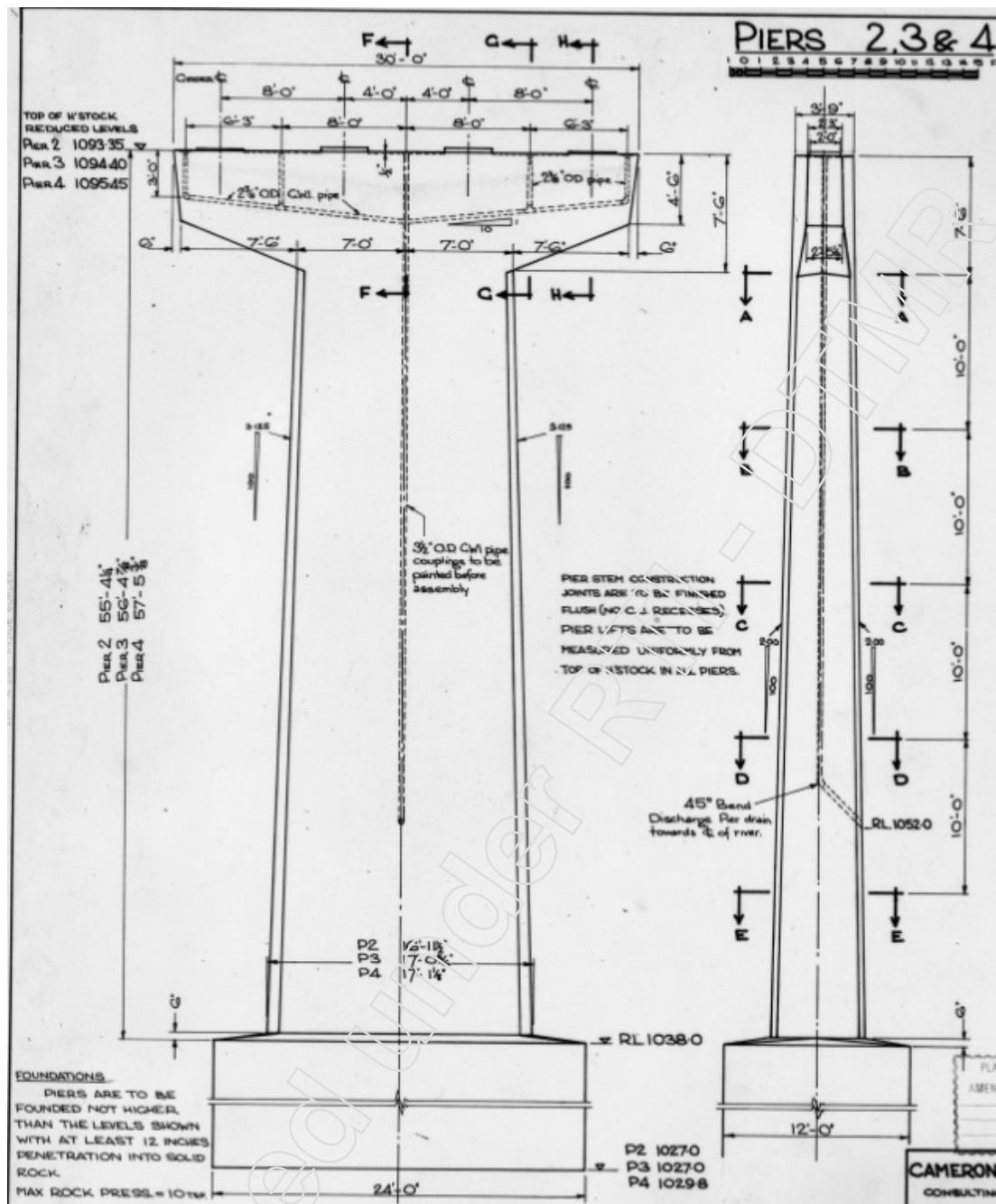


Figure 5 Piers 2, 3 & 4 (Piers 1 & 5 similar)

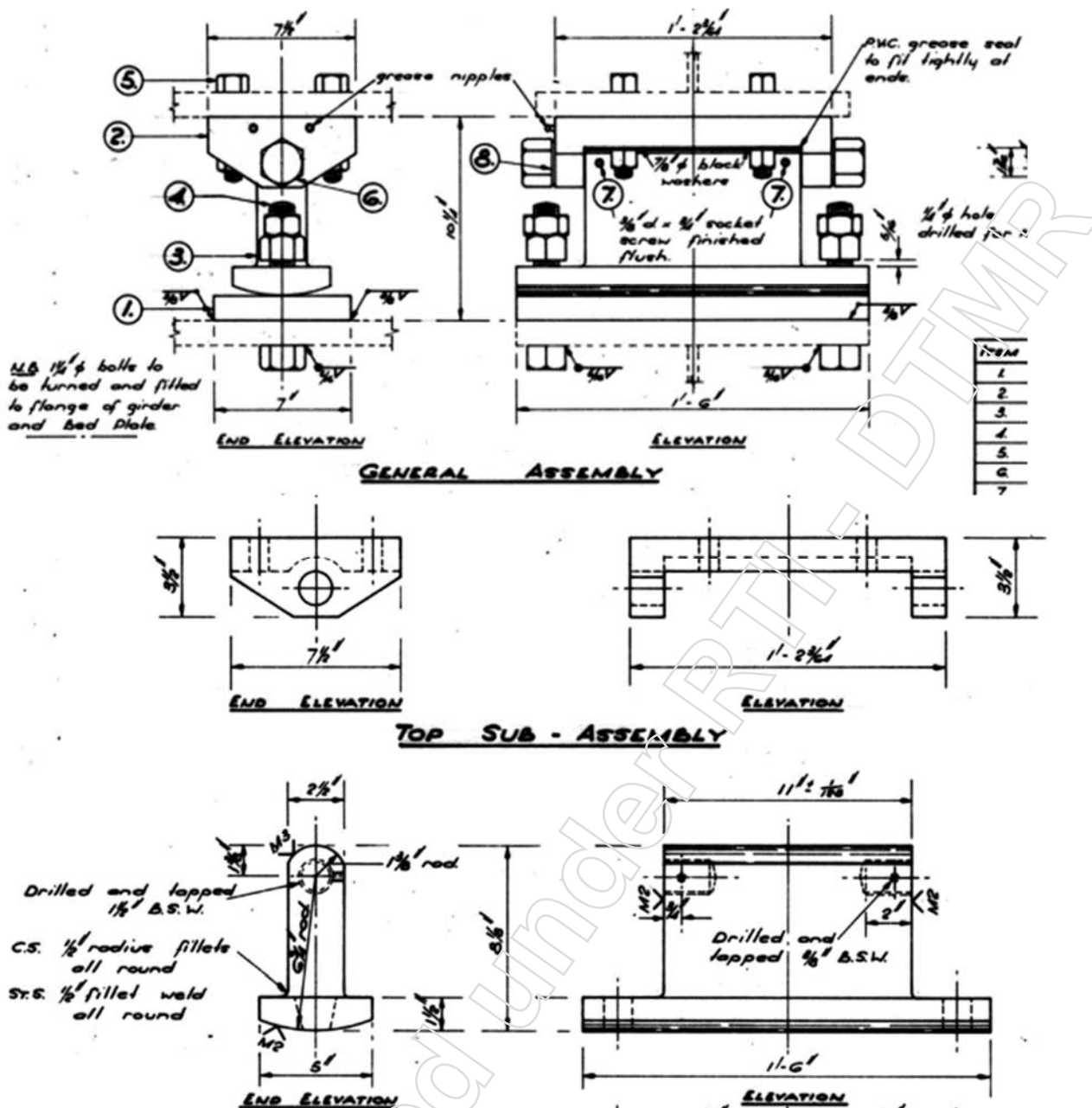


Figure 6 Expansion joint rocker bearings at drop-in spans. Note: Bottom radius of rocker ($6\frac{3}{4}$ "") rotates on a flat surface. Top radius of rocker ($1\frac{3}{8}$ "") rotates in a greased cylindrical groove in the sole plate. Grease nipples and PVC seals / washers provided to lubricate movement of rocker against sole plate.

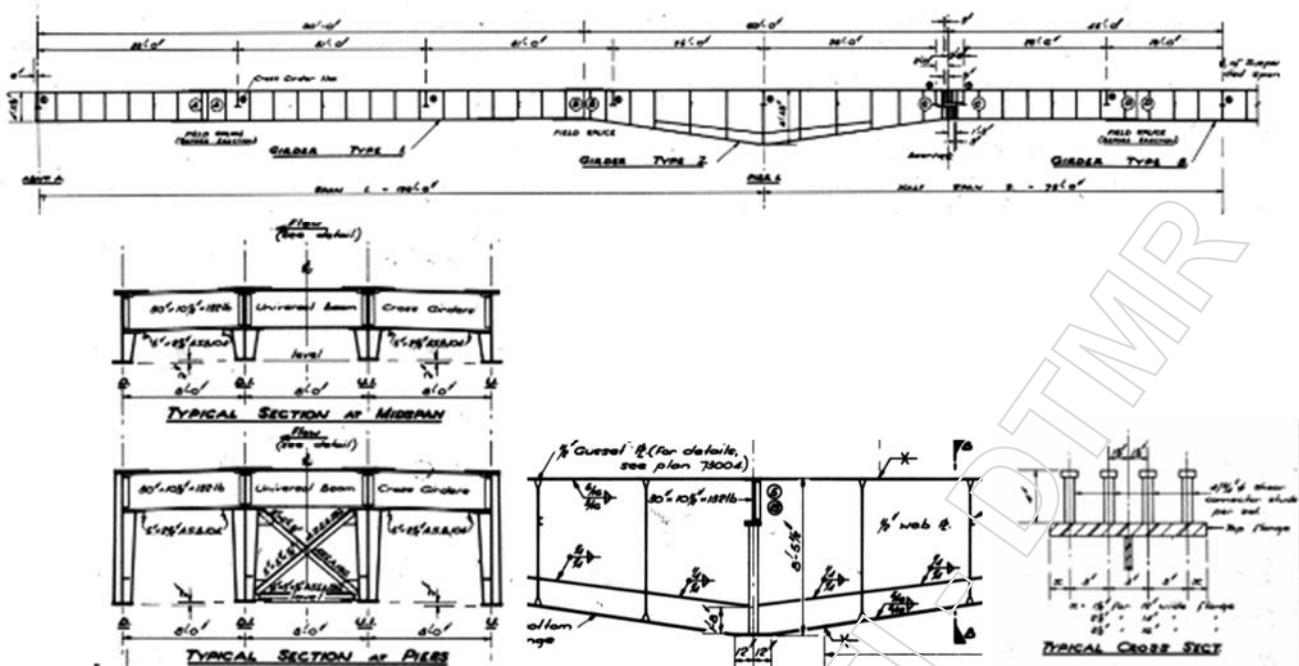


Figure 7 Overview of girders. Note haunch at piers, stiffened webs, drop-in spans and shear studs

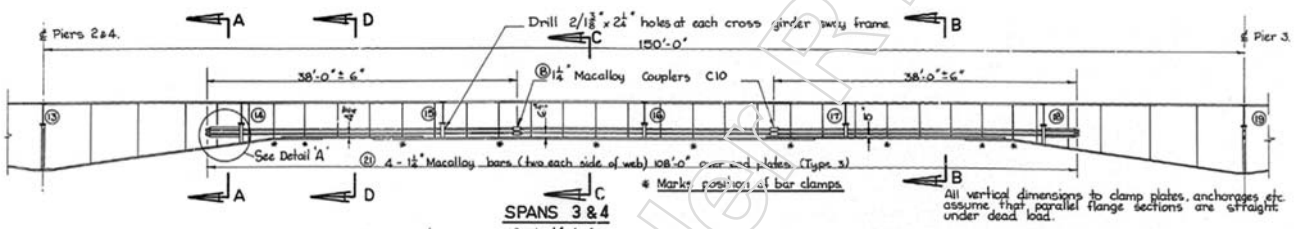


Figure 8 Prestressing of lower flanges – Span 3 & 4 shown. All sag moment regions treated this way

5.4 Deck Wearing Surface and Line Marking

The bridge has a concrete wearing surface (refer Figure 9). The line marking is eccentric with a wider shoulder on the northern side to accommodate a pedestrian walkway.



Figure 9 Deck wearing surface, line-marking and 'footway' looking towards Cairns away from Kuranda (eastbound)

5.5 Dates

The drawings for the Barron River Bridge at Kuranda were progressively released over a period of 18 months between December 1960 and June 1962 with the steel for the girders pre-purchased by the Department of Transport and Main Roads and supplied to the successful tenderer for the superstructure. This accelerated construction program appears related to the construction of the Barron Gorge Hydro scheme, which was commissioned in 1963 and flooded the previous low-level bridge (refer Table 2).

Significantly, the steel girders were retrofitted with stressed Macalloy bars before the bridge was opened. The drawings for the retrofit were signed in March 1963 – more than 18 months after the drawings for the steel girders were signed. The reason for the retrofit has not been identified, but it was possibly in response to the failure by brittle fracture⁷ of the steel girder Kings Bridge in Melbourne in July 1962. An alternative hypothesis is that an independent review recommended strengthening. This retrofit is now compromised through both pitting corrosion and wear of the stressing bars vibrating against the girders raising concerns of brittle failure in the bars.

⁷ Brittle fracture is uncommon in Queensland but can occur. Factors that mitigate against brittle fracture at Barron River include the moderate temperatures at Kuranda and the detailing of the welding to avoid transverse fillet welds.

Table 2 Summary of the dates the drawings were signed

Drawings	Date drawings signed:
General Arrangement	16/12/1960
Piers	1/11/1960 16/12/1960
Abutments	19/05/1961 15/06/1961
Pier Bearings	16/06/1961
Steel girders	10/08/1961 22/08/1961
Suspended span bearings	22/08/1961
Shear connectors	22/08/1961
Temporary works for girder erection	31/10/1961
Deck	19/12/1961
Inspection gantry rails	6/03/1962 2/05/1962
Deck joints	27/03/1962
Guardrail	20/06/1962 25/06/1962
Collapse of Kings Bridge (Melbourne)	10/07/1962
Prestressing of lower flange	15/03/1963 23/04/1963
Barron Gorge Hydro commissioned	1963

6. Current Situation

Current Risk Rating = 2578 – relatively high

A Tier 1 Bridge Assessment has been undertaken by KBR but has not been independently reviewed⁸. The assessment was made using standard assumptions including the presence of multiple vehicles simultaneously on the bridge. This assessment identifies the following areas as operating at margins less than Australian Standard margins for GML semi-trailers (42.5 t)⁹:

- Girder bending (hog) over piers (minimum SAR¹⁰ ~ 0.6)
- Girder bending (sag) (minimum SAR ~ 0.8)

⁸ Independent review / higher level assessment is recommended

⁹ Current access is for GML vehicles which include 50.5 t 19 m B-doubles and truck and dog.

¹⁰ SAR = Strength Assessment Ratio is defined in Appendix D. A SAR of 0.6 means that the bridge has 60% of the capacity required for current loading as per AS 5100.7 based on standard assumptions such as a live load factor = 2.0, dynamic load allowance = 40%, multiple vehicles on the bridge simultaneously, nominal material properties.

- Pier cantilever bending (hog) (minimum SAR ~ 0.8)

Recent Inspection Reports:

- Level 3 Inspection – Barron River Bridge BIS ID 7799 (BCM&AM, Dec 2015) recommended replacement of corroded nuts and bolts in bearings, replacement of expansion joint bearings, monitoring of movement joints, replacement of compression seals and a repaint. For further information, refer Appendix A.
- Level 2 inspection – Barron River Bridge BIS ID 7799 (May 2017, refer Appendix B) rated the bridge in CS3 for both the original structure and the strengthening (Macalloy bars)
- Inspection Report – Barron River Inspection BIS ID 7799: Defect Repair Options Report #1 (RoadTek, May 2017) – refer Appendix C. Recommended the repair / replacement of bearings / nuts and bolts, assessment of the Abutment joints and an options analysis of the protective coating.

The issues identified in these inspection reports are summarised in Table 3, along with some comments from a ground level inspection by NR on 28 May 2018:

Table 3 Summary of outcomes from inspections

Component	Inspection outcomes	Comments from visual inspection 28/5/2018
Bridge Barriers	Barrier posts: Insufficient thread lengths on the base attachments, no washers and corrosion appearing on base plates. Level 3 inspection requested	Agree
Pedestrian walkway	Poor delineation	Agree
Deck Slab	Some abrasion and cracking – not severe	Agree
Deck Joints	Abutments – Cover plates to expansion joints are noisy and maintenance intensive (refer Figure 10) Drop-in span pinned joints – compression seals deteriorated & leaking Drop-in span expansion joints finger plates operating well. Water discharging onto steelwork and bearings causing deterioration of bearings and steelwork (refer Figure 12 and Figure 13).	Agree. Structure borne vibration / noise from abutment joints transmits through girders. Expansion joint drainage system for finger plates is as per design with overflows able to discharge onto steelwork for the full length of the joint with most water egress concentrated at kerbs and edge girder bearings.

Component	Inspection outcomes	Comments from visual inspection 28/5/2018
Girders	Concern that the protective coatings are beginning to fail – especially near joints (refer Figure 12 and Figure 13). Applies both to girders and post-tensioning bars applied to the bottom flanges. Recommended an options analysis re protective coating	Agree Macalloy bars vibrating against girder stiffeners and brackets causing notches in bars in the Kuranda end span (refer Figure 14) Pitting corrosion observed in Macalloy bars and bottom flange in Kuranda end span.
Bearings	Severe corrosion to bolts restraining bearings – in some locations the nuts and bolts missing to levels below plates (refer Figure 16 and Figure 17) Pitting to base, rocker and sole plates Water from joints increasing the rate of corrosion (refer Figure 12 and Figure 13). Concerns about over rotation of bearings leading to extended road closures / severe damage / collapse (Figure 17).	Agree Red iron oxide deposits evident at Kuranda abutment consistent with fretting of movement joint between the rocker and sole plate (refer Figure 11). Possible wear evident in other bearings (refer Figure 17).
Inspection gantry	Not operational – deterioration of track and WHS issues	Agree
Headstocks	No signs of any severe cracks, spall or exposed reinforcement	Agree
Piers	No signs of any severe cracks, spall or exposed reinforcement	Agree
Footings	Below water / ground	Agree



Figure 10 Barron River Bridge: Abutment deck plates are noisy and difficult to maintain (Kuranda abutment 28 May 2018)



(a) General arrangement



(b) View of underside of bottom flange, sole plate and rocker plate

Figure 11 Barron River Bridge: Kuranda abutment downstream rocker bearing. Note: Grease nipples, 'red' iron oxide dust from fretting of rocker rubbing on sole plate (28 May 2018)

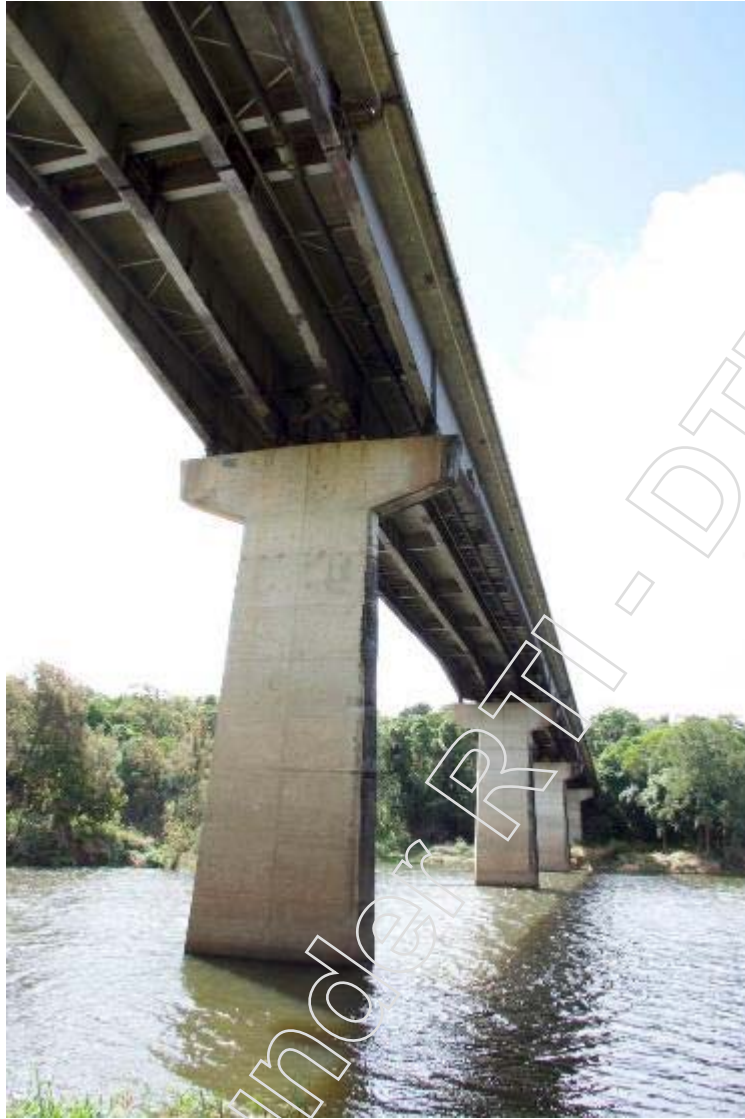


Figure 12 Barron River Bridge. Note: Fabricated steel girders, cross-girders, drop-in span joints, services, rail for inspection gantry, piers (26 May 2018)



Figure 13 Barron River Bridge at an expansion joint of the drop-in span. Note halving-joint, rocker bearings, opportunity for water to penetrate the deck at joint, discolouration from coating holding coat (26 May 2018)



Figure 14 Barron River Bridge: Wear in Macalloy bars vibrating against stiffeners (Kuranda end span, 28 May 2018)



Figure 15 Barron River Bridge: Pitting corrosion in Macalloy bar (Kuranda end span, 28 May 2018)



Figure 16 Barron River Bridge: Rocker bearing at a drop-in span expansion joint. Note: Missing nut and bolt to rocker bearing and possible residue 'flakes' from bolt and nut (image supplied by TMR Cairns)



Figure 17 Barron River Bridge: Rocker bearing at a drop-in span expansion joint. Note: Inclination of rocker; missing nut and top half of bolt through rocker although head of the bolt is still in position, partial loss of head to bolt at the top of the rocker, the visible gap between the shank of the bolt and the restraining bracket (image supplied by TMR Cairns).



Figure 18 Barron River Bridge: Span 2 expansion rocker bearing at Pier 3. Note 'depression' in left end of base plate where it contacts the rocker (Figure 14 from Defect Repair Options Report #1, 20 May 2017)



Figure 19 Barron River Bridge: Fixed bearing at Pier 3. Note stiffeners, two bolts, corroded nut (Figure 7 from Defect Repair Options Report #1, 20 May 2017)



Figure 20 Barron River Bridge: Expansion rocker bearing at Pier 4. Note improved condition away from the deck joints and the unstiffened 'kinks' in the bottom flange of the girders (Figure 22 from Defect Repair Options Report #1, 20 May 2017)

7. Management Strategy

The current management strategy is to maintain the bridge for an expected life of at least 50 years by investigating and managing current risks and taking steps to prevent further deterioration and reduce ongoing maintenance costs for this strategic asset.

Consider developing a business case to support the rehabilitation and life extension works for this major asset.

7.1 Stewards Review

The Barron River Bridge is an iconic major bridge on a strategic route that services Kuranda, the Atherton Tablelands and areas further to the west of Cairns.

It has been servicing the community since its opening in 1963 (55 years). While this is encouraging from a past performance perspective, it is not a guarantee of future performance given the deterioration evident and the increasing traffic demand.

The bridge is a continuous H20S16 bridge with long spans (150 ft or 45.7 m) for its era. The average span of bridges on TMR's current road train and B-double routes in the early 1960s was approximately 11 m – less than ¼ of the span of the Barron River Bridge. The Barron River Bridge is a large bespoke bridge and one of few large span steel girder bridges in Queensland from this era (e.g. Fitzroy Bridge in Rockhampton and the David Trumpy Bridge in Ipswich).

The bridge is located on a General Access route and the traffic is restricted by the range between Kuranda and Cairns. However, modern trucks and trailers as well as improvements in the alignment are enabling larger trucks to access the route. An aspirational goal for this route would be for HML B-doubles to access the route. Access by cranes, low loaders and load platform trailers should also be considered for those vehicles that can traverse the range.

Water penetrating the deck joints has exacerbated the deterioration in the vicinity of the joints, especially around the steel rocker expansion bearings. Away from the leaking deck joints, the rocker bearings are in much better condition. Improving the waterproofing of the deck joints will improve the life / reduce the maintenance costs associated with the bearings and the structural steelwork.

The bridge was repainted in the early 1990's. The original Red lead coating system was over coated rather than removed. There is currently evidence of spots of corrosion including pitting corrosion of the girder flanges and the Macalloy bars.

The pitting corrosion of the Macalloy bars and the notches induced by wear of the Macalloy bars due to vibration are of particular concern because of the high levels of stress (620 MPa) in the Macalloy bars may lead to stress corrosion cracking in these bars and an increased risk of sudden failure of the bars. A plan is required for the corrosion protection of the steelwork and corrosion / abrasion of the Macalloy bars. One option is to replace the Macalloy bars.

Some of the nuts and parts of the bolts that restrain the rocker bearings have deteriorated severely with some portions missing altogether. Corrosion is a likely cause, but this may have been exacerbated by rotations of the rocker eccentrically loading / stressing the bearing restraint bolts and nuts (refer Figure 21). This raises concerns about the restraint of the bearings. Short-term risk interventions are recommended to manage the associated risks.

The fretting corrosion evident at Kuranda abutment rocker bearings suggests the bearings may be suffering significant wear with the rockers 'eating into' the sole plate or vice versa¹¹. There is also some suggestion that the rocker may be wearing into the base plate at some locations. For example, Figure 18 (Figure 14 of Barron River Defect Options Report #1 (Appendix C)) suggests a possible wear depression in the base plate. The Defect Options Report #1 also summarises the measurements between the base plate and the edge of the curved rocker surface (e.g., Figure 17 of Appendix C). A comparison of these field measurements with the

¹¹ One interpretation of Figure 17 is that the bolt through the sole plate to the rocker is closer to the top of the sole plate than shown on the drawings and this is a consequence of wear.

theoretical 'as new' measurements summarised in Figure 21 of this report for the drop-in span rocker bearings suggests that:

- Either there is a build-up of paint and debris on the base plate or there is some wear of the rocker / base plate interface, or a combination.
- The rotations at the time of the measurement were moderate (approximately equivalent to Figure 21 (b)) and potentially enough to load the bolts.

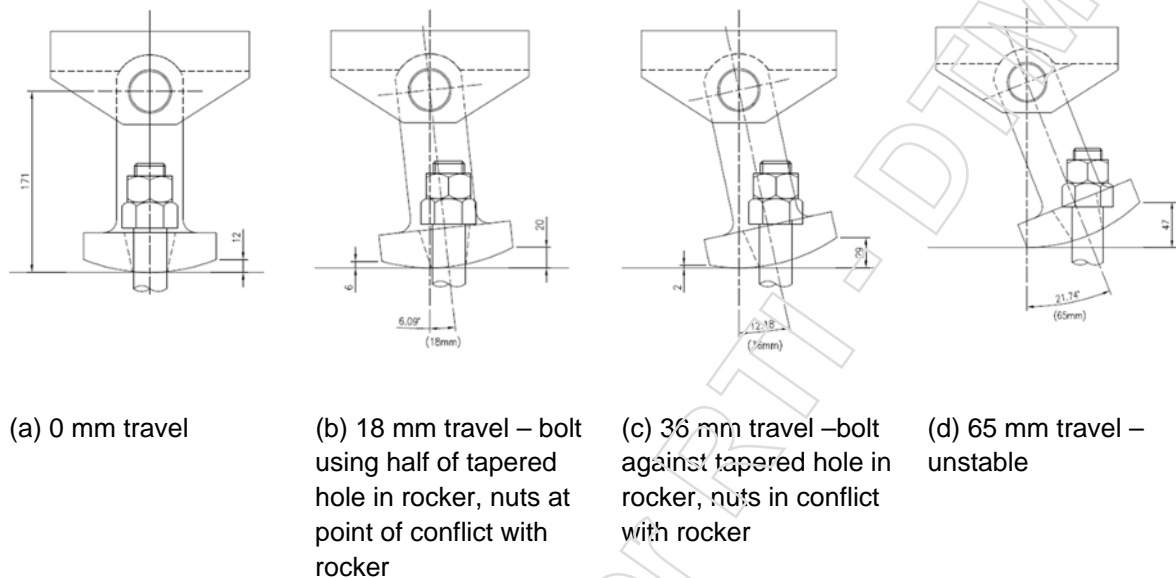


Figure 21 Barron River Bridge: Drop-in span expansion rocker bearing schematic for various relative travel.

Rocker bearings that exceed their travel have the potential to cause significant disruption as the bridge may drop significantly with the resulting dynamics potentially overloading / damaging / collapsing the bridge. The movement studies undertaken to date have focused on the movements due to thermal effects. However, there will also be substantial movements due to traffic loads / crowd loadings (e.g. a fun run starting from the bridge...) due to the haunched girders and the articulation. An audit of the circumstances required for the bearings to exceed their travel should be part of the management plan for this bridge.

The likely increased friction in the rocker bearings is of concern as it leads to unpredictable behaviour, increased forces in the bridge that must be restrained by severely deteriorated restraining bolts and tall pier bearings. These risks should be addressed in the short-term potentially by greasing the rocker bearings and safely restraining potential longitudinal movement by, for example, replacing critical severely deteriorated bolts and nuts or by the addition of restraint blocks.

The bridge was retrofitted with stressed Macalloy bars on the lower flanges in 1963. Information collated to date has not identified the reasons for the retrofit. The timing of the retrofit suggests it may be related to the brittle fracture of the steel Kings Bridge in Melbourne which was designed and constructed at around the same time. The Royal Commission into the collapse of the Kings Bridge was critical of the supply and testing of the higher tensile steel and its fabrication / inspection. The steel for the Barron River Bridge was pre-purchased and supplied to the fabricator (Evans Deakin Industries) by the then Department of Main Roads. The specification indicates that the steel was to Australian Standard A33 (1935) and Class D Plate. This standard is not well-known, brief and does not specify testing for brittle fracture considered essential by the Royal Commission, for example. There is also a wide range of ultimate tension strengths and yield strengths (refer Appendix D for further information). A hypothesis is that concerns about the steel led to the bottom flanges

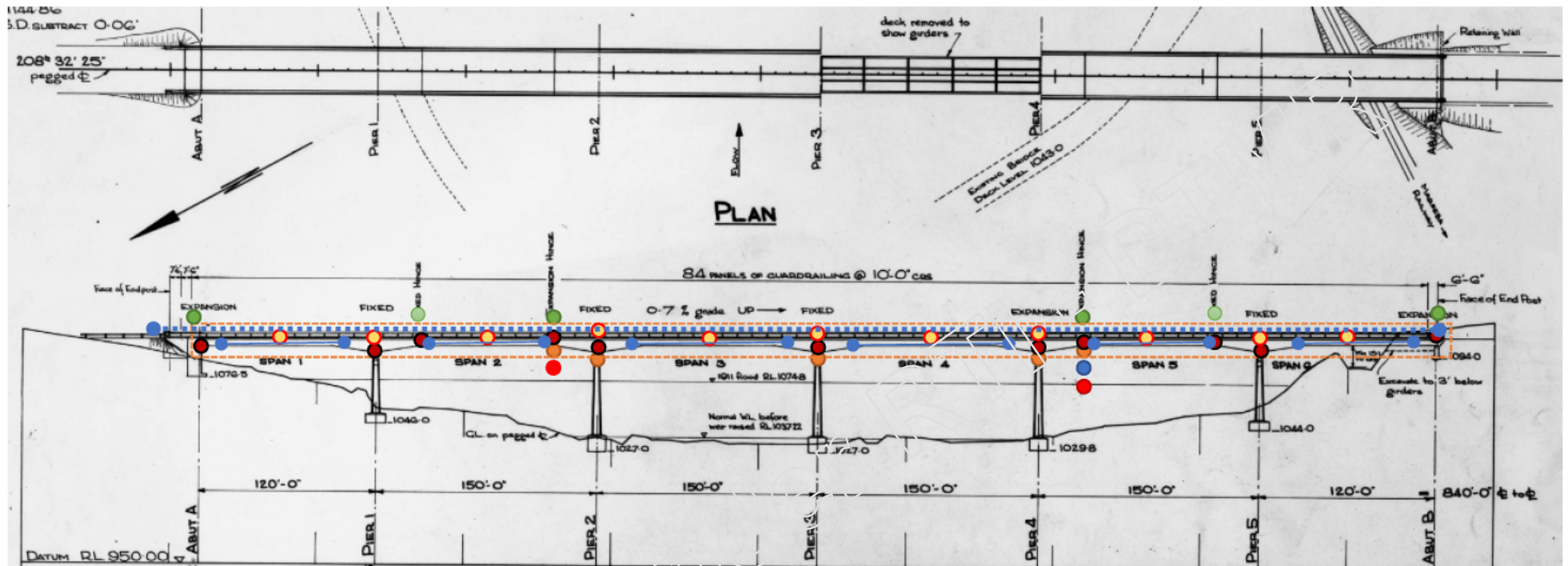
being pre-compressed in order to reduce the tension stresses in the flanges for the then H20S16 design load and thereby reduce the risk of brittle fracture. An alternative hypothesis is that an independent review indicated that the bridge needed to be strengthened. Given that current traffic loads exceed the H20S16 design load it is prudent that properties of the steel and the reasons for the now compromised retrofit inform the management of and access to this bridge.

Assessment experience indicates that bridges with spans significantly larger than the norm for the era do not assess as well for current traffic loads compared to assessments of bridges with typical spans for the era. The available assessment is consistent with this general observation with SARs as low as 0.6. This assessment needs independent validation and a critical review of the sensitivity of the assessment to the assumptions in the assessment, including the issues associated with brittle fracture.

It is noted that the critical elements in the assessments are identified as the edge girders and the pier cantilevers. The critical drive-line for these elements is heavy vehicle adjacent to the kerb. The line marking of a pedestrian walkway on the northern side of the bridge encourages the westbound traffic to travel adjacent to the kerb thereby loading the critical elements more compared to vehicles travelling in lanes centred on the bridge.

The bridge is high, long and over water on a heavily trafficked route. Consequently, access for bridge rehabilitation is difficult / expensive. An access inspection gantry was incorporated in the design but is no longer considered safe to use because of corrosion of the rails and current WHS issues. The type of access required will vary depending on the refurbishment activity. Some activities could be conducted from an UBIU whereas others will require a partial or full scaffold or moveable access platform. Given the significant cost of access it will be prudent to consider the overall demands for access and to schedule multiple activities to utilise the access. For example, if access is required to jack the bearings then it may be prudent to update the protective coating at the same time or to develop a reusable access system that would be suitable for accessing the entire bridge.

A visual summary of the issues is presented in Figure 22.



- Component operating at less than Australian Standard margins for current as-of-right traffic (unverified assessment)
- Retrofitted Macalloy bars potentially pitted and worn from vibration raising concerns about failure
- Severely corroded nuts of bearing anchor bolts.
- Severely corroded hex bolts connecting between the sole plate and rocker of bearings at suspended span
- Concern expressed about the residual travel of expansion bearings
- Fretting wear of the rocker / sole plate (observed at Kuranda abutment (B) and inferred as occurring throughout.
- Expansion deck joints leaking causing deterioration of steel and bearings and noise
- Fixed deck joints leaking causing deterioration of steel and bearings
- Residual life of protective coating – girders, stressing bars and bearings
- Traffic barrier anchor bolt condition / capacity

Figure 22 Summary of issues

7.2 Life Extension Plan

The 256 m long Barron River Bridge at Kuranda is an iconic major bridge on a strategic route that services Kuranda, the Atherton Tablelands and areas further to the west of Cairns. The expectation is that this high long bridge will remain in-service for the foreseeable future.

The bridge was designed for the H20S16 design load (33 t truck) and featured tall piers and fabricated steel girders with spans of 45.7m (150 feet) and 36.6 m (120 feet). The superstructure is continuous over the piers with drop-in spans and steel halving joints. The unverified Tier 1 assessment indicates that the girders and the headstock cantilevers are operating at margins less than current Australian standards for general access semi-trailers (42.5 t) and the 50.5t 19m B-doubles / truck and dogs that can access the route.

The drawings for the Barron River Bridge at Kuranda were progressively released over a period of 18 months between December 1960 and June 1962 with the steel for the girders pre-purchased by the Department of Transport and Main Roads and supplied to the successful tenderer for the superstructure. This accelerated construction program appears related to the construction of the Barron Gorge Hydro scheme, which was commissioned in 1963 and flooded the previous low-level bridge.

Significantly, the steel girders were retrofitted with stressed Macalloy bars before the bridge was opened. The drawings for the retrofit were signed in March 1963 – more than 18 months after the drawings for the steel girders were signed. The reason for the retrofit has not been identified, but it was possibly in response to the failure by brittle fracture¹² of the steel girder Kings Bridge in Melbourne in July 1962. An alternative hypothesis is that an independent review recommended strengthening. This retrofit is now compromised through both pitting corrosion and wear of the stressing bars vibrating against the girders raising concerns of brittle failure in the bars.

There are also concerns about stability of bearings due to the inclination of the rockers, wear, and corrosion with total loss of section in some of the bolts that provide the stability of the bearings. Leaking deck joints contributes both to the deterioration of the bearings and the steelwork in general. There is some suggestion that the protective coating may be reaching the end of its economic life and if access is required for other actions then repainting may be appropriate at the same time.

The abutment deck joints are now noisy and expensive to maintain, and issues have been identified with the guardrails.

After 55 years of service, it is considered timely to develop and implement a detailed Structure Management Plan (SMP) for the Barron River Bridge to manage the identified risks and prepare the bridge for its remaining life. The purpose of the Life Extension Plan is to ensure that the operation, capacity and condition of a specific structure is systematically managed and monitored to ensure; safety of the road user, network efficiency, and prevent occurrences (load or condition) which may lead to severe structural damage or collapse.

¹² Brittle fracture is uncommon in Queensland but can occur. Factors that mitigate against brittle fracture at Barron River include the moderate temperatures at Kuranda and the detailing of the welding to avoid transverse fillet welds.

An indicative outline of the development and implementation of the Life Extension Plan is presented in Table 4:

Table 4 Live Extension Plan – Indicative program

Phase	2018					2019					2020															
	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A
I Risk Management																										
II Investigations																										
III Rehabilitation / Life extension Planning																										
IV Implementation																										
V Management																										

Further details are summarised in Table 5.

Table 5 Development and implementation of a Life Extension Plan for the Barron River Bridge at Kuranda

Activity	Issue / Comments	Priority
<u>Phase I Risk Management</u>		
Review Risks	Establish a risk register including consequences Workshop risks	A
Short-term risk management	For example: Issue an Interim SMP (Access) - Communication of risks associated with heavy vehicle access and keeping loads at current levels during investigations / life extension works. Interim Bearing Stabilisation – Develop safe procedures and reinstate restraints no longer provided by deteriorated bolts to prevent unexpected bearing movements (e.g., replace corroded nuts / bolts / add restraint brackets)	A
Strategic Review	Articulate and confirm long-term aspirations for the bridge	A
	HOLD POINT	
<u>Phase II Investigations</u>		
Bearing Investigation	Issue – stability of bearings due to inclined rockers, wear, and corrosion (some bolts are largely missing) Movement Audit – identify possible circumstances where travel due to thermal and traffic effects (overloads / braking) could exceed Movement allowance of rocker expansion bearings Wear Audit – quantify wear / friction / behaviour and consequences Capacity Audit – vertical loads; lateral & longitudinal loads from braking / wind / earthquake Options Analysis Recommendations	A

Protective coating investigation	<p>Issue – Pitting corrosion evident in girders and Macalloy bars raising concerns about the remaining life of the coating system.</p> <p>Coating history (over coated red lead) / pitting / section loss</p> <p>Estimate remaining life</p> <p>Options analysis</p>	B
Steel Girder material investigation	<p>Issue – Retrofit of girders with Macalloy bars in the tension zone shortly after the collapse of the Kings Bridge in Melbourne raises questions about the properties of the steel that should be used in the assessment of the bridge and the assessment philosophy.</p> <p>Determine metallurgical & engineering properties, including brittle fracture</p> <p>Archive search for reasons for retrofit by prestressing tension flange (TMR, KBR, Libraries, Museums, retired personnel¹³)</p> <p>NDT testing of girders – hardness tests</p> <p>Recommendations for assessment</p>	A
Macalloy Bar Investigation	<p>Issue – the Macalloy bars exhibit pitting corrosion and wear at locations where Macalloy bars rub against restraint brackets and stiffeners. These notches combined with high initial stress may result in premature failure due to loss of section and stress corrosion cracking of bars</p> <p>Review structural and metallurgical properties</p> <p>Options analysis</p> <p>Recommendations</p>	A
Bridge Assessment for traffic loads	<p>Issue – Tier 1 assessment concludes girders and pier headstocks operating at margins substantially less than Australian standard margins.</p> <p>Independent assessment</p> <p>Sensitivity analysis to inform management options / aspirational goals for bridge (e.g., sensitivity to steel properties, heavy vehicles using the route, dynamic loading, drive-line, multiple presence...)</p> <p>Management Options</p> <p>Recommendations</p>	A

¹³ Possible contacts include:

NR

Abutment Deck Joints	Issue – water penetration causing deterioration of steelwork, noise causing community concern, maintenance intensive. Options Analysis (e.g., replace with modern bridge joint) Recommendations	B
Span 2 & 5 Fixed deck joints	Issue – water penetration causing deterioration of steelwork and excessive maintenance costs Options Analysis Recommendations Implementation	B
Span 2 & 5 Expansion deck joints	Issue – Drainage from current finger plates is discharging onto the bearings are steel work below causing severe deterioration of the steelwork and	B
Underwater inspection	Issue – below water portion of the bridge may never have been inspected. Inspection of condition of the piers / footings below the water line. Recommendations	B
Access Investigation	Issue – The bridge is high and crosses water and a railway making access for maintenance / life extension works difficult and expensive. The current access gantry is considered unsafe. Utilising access for multiple activities prudent. Different activities, including long-term maintenance have different access demands Identify requirements for access – bearing replacement, bearing maintenance, protective coating removal / replacement / maintenance, Macalloy bar maintenance / replacement, deck joints Options Analysis Recommendations	B
Traffic Barriers	Issue – Level 2 inspection identified anchor bolts without washers and sufficient length to penetrate the nuts and cracking investigate. Develop recommendations	B

Investigation Summary	Summarise the results of the investigations & options Preliminary costing Recommendations	A
<u>Phase III Rehabilitation / Life Extension Planning</u>		
Rehabilitation / Life Extension Implementation Plan	Develop a plan to address the issues in the light of the investigations	
Strategic Asset Management Plan and & Business Case	Develop Strategic Asset Management Plan for bridge and business case for funding	
	HOLD POINT	
<u>Phase IV Implementation</u>		
Implementation	Design and construction of life extension works as identified from investigations	
Structure Management Strategy (SMS)	Develop an ongoing structure management strategy for bridge, including: <ul style="list-style-type: none"> 1. Operation Management Plan 2. Inspection Plan 3. Structure Maintenance Plan 	
<u>Phase V Management</u>		
Inspect, maintain and manage	Implement the SMS	

Appendix A Level 3 Inspection – Barron River Bridge BIS IS 7799 (BCM&AM, Dec 2015)

Released under RTI - DTMR

Level 3 Inspection

Barron River Bridge

BIS ID 7799



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Prepared by: Bridge Construction Maintenance & Asset Management

December 2015

EXECUTIVE SUMMARY

In response to a request from the North Queensland Region, a Level 3 inspection of Barron River Bridge BIS ID 7799 on Kennedy Highway (32A) was undertaken on the 21st and 22nd of May 2015. The level 3 inspection was to assess the potential risks posed by large rotation of expansion bearings and by continuing corrosion to a number of bearing anchor/ restrained bolts.

The level 3 inspection also was to provide advice on the rectification of any deficiencies identified, and to recommend further investigative works where necessary.

RECOMMENDATIONS

To effectively manage this structure, the following list of works is recommended as early as possible (no latter than 2 years):

- Replace the corroded nuts of bearing anchor bolts at pier P2, P3 P4 and suspended span bearings of (P1-P2) and (P4-P5).
- Replace the defective hex bolts connecting between the sole plate and rocker of bearings at suspended span (P4-P5)
- Jack up to reinstall the expansion bearings at suspended spans (P1-P2) and (P4-P5)
- Monitor further the gap opening at expansion finger joints, particularly in the coldest time
- Replace the aged rubber inserts at suspended span (P1-P2) and (P4-P5) expansion joints
- Repaint the steel components such as girders, stressing bars and bearings

Notes from the District to Bridge Construction Maintenance & Asset Management

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Inspected by: NR

Date: 17th Dec 2015

Report Accepted by: NR

Date: 17 December 2015

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1 INTRODUCTION

Bridge Construction, Maintenance and Asset Management (BCM&AM) was commissioned by the North Queensland Region of Transport and Main Roads to carry out a Level 3 inspection of Barron River Bridge, BIS ID 7799, located on the Kennedy Highway (Road 32A) at chainage 12.599 km.

In addition to bridge condition issues identified by the Region, a Tier 1 assessment undertaken by a consultant has indicated a very low girder capacity for the traffic loads (Semi trailer 45.5T) which are currently trafficking the bridge. Therefore a close inspection of the girders was required to ascertain any presence of structural distress which may further compromise girder capacity.

NR (BCM&AM of the Structures Branch) undertook a site inspection of the bridge on the 21st and 22nd of May 2015. Accompanying him were:

NR Structural Engineer, (Far North District/ Cairns Office) on the first day.

NR Structural Engineer, (RoadTek/ Cairns Office) on the second day.

The aim of this Level 3 inspection was to assess the condition and structural adequacy of the bridge and to outline any remedial measures necessary.

This report presents the issues and deficiencies identified and details rectification works required to address these deficiencies. Appendix A contains photographs of the condition of the bridge taken during the Level 3 inspection.

2 DESCRIPTION OF BRIDGE

The Bridge Information System (BIS) indicates that the bridge was opened to traffic in January 1963. Other details are as follows:

- a. The structure is a composite steel girder and concrete slab bridge, which is 256 m long, 8.5344m wide between kerbs;
- b. The bridge consists of six spans of either 36.576m or 45.720m with no skew;
- c. The bridge is on 0.7% longitudinal slope, up from A1 to A2 abutment;
- d. The bridge is continuous over all piers with hinges creating a simple supported section on spans 2 and 5;
- e. The bridge deck consists of a 165mm to 229mm thick composite concrete deck with 4 welded beam (WB); Steel girders used for various spans with varying depth; 1^{1/4} inch Macalloy bars used to strengthen all spans;
- f. The pier headstocks are supported by a single reinforced concrete column. Each column rests on a reinforced concrete pad footing which bears directly on the foundation material;
- g. Abutment A and B consist of reinforced concrete wing wall and abutment walls supported by a pad footing bearing directly on the foundation material;
- h. The overall condition of the bridge is rated in BIS as Condition State 3 due to reported rocker bearing problems;
- i. The bridge was designed for H20 – S16 loading;
- j. The structure currently is not on a designated B-double or Road Train route.

3 INSPECTION DETAILS

Traffic control was used during this inspection with the southbound lane closed to traffic. An underbridge inspection unit (UBIU) was used to inspect the underside of the superstructure and pier headstocks and was positioned in the southbound lane. The road surface including the kerbs and bridge barriers were inspected from the closed lane. The ambient temperature at inspection time was about 25 degree C. Permanent water existed at all pier locations, therefore the footing and bottom part of piers and abutments could not be inspected.

The most recent routine level 2 inspection of the bridge was undertaken on 17th June 2014. As the bridge has been rated as Condition State 3 since 2008, due to the rotation of movable bearings and corrosion of anchor bolts, the inspection frequency for level 2 inspections is currently every 3 years.

4 BRIDGE SURFACE

4.1 Approaches

Both approaches appeared to be in reasonable condition and were providing a smooth transition onto and off the bridge.

4.2 Bridge Barriers

The kerbs and barriers appeared to be in reasonable condition with no obvious defects observed.

4.3 Bridge Surface

The traffic travels directly on the concrete deck which has a cross fall of 1 in 4. There is a 1.4m wide marked lane for pedestrians on the right side. Overall, the deck surface appeared to be in reasonable condition. (Refer to Photo 1, Appendix A).

4.4 Expansion Joints

On the bridge decks, there are 6 joints (two fixed hinge joints with rubber insert, two finger joints and two sliding steel plate joints at both abutments). In general, they all appear to be in fair condition, except for some swelling of the rubber inserts at the suspended span (P1-P2) and (P4-P5) expansion joints. Below is the summary table of the design and measured joint gaps and observed condition

Location	Type of joint	Design gap at 24°C (mm)	Actual gap (mm)	Condition	Photo
A1	Expansion	38	25	Fair	2
P1-P2	Fixed	25	42	Swelling rubber insert	4

P1-P2	Expansion finger joint	83	92	Fair	5
P4-P5	Expansion finger joint	83	97	Fair	6
P4-P5	Fixed	25	33	Swollen rubber insert	7
A2	Expansion	38	50	Fair	3

The bridge is in Region I and in a Coastal area. According to AS5100, the maximum and minimum design average temperatures are 58°C and 3°C respectively. Therefore from the actual measured gap 92mm and 97mm at span (P1-P2) and (P4- P5), the maximum gap of finger joint is expected to be between 105mm and 120mm accordingly. These gaps are still less than the movable capacity of finger joints 165mm.

4.4.1 Remedial Actions

- Replace the aged rubber insert at suspended span (P1-P2) and (P4-P5) expansion joints.

5 SUPERSTRUCTURE

5.1 Deck

On the soffit of the concrete slab between the steel girders, some small cracks (perpendicular to traffic direction) have been observed (Refer to Photo 8, Appendix A). It was difficult to get close to this area due to limitations with the UBIU and therefore the crack widths could not be measured. No sign of any stain due to water leakage from the top through the deck slab was observed. The cracks are likely caused by shrinkage of concrete

5.1.1 Remedial Actions

- No repair works for the above component are required at this time.

5.2 Girders and cross girders

In general, all steel components are in fair condition despite the presence of some localised spot corrosion appearing on the steel girders (Refer to Photo 9, Appendix A). By visual inspection, the weld connections look good with no sign of cracking. All steel plates appeared in good condition with no sign of distress or buckling. The stressing forces in Maccaloy bars haven't been checked due to time constraints and the unavailability of appropriate equipment. However a hammer tap survey of the stressing bars revealed no sign of abnormal behaviour or cause for concern. The bolts at anchor blocks and bar couples are in good condition.

5.2.1 Remedial Actions

- To protect the steel from further corrosion, it is recommended that it be repainted. However from observing the delamination of paint at the bearing, the presence of red lead paint was detected (Refer orange colour in Photo 12, Appendix A). This will need to be taken into account in determining an appropriate paint system and a methodology to prepare the areas prior to painting.

6 SUBSTRUCTURE

6.1 Bearings

The bridge consists of 4 welded beams sitting on rocker bearings. Currently all expansion bearings have a movement towards Abutment A1. Because of the 0.7% longitudinal grade, the level of Abutment A1 is about 1.79m lower than that of Abutment A2. This may have been the primary cause for the rotation and movement of bearings. Current bearing movement is not deemed to adversely affect the structure capacity or performance. The table below provides a summary of the measured movement and condition of each bearing

Location	Type of bearing	Measured movement (mm)	Condition	Photo
A1	Expansion	-8	Fair	10
P1	Fixed	0	Fair	11
Suspended span (P1-P2)	Fixed hinge	0	Severe corrosion of anchor bolts and exposed red lead paint	12
Suspended span (P1-P2)	Expansion hinge	-15	Fair	13
P2	Fixed	0	Corrosion of anchor bolts	14
P3	Fixed	0	Corrosion of anchor bolts	15
P4	Expansion	-22	Severe corrosion anchor bolt	16
Suspended span (P4-P5)	Expansion hinge	+22		17
Suspended span (P4-P5)	Fixed hinge	0		
P5	Fixed	0		18
A2	Expansion	-8		19

Note:

Inclination towards A2 is a positive value (+)

6.1.1 Remedial Actions

- Replace the corroded nuts of anchor bolts of bearings at pier P2, P3, P4 and suspended span (P1-P2) and (P4-P5)

- Replace the defective hex bolts between the sole plate and rocker (Photo 17).
- Jack up to reinstall the expansion bearings at suspended spans (P1-P2) and (P4-P5)

6.2 Abutments

Both abutments were in sound condition no evidence of cracking or concrete spalling

A minor scour hole was observed adjacent to the front face of Abutment A2 wall. The abutment footings are buried and as such could not be inspected.

6.2.1 Remedial Actions

- No repair works are required at this time.

6.3 Piers

All of the headstocks were in sound condition with no cracking. The footing and lower part of the pier walls were in the water and could not be inspected.

6.3.1 Remedial Actions

- No repair works are required at this time.

7 CONCLUSION

Although movement of expansion bearings and an excessive gap were observed at the finger joints, none of these require urgent attention. However they should be monitored further during future level 2 inspections. If they deteriorate further, then this office should be contacted. However it is recommended that the severe corroded bearings should be repaired as soon as possible.

The repaint of corroded steel components such as steel girders and stressing bars is required within 2 years because of mid aggressive environment. During inspection, the red lead paint has been observed. Therefore the repaint work would be expensive. The fully assessment of existing paint to fund the work needed to implement now.

Appendix A – Photos



Photo 1: Bridge deck



Photo 2: Abutment 1 expansion joint



Photo 3: Abutment 2 expansion joint



Photo 4: P1-P2 fixed joint



Photo 5: P1 – P2 finger joint



Photo 6: P4 – P5 finger joint



Photo 7: P4 – P5 fixed joint



Photo 8: Crack on concrete slab



Photo 9: Steel corrosion



Photo 10: A1 expansion bearing



Photo 11: P1 fixed bearing



Photo 12: Suspended span (P1-P2) fixed bearing. (Evidence of Red Lead Paint)



Photo 13: Suspended span (P1-P2) expansion bearing.



Photo 14: P2 fixed bearing



Photo 15: P3 fixed bearing



Photo 16: P4 fixed bearing



Photo 17: Suspended span (P4-P5) expansion bearing



Photo 18: P5 fixed bearing



Photo 19: A2 expansion bearing

Appendix B Level 2 Inspection (RoadTek, May 2017)

Released under RTI - DTMR

Structure Condition Inspection Report

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Sheet

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Structure Id 7799

Name

Crossing Name Barron River

Alt. Name

Structure Type Bridge

Owner MR DEPARTMENT OF MAIN R

Construction Type Girder/Beam

District 403 Far North

Construction Material Steel

LGA Id 277 MAREEBA SHIRE COUNCIL

Inspector NR

Date 09-MAY-2017

Inspection Level 2 ☒

Programmed ☒

Undersize Components ☐

Level 3 ☐

Exceptional ☐

Underwater ☐

Road Section

Start

End

TDist

Id	Description	S	Cway	S	RPC	Dist	RPC	Dist	Start	End
32A	CAIRNS - MAREEBA	C	1	C	5	0.000	5	0.257	12.535	12.792

Overall Ratings

1

2

3

4

5

Comments

Original Structure (O)

X

L3 Insp (17/12/2015) has recommendations yet to be undertaken. Due to the complexity of the works required contact with SMS Roadteck engineers should be considered for a possible budget & scope of works to be undertaken.

Substructure is in a fair to good condition superstructure rates poorly due to ongoing issues with corrosion & rust decay of the bearings & attachments. Protective coating throughout the structure is showing signs of failure due to age of structure, the protective coating is a lead base paint some further testing required to find out current cover levels.

L3 Insp is required for recommendations for BR1 & BR2 due to insufficient thread lengths on post base attachments majority are flush with the nuts & have no washers also noted was corrosion appearing on the base plates due to mortar pads cast above the base # 061, 074, 075, 076.

Pier 1 J2 & Pier 4 J3 Compression Joint seals are failing & require replacing steel nosing is sound.

Concrete WS showing signs of minor abrasion & transvers cracks, no signs of heavy spalling or exposed reo possible water proofing on top may be required in the near future # 061,062.

Strengthening (St)

X

Transvers tension bars have been retro fitted either side of each girder with single bars in Spans 1, 2, 5 & 6 & double bars in Spans 3 & 4. BIS show the bars were installed in 1963.

CS3 protective coating starting to fail in Spans 3 & 4. All attachments throughout appear to be sound & intact.

Widening (WLn, WRn), Lengthening (L1, L2), Raised (Ra), Redecked (Re), Shortening (S1, S2), Strengthening (St)

Structure Condition Inspection Report

B2/2

Sheet

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Structure Id 7799

Name

Inspection Date 09-MAY-2017

Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Component Location				Exposure Class	Quantity	Unit	Quantity Per Condition State				Maintenance Req'd	Comments
Modification	Group	Component	Standard				1	2	3	4		
O	AP1	GR	72S	3	2.0	EACH		1.0		1.0		CS4 GR1 has heavy impact damage to 2 sections of rail & 1 post spacer block #072. Damage GR section requires replacing.
O	AP1	AP	70O	3	1.0	EACH		1.0				
20m inspected. No signs of any major defects some minor sections of the WS pulling away at the Abutment joint nosing possible allowing water to penetrate down to the bearings below #058,059,060.												
O	AP1	FY	4O	3	20.0	LINM		20.0				
O	AP1	PRO	53O	3	180.0	M2		180.0				20m inspected. Small scour appearing at A1 end under GR1 (1.2m L x 500mm H x 400mm D).
O	A1	J1	14S	3	8.5	LINM		8.5				Some minor pitting & surface rust showing on cover plate, joint performing as designed.
O	S1	BR	2S	3	86.0	LINM				86.0		
L3 Insp required for recommendations for BR1 & BR2 due to insufficient thread lengths on post base attachments majority are flush with the nuts & have no washers also noted was corrosion appearing on the base plates due to mortar pads cast above the base # 061, 074, 075, 076.												
O	S1	K	3C	3	73.0	LINM		73.0			X	
Minor vertical shrinkage cracks appearing on the outer faces of both kerbs, cracks range from H/L to 0.3mm no signs of any large spalls or exposed reo.												
Scupper outlets on underside of the kerbs have moderate rust appearing #007. Scuppers require rust treatment & protective coating applied.												
O	S1	WS	1C	3	310.0	M2		310.0			X	
Concrete WS showing signs of minor abrasion & transvers cracks, no signs of heavy spalling or exposed reo possible water proofing on top may be required in the near future # 061,062.												
Maintenance required - Poor delineation of the pedestrian footway with 4 traffic bollards missing & fog lines getting harder to see # 062. Missing bollards require replacing & fog lines require refreshing.												
O	A1	J2	15O	3	8.5	LINM		8.5				Fixed joint in WS at E2 of Span 1.
O	P1	J1	15O	3	8.5	LINM		8.5				Fixed joint in WS at E1 of Span 2.
O	P1	J2	11O	3	8.5	LINM			8.5			
Steel nosing joint in WS at E1 of Span 2.												
CS3 rubber gland in the joint gap showing signs of perishing also a small section of the rubber gland has worked up to the road surface over the pedestrian footway # 063,064,065 (Monitor).												
O	P1	J3	14S	3	8.5	LINM		8.5				
Steel finger joint in WS at E2 of Span 2.												
Measurements taken between ends of the finger joint refer to (Sketch 008 to 012). No signs of excessive height & differential difference noticed, catch drain was clear # 066.												
Drainage issue with catch drain discharging water directly over the structures outer rocker bearings adding to rust & corrosion problems of the bearings # 015, 022, 024. Possible require re-design or splash shield.												
O	P1	J4	15O	3	8.5	LINM		8.5				Fixed joint in WS at E2 of Span 2.
O	S2	BR	2S	3	91.2	LINM				91.2		
L3 Insp required for recommendations for BR1 & BR2 due to insufficient thread lengths on post base attachments majority are flush with the nuts & have no washers also noted was corrosion appearing on the base plates due to mortar pads cast above the base # 061, 074, 075, 076.												
O	S2	K	3C	3	91.2	LINM		91.2			X	
Minor vertical shrinkage cracks appearing on the outer faces of both kerbs, cracks range from H/L to 0.3mm no signs of any large spalls or exposed reo.												
Scupper outlets on underside of the kerbs have moderate rust appearing #007. Scuppers require rust treatment & protective coating applied.												

Structure Condition Inspection Report

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Structure Id 7799

Name

Inspection Date 09-MAY-2017

Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Component Location				Exposure Class	Quantity	Unit	Quantity Per Condition State				Maintenance Req'd	Comments
Modification	Group	Component	Standard				1	2	3	4		
O	S2	WS	1 C	3	388.0	M2		388.0			X	Concrete WS showing signs of minor abrasion & transvers cracks, no signs of heavy spalling or exposed reo poss ble water proofing on top may be required in the near future # 061,062.
Maintenance required - Poor delineation of the pedestrian footway with 1 traffic bollard missing & fog lines getting harder to see # 062. Missing bollards require replacing & fog lines require refreshing.												
O	P2	J1	15 O	3	8.5	LINM		8.5				Fixed joint in WS at E1 of Span 3.
O	P2	J2	15 O	3	8.5	LINM		8.5				Fixed joint in WS at E2 of Span 3.
O	S3	BR	2 S	3	91.2	LINM				91.2		L3 Insp required for recommendations for BR1 & BR2 due to insufficient thread lengths on post base attachments majority are flush with the nuts & have no washers also noted was corrosion appearing on the base plates due to mortar pads cast above the base # 061, 074, 075, 076.
O	S3	K	3 C	3	91.2	LINM		91.2			X	Minor vertical shrinkage cracks appearing on the outer faces of both kerbs, cracks range from Hi/L to 0.3mm no signs of any large spalls or exposed reo.
Scupper outlets on underside of the kerbs have moderate rust appearing #007. Scuppers require rust treatment & protective coating applied.												
O	S3	WS	1 C	3	388.0	M2		388.0			X	Concrete WS showing signs of minor abrasion & transvers cracks, no signs of heavy spalling or exposed reo poss ble water proofing on top may be required in the near future # 061,062.
Maintenance required - Poor delineation fog lines are getting harder to see # 062. Fog lines require refreshing.												
O	P3	J1	15 O	3	8.5	LINM		8.5				Fixed joint in WS at E1 of Span 4.
O	P3	J2	15 O	3	8.5	LINM		8.5				Fixed joint in WS at E2 of Span 4.
O	S4	BR	2 S	3	91.2	LINM				91.2		L3 Insp required for recommendations for BR1 & BR2 due to insufficient thread lengths on post base attachments majority are flush with the nuts & have no washers also noted was corrosion appearing on the base plates due to mortar pads cast above the base # 061, 074, 075, 076.
O	S4	K	3 C	3	91.2	LINM		91.2			X	Concrete WS showing signs of minor abrasion & transvers cracks, no signs of heavy spalling or exposed reo poss ble water proofing on top may be required in the near future # 061,062.
Scupper outlets on underside of the kerbs have moderate rust appearing #007. Scuppers require rust treatment & protective coating applied.												
O	S4	WS	1 C	3	388.0	M2		388.0			X	Concrete WS showing signs of minor abrasion & transvers cracks, no signs of heavy spalling or exposed reo # 061,062.
Maintenance required - Poor delineation of the pedestrian footway with 3 traffic bollards missing & fog lines getting harder to see # 062. Missing bollards require replacing & fog lines require refreshing.												
O	P4	J1	15 O	3	8.5	LINM		8.5				Fixed joint in WS at E1 of Span 5.
O	P4	J2	14 S	3	8.5	LINM		8.5				Steel finger joint in WS at E1 of Span 5.
Measurements taken between ends of the finger joint refer to (Sketch 013 to 016). No signs of excessive height & differential difference noticed, catch drain was clear # 067.												
Drainage issue with catch drain discharging water directly over the structures outer rocker bearings adding to rust & corrosion problems of the bearings # 024, 050, 051, 055, 056. Possible require re-design or splash shield.												
O	P4	J3	11 O	3	8.5	LINM			8.5			Steel nosing joint in WS at E2 of Span 5.
CS3 rubber gland in the joint gap showing signs of moderate perishing also a small section of the rubber gland has worked up above the road surface over the pedestrian footway # 068,069,070. Rubber gland requires replacing.												

Structure Condition Inspection Report

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Structure Id 7799

Name

Inspection Date 09-MAY-2017

Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Component Location				Exposure Class	Quantity	Unit	Quantity Per Condition State				Maintenance Req'd	Comments
Modification	Group	Component	Standard				1	2	3	4		
O	P4	J4	15O	3	8.5	LINM		8.5				Fixed joint in WS at E2 of Span 5.
O	S5	BR	2S	3	91.2	LINM				91.2		
L3 Insp required for recommendations for BR1 & BR2 due to insufficient thread lengths on post base attachments majority are flush with the nuts & have no washers also noted was corrosion appearing on the base plates due to mortar pads cast above the base # 061, 074, 075, 076.												
O	S5	K	3C	3	91.2	LINM		91.2			X	
Minor vertical shrinkage cracks appearing on the outer faces of both kerbs, cracks range from H/L to 0.3mm no signs of any large spalls or exposed reo.												
Scupper outlets on underside of the kerbs have moderate rust appearing #007. Scuppers require rust treatment & protective coating applied.												
O	S5	WS	1C	3	388.0	M2		388.0			X	
Concrete WS showing signs of minor abrasion & transvers cracks, no signs of heavy spalling or exposed reo poss ble water proofing on top may be required in the near future # 061,062.												
Maintenance required - Poor delineation of the pedestrian footway with 1 traffic bollard missing & fog lines getting harder to see # 062. Missing bollards require replacing & fog lines require refreshing.												
O	P5	J1	15O	3	8.5	LINM		8.5				Fixed joint in WS at E1 of Span 6.
O	S6	BR	2S	2	74.0	LINM				74.0		
L3 Insp required for recommendations for BR1 & BR2 due to insufficient thread lengths on post base attachments majority are flush with the nuts & have no washers also noted was corrosion appearing on the base plates due to mortar pads cast above the base # 061, 074, 075, 076.												
O	S6	K	3C	3	74.0	LINM		74.0			X	
Minor vertical shrinkage cracks appearing on the outer faces of both kerbs, cracks range from H/L to 0.3mm no signs of any large spalls or exposed reo.												
Scupper outlets on underside of the kerbs have moderate rust appearing #007. Scuppers require rust treatment & protective coating applied.												
O	S6	WS	1C	3	310.0	M2		310.0			X	
Concrete WS showing signs of minor abrasion & transvers cracks, no signs of heavy spalling or exposed reo poss ble water proofing on top may be required in the near future # 061,062.												
Maintenance required - Poor delineation fog lines are getting harder to see # 062. Fog lines require refreshing.												
O	A2	J1	14S	3	8.5	LINM		7.5	1.0			
CS3 Steel plate has broken its anchor tab into S6 deck near centre dividing line causing the steel plate to slap at location #073. Broken anchor tab requires re-welding.												
O	AP2	PRO	53O	3	120.0	M2		120.0				20m inspected.
O	AP2	GR	72S	3	2.0	EACH		2.0				GR1 has some minor impact damage at the bridge connection, attachments to bridge terminal end still sound.
O	AP2	AP	70O	3	1.0	EACH		1.0				20m inspected no signs of any major issues #071
O	A1	PED	44O	3	4.0	EACH		4.0				
O	A1	B	43S	3	4.0	EACH		4.0				
Rocker Bearings on top of A1 Abutment. Refer to Sketch 001 (Bearing measurements between Rocker & Sole Plates)												
Some minor pitting in B4 rocker & sole plate also B1 & B4 have leaching stains at the hinge attachment #001, 002, 003, 004 (Monitor).												
O	A1	A	50O	3	1.0	EACH		1.0				
No signs of any sever cracks or spalls some old leaching stains throughout the Abutment & bearing shelf where both dry at the time of the Inspection #005.												
O	A1	F	59C	3	1.0	EACH	X	X	X	X		Component is buried #005.

Structure Condition Inspection Report

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Structure Id 7799

Name

Inspection Date 09-MAY-2017

Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Component Location				Exposure Class	Quantity	Unit	Quantity Per Condition State				Maintenance Req'd	Comments
Modification	Group	Component	Standard				1	2	3	4		
O	S1	D	20C	3	354.0	M2		354.0			X	
Minor cracks in bay 5 at mid-span were mapped in 2001, cracks show no signs of change.												
Maintenance - Small spall with exposed rusty reo in bay 5 at mid-span requires treating.												
Rest of the concrete deck is sound with no signs of large spalls or sever cracks. It has been noted in the structures kerbs that the scupper outlets have moderate rust appearing & require rust treatment.												
O	S1	G	22S	3	4.0	EACH		4.0				
No signs of any major defects, possible brake down of the protective coating in girders due to age of structure #008. Protective coating is a lead base paint some further testing required to find out current cover levels.												
ST	S1	G	22S	3	4.0	EACH		4.0				
Single transvers tension bars have been retro fitted either side of each girder, protective coating & attachments are sound refer to #008,014.												
O	S1	XG	31C	3	1.0	EACH		1.0				Small spalled section in the underside of the XG in bay 3, no signs of exposed reo.
O	S1	XG	31S	3	4.0	EACH		4.0				
All attachments are sound & intact no signs of any major defects, possible brake down of the protective coating due to age of structure #008. Protective coating is a lead base paint some further testing required to find out current cover levels.												
O	S1	W	71O	3	1.0	EACH		1.0			X	
Moderate scour appearing in front of the abutment below the water pipe valve, approximately (500mm D x 1m W) #005,006 scour requires backfilling possible with a concrete pad.												
E1 Upstream 1st location possible incorrect, previous & current have minimal change.												
MS Downstream Local scour against 1st, previous & current have no change.												
O	P1	B	40O	3	4.0	EACH		4.0				
Fixed Bearings located on top of Pier 1.												
No signs of any major defects all bearings performing as designed, protective coating still sound #009.												
O	P1	PED	44O	3	4.0	EACH		4.0				
O	P1	B	43S	3	4.0	EACH		2.0		2.0		
CS4 B1 & B4 outer anchors have moderate to heavy corrosion with some loss of section to the nuts also rust flaking & pitting appearing on the rocker & sole plate with moisture staining evident #010, 011. L3 Insp (17/12/2015) has recommendations yet to be undertaken. Due to the complexity of the works required contact with SMS Roadtek engineers should be considered for a possible budget & scope of works to be undertaken.												
CS2 B2 & B3 appear sound & are still functioning as designed.												
O	P1	H	54C	3	1.0	EACH		1.0				No signs of any sever cracks, spalls or exposed reo.
O	P1	C	56C	3	1.0	EACH		1.0				No signs of any sever cracks, spalls or exposed reo.
O	P1	F	59C	3	1.0	EACH	X	X	X	X		Component is buried #030
O	S2	D	20C	3	442.0	M2		440.0	2.0			
CS3 Some moderate spalls with exposed rusty reo appearing under soffit of the finger joint at E2 of the deck in bays 2 & 4 #024,025. Rusty reo requires treating.												
Water main joiner has some moderate corrosion appearing #027. Service asset owner needs to be notified of issue.												
Rest of the concrete deck is sound with no signs of large spalls or sever cracks. It has been noted in the structures kerbs that the scupper outlets have moderate rust appearing & require rust treatment.												

Structure Condition Inspection Report

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Structure Id 7799

Name

Inspection Date 09-MAY-2017

Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Component Location				Exposure Class	Quantity	Unit	Quantity Per Condition State				Maintenance Req'd	Comments
Modification	Group	Component	Standard				1	2	3	4		
O	S2	G	22 S	3	4.0	EACH		4.0			X	* Location of item/condition * Description of defects by location type, magnitude, extent * References of sketches and photos (Roll/Exposure Nos)
Maintenance required - Some spot rust appearing in all 4 girders with mould building up on some outer faces #012,013,014. Spot rust & mould build up requires cleaning & treating.												
No signs of any major defects, possible brake down of the protective coating in girders due to age of structure #008. Protective coating is a lead base paint some further testing required to find out current cover levels.												
ST	S2	G	22 S	3	4.0	EACH		4.0				
Single transvers tension bars have been retro fitted either side of each girder, protective coating & attachments are sound refer to #008,014.												
O	S2	XG	31 S	3	8.0	EACH		8.0				
All attachments are sound & intact, no signs of any major defects, possible brake down of the protective coating due to age of structure #008. Protective coating is a lead base paint some further testing required to find out current cover levels.												
O	S2	W	71 O	3	1.0	EACH		1.0				
E1 & MS Upstream Local scour against 1st, previous & current have minimal or no change												
E2 Downstream Local scour against 1st, previous & current have minimal change.												
O	P2	B	43 S	3	4.0	EACH		2.0		2.0		
Rocker Bearings located at E2 of S2 Girders. Refer to Sketch 003 (Bearing measurement? between Rocker & Sole Plates)												
CS4 B1 lower outer attachment bolt & nut has decayed away with moderate corrosion in the hinge pin & upper attachments also bearing appears to have rotated to its tolerance limits, no signs of sever cracks at the bearing supports to the Headstock #015,016,017,018,019,020.												
CS4 B4 lower outer attachment bolt & nut has heavy decayed with moderate corrosion in the hinge pin & upper attachments, no signs of sever cracks at the bearing supports to the Headstock #021,022,023.												
B1 & B4 sit directly under the finger joint catch tray outlet a design recommendation has been suggested in the Pier joint to possible direct water & debris away from the bearings #026												
B2 & B3 have also possible rotated to their limits #028,029. No signs of sever cracks at the bearing supports to the Headstock some dirt is building up around the rocker & sole plate requires clearing.												
L3 Insp (17/12/2015) has recommendations yet to be undertaken. Due to the complexity of the works required contact with SMS Roadtek engineers should be considered for a possible budget & scope of works to be undertaken.												
O	P2	B	40 O	3	4.0	EACH		3.0	1.0			
Fixed Bearings located on top of Pier 2.												
CS3 B1 has some moderate decay with loss of section to the lower attachment nut #031. L3 Insp (17/12/2015) has recommendations yet to be undertaken. Contact with SMS Roadtek engineers for possible budgeting & scope of works to be undertaken should be considered.												
Maintenance - B4 outside lower anchor showing signs of minor pitting, pitting requires treating.												
O	P2	PED	44 O	3	4.0	EACH		4.0				
O	P2	H	54 C	3	1.0	EACH		1.0				No signs of any sever cracks, spalls or exposed reo.
O	P2	C	56 C	3	1.0	EACH		1.0				No signs of any sever cracks, spalls or exposed reo.
O	P2	F	59 C	3	1.0	EACH	X	X	X	X		Component is buried #032.
O	S3	D	20 C	3	442.0	M2		442.0				
Small spalled sections with exposed rusty reo in bay 1 at mid-span & in bay 4 at E1 #033. Rusty reo requires treating.												
Rest of the concrete deck is sound with no signs of large spalls or sever cracks. It has been noted in the structures kerbs that the scupper outlets have moderate rust appearing & require rust treatment.												

Structure Condition Inspection Report

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Structure Id 7799

Name

Inspection Date 09-MAY-2017

Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Component Location				Exposure Class	Quantity	Unit	Quantity Per Condition State				Maintenance Req'd	Comments
Modification	Group	Component	Standard				1	2	3	4		
O	S3	G	22 S	3	4.0	EACH		4.0			X	

Maintenance required - Spot rust treatment has been applied to majority of the spot rust appearing on the girders some sections have not been covered & require treating #042,043,044.

No signs of any major defects, possible brake down of the protective coating in girders due to age of structure #008. Protective coating is a lead base paint some further testing required to find out current cover levels.

ST	S3	G	22 S	3	4.0	EACH		1.0	3.0			
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Double transvers tension bars have been retro fitted either side of each girder, attachments are sound.

CS3 G2, G3 & G4 protective coating starting to fail at ends of the tension bar refer to #034,035,036. Ends of tension bars require cleaning & treating.

O	S3	XG	31 S	3	6.0	EACH		6.0			X	
---	----	----	------	---	-----	------	--	-----	--	--	---	--

Maintenance required - Spot rust treatment has been applied to majority of the spot rust appearing on the XG 6 some sections have not been covered & require treating #042,044.

All XG attachments are sound & intact, no signs of any major defects, possible brake down of the protective coating due to age of structure #008. Protective coating is a lead base paint some further testing required to find out current cover levels.

O	S3	W	71 O	3	1.0	EACH		1.0				
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E2 Upstream Local scour against 1st, previous & current have minimal change.

MS Downstream Local scour against 1st, previous & current have minimal change.

O	P3	B	40 O	3	4.0	EACH		2.0		2.0		
---	----	---	------	---	-----	------	--	-----	--	-----	--	--

Fixed Bearings located on top of Pier 3.

CS4 B1 lower outer attachment nut has decayed away with moderate corrosion in the hinge pin & upper attachments, no signs of sever cracks at the bearing supports to the Headstock #037.

CS2 Maintenance - B3 Protective coating failing on bottom sub assembly flange #038,039 requires cleaning & treating.

CS4 B4 lower inner attachment bolt & nut has decay with moderate corrosion also decay & corrosion in the upper attachments, no signs of sever cracks at the bearing supports to the Headstock #040,041.

L3 Insp (17/12/2015) has recommendations yet to be undertaken. Due to the complexity of the works required contact with SMS Roadtek engineers should be considered for a possible budget & scope of works to be undertaken.

O	P3	H	54 C	3	1.0	EACH		1.0				No signs of any sever cracks, spalls or exposed reo.
O	P3	C	56 C	3	1.0	EACH		1.0				No signs of any sever cracks, spalls or exposed reo.
O	P3	F	59 C	3	1.0	EACH		1.0				Component is buried.
O	S4	D	20 C	3	442.0	M2		442.0				

Some minor cracks appearing H/L to 0.2mm in bay 2.

Rest of the concrete deck is sound with no signs of large spalls or sever cracks. It has been noted in the structures kerbs that the scupper outlets have moderate rust appearing & require rust treatment.

O	S4	G	22 S	3	4.0	EACH		4.0			X	
---	----	---	------	---	-----	------	--	-----	--	--	---	--

Maintenance required - Spot rust treatment has been applied to majority of the spot rust appearing on the girders some sections have not been covered & require treating refer to #042,043,044.

No signs of any major defects, possible brake down of the protective coating in girders due to age of structure #008. Protective coating is a lead base paint some further testing required to find out current cover levels.

ST	S4	G	22 S	3	4.0	EACH		3.0	1.0			
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Double transvers tension bars have been retro fitted either side of each girder, attachments are sound.

CS3 G4 protective coating starting to fail at MS to E2 of the tension bar refer to #034,035,036. Tension bars require cleaning & treating.

Structure Condition Inspection Report

B2/2

Sheet

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Structure Id 7799

Name

Inspection Date 09-MAY-2017

Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Component Location				Exposure Class	Quantity	Unit	Quantity Per Condition State				Maintenance Req'd	Comments
Modification	Group	Component	Standard				1	2	3	4		
O	S4	XG	31 S	3	6.0	EACH		6.0				
All attachments are sound & intact, no signs of any major defects, possible brake down of the protective coating due to age of structure #008. Protective coating is a lead base paint some further testing required to find out current cover levels.												
O	S4	W	71 O	3	1.0	EACH		1.0				
E1 & MS Upstream Local scour against 1st, previous & current have minimal or no change.												
E1 & MS Downstream Local scour against previous at E1 & 1st at MS.												
O	P4	B	43 S	3	8.0	EACH		4.0	1.0	3.0		
B1, B2, B3, B4 Rocker Bearings located on top of Pier 4. Refer to Sketch 004 (Bearing measurement?s between Rocker & Sole Plates)												
CS4 B1 lower attachment nuts showing signs of decayed with moderate corrosion also decayed with moderate corrosion in the hinge pin, no signs of sever cracks at the bearing supports to the Headstock #045.												
CS3 B4 lower attachments showing signs of moderate corrosion also decay & corrosion in the upper attachments, no signs of sever cracks at the bearing supports to the Headstock #046.												
B1, B2, B3 & B4 Rocker possible rotated to their limits #047,048,049.												
B5, B6, B7 & B8 Rocker Bearings located at E1 of S5 Girders. Refer to Sketch 005 (Bearing measurement?s between Rocker & Sole Plates)												
CS4 B5 lower outer attachment bolt & nut has decayed away with moderate corrosion in the hinge pins, also bearing appears to have rotated to its tolerance limits #050,051.												
CS4 B8 lower outer attachment bolt & nut has decayed away with moderate corrosion in the hinge pins, also bearing appears to have rotated to its tolerance limits #055,056.												
B6 & B7 have also possible rotated to their limits #052,053,054. Some dirt is building up around the rocker & sole plate requires clearing.												
L3 Insp (17/12/2015) has recommendations yet to be undertaken. Due to the complexity of the works required contact with SMS Roadtek engineers should be considered for a possible budget & scope of works to be undertaken.												
O	P4	PED	44 O	3	4.0	EACH		4.0				
O	P4	H	54 C	3	1.0	EACH		1.0				No signs of any sever cracks, spalls or exposed reo.
O	P4	C	56 C	3	1.0	EACH		1.0				No signs of any sever cracks, spalls or exposed reo.
O	P4	F	59 C	3	1.0	EACH	X	X	X	X		Component is buried.
O	S5	D	20 C	3	442.0	M2		438.0	4.0			
CS3 Some moderate spalls with exposed rusty reo appearing under soffit of the finger joint at E2 of the deck in bays 1,2,3,4 & 5 refer to #024,025. Rusty reo requires treating.												
Water main joiner has some moderate corrosion appearing #027. Service asset owner needs to be notified of issue.												
Rest of the concrete deck is sound with no signs of large spalls or sever cracks. It has been noted in the structures kerbs that the scupper outlets have moderate rust appearing & require rust treatment.												
O	S5	G	22 S	3	4.0	EACH		4.0			X	
Maintenance required - Spot rust treatment has been applied to majority of the spot rust appearing on the girders some sections have not been covered & require treating refer to #042,043,044.												
No signs of any major defects, possible brake down of the protective coating in girders due to age of structure #008. Protective coating is a lead base paint some further testing required to find out current cover levels.												
ST	S5	G	22 S	3	4.0	EACH		4.0				
Single transvers tension bars have been retro fitted either side of each girder, protective coating & attachments are sound refer to #008,014.												
O	S5	XG	31 S	3	8.0	EACH		8.0				
All attachments are sound & intact, no signs of any major defects, possible brake down of the protective coating due to age of structure #008. Protective coating is a lead base paint some further testing required to find out current cover levels.												

Structure Condition Inspection Report

B2/2

Sheet

9 Of 9

Structure Id 7799

Name

Inspection Date 09-MAY-2017

Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Component Location				Exposure Class	Quantity	Unit	Quantity Per Condition State				Maintenance Req'd	Comments
Modification	Group	Component	Standard				1	2	3	4		
O	S5	W	71 O	3	1.0	EACH		1.0				
E1 Upstream Local scour against 1st, previous & current have minimal change. MS Upstream Local scour against 1st.												
E1 & E2 Downstream Local scour against 1st, previous & current have minimal or no change.												
O	P5	B	43 S	3	4.0	EACH			4.0			
Rocker Bearings located at E2 of S5 Girders. Refer to Sketch 006 (Bearing measurement?s between Rocker & Sole Plates)												
CS3 B1, B2, B3, B4 protective coating failing with signs of meduim corrsion appearing on rocker & sole plates #057. L3 Insp (17/12/2015) has recommendations yet to be undertaken. Due to the complexity of the works required contact with SMS Roadtek engineers should be considered for a possible budget & scope of works to be undertaken.												
O	P5	B	40 O	3	4.0	EACH		4.0				
Fixed Bearings located on top of Pier 5. No signs of any major defects all bearings performing as designed, protective coating still sound refer to #009.												
O	P5	PED	44 O	3	4.0	EACH		4.0				
O	P5	H	54 C	3	1.0	EACH		1.0				No signs of any sever cracks, spalls or exposed reo.
O	P5	C	56 C	3	1.0	EACH		1.0				No signs of any sever cracks, spalls or exposed reo.
O	P5	F	59 C	3	1.0	EACH	X	X	X	X		Component is buried.
O	S6	D	20 C	3	354.0	M2		354.0				
No signs of large spalls or sever cracks. It has been noted in the structures kerbs that the scupper outlets have moderate rust appearing & require rust treatment.												
O	S6	G	22 S	3	4.0	EACH		4.0				
All attachments are sound & intatct, no signs of any major defects, possible brake down of the protective coating in girders due to age of structure #008. Protective coating is a lead base paint some further testing required to find out current cover levels.												
ST	S6	G	22 S	3	4.0	EACH		4.0				
Single transvers tension bars have been retro fitted either side of each girder, protective coating & attachments are sound refer to #008,014.												
O	S6	XG	31 S	3	4.0	EACH		4.0				
All attachments are sound & intatct, no signs of any major defects, possible brake down of the protective coating due to age of structure #008. Protective coating is a lead base paint some further testing required to find out current cover levels.												
O	S6	XG	31 C	3	1.0	EACH		1.0				
O	S6	W	71 O	3	1.0	EACH		1.0				E1, MS & E2 Downstream Local scour against 1st, previous & current have minimal or no change.
O	A2	B	43 S	3	4.0	EACH		4.0				
Rocker Bearings located on top of A2 Abutment. Refer to Sketch 007 (Bearing measurement?s between Rocker & Sole Plates)												
B1, B2, B3 have no signs of any major defects all bearings performing as designed, protective coating still sound.												
Maintenance - B4 has some minor rust flacking appearing on the sole plate, bearing performing as designed sole plate requires cleaning & protective coating applied.												
O	A2	PED	44 O	3	4.0	EACH		4.0				
O	A2	A	50 C	3	1.0	EACH		1.0				No signs of any sever cracks, spalls or exposed reo.
O	A2	F	59 C	3	1.0	EACH	X	X	X	X		Component is buried.

Defective Components Report							B2/3		Sheet 1 Of 4	
Structure Id <u>7799</u>				Name _____						
Crossing Name <u>Barron River</u>				Alt. Name _____						
Structure Type <u>Bridge</u>				Owner <u>MR DEPARTMENT OF MAIN R</u>						
Construction Type <u>Girder/Beam</u>				District <u>403 Far North</u>						
Construction Material <u>Steel</u>				LGA Id <u>277 MAREEBA SHIRE COUNCI</u>						
Inspector <u>NR</u>				Date <u>09-MAY-2017</u>						
Inspection Level 2 <input checked="" type="checkbox"/>				Programmed <input checked="" type="checkbox"/>						
Level 3 <input type="checkbox"/>				Exceptional <input type="checkbox"/>				Underwater <input type="checkbox"/>		
Road Section				Start		End		TDist		
Id	Description	S Cway	S RPC	Tdist	RPC	Tdist	Start	End		
32A	CAIRNS - MAREEBA	C 1	C 5	0.000	5	0.257	12.535	12.792		
Component Location				Exposure Class	Condition State	Description of Defect * Detailed Description * Estimated Quantity * "Other" action required * Urgency of action (what, who, when, how) * Recommended Testing * Reference of Sketches and Photos (Roll/Exposure Nos)	Required Action (X)			
Modification	Group	Component	Standard Number				Monitor	Level 3	Inspection	Other
O	AP1	GR1	72 S	3	4					X
CS4 GR1 has heavy impact damage to 2 sections of rail & 1 post spacer block #072. Damage GR section requires replacing.										
O	S1	BR1	2 S	3	4			X		
L3 Insp required for recommendations for BR1 due to insufficient thread lengths on post base attachments majority are flush with the nuts & have no washers also noted was corrosion appearing on the base plates due to mortar pads cast above the base # 061, 074, 075, 076.										
O	S1	BR2	2 S	3	4			X		
L3 Insp required for recommendations for BR2 due to insufficient thread lengths on post base attachments majority are flush with the nuts & have no washers also noted was corrosion appearing on the base plates due to mortar pads cast above the base # 061, 074, 075, 076.										
O	P1	J2	11 O	3	3		X			
CS3 rubber gland in the joint gap showing signs of perishing also a small section of the rubber gland has worked up to the road surface over the pedestrian footway # 063,064,065 (Monitor).										
O	S2	BR1	2 S	3	4			X		
L3 Insp required for recommendations for BR1 due to insufficient thread lengths on post base attachments majority are flush with the nuts & have no washers also noted was corrosion appearing on the base plates due to mortar pads cast above the base # 061, 074, 075, 076.										
O	S2	BR2	2 S	3	4			X		
L3 Insp required for recommendations for BR2 due to insufficient thread lengths on post base attachments majority are flush with the nuts & have no washers also noted was corrosion appearing on the base plates due to mortar pads cast above the base # 061, 074, 075, 076.										
O	S3	BR1	2 S	3	4			X		
L3 Insp required for recommendations for BR2 due to insufficient thread lengths on post base attachments majority are flush with the nuts & have no washers also noted was corrosion appearing on the base plates due to mortar pads cast above the base # 061, 074, 075, 076.										
O	S3	BR2	2 S	3	4			X		
L3 Insp required for recommendations for BR2 due to insufficient thread lengths on post base attachments majority are flush with the nuts & have no washers also noted was corrosion appearing on the base plates due to mortar pads cast above the base # 061, 074, 075, 076.										
O	S4	BR1	2 S	3	4			X		
L3 Insp required for recommendations for BR1 due to insufficient thread lengths on post base attachments majority are flush with the nuts & have no washers also noted was corrosion appearing on the base plates due to mortar pads cast above the base # 061, 074, 075, 076.										
O	S4	BR2	2 S	3	4			X		

Defective Components Report						B2/3		Sheet 2 Of 4	
Structure Id		7799		Name					
Inspection Date		09-MAY-2017		Inspection Level 2 <input checked="" type="checkbox"/>		Level 3 <input type="checkbox"/>		Underwater <input type="checkbox"/>	
Component Location				Exposure Class	Condition State	Description of Defect * Detailed Description * Estimated Quantity * "Other" action required * Urgency of action (what, who, when, how) * Recommended Testing * Reference of Sketches and Photos (Roll/Exposure Nos)	Required Action (X)		
Modification	Group	Component	Standard Number				Monitor	Level 3 Inspection	Other
<p>L3 Insp required for recommendations for BR2 due to insufficient thread lengths on post base attachments majority are flush with the nuts & have no washers also noted was corrosion appearing on the base plates due to mortar pads cast above the base # 061, 074, 075, 076.</p>									
O	P4	J3	11 O	3	3				X
Steel nosing joint in WS at E2 of Span 5.									
CS3 rubber gland in the joint gap showing signs of moderate perishing also a small section of the rubber gland has worked up above the road surface over the pedestrian footway # 068,069,070. Rubber gland requires replacing.									
O	S5	BR1	2 S	3	4		X		
L3 Insp required for recommendations for BR1 due to insufficient thread lengths on post base attachments majority are flush with the nuts & have no washers also noted was corrosion appearing on the base plates due to mortar pads cast above the base # 061, 074, 075, 076.									
O	S5	BR2	2 S	3	4		X		
L3 Insp required for recommendations for BR2 due to insufficient thread lengths on post base attachments majority are flush with the nuts & have no washers also noted was corrosion appearing on the base plates due to mortar pads cast above the base # 061, 074, 075, 076.									
O	S6	BR1	2 S	2	4		X		
L3 Insp required for recommendations for BR1 due to insufficient thread lengths on post base attachments majority are flush with the nuts & have no washers also noted was corrosion appearing on the base plates due to mortar pads cast above the base # 061, 074, 075, 076.									
O	S6	BR2	2 S	2	4		X		
L3 Insp required for recommendations for BR2 due to insufficient thread lengths on post base attachments majority are flush with the nuts & have no washers also noted was corrosion appearing on the base plates due to mortar pads cast above the base # 061, 074, 075, 076.									
O	A2	J1	14 S	3	3				X
CS3 Steel plate has broken its anchor tab into S6 deck near centre dividing line causing the steel plate to slap at location #073. Broken anchor tab requires re-welding.									
O	P1	B1	43 S	3	4				X
CS4 B1 outer anchors have moderate to heavy corrosion with some loss of section to the nuts also rust flaking & pitting appearing on the rocker & sole plate with moisture staining evident #010, 011. L3 Insp (17/12/2015) has recommendations yet to be undertaken. Due to the complexity of the works required contact with SMS Roadtek engineers should be considered for a possible budget & scope of works to be undertaken.									
O	P1	B4	43 S	3	4				X
CS4 B4 outer anchors have moderate to heavy corrosion with some loss of section to the nuts also rust flaking & pitting appearing on the rocker & sole plate with moisture staining evident #010, 011. L3 Insp (17/12/2015) has recommendations yet to be undertaken. Due to the complexity of the works required contact with SMS Roadtek engineers should be considered for a possible budget & scope of works to be undertaken.									
O	S2	D1	20 C	3	3				X
CS3 Some moderate spalls with exposed rusty reo appearing under soffit of the finger joint at E2 of the deck in bays 2 & 4 #024,025. Rusty reo requires treating.									
Water main collar joint has some moderate corrosion appearing #027. Service asset owner needs to be notified of issue.									
O	P2	B1	43 S	3	4				X
Rocker Bearings located at E2 of S2 Girders. Refer to Sketch 003 (Bearing measurement's between Rocker & Sole Plates)									
CS4 B1 lower outer attachment bolt & nut has decayed away with moderate corrosion in the hinge pin & upper attachments also bearing appears to have rotated to its tolerance limits, no signs of sever cracks at the bearing supports to the Headstock #015,016,017,018,019,020.									

Defective Components Report							B2/3		Sheet 3 Of 4		
Structure Id <u>7799</u>							Name _____				
Inspection Date <u>09-MAY-2017</u>							Inspection Level 2 <input checked="" type="checkbox"/> Level 3 <input type="checkbox"/> Underwater <input type="checkbox"/>				
Component Location				Exposure Class	Condition State	Description of Defect * Detailed Description * Estimated Quantity * "Other" action required * Urgency of action (what, who, when, how) * Recommended Testing * Reference of Sketches and Photos (Roll/Exposure Nos)	Required Action (Y)				
Modification	Group	Component	Standard Number				Monitor	Level 3	Inspection	Other	
B1 sit directly under the finger joint catch tray outlet a design recommendation has been suggested in the Pier joint to possible direct water & debris away from the bearings #026.											
L3 Insp (17/12/2015) has recommendations yet to be undertaken. Due to the complexity of the works required contact with SMS Roadtek engineers should be considered for a possible budget & scope of works to be undertaken.											
O	P2	B4	43 S	3	4					X	
Rocker Bearings located at E2 of S2 Girders. Refer to Sketch 003 (Bearing measurement's between Rocker & Sole Plates).											
CS4 B4 lower outer attachment bolt & nut has heavy decayed with moderate corrosion in the hinge pin & upper attachments, no signs of sever cracks at the bearing supports to the Headstock #021,022,023.											
B4 sit directly under the finger joint catch tray outlet a design recommendation has been suggested in the Pier joint to possible direct water & debris away from the bearings #026.											
L3 Insp (17/12/2015) has recommendations yet to be undertaken. Due to the complexity of the works required contact with SMS Roadtek engineers should be considered for a possible budget & scope of works to be undertaken.											
O	P2	B1	40 O	3	3					X	
Fixed Bearings located on top of Pier 2.											
CS3 B1 has some moderate decay with loss of section to the lower attachment nut #031. L3 Insp (17/12/2015) has recommendations yet to be undertaken. Contact with SMS Roadtek engineers for possible budgeting & scope of works to be undertaken should be considered.											
Maintenance - B4 outside lower anchor showing signs of minor pitting, pitting requires treating.											
ST	S3	G2	22 S	3	3					X	
CS3 G2 protective coating starting to fail at E2 of the tension bar refer to #034,035,036. Tension bars require cleaning & treating.											
ST	S3	G3	22 S	3	3					X	
CS3 G3 protective coating starting to fail at E2 of the tension bar refer to #034,035,036. Tension bars require cleaning & treating.											
ST	S3	G4	22 S	3	3					X	
CS3 G4 protective coating starting to fail at E2 of the tension bar refer to #034,035,036. Tension bars require cleaning & treating.											
O	P3	B1	40 O	3	4					X	
Fixed Bearings located on top of Pier 3.											
CS4 B1 lower outer attachment nut has decayed away with moderate corrosion in the hinge pin & upper attachments, no signs of sever cracks at the bearing supports to the Headstock #037. L3 Insp (17/12/2015) has recommendations yet to be undertaken. Due to the complexity of the works required contact with SMS Roadtek engineers should be considered for a possible budget & scope of works to be undertaken.											
O	P3	B4	40 O	3	4					X	
Fixed Bearings located on top of Pier 3.											
CS4 B4 lower inner attachment bolt & nut has decay with moderate corrosion also decay & corrosion in the upper attachments, no signs of sever cracks at the bearing supports to the Headstock #040,041. L3 Insp (17/12/2015) has recommendations yet to be undertaken. Due to the complexity of the works required contact with SMS Roadtek engineers should be considered for a possible budget & scope of works to be undertaken.											
ST	S4	G4	22 S	3	3					X	
CS3 G4 protective coating starting to fail at MS to E2 of the tension bar refer to #034,035,036. Tension bars require cleaning & treating.											

Defective Components Report						B2/3	Sheet 4 Of 4		
Structure Id		7799		Name					
Inspection Date		09-MAY-2017		Inspection Level 2 <input checked="" type="checkbox"/>		Level 3 <input type="checkbox"/>		Underwater <input type="checkbox"/>	
Component Location				Exposure Class	Condition State	Description of Defect * Detailed Description * Estimated Quantity * "Other" action required * Urgency of action (what, who, when, how) * Recommended Testing * Reference of Sketches and Photos (Roll/Exposure Nos)	Required Action (X)		
Modification	Group	Component	Standard Number				Monitor	Level 3 Inspection	Other
O	P4	B1	43 S	3	4			X	
B1, B2, B3, B4 Rocker Bearings located on top of Pier 4. Refer to Sketch 004 (Bearing measurement?s between Rocker & Sole Plates) CS4 B1 lower attachment nuts showing signs of decayed with moderate corrosion also decayed with moderate corrosion in the hinge pin, no signs of sever cracks at the bearing supports to the Headstock #045. L3 Insp (17/12/2015) has recommendations yet to be undertaken. Due to the complexity of the works required contact with SMS Roadtek engineers should be considered for a possible budget & scope of works to be undertaken.									
O	P4	B4	43 S	3	3			X	
B1, B2, B3, B4 Rocker Bearings located on top of Pier 4. Refer to Sketch 004 (Bearing measurement?s between Rocker & Sole Plates) CS3 B4 lower attachments showing signs of moderate corrosion also decay & corrosion in the upper attachments, no signs of sever cracks at the bearing supports to the Headstock #046. L3 Insp (17/12/2015) has recommendations yet to be undertaken. Due to the complexity of the works required contact with SMS Roadtek engineers should be considered for a possible budget & scope of works to be undertaken.									
O	P4	B5	43 S	3	4			X	
B5, B6, B7 & B8 Rocker Bearings located at E1 of S5 Girders. Refer to Sketch 005 (Bearing measurement?s between Rocker & Sole Plates) CS4 B5 lower outer attachment bolt & nut has decayed away with moderate corrosion in the hinge pins, also bearing appears to have rotated to its tolerance limits #050,051. L3 Insp (17/12/2015) has recommendations yet to be undertaken. Due to the complexity of the works required contact with SMS Roadtek engineers should be considered for a possible budget & scope of works to be undertaken.									
O	P4	B8	43 S	3	4			X	
B5, B6, B7 & B8 Rocker Bearings located at E1 of S5 Girders. Refer to Sketch 005 (Bearing measurement?s between Rocker & Sole Plates). CS4 B8 lower outer attachment bolt & nut has decayed away with moderate corrosion in the hinge pins, also bearing appears to have rotated to its tolerance limits #055,056. L3 Insp (17/12/2015) has recommendations yet to be undertaken. Due to the complexity of the works required contact with SMS Roadtek engineers should be considered for a possible budget & scope of works to be undertaken.									
O	S5	D1	20 C	3	3			X	
CS3 Some moderate spalls with exposed rusty reo appearing under soffit of the finger joint at E2 of the deck in bays 1,2,3,4 & 5 refer to #024,025. Rusty reo requires treating. Water main joiner has some moderate corrosion appearing #027. Service asset owner needs to be notified of issue. Rest of the concrete deck is sound with no signs of large spalls or sever cracks. It has been noted in the structures kerbs that the scupper outlets have moderate rust appearing & require rust treatment.									
O	P5	B1	43 S	3	3			X	
Rocker Bearings located at E2 of S5 Girders. Refer to Sketch 006 (Bearing measurement?s between Rocker & Sole Plates) CS3 B1, B2, B3, B4 protective coating failing with signs of medium corrosion appearing on rocker & sole plates #057. L3 Insp (17/12/2015) has recommendations yet to be undertaken. Due to the complexity of the works required contact with SMS Roadtek engineers should be considered for a possible budget & scope of works to be undertaken.									

Standard Procedure Exceptions Report						B2/4		Sheet 1 Of 1			
Structure Id <u>7799</u>			Name _____								
Crossing Name <u>Barron River</u>			Alt. Name _____								
Structure Type <u>Bridge</u>			Owner <u>MR</u>		<u>DEPARTMENT OF MAIN ROADS</u>						
Construction Type <u>Girder/Beam</u>			District <u>403</u>		<u>Far North</u>						
Construction Material <u>Steel</u>			LGA Id <u>277</u>		<u>MAREEBA SHIRE COUNCIL</u>						
Inspector <u>NR</u>			Date <u>09-MAY-2017</u>								
Inspection Level 2 <input checked="" type="checkbox"/>			Programmed <input checked="" type="checkbox"/>			Underwater <input type="checkbox"/>					
Level 3 <input type="checkbox"/>			Exceptional <input type="checkbox"/>								
Road Section			Start		End		TDist				
Id	Description		S	Cway	S	RPC	Dist	RPC	Dist	Start	End
32A	CAIRNS - MAREEBA		C	1	C	5	0.000	5	0.257	12.535	12.792

Component Location				Exception (X)						
Modification	Group	Component	Standard Number	Exposure Class	Undefined Component	Component Not Inspected	Less than 25% Comp Inspected	Other	Comments	
O	A1	F	59 C	3		X			Component is buried #005.	
O	P1	F	59 C	3		X			Component is buried #030	
O	P2	F	59 C	3		X			Component is buried #032.	
O	P4	F	59 C	3		X			Component is buried.	
O	P5	F	59 C	3		X			Component is buried.	
O	A2	F	59 C	3		X			Component is buried.	

Structure Id <u>7799</u>	Name _____
Crossing Name <u>Barron River</u>	Alt. Name _____
Structure Type <u>Bridge</u>	Owner <u>MR DEPARTMENT OF MAIN R</u>
Construction Type <u>Girder/Beam</u>	District <u>403 Far North</u>
Construction Material <u>Steel</u>	LGA Id <u>277 MAREEBA SHIRE COUNCI</u>
Inspector <u>NR</u>	Date <u>09-MAY-2017</u>
Inspection Level 2 <input checked="" type="checkbox"/>	Programmed <input checked="" type="checkbox"/>
Level 3 <input type="checkbox"/>	Exceptional <input type="checkbox"/>
	Underwater <input type="checkbox"/>

Road Section			Start		End		TDist	
Id	Description	S Cway S	RPC	Dist	RPC	Dist	Start	End
32A	CAIRNS - MAREEBA	C 1	C 5	0.000	5	0.257	12.535	12.792

Film/Exposure Number	Sketch No	Location			Description	Id
		Modification	Group	Component		
001		O	A1	B1	B1 full view	562203
002		O	A1	B1	B1 Leaching stains on hinge	562204
003		O	A1	B4	B4 Minor pitting on rocker & sole plate	562205
004		O	A1	B4	B4 Minor pitting on rocker & sole plate	562206
005		O	A1	A	Full view of A1 Abutment	562210
006		O	A1	A	Scour in front of A1 Abutment	562211
007		O	S1	K1	Rust scupper outlet	562212
008		O	S1	D	Underside of S1 E2 to E1	562213
009		O	P1	B1	Pier 1 B1 to B4	562214
010		O	P1	B1	Pier 1 B1 Span 2 G1 at E1	562216
011		O	P1	B4	Pier 1 B4 Span 2 G4 at E1	562217
012		O	S2	G4	Span 2 G4 outer face E1	562218
013		O	S2	G3	Span 2 G3 E2 to E1 spot rust	562219
014		O	S2	G4	Spot rust on Span 2 G3 & G4 & unused gantry frame	562221
015		O	P2	B1	Pier 2 B1 Span 2 G1 E2 corrosion at top attachments	562222
016		O	P2	B1	Pier 2 B1 Span 2 G1 E2 corrosion on top attachments	562225
017		O	P2	B1	Pier 2 B1 Span 2 G1 E2 corrosion on hinge bolt	562226
018		O	P2	B1	Pier 2 B1 Span 2 G1 E2 corrosion on rocker & sole plate	562227
019		O	P2	B1	Pier 2 B1 Span 2 G1 E2 corrosion on top attachments & hinge	562228

Structure Id 7799 Name _____
 Inspection Date 09-MAY-2017 Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Film/Exposure Number	Sketch No	Location			Description	Id
		Modification	Group	Component		
					* Deck Surface (full width and alignment) * Side View (waterway, spans, piers, etc) * Underside (deck and pier construction) * Deficient Component and Major Defects * Undefined Elements	
020		O	P2	B1	Pier 2 B1 Span 2 G1 E2 corrosion on top attachments & ro	562229
021		O	P2	B4	Pier 2 B4 Span 2 G4 E2 corrosion on hinge bolt	562231
022		O	P2	B4	Pier 2 B4 Span 2 G4 E2 corrosion on lower attachment	562232
023		O	P2	B4	Pier 2 B4 Span 2 G4 E2 corrosion on lower attachment bol	562234
024		O	S2	D1	Spalls in deck around soffit of the finger joint	561664
025		O	S2	D1	Spalls in deck around soffit of the finger joint	561666
026		O	P1	J3	Water discharge over Pier 2 B4 Span 2 G4 from figure joint	562239
027		O	S2	D1	Water main joiner rusty	561667
028		O	P2	B2	Pier 2 B2 Span 2 G2 E2	562241
029		O	P2	B3	Pier 2 B3 Span 2 G3 E2	562243
030		O	P1	PW	Pier 1 Span 2 side	562245
031		O	P2	B1	Pier 2 B1 on top of Pier 2 decay on lower attachment	562246
032		O	P3	PW	Pier 3 to A2 Side 2	562247
033		O	S3	D	Small spalls in bay 4 at E1	562249
034		ST	S3	G4	Protective coating failing on tension bars	561682
035		ST	S3	G4	Protective coating failing on tension bars	561683
036		ST	S3	G4	Protective coating failing on tension bars	561684
037		O	P3	B1	B1 on top of Pier 3 decay on lower attachment	562250
038		O	P3	B3	B3 on top of Pier 3 corrosion of flanges	562251
039		O	P3	B3	B3 on top of Pier 3 corrosion of flange	562252
040		O	P3	B4	B4 on top of Pier 3 corrosion on attachments	562253
041		O	P3	B4	B4 on top of Pier 3 corrosion on attachments	562254
042		O	S3	G2	Span 3 G2 E2 some spot rust & minor pitting untreated	562255
043		O	S3	G2	Span 3 G2 E2 some spot rust & minor pitting untreated	562256
044		O	S3	G2	Span 3 G2 E2 some areas of spot rust treated & untreated	562257
045		O	P4	B1	B1 on top of Pier 4 corrosion & decay on attachments	562258

Structure Id 7799 Name _____
 Inspection Date 09-MAY-2017 Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Film/Exposure Number	Sketch No	Location			Description	Id
		Modification	Group	Component		
					* Deck Surface (full width and alignment) * Side View (waterway, spans, piers, etc) * Underside (deck and pier construction) * Deficient Component and Major Defects * Undefined Elements	
046		O	P4	B4	B4 on top of Pier 4 corrosion & decay on attachments	562259
047		O	P4	B3	B3 to B1 on top of Pier 4 Span 4 side.	562260
048		O	P4	B4	B4 on top of Pier 4.	562261
049		O	P4	B3	B3 to B1 on top of Pier 4 Span 5 side.	562262
050		O	P4	B1	Pier 4 B1 Span 5 G1 E1 decay around hinge bolt & possible over rotated.	562264
051		O	P4	B1	Pier 4 B1 Span 5 G1 E1 decay around hinge bolt & possible over rotated.	562265
052		O	P4	B2	Pier 4 B2 Span 5 G2 E1 possible over rotated.	562764
053		O	P4	B3	Pier 4 B3 Span 5 G3 E1 possible over rotated.	562765
054		O	P1	B3	Pier 4 B3 Span 5 G3 E1 possible over rotated.	562769
055		O	P4	B4	Pier 4 B4 Span 5 G4 E1 decay around hinge bolt & lower a	562770
056		O	P4	B4	Pier 4 B4 Span 5 G4 E1 decay around hinge bolt & lower a	562771
057		O	P5	B4	Pier 5 B4 Span 5 G4 E2 loss of protective coating	562772
058		O	AP1	AP	AP1 AP with chainage	562773
059		O	AP1	AP	Top of A1 Joint & end of AP1 AP	562774
060		O	AP1	AP	Top of A1 Joint & end of AP1 AP	562776
061		O	S1	WS	Top of Structure S1 to S6	562778
062		O	S1	WS	Showing general abrasion & minor cracks in WS, applicable	562783
063		O	P1	J2	Rubber gland over the pedestrian footway	561521
064		O	P1	J2	Rubber gland showing signs of perishing	561522
065		O	P1	J2	Rubber gland showing signs of perishing	561525
066		O	P1	J3	Top of Pier 1 J3 finger joint	562786
067		O	P4	J2	Top of Pier 4 J2 finger joint	562787
068		O	P4	J3	Rubber gland perishing in the joint gap	561541
069		O	P4	J3	Rubber gland above WS	561542
070		O	P4	J3	Rubber gland perishing in the joint gap	561544
071		O	AP2	AP	AP2 AP with chainage	562788

Structure Id 7799
 Inspection Date 09-MAY-2017

Name _____
 Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Film/Exposure Number	Sketch No	Location			Description	Id
		Modification	Group	Component		
072		O	AP1	GR1	AP1 GR1 impact damage	561500
073		O	A2	J1	Steel cover plate slaping under load	561554
074		O	S3	BR1	S3 BR1 Post cast below MP & fulsh anchor nuts, applicabl	562790
075		O	S3	BR1	S3 BR1 Post cast below MP & fulsh anchor nuts, applicabl	562793
076		O	S3	BR1	S3 BR1 Post cast below MP & fulsh anchor nuts, applicabl	562795
Sketch 001		O	A1	B	Sketch 001 to 007 Bearing measurement?s between Rock	562193
Sketch 008 to 016		O	P1	J3	Sketch 008 to 016 Finger joint gaps	563229

Structure Id 7799
 Inspection Date 09-MAY-2017

Name _____
 Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Pictures

** All images printed for this report.

Id

Date

Film / Exposure Number

Sketch No

Description

Mod

Category

Number

Comp Code

Comp No



Structure Id 7799

Name _____

Inspection Date 09-MAY-2017

Inspection Level 2 ☒Level 3 ☐Underwater ☐

Pictures

** All images printed for this report.

Id 561521

Date 09-MAY-2017

Film / Exposure Number

063

Sketch No

Description

Rubber gland over the pedestrian footway

Mod Category Number Comp Code Comp No

O

P

1

J2



Id 561522

Date 09-MAY-2017

Film / Exposure Number

064

Sketch No

Description

Rubber gland showing signs of perishing

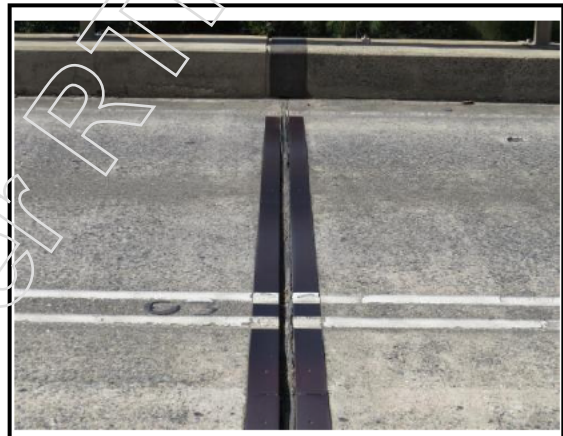
Mod Category Number Comp Code Comp No

O

P

1

J2



Id 561525

Date 09-MAY-2017

Film / Exposure Number

065

Sketch No

Description

Rubber gland showing signs of perishing

Mod Category Number Comp Code Comp No

O

P

1

J2



Structure Id 7799

Name _____

Inspection Date 09-MAY-2017

Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Pictures

** All images printed for this report.

Id 561541

Date 09-MAY-2017

Film / Exposure Number

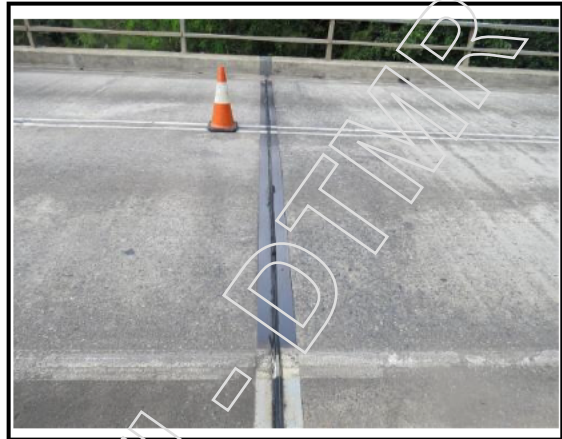
068

Sketch No

Description

Rubber gland perishing in the joint gap

Mod Category Number Comp Code Comp No

 O P 4 J3 

Id 561542

Date 09-MAY-2017

Film / Exposure Number

069

Sketch No

Description

Rubber gland above WS

Mod Category Number Comp Code Comp No

 O P 4 J3 

Id 561544

Date 09-MAY-2017

Film / Exposure Number

070

Sketch No

Description

Rubber gland perishing in the joint gap

Mod Category Number Comp Code Comp No

 O P 4 J3 

Structure Id 7799

Name _____

Inspection Date 09-MAY-2017

Inspection Level 2 ☒Level 3 ☐Underwater ☐

Pictures

** All images printed for this report.

Id 561554

Date 09-MAY-2017

Film / Exposure Number

073

Sketch No

Description

Steel cover plate slaping under load

Mod Category Number Comp Code Comp No

O A 2 J1



Id 561682

Date 09-MAY-2017

Film / Exposure Number

034

Sketch No

Description

Protective coating failing on tension bars

Mod Category Number Comp Code Comp No

ST S 3 G 4



Id 561683

Date 09-MAY-2017

Film / Exposure Number

035

Sketch No

Description

Protective coating failing on tension bars

Mod Category Number Comp Code Comp No

ST S 3 G 4



Structure Id 7799

Name _____

Inspection Date 09-MAY-2017

Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Pictures

** All images printed for this report.

Id 561684

Date 09-MAY-2017

Film / Exposure Number

036

Sketch No

Description

Protective coating failing on tension bars

Mod Category Number Comp Code Comp No

ST S 3 G 4



Id 562193

Date 09-MAY-2017

Film / Exposure Number

Sketch 001

Sketch No

Description

Sketch 001 to 007 Bearing measurement?s between Rocker & Sole Plates

Mod Category Number Comp Code Comp No

O A 1 B

Id 562203

Date 09-MAY-2017

Film / Exposure Number

001

Sketch No

Description

B1 full view

Mod Category Number Comp Code Comp No

O A 1 B 1



Id 562204

Date 09-MAY-2017

Film / Exposure Number

002

Sketch No

Description

B1 Leaching stains on hinge

Mod Category Number Comp Code Comp No

O A 1 B 1



Structure Id 7799

Name _____

Inspection Date 09-MAY-2017

Inspection Level 2 ☒Level 3 ☐Underwater ☐

Pictures

** All images printed for this report.

Id 562205

Date 09-MAY-2017

Film / Exposure Number

003

Sketch No

Description

B4 Minor pitting on rocker & sole plate

Mod Category Number Comp Code Comp No

O	A	1	B	4
---	---	---	---	---



Id 562206

Date 09-MAY-2017

Film / Exposure Number

004

Sketch No

Description

B4 Minor pitting on rocker & sole plate

Mod Category Number Comp Code Comp No

O	A	1	B	4
---	---	---	---	---



Id 562210

Date 09-MAY-2017

Film / Exposure Number

005

Sketch No

Description

Full view of A1 Abutment

Mod Category Number Comp Code Comp No

O	A	1	A	
---	---	---	---	--



Structure Id 7799

Name

Inspection Date 09-MAY-2017

Inspection Level 2 ☒Level 3 ☐Underwater ☐

Pictures

** All images printed for this report.

Id 562211

Date 09-MAY-2017

Film / Exposure Number

006

Sketch No

Description

Scour in front of A1 Abutment

Mod Category Number Comp Code Comp No

O

A

1

A



Id 562212

Date 09-MAY-2017

Film / Exposure Number

007

Sketch No

Description

Rust scupper outlet

Mod Category Number Comp Code Comp No

O

S

1

K

1



Id 562213

Date 09-MAY-2017

Film / Exposure Number

008

Sketch No

Description

Underside of S1 E2 to E1

Mod Category Number Comp Code Comp No

O

S

1

D



Structure Id 7799

Name _____

Inspection Date 09-MAY-2017

Inspection Level 2 ☒Level 3 ☐Underwater ☐

Pictures

** All images printed for this report.

Id 562214

Date 09-MAY-2017

Film / Exposure Number

009

Sketch No

Description

Pier 1 B1 to B4

Mod Category Number Comp Code Comp No

O P 1 B 1



Id 562216

Date 09-MAY-2017

Film / Exposure Number

010

Sketch No

Description

Pier 1 B1 Span 2 G1 at E1

Mod Category Number Comp Code Comp No

O P 1 B 1



Id 562217

Date 09-MAY-2017

Film / Exposure Number

011

Sketch No

Description

Pier 1 B4 Span 2 G4 at E1

Mod Category Number Comp Code Comp No

O P 1 B 4



Structure Id 7799

Name _____

Inspection Date 09-MAY-2017

Inspection Level 2 ☒Level 3 ☐Underwater ☐

Pictures

** All images printed for this report.

Id 562218

Date 09-MAY-2017

Film / Exposure Number

012

Sketch No

Description

Span 2 G4 outer face E1

Mod Category Number Comp Code Comp No

O S 2 G 4



Id 562219

Date 09-MAY-2017

Film / Exposure Number

013

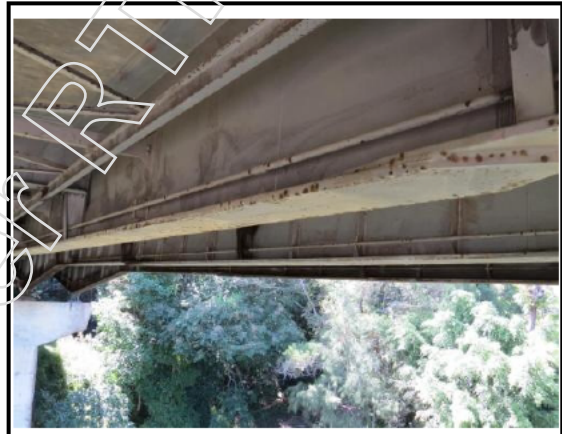
Sketch No

Description

Span 2 G3 E2 to E1 spot rust

Mod Category Number Comp Code Comp No

O S 2 G 3



Id 562221

Date 09-MAY-2017

Film / Exposure Number

014

Sketch No

Description

Spot rust on Span 2 G3 & G4 & unused gantry frame

Mod Category Number Comp Code Comp No

O S 2 G 4



Structure Id 7799

Name

Inspection Date 09-MAY-2017

Inspection Level 2 ☒Level 3 ☐Underwater ☐

Pictures

** All images printed for this report.

Id 562222

Date 09-MAY-2017

Film / Exposure Number

015

Sketch No

Description

Pier 2 B1 Span 2 G1 E2 corrosion at top attachments

Mod Category Number Comp Code Comp No

O P 2 B 1



Id 562225

Date 09-MAY-2017

Film / Exposure Number

016

Sketch No

Description

Pier 2 B1 Span 2 G1 E2 corrosion on top attachments

Mod Category Number Comp Code Comp No

O P 2 B 1



Id 562226

Date 09-MAY-2017

Film / Exposure Number

017

Sketch No

Description

Pier 2 B1 Span 2 G1 E2 corrosion on hinge bolt

Mod Category Number Comp Code Comp No

O P 2 B 1



Structure Id 7799

Name _____

Inspection Date 09-MAY-2017

Inspection Level 2 ☒Level 3 ☐Underwater ☐

Pictures

** All images printed for this report.

Id 562227

Date 09-MAY-2017

Film / Exposure Number

018

Sketch No

Description

Pier 2 B1 Span 2 G1 E2 corrosion on rocker & sole plate

Mod Category Number Comp Code Comp No

O

P

2

B

1



Id 562228

Date 09-MAY-2017

Film / Exposure Number

019

Sketch No

Description

Pier 2 B1 Span 2 G1 E2 corrosion on top attachments & hinge bolt

Mod Category Number Comp Code Comp No

O

P

2

B

1



Id 562229

Date 09-MAY-2017

Film / Exposure Number

020

Sketch No

Description

Pier 2 B1 Span 2 G1 E2 corrosion on top attachments & rocker & sole plate

Mod Category Number Comp Code Comp No

O

P

2

B

1



Structure Id 7799

Name _____

Inspection Date 09-MAY-2017

Inspection Level 2 ☒Level 3 ☐Underwater ☐

Pictures

** All images printed for this report.

Id 562231

Date 09-MAY-2017

Film / Exposure Number

021

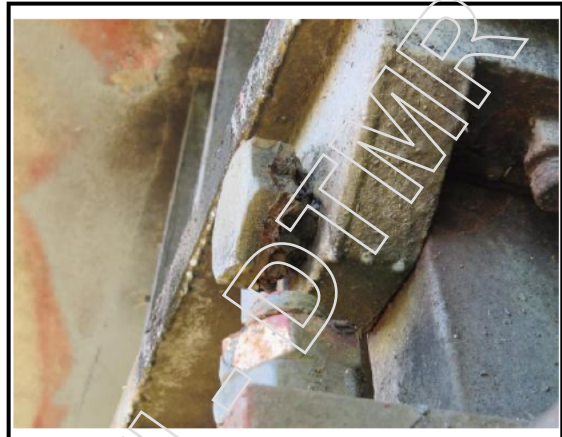
Sketch No

Description

Pier 2 B4 Span 2 G4 E2 corrosion on hinge bolt

Mod Category Number Comp Code Comp No

O P 2 B 4



Id 562232

Date 09-MAY-2017

Film / Exposure Number

022

Sketch No

Description

Pier 2 B4 Span 2 G4 E2 corrosion on lower attachment

Mod Category Number Comp Code Comp No

O P 2 B 4



Id 562234

Date 09-MAY-2017

Film / Exposure Number

023

Sketch No

Description

Pier 2 B4 Span 2 G4 E2 corrosion on lower attachment bolt

Mod Category Number Comp Code Comp No

O P 2 B 4



Structure Id 7799

Name _____

Inspection Date 09-MAY-2017

Inspection Level 2 ☒Level 3 ☐Underwater ☐

Pictures

** All images printed for this report.

Id 562239

Date 09-MAY-2017

Film / Exposure Number

026

Sketch No

Description

Water discharge over Pier 2 B4 Span 2 G4 from figure joint

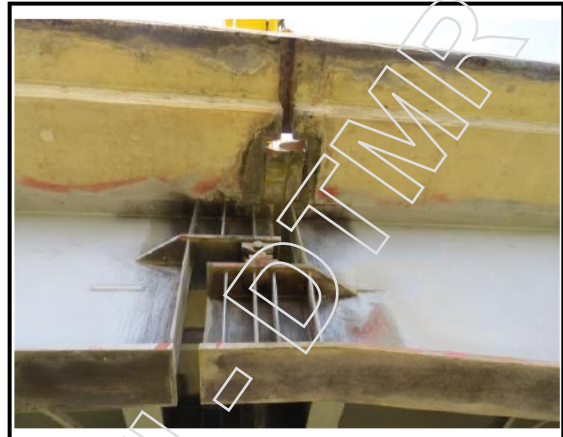
Mod Category Number Comp Code Comp No

O

P

1

J3



Id 562241

Date 09-MAY-2017

Film / Exposure Number

028

Sketch No

Description

Pier 2 B2 Span 2 G2 E2

Mod Category Number Comp Code Comp No

O

P

2

B

2



Id 562243

Date 09-MAY-2017

Film / Exposure Number

029

Sketch No

Description

Pier 2 B3 Span 2 G3 E2

Mod Category Number Comp Code Comp No

O

P

2

B

3



Structure Id 7799

Name

Inspection Date 09-MAY-2017

Inspection Level 2 ☒Level 3 ☐Underwater ☐

Pictures

** All images printed for this report.

Id 562245

Date 09-MAY-2017

Film / Exposure Number

030

Sketch No

Description

Pier 1 Span 2 side

Mod Category Number Comp Code Comp No

O

P

1

PW



Id 562246

Date 09-MAY-2017

Film / Exposure Number

031

Sketch No

Description

Pier 2 B1 on top of Pier 2 decay on lower attachment

Mod Category Number Comp Code Comp No

O

P

2

B

1



Id 562247

Date 09-MAY-2017

Film / Exposure Number

032

Sketch No

Description

Pier 3 to A2 Side 2

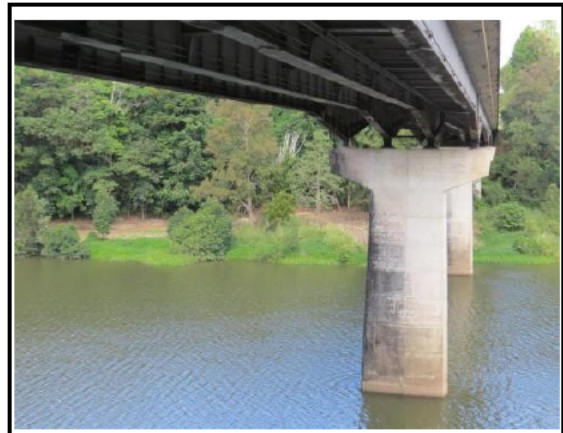
Mod Category Number Comp Code Comp No

O

P

3

PW



Structure Id 7799

Name

Inspection Date 09-MAY-2017

Inspection Level 2 ☒Level 3 ☐Underwater ☐

Pictures

** All images printed for this report.

Id 562249

Date 09-MAY-2017

Film / Exposure Number

033

Sketch No

Description

Small spalls in bay 4 at E1

Mod Category Number Comp Code Comp No

O S 3 D



Id 562250

Date 09-MAY-2017

Film / Exposure Number

037

Sketch No

Description

B1 on top of Pier 3 decay on lower attachment

Mod Category Number Comp Code Comp No

O P 3 B 1



Id 562251

Date 09-MAY-2017

Film / Exposure Number

038

Sketch No

Description

B3 on top of Pier 3 corrosion of flanges

Mod Category Number Comp Code Comp No

O P 3 B 3



Structure Id 7799

Name

Inspection Date 09-MAY-2017

Inspection Level 2 ☒Level 3 ☐Underwater ☐

Pictures

** All images printed for this report.

Id 562252

Date 09-MAY-2017

Film / Exposure Number

039

Sketch No

Description

B3 on top of Pier 3 corrosion of flange

Mod Category Number Comp Code Comp No

O P 3 B 3



Id 562253

Date 09-MAY-2017

Film / Exposure Number

040

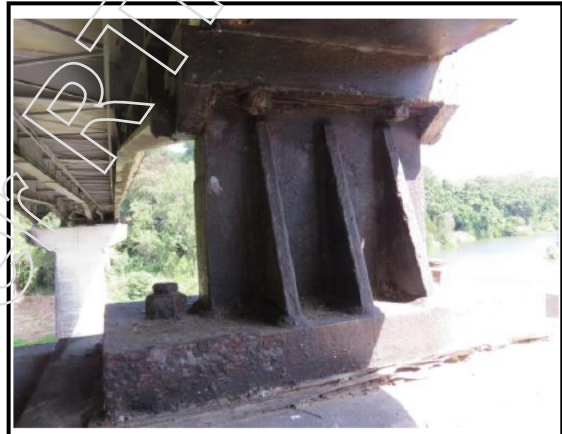
Sketch No

Description

B4 on top of Pier 3 corrosion on attachments

Mod Category Number Comp Code Comp No

O P 3 B 4



Id 562254

Date 09-MAY-2017

Film / Exposure Number

041

Sketch No

Description

B4 on top of Pier 3 corrosion on attachments

Mod Category Number Comp Code Comp No

O P 3 B 4



Structure Id 7799

Name _____

Inspection Date 09-MAY-2017

Inspection Level 2 ☒Level 3 ☐Underwater ☐

Pictures

** All images printed for this report.

Id 562255

Date 09-MAY-2017

Film / Exposure Number

042

Sketch No

Description

Span 3 G2 E2 some spot rust & minor pitting untreated

Mod Category Number Comp Code Comp No

O

S

3

G

2



Id 562256

Date 09-MAY-2017

Film / Exposure Number

043

Sketch No

Description

Span 3 G2 E2 some spot rust & minor pitting untreated

Mod Category Number Comp Code Comp No

O

S

3

G

2



Id 562257

Date 09-MAY-2017

Film / Exposure Number

044

Sketch No

Description

Span 3 G2 E2 some areas of spot rust treated & untreated

Mod Category Number Comp Code Comp No

O

S

3

G

2



Structure Id 7799

Name

Inspection Date 09-MAY-2017

Inspection Level 2 ☒

Level 3 ☐

Underwater ☐

Pictures

** All images printed for this report.

Id 562258

Date 09-MAY-2017

Film / Exposure Number

045

Sketch No

Description

B1 on top of Pier 4 corrosion & decay on attachments

Mod Category Number Comp Code Comp No

O P 4 B 1



Id 562259

Date 09-MAY-2017

Film / Exposure Number

046

Sketch No

Description

B4 on top of Pier 4 corrosion & decay on attachments

Mod Category Number Comp Code Comp No

O P 4 B 4



Id 562260

Date 09-MAY-2017

Film / Exposure Number

047

Sketch No

Description

B3 to B1 on top of Pier 4 Span 4 side.

Mod Category Number Comp Code Comp No

O P 4 B 3



Structure Id 7799

Name _____

Inspection Date 09-MAY-2017

Inspection Level 2 ☒Level 3 ☐Underwater ☐

Pictures

** All images printed for this report.

Id 562261

Date 09-MAY-2017

Film / Exposure Number

048

Sketch No

Description

B4 on top of Pier 4.

Mod Category Number Comp Code Comp No

O	P	4	B	4
---	---	---	---	---



Id 562262

Date 09-MAY-2017

Film / Exposure Number

049

Sketch No

Description

B3 to B1 on top of Pier 4 Span 5 side.

Mod Category Number Comp Code Comp No

O	P	4	B	3
---	---	---	---	---



Id 562264

Date 09-MAY-2017

Film / Exposure Number

050

Sketch No

Description

Pier 4 B1 Span 5 G1 E1 decay around hinge bolt & possible over rotated.

Mod Category Number Comp Code Comp No

O	P	4	B	1
---	---	---	---	---



Structure Id 7799

Name

Inspection Date 09-MAY-2017

Inspection Level 2 ☒

Level 3 ☐

Underwater ☐

Pictures

** All images printed for this report.

Id 562265

Date 09-MAY-2017

Film / Exposure Number

051

Sketch No

Description

Pier 4 B1 Span 5 G1 E1 decay around hinge bolt & possible over rotated.

Mod Category Number Comp Code Comp No

O P 4 B 1



Id 562764

Date 09-MAY-2017

Film / Exposure Number

052

Sketch No

Description

Pier 4 B2 Span 5 G2 E1 possible over rotated.

Mod Category Number Comp Code Comp No

O P 4 B 2



Id 562765

Date 09-MAY-2017

Film / Exposure Number

053

Sketch No

Description

Pier 4 B3 Span 5 G3 E1 possible over rotated.

Mod Category Number Comp Code Comp No

O P 4 B 3



Structure Id 7799

Name

Inspection Date 09-MAY-2017

Inspection Level 2 ☒Level 3 ☐Underwater ☐

Pictures

** All images printed for this report.

Id 562769

Date 09-MAY-2017

Film / Exposure Number

054

Sketch No

Description

Pier 4 B3 Span 5 G3 E1 possible over rotated.

Mod Category Number Comp Code Comp No

O P 1 B 3



Id 562770

Date 09-MAY-2017

Film / Exposure Number

055

Sketch No

Description

Pier 4 B4 Span 5 G4 E1 decay around hinge bolt & lower anchor missing

Mod Category Number Comp Code Comp No

O P 4 B 4



Id 562771

Date 09-MAY-2017

Film / Exposure Number

056

Sketch No

Description

Pier 4 B4 Span 5 G4 E1 decay around hinge bolt & lower anchor missing

Mod Category Number Comp Code Comp No

O P 4 B 4



Structure Id 7799

Name _____

Inspection Date 09-MAY-2017

Inspection Level 2 ☒Level 3 ☐Underwater ☐

Pictures

** All images printed for this report.

Id 562772

Date 09-MAY-2017

Film / Exposure Number

057

Sketch No

Description

Pier 5 B4 Span 5 G4 E2 loss of protective coating

Mod Category Number Comp Code Comp No

O P 5 B 4



Id 562773

Date 09-MAY-2017

Film / Exposure Number

058

Sketch No

Description

AP1 AP with chainage

Mod Category Number Comp Code Comp No

O AP 1 AP



Id 562774

Date 09-MAY-2017

Film / Exposure Number

059

Sketch No

Description

Top of A1 Joint & end of AP1 AP

Mod Category Number Comp Code Comp No

O AP 1 AP



Structure Id 7799

Name _____

Inspection Date 09-MAY-2017

Inspection Level 2 ☒Level 3 ☐Underwater ☐

Pictures

** All images printed for this report.

Id 562776

Date 09-MAY-2017

Film / Exposure Number

060

Sketch No

Description

Top of A1 Joint & end of AP1 AP

Mod Category Number Comp Code Comp No

O

AP

1

AP



Id 562778

Date 09-MAY-2017

Film / Exposure Number

061

Sketch No

Description

Top of Structure S1 to S6

Mod Category Number Comp Code Comp No

O

S

1

WS



Id 562783

Date 09-MAY-2017

Film / Exposure Number

062

Sketch No

Description

Showing general abrasion & minor cracks in WS, applicable throughout all spans

Mod Category Number Comp Code Comp No

O

S

1

WS



Structure Id 7799

Name _____

Inspection Date 09-MAY-2017

Inspection Level 2 ☒Level 3 ☐Underwater ☐

Pictures

** All images printed for this report.

Id 562786

Date 09-MAY-2017

Film / Exposure Number

066

Sketch No

Description

Top of Pier 1 J3 finger joint

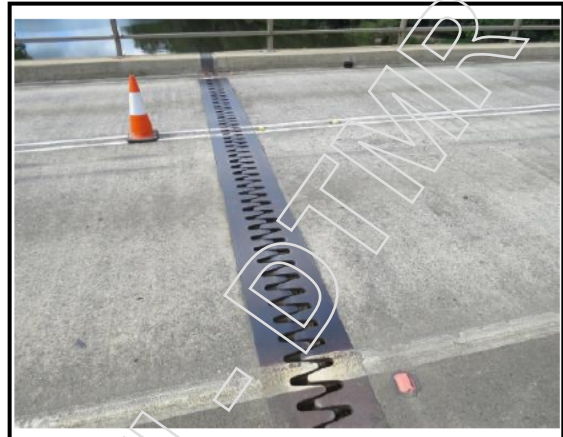
Mod Category Number Comp Code Comp No

O

P

1

J3



Id 562787

Date 09-MAY-2017

Film / Exposure Number

067

Sketch No

Description

Top of Pier 4 J2 finger joint

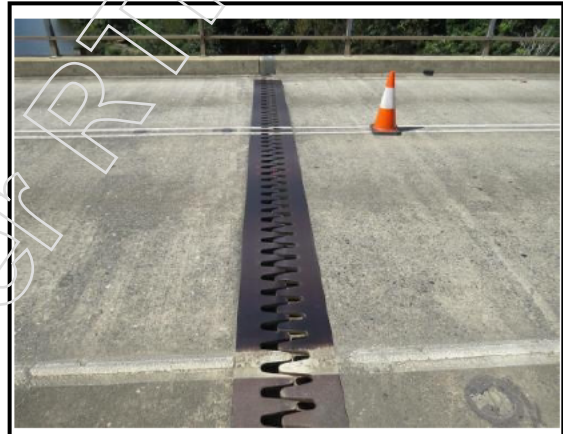
Mod Category Number Comp Code Comp No

O

P

4

J2



Id 562788

Date 09-MAY-2017

Film / Exposure Number

071

Sketch No

Description

AP2 AP with chainage

Mod Category Number Comp Code Comp No

O

AP

2

AP



Structure Id 7799

Name

Inspection Date 09-MAY-2017

Inspection Level 2 ☒Level 3 ☐Underwater ☐

Pictures

** All images printed for this report.

Id 562790

Date 09-MAY-2017

Film / Exposure Number

074

Sketch No

Description

S3 BR1 Post cast below MP & fulsh anchor nuts, applicable throughout all spans.

Mod Category Number Comp Code Comp No

O S 3 BR 1



Id 562793

Date 09-MAY-2017

Film / Exposure Number

075

Sketch No

Description

S3 BR1 Post cast below MP & fulsh anchor nuts, applicable throughout all spans.

Mod Category Number Comp Code Comp No

O S 3 BR 1



Id 562795

Date 09-MAY-2017

Film / Exposure Number

076

Sketch No

Description

S3 BR1 Post cast below MP & fulsh anchor nuts, applicable throughout all spans.

Mod Category Number Comp Code Comp No

O S 3 BR 1



Id 563229

Date 09-MAY-2017

Film / Exposure Number

Sketch 008 to 016

Sketch No

Description

Sketch 008 to 016 Finger joint gaps

Mod Category Number Comp Code Comp No

O P 1 J3

Structure Id 7799

Name

Inspection Date 09-MAY-2017

Inspection Level 2 ☒Level 3 ☐Underwater ☐

Pictures

** All images printed for this report.

Id 561664

Date

Film / Exposure Number

024

Sketch No

Description

Spalls in deck around soffit of the finger joint

Mod Category Number Comp Code Comp No

O S 2 D 1



Id 561666

Date

Film / Exposure Number

025

Sketch No

Description

Spalls in deck around soffit of the finger joint

Mod Category Number Comp Code Comp No

O S 2 D 1



Id 561667

Date

Film / Exposure Number

027

Sketch No

Description

Water main joiner rusty

Mod Category Number Comp Code Comp No

O S 2 D 1



Structure Scour Soundings Report										B2/7		Sheet 1 Of 3	
Structure Id		7799				Name							
Crossing Name		Barron River				Alt. Name							
Structure Type		Bridge				Owner		MR DEPARTMENT OF MAIN R					
Construction Type		Girder/Beam				District		403 Far North					
Construction Material		Steel				LGA Id		277 MAREEBA SHIRE COUNCI					
Inspector		NR				Date		09-MAY-17					
Inspection Level 2		<input checked="" type="checkbox"/>		Programmed		<input type="checkbox"/>		Partial Inspection		<input type="checkbox"/>			
Level 3		<input type="checkbox"/>		Exceptional		<input type="checkbox"/>		Underwater		<input type="checkbox"/>			

Road Section					Start	End	TDist		
Id	Description	S Cway	S	RPC	Dist	RPC	Dist	Start	End
32A	CAIRNS - MAREEBA	C	1	C	5	0.000	5	0.257	12.535 12.792

Sounding Location				Permanent Reference Feature	Sounding Depth (m)							Condition State	Critical Scour Dip	Comments
Modification	Group	Location	Side		Water Surface	Stream Bed								
						First	Previous	Rehab	Current	First Diff	Current Diff			
O	S1	E1	U	Top Of Ker		1.8	4.2		4.3	2.5	0.1	3		First Scour Survey: 17-MAR-2008 Last Stream Bed Rehab: Previous Scour Survey: 09-MAY-2017
1st location possible incorrect, previous & current have minimal change.														
O	S1	MS	U	Top Of Ker		8.0	8.2		8.2	0.2	0.0	2		
O	S1	E2	U	Top Of Ker		12.7	13.0		13.1	0.4	0.1	2		
O	S2	E1	U	Top Of Ker		12.7	14.0		14.0	1.3	0.0	2	Local scour against 1st, previous & current no change.	
O	S2	MS	U	Top Of Ker		15.5	14.7		14.9	0.6	0.2	2		
Local scour against 1st, previous & current have minimal change.														
O	S2	E2	U	Top Of Ker	17.2	20.7	20.2		20.5	0.2	0.3	2		

Sounding Locations		Depth (metres)							
		CS 1		CS 2		CS 3		CS 4	
Group	Location (Abbreviation) (Describe Other (O) in comments)	Change in depth	Local scour depth	Change in depth	Local scour depth	Change in depth	Local scour depth	Change in depth	Local scour depth
Span	End1 (E1), Midspan (MS), End 2 (E2), Other (O)	<0.2	<0.5	0.2 to 0.49	0.5 to 1.99	0.5 to 1.0	2.0 to 4.0	>1.0	>4.0

Structure Scour Soundings Report

B2/7

Sheet

2 Of 3

Structure Id 7799

Name

Survey Date 09-MAY-17

Inspection Level 2 ☒

Level 3 ☐

Underwater ☐

Sounding Location				Permanent Reference Feature	Sounding Depth (m)							Condition State	Critical Scour Dip	Comments
Modification	Group	Location	Side		Water Surface	Stream Bed								
						First	Previous	Rehab	Current	First Diff	Current Diff			
O	S3	E1	U	Top Of Ker	17.2	20.7	20.4		20.6	0.1	0.2	2		
O	S3	MS	U	Top Of Ker	17.2	21.0	21.4		21.2	0.2	0.2	2		
O	S3	E2	U	Top Of Ker	17.2	20.0	20.7		21.1	1.1	0.4	2		
Local scour against 1st, previous & current have minimal change.														
O	S4	E1	U	Top Of Ker	17.2	20.0	21.0		21.0	1.0	0.0	2		
Local scour against 1st, previous & current have no change.														
O	S4	MS	U	Top Of Ker	17.2	21.0	21.4		20.8	0.2	0.6	2		
Local scour against previous, 1st & current have minimal change.														
O	S4	E2	U	Top Of Ker	17.2	21.0	21.6		21.3	0.3	0.3	2		
O	S5	E1	U	Top Of Ker	17.2	21.0	21.7		21.5	0.5	0.2	2		
Local scour against 1st, previous & current have minimal change.														
O	S5	MS	U	Top Of Ker	17.2	18.2	18.1		17.5	0.7	0.6	2		Local scour against 1st.
O	S5	E2	U	Top Of Ker		15.7	15.6		15.8	0.1	0.2	2		
O	S6	E1	U	Top Of Ker		15.7	15.6		15.5	0.2	0.1	2		
O	S6	MS	U	Top Of Ker		6.6	6.7		6.7	0.1	0.0	1		
O	S6	E2	U	Top Of Ker		1.7	1.8		2.0	0.3	0.2	2		
O	S1	E1	D	Top Of Ker		4.8	4.8		5.0	0.2	0.2	2		
O	S1	MS	D	Top Of Ker		9.1	8.5		8.5	0.6	0.0	2		
Local scour against 1st, previous & current have no change.														
O	S1	E2	D	Top Of Ker		13.6	13.6		13.5	0.1	0.1	1		
O	S2	E1	D	Top Of Ker		14.2	14.2		14.0	0.2	0.2	2		
O	S2	MS	D	Top Of Ker		15.2	15.0		15.0	0.2	0.0	2		
O	S2	E2	D	Top Of Ker	17.4	21.0	20.0		20.3	0.7	0.3	2		
Local scour against 1st, previous & current have minimal change.														

Structure Scour Soundings Report

B2/7

Sheet

3 Of 3

Structure Id 7799

Name

Survey Date 09-MAY-17

Inspection Level 2 ☒

Level 3 ☐

Underwater ☐

Sounding Location				Permanent Reference Feature	Sounding Depth (m)							Condition State	Critical Scour Dip	Comments
Modification	Group	Location	Side		Water Surface	Stream Bed								
						First	Previous	Rehab	Current	First Diff	Current Diff			
O	S3	E1	D	Top Of Ker	17.4	20.9	20.5		20.5	0.4	0.0	2		First Scour Survey: 17-MAR-2008 Last Stream Bed Rehab: Previous Scour Survey: 09-MAY-2017
O	S3	MS	D	Top Of Ker	17.4	20.6	21.4		21.4	0.8	0.0	2		
Local scour against 1st, previous & current have minimal change.														
O	S3	E2	D	Top Of Ker	17.4	21.1	21.0		21.3	0.2	0.3	2		
O	S4	E1	D	Top Of Ker	17.4	21.2	22.2		21.6	0.4	0.6	2		Local scour against previous.
O	S4	MS	D	Top Of Ker	17.4	21.3	21.2		20.8	0.5	0.4	2		Local scour against 1st.
O	S4	E2	D	Top Of Ker	17.4	20.9	21.2		20.9	0.0	0.3	2		
O	S5	E1	D	Top Of Ker	17.4	21.8	21.0		21.0	0.8	0.0	2		
Local scour against 1st, previous & current have no change.														
O	S5	MS	D	Top Of Ker		16.8	17.2		17.2	0.4	0.0	2		
O	S5	E2	D	Top Of Ker		16.2	14.6		15.0	1.2	0.4	2		
Local scour against 1st, previous & current have minimal change.														
O	S6	E1	D	Top Of Ker		16.0	13.9		14.0	2.0	0.1	3		
Local scour against 1st, previous & current have minimal change.														
O	S6	MS	D	Top Of Ker		7.0	6.5		6.5	0.5	0.0	2		
Local scour against 1st, previous & current have no change.														
O	S6	E2	D	Top Of Ker		2.6	2.0		2.0	0.6	0.0	2		
Local scour against 1st, previous & current have no change.														

Structure Maintenance Schedule

M1

Sheet
1 of 13

Structure Id 7799

Name

Crossing Name Barron River

Alt. Name

Structure Type Bridge

Owner MR DEPARTMENT OF MAIN R

Construction Type Girder/Beam

District 403 Far North

Construction Material Steel

LGA Id 277 MAREEBA SHIRE COUNCIL

Inspector NR

Date 09-MAY-2017

Inspection Level 1 ☐ 2 ☒ 3 ☐

Overall Condition Rating 3

Underwater ☐

Vermin Screens ☐ Security Measures ☐

Road Section

Start

End

TDist

Id Description

S Cway S RPC

Dist RPC

Dist

Start

End

Inspector's Comments

L3 Insp (17/12/2015) has recommendations yet to be undertaken. Due to the complexity of the works required contact with SMS Roadteck engineers should be considered for a possible budget & scope of works to be undertaken.

Steward's Comments

Vermin Screen Comments

Security Measures Comments

Total Maintenance Backlog Amount \$ 39687.4

Structure Maintenance Schedule						M1		Sheet 2 of 13				
Structure Id <u>7799</u>			Name _____									
Inspection Date <u>09-MAY-2017</u>			Inspection Level 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/>									
Defect Location and Details (from B2 forms)												
Component Location (Modification/Group/Component/Standard Number						O	/	A2	/	J1	/	14S
Component Description _____						Joint	Significance	1 <input type="checkbox"/>	2 <input checked="" type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	
Defect Details _____						Condition State	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input checked="" type="checkbox"/>	4 <input type="checkbox"/>		
CS3 Steel plate has broken its anchor tab into S6 deck near centre dividing line causing the steel plate to slap at location #073. Broken anchor tab requires re-welding.												
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed					
859	Bridgework, general	\$	1	1500	1500	2	N					
900A3	Traffic management (including TMP)	P/SUM	1	1200	1200	2	N					
Sub-total \$					2700							
Defect Location and Details (from B2 forms)												
Component Location (Modification/Group/Component/Standard Number						O	/	AP1	/	GR1	/	72S
Component Description _____						Guard Rails	Significance	1 <input checked="" type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	
Defect Details _____						Condition State	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input checked="" type="checkbox"/>		
CS4 GR1 has heavy impact damage to 2 sections of rail & 1 post spacer block #072. Damage GR section requires replacing.												
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed					
72S1	Replace guardrail section	M	9.4	371	3487.4	2	N					
900E3	Traffic management (including Traffic Management Plan)	P/SUM	1	1200	1200	2	N					
Sub-total \$					4687.4							
Defect Location and Details (from B2 forms)												
Component Location (Modification/Group/Component/Standard Number						O	/	P2	/	B1	/	40O
Component Description _____						Bearings	Significance	1 <input type="checkbox"/>	2 <input checked="" type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	
Defect Details _____						Condition State	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input checked="" type="checkbox"/>	4 <input type="checkbox"/>		
Fixed Bearings located on top of Pier 2.												
CS3 B1 has some moderate decay with loss of section to the lower attachment nut #031. L3 Insp (17/12/2015) has recommendations yet to be undertaken												
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed					
Sub-total \$												

Structure Maintenance Schedule						M1		Sheet 3 of 13	
Structure Id <u>7799</u>				Name _____					
Inspection Date <u>09-MAY-2017</u>				Inspection Level 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/>					
Defect Location and Details (from B2 forms)									
Component Location (Modification/Group/Component/Standard Number				O / P3 / B1 / 400					
Component Description <u>Bearings</u>				Significance		1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>			
Defect Details				Condition State		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/>			
Fixed Bearings located on top of Pier 3.									
CS4 B1 lower outer attachment nut has decayed away with moderate corrosion in the hinge pin & upper attachments, no signs of sever cracks at the bear									
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed		
Sub-total \$					_____				
Defect Location and Details (from B2 forms)									
Component Location (Modification/Group/Component/Standard Number				O / P3 / B4 / 400					
Component Description <u>Bearings</u>				Significance		1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>			
Defect Details				Condition State		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/>			
Fixed Bearings located on top of Pier 3.									
CS4 B4 lower inner attachment bolt & nut has decay with moderate corrosion also decay & corrosion in the upper attachments, no signs of sever cracks at the bearing supports to the Headstock #040,041. L3 Insp (17/12/2015) has recommendations yet to be undertaken. Due to the complexity of the works									
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed		
Sub-total \$					_____				
Defect Location and Details (from B2 forms)									
Component Location (Modification/Group/Component/Standard Number				O / P1 / B1 / 43S					
Component Description <u>Bearings</u>				Significance		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input type="checkbox"/>			
Defect Details				Condition State		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/>			
CS4 B1 outer anchors have moderate to heavy corrosion with some loss of section to the nuts also rust flaking & pitting appearing on the rocker & sole plate with moisture staining evident #010, 011. L3 Insp (17/12/2015) has recommendations yet to be undertaken. Due to the complexity of the works required contact with SMS Roadtek engineers should be considered for a possible budget & scope of works to be undertaken.									
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed		
Sub-total \$					_____				

Structure Maintenance Schedule						M1		Sheet 4 of 13	
Structure Id <u>7799</u>				Name _____					
Inspection Date <u>09-MAY-2017</u>				Inspection Level 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/>					
Defect Location and Details (from B2 forms)									
Component Location (Modification/Group/Component/Standard Number				O <input type="checkbox"/> / P1 <input type="checkbox"/> / B4 <input type="checkbox"/> / 43S					
Component Description <u>Bearings</u>				Significance		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input type="checkbox"/>			
Defect Details				Condition State		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/>			
CS4 B4 outer anchors have moderate to heavy corrosion with some loss of section to the nuts also rust flaking & pitting appearing on the rocker & sole plate with moisture staining evident #010, 011. L3 Insp (17/12/2015) has recommendations yet to be undertaken. Due to the complexity of the works required contact with SMS Roadtek engineers should be considered for a possible budget & scope of works to be undertaken.									
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed		
Sub-total \$						_____			
Defect Location and Details (from B2 forms)									
Component Location (Modification/Group/Component/Standard Number				O <input type="checkbox"/> / P2 <input type="checkbox"/> / B1 <input type="checkbox"/> / 43S					
Component Description <u>Bearings</u>				Significance		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input type="checkbox"/>			
Defect Details				Condition State		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/>			
Rocker Bearings located at E2 of S2 Girders. Refer to Sketch 003 (Bearing measurement?s between Rocker & Sole Plates)									
CS4 B1 lower outer attachment bolt & nut has decayed away with moderate corrosion in the hinge pin & upper attachments also bearing appears to have									
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed		
Sub-total \$						_____			
Defect Location and Details (from B2 forms)									
Component Location (Modification/Group/Component/Standard Number				O <input type="checkbox"/> / P2 <input type="checkbox"/> / B4 <input type="checkbox"/> / 43S					
Component Description <u>Bearings</u>				Significance		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input type="checkbox"/>			
Defect Details				Condition State		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/>			
Rocker Bearings located at E2 of S2 Girders. Refer to Sketch 003 (Bearing measurement?s between Rocker & Sole Plates).									
CS4 B4 lower outer attachment bolt & nut has heavy decayed with moderate corrosion in the hinge pin & upper attachments, no signs of sever cracks at tl									
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed		
Sub-total \$						_____			

Structure Maintenance Schedule						M1		Sheet 5 of 13						
Structure Id <u>7799</u>			Name _____											
Inspection Date <u>09-MAY-2017</u>			Inspection Level 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/>											
Defect Location and Details (from B2 forms)														
Component Location (Modification/Group/Component/Standard Number						O	/	P4	/	B4	/	43S		
Component Description <u>Bearings</u>						Significance	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input checked="" type="checkbox"/>	4	<input type="checkbox"/>
Defect Details						Condition State	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input checked="" type="checkbox"/>	4	<input type="checkbox"/>
B1, B2, B3, B4 Rocker Bearings located on top of Pier 4. Refer to Sketch 004 (Bearing measurement?s between Rocker & Sole Plates)														
CS3 B4 lower attachments showing signs of moderate corrosion also decay & corrosion in the upper attachments, no signs of severe cracks at the bearing														
Activity No	Description					Unit	Quantity	Unit Rate	Amount	Priority	Completed			
Sub-total \$ _____														
Defect Location and Details (from B2 forms)														
Component Location (Modification/Group/Component/Standard Number						O	/	P4	/	B1	/	43S		
Component Description <u>Bearings</u>						Significance	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input checked="" type="checkbox"/>	4	<input type="checkbox"/>
Defect Details						Condition State	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input type="checkbox"/>	4	<input checked="" type="checkbox"/>
B1, B2, B3, B4 Rocker Bearings located on top of Pier 4. Refer to Sketch 004 (Bearing measurement?s between Rocker & Sole Plates)														
CS4 B1 lower attachment nuts showing signs of decayed with moderate corrosion also decayed with moderate corrosion in the hinge pin, no signs of seve														
Activity No	Description					Unit	Quantity	Unit Rate	Amount	Priority	Completed			
Sub-total \$ _____														
Defect Location and Details (from B2 forms)														
Component Location (Modification/Group/Component/Standard Number						O	/	P4	/	B5	/	43S		
Component Description <u>Bearings</u>						Significance	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input checked="" type="checkbox"/>	4	<input type="checkbox"/>
Defect Details						Condition State	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input type="checkbox"/>	4	<input checked="" type="checkbox"/>
B5, B6, B7 & B8 Rocker Bearings located at E1 of S5 Girders. Refer to Sketch 005 (Bearing measurement?s between Rocker & Sole Plates)														
CS4 B5 lower outer attachment bolt & nut has decayed away with moderate corrosion in the hinge pins, also bearing appears to have rotated to its toleran														
Activity No	Description					Unit	Quantity	Unit Rate	Amount	Priority	Completed			
Sub-total \$ _____														

Structure Maintenance Schedule						M1		Sheet 6 of 13						
Structure Id <u>7799</u>			Name _____											
Inspection Date <u>09-MAY-2017</u>			Inspection Level 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/>											
Defect Location and Details (from B2 forms)														
Component Location (Modification/Group/Component/Standard Number						O	/	P4	/	B8	/	43S		
Component Description <u>Bearings</u>						Significance	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input checked="" type="checkbox"/>	4	<input type="checkbox"/>
Defect Details						Condition State	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input type="checkbox"/>	4	<input checked="" type="checkbox"/>
B5, B6, B7 & B8 Rocker Bearings located at E1 of S5 Girders. Refer to Sketch 005 (Bearing measurement?s between Rocker & Sole Plates).														
CS4 B8 lower outer attachment bolt & nut has decayed away with moderate corrosion in the hinge pins, also bearing appears to have rotated to its toleran														
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed							
Sub-total \$						_____								
Defect Location and Details (from B2 forms)														
Component Location (Modification/Group/Component/Standard Number						O	/	P5	/	B1	/	43S		
Component Description <u>Bearings</u>						Significance	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input checked="" type="checkbox"/>	4	<input type="checkbox"/>
Defect Details						Condition State	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input checked="" type="checkbox"/>	4	<input type="checkbox"/>
Rocker Bearings located at E2 of S5 Girders. Refer to Sketch 006 (Bearing measurement?s between Rocker & Sole Plates)														
CS3 B1, B2, B3, B4 protective coating failing with signs of meduim corrosion appearing on rocker & sole plates #057. L3 Insp (17/12/2015) has recommend														
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed							
Sub-total \$						_____								
Defect Location and Details (from B2 forms)														
Component Location (Modification/Group/Component/Standard Number						O	/	P1	/	J2	/	11O		
Component Description <u>Joint</u>						Significance	1	<input type="checkbox"/>	2	<input checked="" type="checkbox"/>	3	<input type="checkbox"/>	4	<input type="checkbox"/>
Defect Details						Condition State	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input checked="" type="checkbox"/>	4	<input type="checkbox"/>
CS3 rubber gland in the joint gap showing signs of perishing also a small section of the rubber gland has worked up to the road surface over the pedestrian footway # 063,064,065 (Monitor).														
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed							
Sub-total \$						_____								

Structure Maintenance Schedule						M1		Sheet 7 of 13				
Structure Id <u>7799</u>			Name _____									
Inspection Date <u>09-MAY-2017</u>			Inspection Level 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/>									
Defect Location and Details (from B2 forms)												
Component Location (Modification/Group/Component/Standard Number						O	/	P4	/	J3	/	110
Component Description _____						Joint	Significance	1 <input type="checkbox"/>	2 <input checked="" type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	
Defect Details _____						Condition State	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input checked="" type="checkbox"/>	4 <input type="checkbox"/>		
Steel nosing joint in WS at E2 of Span 5.												
CS3 rubber gland in the joint gap showing signs of moderate perishing also a small section of the rubber gland has worked up above the road surface ove												
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed					
900A3	Traffic management (including TMP)	P/SUM	1	1200	1200	2	N					
500O4	Repair of compression joint seal expansion joints	EA	1	3500	3500	2	N					
								Sub-total \$ <u>4700</u>				
Defect Location and Details (from B2 forms)												
Component Location (Modification/Group/Component/Standard Number						O	/	S1	/	BR1	/	2S
Component Description _____						Bridge Barriers	Significance	1 <input checked="" type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	
Defect Details _____						Condition State	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input checked="" type="checkbox"/>		
L3 Insp required for recommendations for BR1 due to insufficient thread lengths on post base attachments majority are flush with the nuts & have no washers also noted was corrosion appearing on the base plates due to mortar pads cast above the base # 061, 074, 075, 076.												
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed					
								Sub-total \$ _____				
Defect Location and Details (from B2 forms)												
Component Location (Modification/Group/Component/Standard Number						O	/	S1	/	BR2	/	2S
Component Description _____						Bridge Barriers	Significance	1 <input checked="" type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	
Defect Details _____						Condition State	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input checked="" type="checkbox"/>		
L3 Insp required for recommendations for BR2 due to insufficient thread lengths on post base attachments majority are flush with the nuts & have no washers also noted was corrosion appearing on the base plates due to mortar pads cast above the base # 061, 074, 075, 076.												
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed					
								Sub-total \$ _____				

Structure Maintenance Schedule						M1		Sheet 8 of 13	
Structure Id <u>7799</u>				Name _____					
Inspection Date <u>09-MAY-2017</u>				Inspection Level 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/>					
Defect Location and Details (from B2 forms)									
Component Location (Modification/Group/Component/Standard Number				O / S2 / BR1 / 2S					
Component Description <u>Bridge Barriers</u>				Significance		1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>			
Defect Details				Condition State		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/>			
L3 Insp required for recommendations for BR1 due to insufficient thread lengths on post base attachments majority are flush with the nuts & have no washers also noted was corrosion appearing on the base plates due to mortar pads cast above the base # 061, 074, 075, 076.									
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed		
Sub-total \$					_____				
Defect Location and Details (from B2 forms)									
Component Location (Modification/Group/Component/Standard Number				O / S2 / BR2 / 2S					
Component Description <u>Bridge Barriers</u>				Significance		1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>			
Defect Details				Condition State		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/>			
L3 Insp required for recommendations for BR2 due to insufficient thread lengths on post base attachments majority are flush with the nuts & have no washers also noted was corrosion appearing on the base plates due to mortar pads cast above the base # 061, 074, 075, 076.									
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed		
Sub-total \$					_____				
Defect Location and Details (from B2 forms)									
Component Location (Modification/Group/Component/Standard Number				O / S3 / BR1 / 2S					
Component Description <u>Bridge Barriers</u>				Significance		1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>			
Defect Details				Condition State		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/>			
L3 Insp required for recommendations for BR2 due to insufficient thread lengths on post base attachments majority are flush with the nuts & have no washers also noted was corrosion appearing on the base plates due to mortar pads cast above the base # 061, 074, 075, 076.									
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed		
Sub-total \$					_____				

Structure Maintenance Schedule						M1		Sheet 9 of 13	
Structure Id <u>7799</u>				Name _____					
Inspection Date <u>09-MAY-2017</u>				Inspection Level 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/>					
Defect Location and Details (from B2 forms)									
Component Location (Modification/Group/Component/Standard Number				O / S3 / BR2 / 2S					
Component Description <u>Bridge Barriers</u>				Significance		1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>			
Defect Details				Condition State		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/>			
L3 Insp required for recommendations for BR2 due to insufficient thread lengths on post base attachments majority are flush with the nuts & have no washers also noted was corrosion appearing on the base plates due to mortar pads cast above the base # 061, 074, 075, 076.									
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed		
Sub-total \$					_____				
Defect Location and Details (from B2 forms)									
Component Location (Modification/Group/Component/Standard Number				O / S4 / BR1 / 2S					
Component Description <u>Bridge Barriers</u>				Significance		1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>			
Defect Details				Condition State		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/>			
L3 Insp required for recommendations for BR1 due to insufficient thread lengths on post base attachments majority are flush with the nuts & have no washers also noted was corrosion appearing on the base plates due to mortar pads cast above the base # 061, 074, 075, 076.									
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed		
Sub-total \$					_____				
Defect Location and Details (from B2 forms)									
Component Location (Modification/Group/Component/Standard Number				O / S4 / BR2 / 2S					
Component Description <u>Bridge Barriers</u>				Significance		1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>			
Defect Details				Condition State		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/>			
L3 Insp required for recommendations for BR2 due to insufficient thread lengths on post base attachments majority are flush with the nuts & have no washers also noted was corrosion appearing on the base plates due to mortar pads cast above the base # 061, 074, 075, 076.									
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed		
Sub-total \$					_____				

Structure Maintenance Schedule						M1		Sheet 10 of 13	
Structure Id <u>7799</u>				Name _____					
Inspection Date <u>09-MAY-2017</u>				Inspection Level 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/>					
Defect Location and Details (from B2 forms)									
Component Location (Modification/Group/Component/Standard Number				O / S5 / BR1 / 2S					
Component Description <u>Bridge Barriers</u>				Significance		1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>			
Defect Details				Condition State		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/>			
L3 Insp required for recommendations for BR1 due to insufficient thread lengths on post base attachments majority are flush with the nuts & have no washers also noted was corrosion appearing on the base plates due to mortar pads cast above the base # 061, 074, 075, 076.									
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed		
Sub-total \$					_____				
Defect Location and Details (from B2 forms)									
Component Location (Modification/Group/Component/Standard Number				O / S5 / BR2 / 2S					
Component Description <u>Bridge Barriers</u>				Significance		1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>			
Defect Details				Condition State		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/>			
L3 Insp required for recommendations for BR2 due to insufficient thread lengths on post base attachments majority are flush with the nuts & have no washers also noted was corrosion appearing on the base plates due to mortar pads cast above the base # 061, 074, 075, 076.									
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed		
Sub-total \$					_____				
Defect Location and Details (from B2 forms)									
Component Location (Modification/Group/Component/Standard Number				O / S6 / BR1 / 2S					
Component Description <u>Bridge Barriers</u>				Significance		1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>			
Defect Details				Condition State		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/>			
L3 Insp required for recommendations for BR1 due to insufficient thread lengths on post base attachments majority are flush with the nuts & have no washers also noted was corrosion appearing on the base plates due to mortar pads cast above the base # 061, 074, 075, 076.									
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed		
Sub-total \$					_____				

Structure Maintenance Schedule						M1		Sheet 11 of 13						
Structure Id <u>7799</u>			Name _____											
Inspection Date <u>09-MAY-2017</u>			Inspection Level 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/>											
Defect Location and Details (from B2 forms)														
Component Location (Modification/Group/Component/Standard Number						O	/	S6	/	BR2	/	2S		
Component Description <u>Bridge Barriers</u>						Significance	1	<input checked="" type="checkbox"/>	2	<input type="checkbox"/>	3	<input type="checkbox"/>	4	<input type="checkbox"/>
Defect Details						Condition State	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input type="checkbox"/>	4	<input checked="" type="checkbox"/>
L3 Insp required for recommendations for BR2 due to insufficient thread lengths on post base attachments majority are flush with the nuts & have no washers also noted was corrosion appearing on the base plates due to mortar pads cast above the base # 061, 074, 075, 076.														
Activity No	Description					Unit	Quantity	Unit Rate	Amount	Priority	Completed			
Sub-total \$										_____				
Defect Location and Details (from B2 forms)														
Component Location (Modification/Group/Component/Standard Number						O	/	S2	/	D1	/	20C		
Component Description <u>Deck</u>						Significance	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input checked="" type="checkbox"/>	4	<input type="checkbox"/>
Defect Details						Condition State	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input checked="" type="checkbox"/>	4	<input type="checkbox"/>
CS3 Some moderate spalls with exposed rusty reo appearing under soffit of the finger joint at E2 of the deck in bays 2 & 4 #024,025. Rusty reo requires treating.														
Activity No	Description					Unit	Quantity	Unit Rate	Amount	Priority	Completed			
100S3	Clean and paint steelwork					L/SUM	1	1500	1500	3	N			
945A4	Access using Elevated Work Platform (EWP)					P/SUM	1	3500	3500	3	N			
900E3	Traffic management (including Traffic Management Plan)					P/SUM	1	1200	1200	3	N			
Sub-total \$										6200				
Defect Location and Details (from B2 forms)														
Component Location (Modification/Group/Component/Standard Number						O	/	S5	/	D1	/	20C		
Component Description <u>Deck</u>						Significance	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input checked="" type="checkbox"/>	4	<input type="checkbox"/>
Defect Details						Condition State	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input checked="" type="checkbox"/>	4	<input type="checkbox"/>
CS3 Some moderate spalls with exposed rusty reo appearing under soffit of the finger joint at E2 of the deck in bays 1,2,3,4 & 5 refer to #024,025. Rusty reo requires treating.														
Activity No	Description					Unit	Quantity	Unit Rate	Amount	Priority	Completed			
100S3	Clean and paint steelwork					L/SUM	1	2500	2500	3	N			
945A1	Access from deck (UBIU)					P/SUM	1	3500	3500	3	N			
900E3	Traffic management (including Traffic Management Plan)					P/SUM	1	1200	1200	3	N			
Sub-total \$										7200				

Structure Maintenance Schedule						M1		Sheet 12 of 13	
Structure Id <u>7799</u>			Name _____						
Inspection Date <u>09-MAY-2017</u>			Inspection Level 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/>						
Defect Location and Details (from B2 forms)									
Component Location (Modification/Group/Component/Standard Number						ST	/	S3	/
Component Description _____						Girders	Significance	1 <input type="checkbox"/>	2 <input type="checkbox"/>
Defect Details _____						Condition State	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input checked="" type="checkbox"/>
CS3 G2 protective coating starting to fail at E2 of the tension bar refer to #034,035,036. Tension bars require cleaning & treating.									
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed		
100S3	Clean and paint steelwork	L/SUM	1	1200	1200	3	N		
945A1	Access from deck (UBIU)	P/SUM	1	3500	3500	3	N		
900E3	Traffic management (including Traffic Management Plan)	P/SUM	1	1200	1200	3	N		
Sub-total \$					5900				
Defect Location and Details (from B2 forms)									
Component Location (Modification/Group/Component/Standard Number						ST	/	S3	/
Component Description _____						Girders	Significance	1 <input type="checkbox"/>	2 <input type="checkbox"/>
Defect Details _____						Condition State	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input checked="" type="checkbox"/>
CS3 G3 protective coating starting to fail at E2 of the tension bar refer to #034,035,036. Tension bars require cleaning & treating.									
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed		
100S3	Clean and paint steelwork	L/SUM	1	1200	1200	3	N		
Sub-total \$					1200				
Defect Location and Details (from B2 forms)									
Component Location (Modification/Group/Component/Standard Number						ST	/	S3	/
Component Description _____						Girders	Significance	1 <input type="checkbox"/>	2 <input type="checkbox"/>
Defect Details _____						Condition State	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input checked="" type="checkbox"/>
CS3 G4 protective coating starting to fail at E2 of the tension bar refer to #034,035,036. Tension bars require cleaning & treating.									
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed		
100S3	Clean and paint steelwork	L/SUM	1	1200	1200	3	N		
Sub-total \$					1200				

Structure Maintenance Schedule				M1		Sheet 13 of 13	
Structure Id <u>7799</u>		Name _____					
Inspection Date <u>09-MAY-2017</u>		Inspection Level 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/>					
Defect Location and Details (from B2 forms)							
Component Location (Modification/Group/Component/Standard Number				ST	/	S4	/
Girders				G4	/	22S	
Component Description _____				Significance	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
Defect Details _____				Condition State	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input checked="" type="checkbox"/>
CS3 G4 protective coating starting to fail at MS to E2 of the tension bar refer to #034,035,036. Tension bars require cleaning & treating.							
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed
100S3	Clean and paint steelwork	L/SUM	1	1200	1200	3	N
945A1	Access from deck (UBIU)	P/SUM	1	3500	3500	3	N
900E3	Traffic management (including Traffic Management Plan)	P/SUM	1	1200	1200	3	N
Sub-total \$					5900		

Appendix C Inspection Report – Barron River Inspection BIS ID 7799: Defect Repair options Report #1 (RoadTek, May 2017)

Released under RTI - DTMR

Inspection Report

Barron River Inspection BIS ID 7799

Defect Repair Options Report # 1

May, 2017

Inspection Details

Job Name:	Barron River
Job Number:	N/A
Region:	Far North
Road:	Gold Coast Highway (Helensvale – Southport) – Road 11A
Administrator:	TMR – South Coast
Administrator Contact:	NR @tmr.qld.gov.au
Contractor:	TMR – RoadTek
Contractor Contact:	NR @tmr.qld.gov.au

BIS Number	7799
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Inspection Date	29 May 2017
Inspection Location	Desk Top Review
Inspection Team	NR @tmr.qld.gov.au NR @tmr.qld.gov.au

Items Inspected	Bearing Inspection
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Report Approval:

NR

NR

Principal Manager (Structures Management Services)

Introduction

On the 29th May 2017, a desk top review of the previous Level 2 inspection of the Barron River Bridge on the Cairns to Kuranda Road was undertaken.

The bridge structure consists of a steel girder superstructure with a reinforced concrete deck.

The Level 2 inspection report had identified the following defects:

- A number of the bearings were showing signs of distress;
- Joint sealant at the expansion joints have failed;
- The paint system is showing signs of breaking down;
- Drainage catch tray at the expansion joints is too short;

Inspection Review

The purpose of the inspection review was to determine the severity of the defects found in the Level 2 inspection and determine a suitable course of action to repair the defects.

Bearings

Abutment Expansion Bearing - Defects

The abutment bearings are situated at locations 1 and 11, refer to Figure 1. The bearings consist of a rocker bearing, refer to Figure 2. The main defects found at the abutments was the corrosion of the top 1.5" British Standard Whitworth (B.S.W) bolt, refer to Figure 3. There is pitting corrosion occurring between the sole plate and the lower rocker surface, refer to Figure 4.

The bearing lower contact surfaces were measured to determine the extent of the range of movement available. Figure 5 shows the bearing is positioned centrally about the abutment. There are no concerns with the range of movement of the abutment bearings.

Abutment Expansion Bearing – Consequence of Undertaking the Repair

The top connecting bolt could fail in shear. This could lead to the rocker bearing being displaced, which could lead to the closure of the structure for an extended period.

Abutment Expansion Bearing -- Repairs Required

It is recommended the following repair works are undertaken.

- Replace the 1.5" BSW bolt with a new 1.5" BSW bolt.
- Abrasive blast the entire bearing, but in particular the exposed contact surfaces. Then patch paint with a zinc rich paint.
- Apply grease to the contact surfaces between the lower and upper contact surfaces.

Pier Fixed Bearing - Defects

The pier fixed bearings are situated at locations 2, 5, 6 and 10, refer to Figure 1. The bearings consist of a fixed base with a hinge over the top of the bearing to allow rotation of the girder. The main defects found at the pier bearings was the corrosion of the lower 1.5" holding down nut, refer to Figure 6 and Figure 7. The bearings have minor surface corrosion of the bearing frame, refer to Figure 8.

Pier Fixed Bearing – Consequence of Undertaking the Repair

There is only a minor consequence to the structural performance if the holding down nut is lost. If refurbishment work is being undertaken on other bearings, then the nuts should be replaced.

Pier Fixed Bearing – Repairs Required

It is recommended the following repair works are undertaken.

- Replace the 1.5" corroded nut with a new 1.5" nut.
- Abrasive blast the bearing and patch paint with a zinc rich paint.
- Apply grease to the upper contact surfaces.

Fixed Hinge Bearing - Defects

The fixed hinge bearings are situated at locations 3 and 9, refer to Figure 1. The bearings consist of a curved upper plate which allows the bridge drop-in span to rotate. The main defect with this bearing is corrosion of the holding down bolt and the corrosion of the contact surfaces between the curved plate and the sole plate, refer to Figure 9, Figure 10 and Figure 11.

The bearing lower contact surfaces were measured to determine the extent of the range of movement available. Figure 12 and Figure 13 shows the bearing is positioned centrally about the fixed hinge. There are no concerns with the range of movement of the bearings.

Fixed Hinge Bearing – Consequence of Undertaking the Repair

If the bolt which connects the cantilever span to the drop-in span was to fail, then the fixed end of the drop-in span would not be restraint which could lead to the expansion end over rotating and collapse of the drop-in span. This would result in the closure of the structure for months.

Fixed Hinge Bearing – Repairs Required

It is recommended the following repair works are undertaken.

- Replace the corroded 1.25" B.S.W bolt and nut with a new 1.25" B.S.W bolt and nut.
- Abrasive blast the bearing and patch paint with a zinc rich paint.
- Apply grease to the contact surfaces.

Expansion Hinge Bearing - Defects

The expansion hinge bearings are situated at locations 4 and 8, refer to Figure 1. The bearings consist of a rocker bearing which allows the bridge drop-in span to rotate and thermally expand, refer to Figure 14. The main pin bolt which connects the rocker to the structure is showing signs of corrosion, refer to Figure 15. The bearing contact surfaces have pitting corrosion and debris around the bearing, refer to Figure 16.

The bearing lower contact surfaces were measured to determine the extent of the range of movement available. Figure 16 and Figure 17 shows the span 2 bearing is leaning towards the Abutment A. Figure 18 and Figure 19 shows the span 2 bearing is leaning towards the Abutment B.

As the bridge was inspected on a cooler morning, there is a concern the bearing travel limit will be reached if the structure cools beyond the range of the bearings.

The cause of the corrosion of the outside bearings can be attributed to the fact that the drainage does not extend beyond the structure, refer to Figure 20. The water discharges onto the outside bearing increasing the corrosion of the bearing.

Expansion Hinge Bearing – Consequence of Undertaking the Repair

If the bearings were to over rotate this could lead to the collapse of the drop-in span. This would result in the closure of the structure for months.

Expansion Hinge Bearing – Repairs Required

It is recommended the following repair works are undertaken.

- Fabricate a new replica rocker bearing where the range of rotation of the lower curved surface can be increased. Figure 21 shows the typical detail of the increase of the lower curved surface.
- Jack up the suspended span and replace existing bearing with a new replica bearing.
- Replace the corroded B.S.W bolts and nuts with a new metric EN 14399 bolts and nuts.
- Abrasive blast the bearing contact areas and patch paint with a zinc rich paint.
- Apply grease to the contact surfaces.
- Lower the bridge onto the new bearings.

For the above operation the bridge will need to be closed to all traffic while the bearings are being replaced.

Pier Expansion Bearing - Defects

The pier expansion hinge bearings are situated at location 7, refer to Figure 1. The bearings consist of a rocker bearing, refer to Figure 22. The bearing lower contact surfaces were measured to determine the extent of the range of movement available. Figure 23 shows the bearing is leaning towards the Abutment A. As the bridge was inspected on a cooler morning, there is a concern the bearing travel limit will be reached if the structure cools beyond the range of the bearings.

The rotation of the bearing is likely to have occurred when the bridge was originally constructed.

Pier Expansion Bearing – Consequence of Undertaking the Repair

If the bearings at this pier were to over rotate this could lead to the collapse of the superstructure. This would result in the closure of the structure for months.

Pier Expansion Bearing – Repairs Required

It is recommended the following repair works are undertaken.

- Replace the corroded 1.25” B.S.W bolt and nut with a new 1.25” B.S.W bolt and nut.
- Abrasive blast the bearing and patch paint with a zinc rich paint.
- Apply grease to the contact surfaces.
- Monitor the movement of the pier 4 bearings over a period of 6 months to determine the extent of the bearing movement.

Joints

Fixed Joints - Defects

The rubber gland which is located within the steel angle nosing has reached the end of their design life, refer to Figure 24.

Fixed Joints – Consequence of Undertaking the Repair

The performance of the joints has no impact on the structural performance of the structure. The defect only effects the long term durability of the structure.

Fixed Joint – Repairs Required

It is recommended the following repair works are undertaken.

- Remove the existing rubber gland.
- Abrasive blast the steel angle;
- Install a foam backing rod.
- Install Dow Corning 902 RCS or approved equivalent proprietary expansion joint system.

Abutment Joints - Defects

The steel plate which spans over the abutment has a tendency to work loose and rattle, refer to Figure 25 and Figure 26. The plate rattling has resulted in the concrete deck developing a drummy area on the trailing edge of the plate.

Abutment Joints – Consequence of Undertaking the Repair

The performance of the joints has no impact on the structural performance of the structure. The defect only effects the long term durability of the structure.

Abutment Joints – Repairs Required

The desk top review was not able to clearly define the extent of the defect. It is recommended that a Level 3 inspection of the abutment joint needs to be undertaken, to determine the following.

- Cause of the defect;
- Is joint rehabilitation possible;
- Is joint replacement required?

Painting

Painting - Defects

The steelwork components are showing signs that the current paint system is no longer protecting the structure.

Painting – Consequence of Undertaking the Repair

Based on the current condition of the paint. The paint system has no structural performance impacts on the structure.

However, if the paint system is permitted to degrade, the paint system will not provide protection to the structure. This could affect the long term durability and structural performance of the structure. The degradation of the structure over time would lead to load restrictions being applied to the structure.

Painting – Repairs Required

It is recommended the following repair works are undertaken.

- Carry out a Level 3 inspection of the existing paint system to determine the condition of the paint. This will lead to the development of a possible options analysis for the structure.

Recommendation

This document outlines defects outlined in the Level 2 report. The recommended repairs outline in the report are a basic outline of the works to be undertaken. If works are to be undertaken, more comprehensive repair procedures need to be developed.

From an asset management priority perspective, it is recommended the following works are prioritised.

- Replace the Drop-in span expansion hinges bearings;
- Repair the drainage above the Drop-in span expansion hinges bearings;
- Monitor the Pier 4 expansion hinge bearings;
- Repair the Drop-in span fixed hinge bearings;
- Repair the abutment expansion bearings;
- Assess the abutment joints;
- Repair the fixed joints;
- Replace the fixed bearing hold down nuts;
- Assess the existing paint for the development of a possible options analysis.

A Level 3 inspection is required to confirm all the dimensions which are based on the developed repair procedures.

Photos

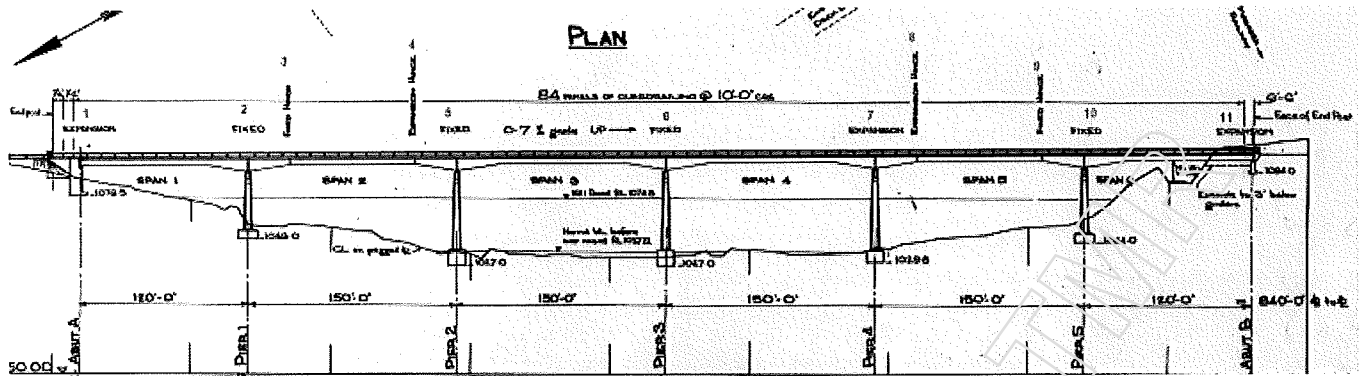


Figure 1 View of the bridge articulation



Figure 2 View of the typical abutment A bearing



Figure 3 View of the corroded bolt

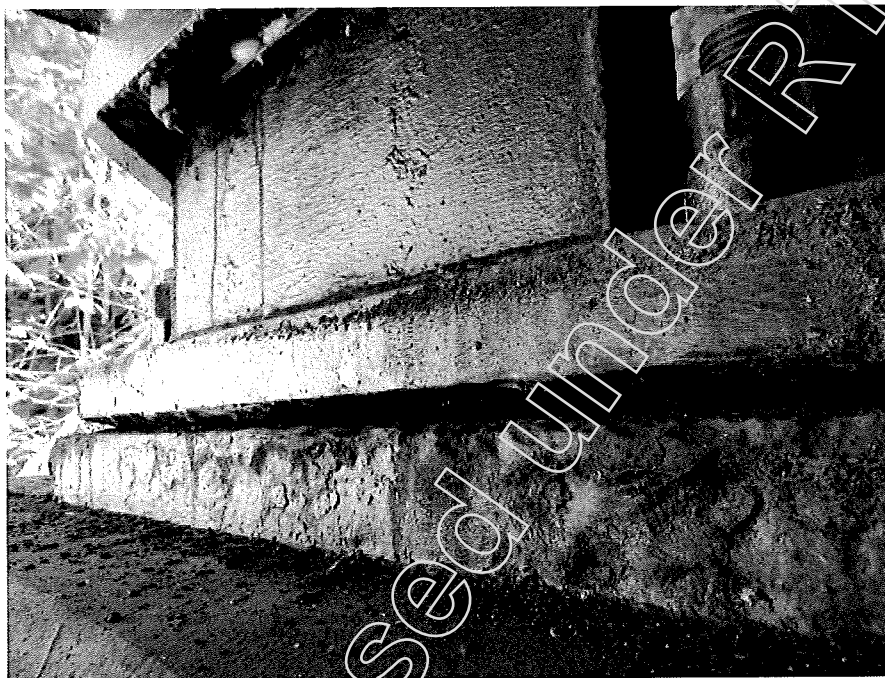
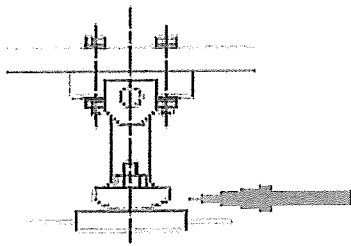


Figure 4 View of the corrosion between the rocker surface and the sole plate



1	2
Chainage →	
4	3

Time 9.00am

Temp 24%

A1 Abutment - Gap between Rocker & Soul Plate				
Location	1	2	3	4
B1	9mm	12mm	13mm	8mm
B2	9mm	13mm	12mm	11mm
B3	8mm	8mm	12mm	12mm
B4	9mm	14mm	15mm	8mm

Figure 5 View of the movements at the abutment A1

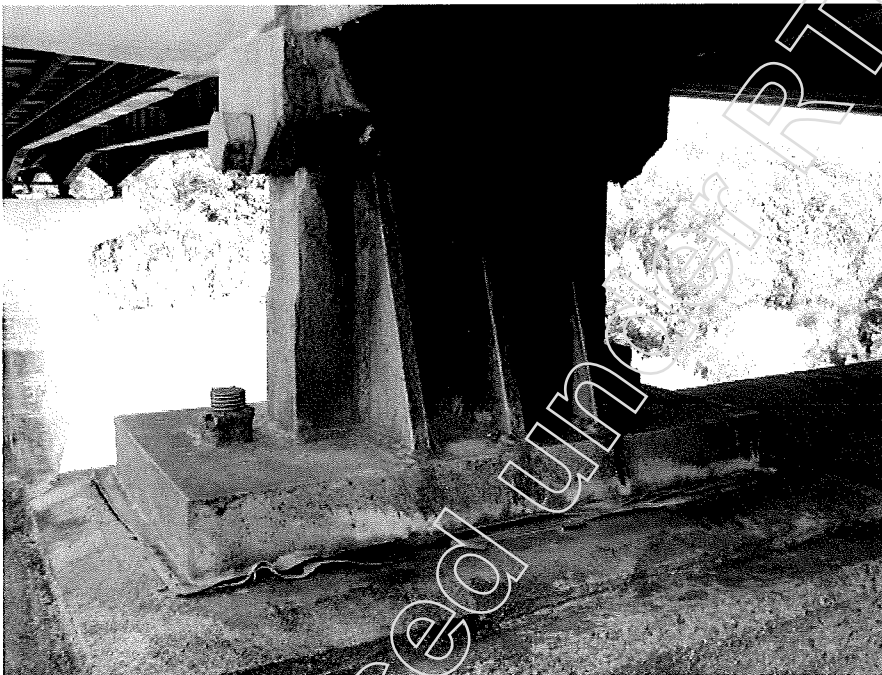


Figure 6 View of the corroded nut on the Pier 2 fixed bearing



Figure 7 View of the corroded nut on the Pier 3 fixed bearing



Figure 8 View of the corrosion on the Pier 3 fixed bearing



Figure 9 View of Span 2 Fixed Hinge bearing



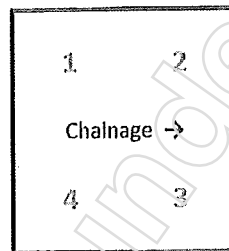
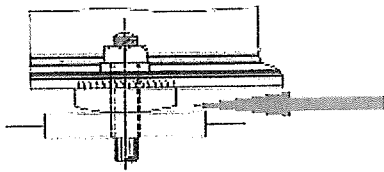
Figure 10 View of Span 2 Fixed Hinge bearing



Figure 11 View of the corrosion on the Span 5 Fixed Hinge bearing

Sketch 002

Date 09/05/17

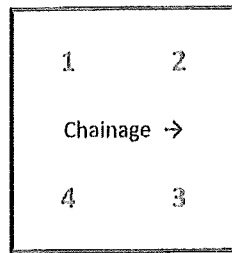
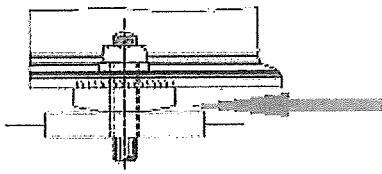


Time 9.00am

Temp 24%

P1 Span 2 G E1 - Gap between Rocker & Soul Plate				
Location	1	2	3	4
B1	15mm	13mm	12mm	15mm
B2	13mm	13mm	12mm	12mm
B3	12mm	12mm	12mm	13mm
B4	17mm	14mm	13mm	15mm

Figure 12 View of Span 2 Fixed Hinge bearing movements



Time 9.00am

Temp 24%

P5 Span5 G E2 - Gap between Rocker & Soul Plate				
Location	1	2	3	4
B1	14mm	13mm	14mm	12mm
B2	13mm	13mm	12mm	12mm
B3	10mm	14mm	13mm	14mm
B4	11mm	15mm	13mm	14mm

Figure 13 View of the Span 5 Fixed Hinge bearing movements

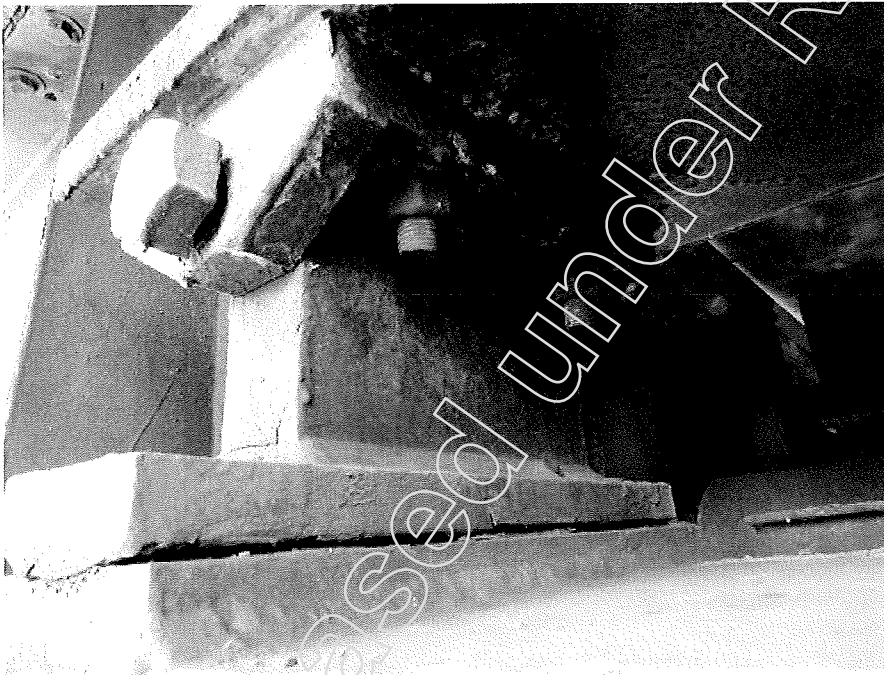


Figure 14 View of the Span 2 expansion hinge (dishing of sole plate ?)

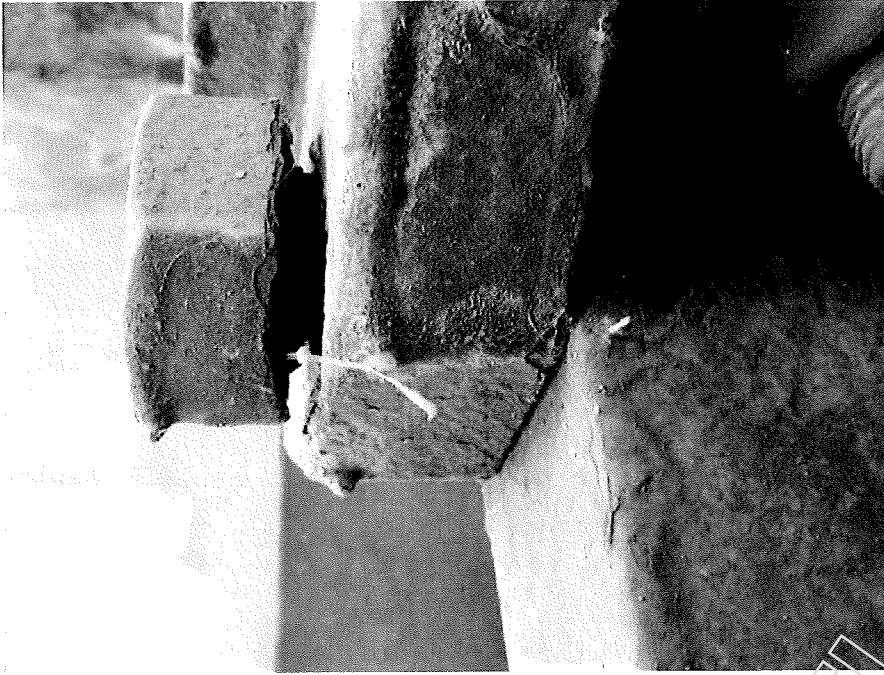


Figure 15 View of the corroded top bolt

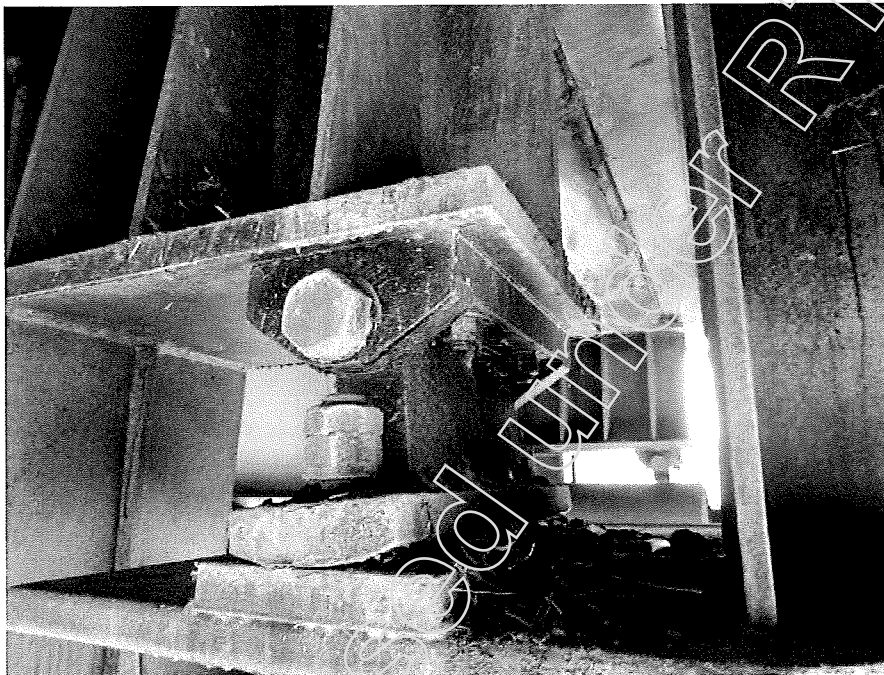
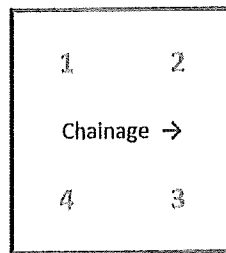
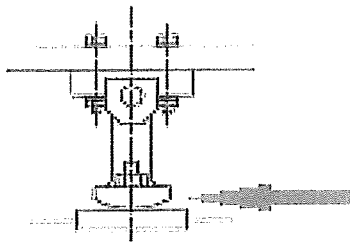


Figure 16 View of span 2 expansion bearing



Time 9.00am

Temp 24%

P2 Span 2 G E2 - Gap between Rocker & Soutl Plate				
Location	1	2	3	4
B1	5mm	14mm	14mm	6mm
B2	5mm	16mm	17mm	5mm
B3	5mm	15mm	15mm	4mm
B4	8mm	12mm	14mm	5mm

Figure 17 View of the Span 2 expansion movements

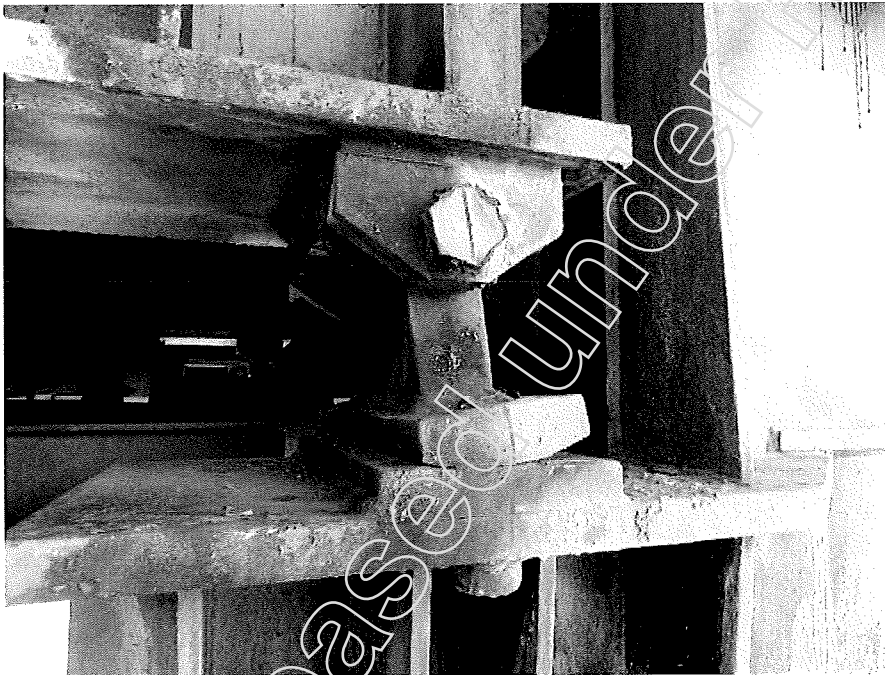
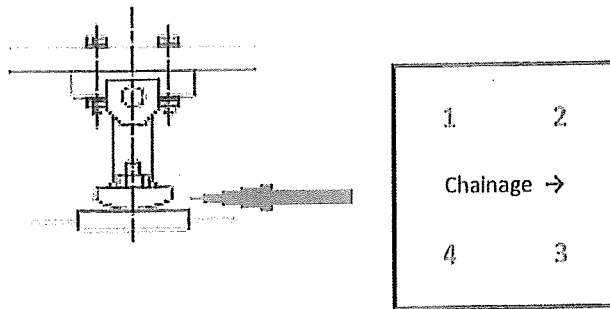


Figure 18 View of the corrosion on the Span 5 expansion bearing



Time 9.00am

Temp 24%

P4 Span 5 G E1 - Gap between Rocker & Soul Plate				
Location	1	2	3	4
B1	19mm	2mm	2mm	17mm
B2	15mm	7mm	8mm	16mm
B3	16mm	6mm	5mm	17mm
B4	13mm	6mm	8mm	10mm

Figure 19 View of the span 5 expansion bearing movements



Figure 20 View of drainage which discharges onto the bearings

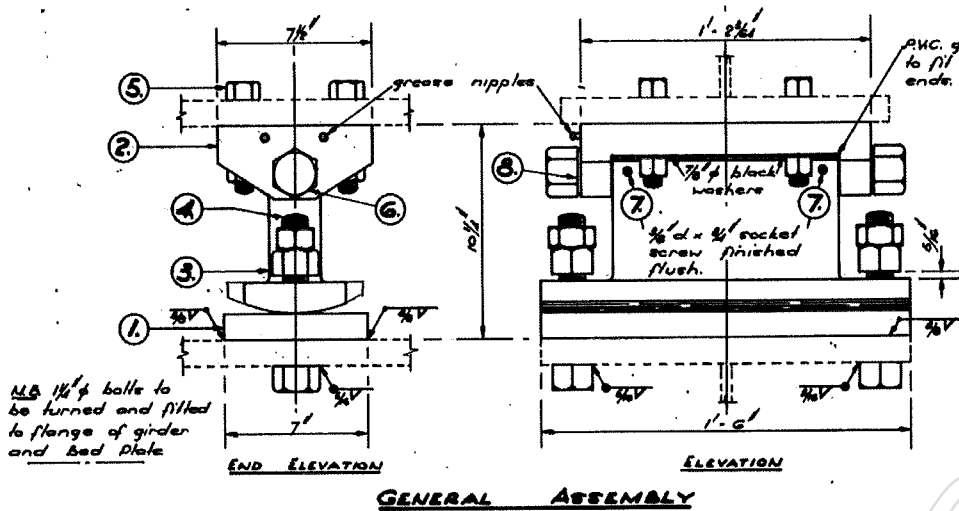
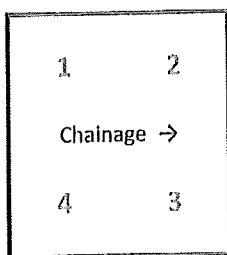
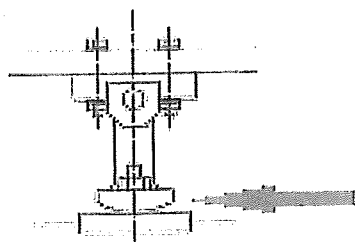


Figure 21 View of extension of the lower curved surface



Figure 22 View of the corrosion on the Pier 4 expansion bearing



Time 9.00am

Temp 24%

Pier 4 - Gap between Rocker & Soul Plate				
Location	1	2	3	4
B1	2mm	16mm	18mm	3mm
B2	2mm	16mm	14mm	2mm
B3	3mm	15mm	13mm	3mm
B4	2mm	15mm	14mm	3mm

Figure 23 View of the bearing measurement on the Pier 4 bearings

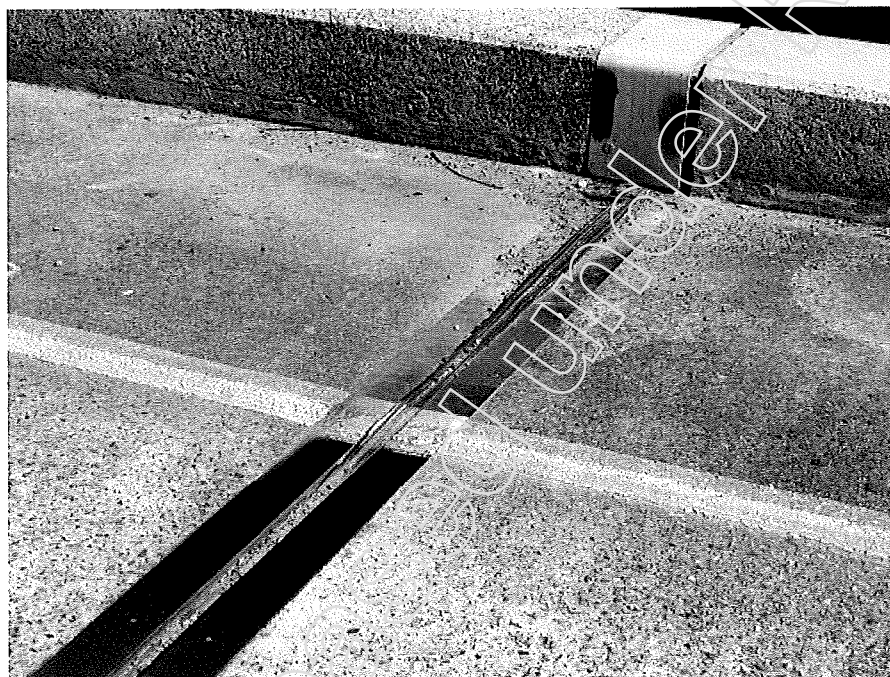


Figure 24 View of the fixed pier joint

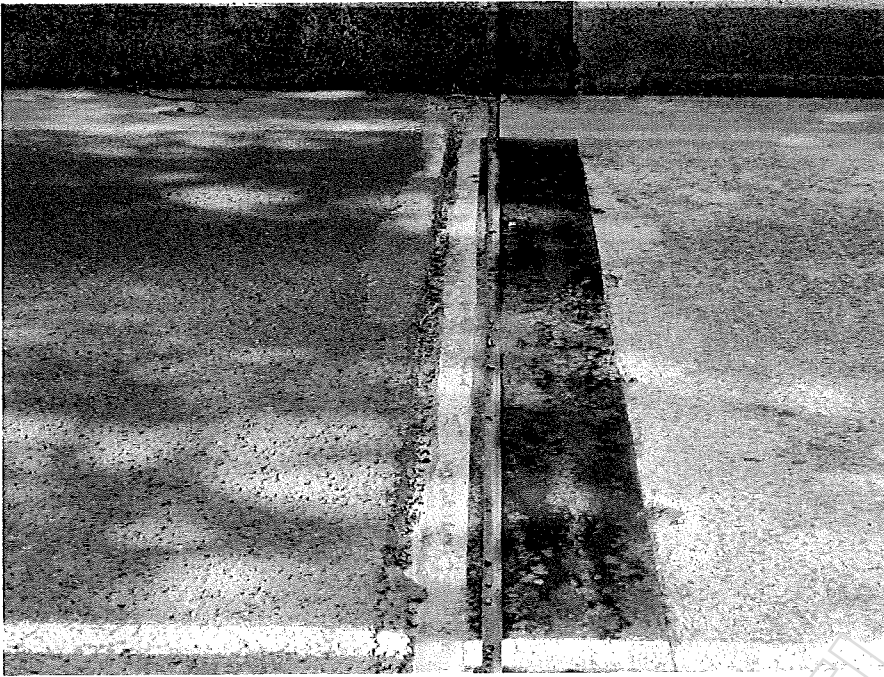


Figure 25 View of the abutment A expansion plate

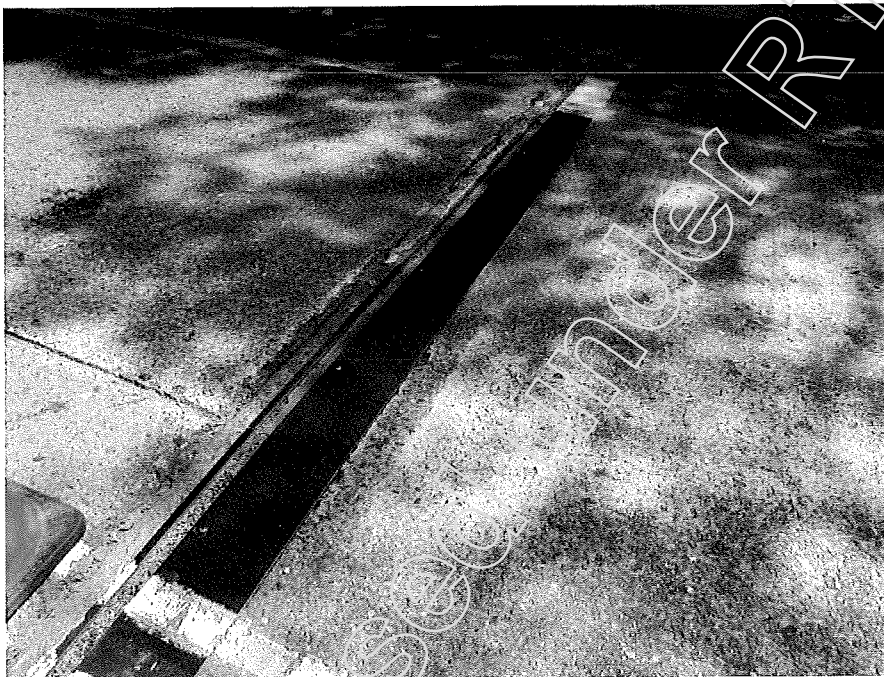


Figure 26 View of the abutment B expansion plate

Appendix D Miscellaneous BIS ID 7799

Barron River Bridge: Material Properties

Material	Property																																						
Concrete	21 MPa (3,000 psi) uno																																						
Reinforcement	f _{sy} = 230 MPa (Structural Grade A81)																																						
Structural steel	No information of the drawings. Most steel was supplied by the Commissioner Specification provides the following:																																						
	Square edge flats Girder flats Rolled steel beams Rolled Steel angles	Australian Standard A1(1956) <table><tr><th>Material</th><th>Nominal thickness in.</th><th>Ultimate tensile stress tons/sq. in.</th><th>Yield stress min. tons/sq. in.</th><th>Elongation min. per cent</th></tr><tr><td></td><td></td><td>MPa</td><td>MPa</td><td>Test piece</td></tr><tr><td></td><td></td><td></td><td></td><td>A B F</td></tr><tr><td></td><td>Below 1/4</td><td>Bend</td><td>Tests only</td><td>required.</td></tr><tr><td rowspan="4">Rolled sections Flat bars Round and square bars (other than rivet bars)</td><td>1/4 up to but excluding 3/8</td><td>28-33</td><td>15-25</td><td>20 16 ---</td></tr><tr><td>3/8 up to and including 1/2</td><td>386 - 455</td><td>207 - 345</td><td>20 20 ---</td></tr><tr><td></td><td>28-33</td><td>15-25</td><td>20 20 ---</td></tr><tr><td>Over 1/2</td><td>28-33</td><td>14.75</td><td>20 20 24</td></tr></table>	Material	Nominal thickness in.	Ultimate tensile stress tons/sq. in.	Yield stress min. tons/sq. in.	Elongation min. per cent			MPa	MPa	Test piece					A B F		Below 1/4	Bend	Tests only	required.	Rolled sections Flat bars Round and square bars (other than rivet bars)	1/4 up to but excluding 3/8	28-33	15-25	20 16 ---	3/8 up to and including 1/2	386 - 455	207 - 345	20 20 ---		28-33	15-25	20 20 ---	Over 1/2	28-33	14.75	20 20 24
	Material	Nominal thickness in.	Ultimate tensile stress tons/sq. in.	Yield stress min. tons/sq. in.	Elongation min. per cent																																		
			MPa	MPa	Test piece																																		
					A B F																																		
	Below 1/4	Bend	Tests only	required.																																			
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	3/8 up to and including 1/2	386 - 455	207 - 345	20 20 ---																																			
		28-33	15-25	20 20 ---																																			
	Over 1/2	28-33	14.75	20 20 24																																			
	or British Standard Specification BS 15 (1959)																																						
	Universal beams	BS 15 (1959)																																					
	Plates (for girders)	Australian Standard A33 (1937) for Class D Plate 28 tons/in ² < UTS < 33 tons/in ² or 386 MPa < UTS < 455 MPa 20% elongation Yield strength not less than 50% UTS Sulphur and phosphorus: both <0.06% No other chemical requirements or British Standard Specification BS 15 (1959)																																					
Bearing Steel	Cast Steel or	Australian Standard Specification E.7-1938 for Grade B Cast Steel. Forged Steel complying with SAA Specification E.17-44 for Class L Forgings may be used in lieu of Structural Steel or Cast Steel for Expansion bearing Sole Plate.																																					
	Structural Steel	Structural steel produced by the acid or basic Open Hearth process complying with Australian Standard Specification A1 1956 or British Standard Specification BSS 15 – 1948.																																					

Strength Assessment Ratio (SAR)

Assessment ratios such as the Strength Assessment Ratio (SAR) are defined in the Tier 1 Bridge Heavy Load Assessment Criteria. An extract from the T1BHLAC follows. For further information refer to the T1BHLAC:

For the purposes of Tier 1 assessments in accordance with this Brief, the general strength equation for bridges is expressed as follows:

$$\phi R_u \geq \gamma_G G + \gamma_{GS} G_S + \gamma_{Q_{RV}} (1 + \alpha_{RV}) Q_{RV} + \sum_{i=1}^n \gamma_{Q_{AV}} (1 + \alpha_{AV_i}) AVF_{AV_i} Q_{AV_i}$$

The general strength equation can be rearranged to define the following Assessment Ratios:

a) Strength Assessment Ratio (SAR)

$$\begin{aligned} SAR &= \frac{\phi R_u}{(\gamma_G G + \gamma_{GS} G_S) + \gamma_{Q_{RV}} (1 + \alpha_{RV}) Q_{RV} + \sum_{i=1}^n \gamma_{Q_{AV}} (1 + \alpha_{AV_i}) AVF_{AV_i} Q_{AV_i}} \\ &= \frac{\phi R_u}{G^* + Q_{RV}^* + Q_{AV}^*} \\ &= \frac{\text{ULS capacity}}{\text{Total ULS load effects}} \end{aligned}$$

b) Equivalence Ratio Traffic (ERT)

$$\begin{aligned} ERT &= \frac{\phi R_u - (\gamma_G G + \gamma_{GS} G_S)}{\gamma_{Q_{RV}} (1 + \alpha_{RV}) Q_{RV} + \sum_{i=1}^n \gamma_{Q_{AV}} (1 + \alpha_{AV_i}) AVF_{AV_i} Q_{AV_i}} \\ &= \frac{\phi R_u - G^*}{Q_{RV}^* + Q_{AV}^*} \\ &= \frac{\text{Available ULS bridge capacity for live load effects}}{\text{ULS loading applied by Reference and Accompanying Vehicles}} \end{aligned}$$

c) Equivalence Ratio Bridge (ERB)

$$\begin{aligned} ERB &= \frac{\phi R_u - (\gamma_G G + \gamma_{GS} G_S) - \sum_{i=1}^n \gamma_{Q_{AV}} (1 + \alpha_{AV_i}) AVF_{AV_i} Q_{AV_i}}{\gamma_{Q_{RV}} (1 + \alpha_{RV}) Q_{RV}} \\ &= \frac{\phi R_u - G^* - Q_{AV}^*}{Q_{RV}^*} \\ &= \frac{\text{Available ULS bridge capacity for Reference Vehicle effects}}{\text{ULS loading applied by Reference Vehicle}} \end{aligned}$$

The Assessment Ratios are calculated at the component level for a given loading scenario. The minimum values of the Assessment Ratios correspond to the weakest link in the bridge and are therefore of prime interest.

Assessment Ratios can be recorded for both a particular location and effect of interest or for groups of components incorporating data from a range of locations, components and effects. The Assessment Ratio reported for groups of components are the minimum Assessment Ratios for the grouping.

Definition of Fretting

Fretting damage in steel can be identified by the presence of a pitted surface and fine 'red' iron oxide dust resembling cocoa powder. Strictly this debris is not 'rust' as its production requires no water. The particles are much harder than the steel surfaces in contact, so abrasive wear is inevitable; however, particulates are not required to initiate fret.

The fundamental way to prevent fretting is to design for no relative motion of the surfaces at the contact. Surface roughness plays an important role as fretting normally occurs by the contact of the asperities of the mating surfaces. Lubricants are often employed to mitigate fretting because they reduce friction and inhibit oxidation (<https://en.wikipedia.org/wiki/Fretting>).

Assessment of Short-term Risks and Investigation Scope

Barron River Bridge (7799)

Version No: 0.2
Date: 30/11/2018

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TMR OnQ Template Version 3.0 (06/09/2017)

Project Summary

Region/District	North Queensland Region Far North District
Road Name/Location/Local Government	32A Kennedy Highway Bridge over Barron River at Kuranda Mareeba Shire Council
Program	Structures Rehabilitation Program (Element 19)
Project Number	364373
Project Description	Barron River Bridge Investigation

Document Control

Prepared by:	NR
Title:	Contract Engineer
Branch:	Engineering & Technology Structures
Division/Region:	Infrastructure Management & Delivery
Location:	313 Adelaide Street, Brisbane
Version no:	0.2
Version date:	30/11/2018
Status:	Approved Document
DMS ref. no:	450/08757
File/Doc no:	

Version history

Version no.	Date	Changed by	Nature of amendment
	12 Oct 2018	NR	Initial draft "Assessment of Short-term risks"
	16 Oct 2018		Initial draft of combined document.
0.1	23 Nov 2018		Final draft
0.2	30 Nov 2018		Approved document

Endorsement and Approval

Customer

I accept that this project has been completed and handed over to my organisation:

Name	<input type="text" value="NR"/>		
Position	Manager (Delivery & Operations)		
Signature		Date	
Comments			

The following officers have **endorsed** this document:

Name	<input type="text" value="NR"/>		
Position	Principal Engineer (Civil)		
Signature		Date	

Name	<input type="text" value="NR"/>		
Position	Engineer (Civil)		
Signature		Date	

Name	<input type="text" value="NR"/>		
Position	Contract Engineer		
Signature		Date	

Sponsor

This project has been completed and this report hands it over to the project customer:

Name	<input type="text" value="NR"/>		
Position	Deputy Chief Engineer (Structures)		
Signature		Date	
Comments			

The following officers have **endorsed** this document:

Name	<input type="text" value="NR"/>		
Position	Director, Structures Management		
Signature		Date	

Name	<input type="text" value="NR"/>		
Position	Manager, Structures Stewardship		
Signature		Date	

Name	<input type="text" value="NR"/>		
Position	Manager, Structures Stewardship		
Signature		Date	

Project Manager & Technical Lead:

Name	<input type="text" value="NR"/>		
Position	Contract Engineer		
Signature		Date	

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1. Purpose of this document

The purpose of this document is to hand over the completed deliverables to the customer with details of the risks and the recommendations for investigating and managing the risks associated with the Barron River Bridge at Kuranda.

The document was actioned following a review and a Skype meeting between Structures and Far North District on 6 September 2018 to discuss the draft "Structure Management Plan – Barron River Bridge (7799)", which was subsequently renamed to the Life Extension Investigation – Interim Report – Barron River Bridge (7799) when issued as an approved document in November 2018.

2. Governance

2.1 Key Roles

The key project management roles were:

Project Customer	NR	Manager (Delivery & Operations)
Project Sponsor	NR	Deputy Chief Engineer (Structures)
Project Manager	NR	Contract Engineer
Advisory Group	NR	

2.2 Reviews and reporting

The assessment of the short-term risks and the recommendations were reviewed by members of TMR's Engineering Technology | Structures Branch and Far North District. The report was updated after consideration of the comments.

The draft report was discussed during a Skype meeting between Structures and Far North District on 24 October 2018. The report has been updated to reflect the discussion at this meeting. At this meeting it was agreed that an initial investigation be undertaken subject to an approval of the Project Management Plan for the initial investigations and budget. An initial budget of \$280,000 was discussed.

2.3 Related documents

Documents related to the Barron River Bridge at Kuranda include:

- TMR Structures, November 2018, "Assessment of Short-term Risks and Investigation Scope – Barron River Bridge (7799)" – this document
- TMR Structures Management, November 2018, "Life Extension Interim Report – Barron River Bridge (7799)". Note: The initial 29 June 2018 draft of this report titled "Structure Management Plan – Barron River Bridge (7799)". It was renamed at the time of issue.

- RoadTek, May 2017, “Inspection Report – Barron River Inspection BIS ID 7799: Defect Repair options Report #1”¹
- RoadTek, May 2017, “Level 2 Inspection”²
- TMR BCM&AM, Dec 2015, “Level 3 Inspection – Barron River Bridge BIS IS 7799”³

3. Objectives and scope

3.1 Objectives

- Develop a plan to manage the short-term risks identified in the “Life Extension Interim Report”
- Preparation of a scope of works and budget estimate for the investigation and short-term risk management of the bridge.

3.2 In scope

- Assess the short-term risks associated with:
 - Fracture of the Macalloy Bars
 - Stability of the rocker bearings
 - Vehicle effects exceeding the residual capacity
- Develop recommendations for the management of the short-term risks
- Identify an initial scope and budget for the investigation of the risks

3.3 Out of scope

- Conduct of detailed investigations.
- Development of a Structure Management Plan for the bridge.

¹ A copy of this report is included as Appendix C of “Life Extension Investigation – Interim Report – Barron River Bridge (7799)”

² A copy of this report is included as Appendix B of “Life Extension Investigation – Interim Report – Barron River Bridge (7799)”

³ A copy of this report is included as Appendix A of “Life Extension Investigation – Interim Report – Barron River Bridge (7799)”

4. Introduction



Figure 1 Bridge over Barron River at Kuranda: View of underside of deck looking towards Cairns abutment

This report follows the draft Structure Management Plan (29 June 2018) and the 6 September 2018 Skype meeting between E&T Structures and the Far North District to discuss the plan where it was agreed that an assessment of the short-term risks and scope for the investigations would be prepared. The following risks are considered:

- Fracture of Macalloy bars
- Stability of rocker bearings
- Assessment & Brittle Fracture

This report summarises:

- The assessment of the threats and the precautionary and mitigating control measures for the short-term while further investigation is undertaken.
- The scope, timing and budget estimates for the proposed investigations of the risks

It is intended that risk assessments be updated and communicated as the results of the investigations become available.

5. Past performance

The bridge has supported the applied traffic loads for many years. The road is classified as a General Access route and so has been accessible to GML semitrailers, 19 m B-doubles and truck and dog heavy vehicles for many years.

The Kuranda range provides a natural 'choke' to the number of heavy vehicles that access the bridge. However, improvements to the road geometry and the increasing capability of trucks means larger vehicles (possibly travelling without a permit) may be able to access the bridge.

There is ongoing deterioration, although the condition of the steelwork and bearings currently appear better than a decade ago (2008 Level 2 Inspection). For example, there is significantly less active rust visible and much less debris around the bearings (and plants growing in the debris) in 2018 compared with 2008.

The Macalloy bars applied to the bottom flange as a retrofit immediately before opening have also performed satisfactorily despite their high levels of prestress, brittle nature, corrosion and the ongoing wear caused by the bars vibrating against the stiffeners and their restraint brackets.

While past performance in no guarantee for future performance, it does however provide some confidence for the bridge to remain in-service in the short-term while investigations and rehabilitation occurs provided (AS 13822):

- The loads on the bridge do not increase
- The condition of the structure does not deteriorate

Unfortunately, the condition of the Macalloy bars is continually, albeit gradually, deteriorating due to the vibrations between the Macalloy bars and the girders leading to wear and loss of section.

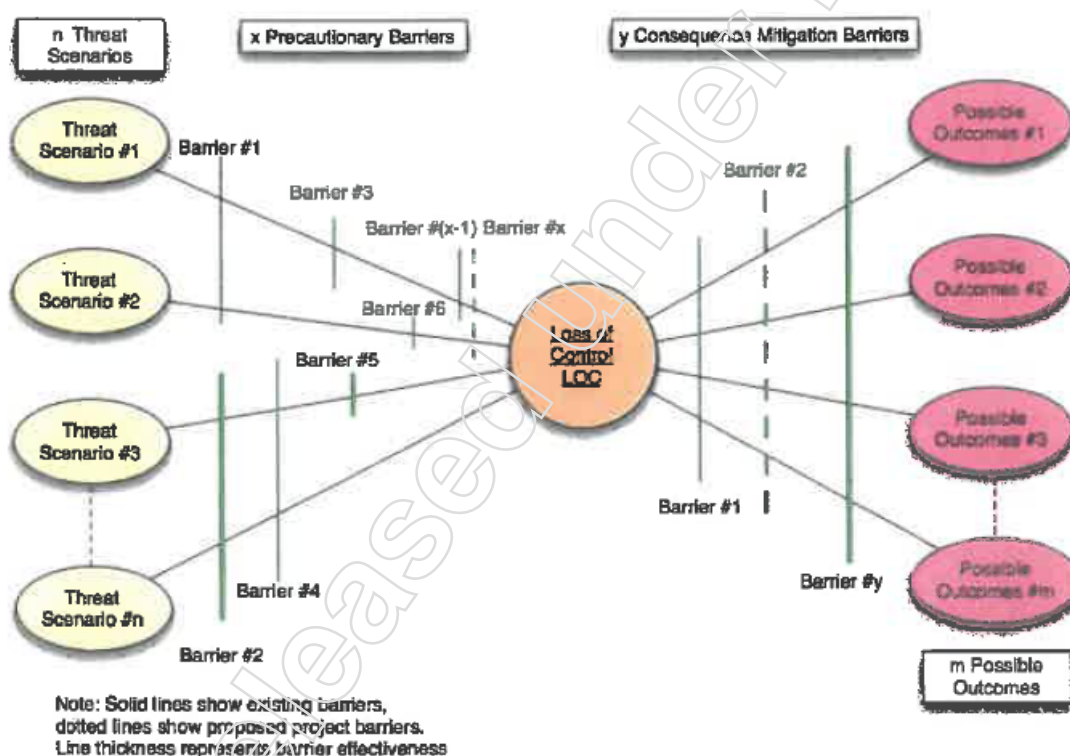
6. Assessment of short-term risks

6.1 Introduction

The following sections discuss the short-term risks under the following headings:

- Background
- Threat-barrier diagrams
- Loss of control
- Threats
- Consequences
- Precautionary barriers
- Mitigating barriers

The threat-barrier diagrams have been used to present the threats, consequences, precautionary barriers and mitigating barriers as articulated by Robinson, Francis and Procter (2018) in their book titled “Engineering Due Diligence”. The authors state that *threat barrier diagrams, are another representation of the cause-consequence models. They can be particularly useful in showing barriers that have effects on multiple threats as shown in the generic diagram following.*



Threat barrier diagram

Threat-barrier diagrams are also referred to as a “bow-tie” and provide a useful discipline and method to present the threats, consequences and barriers.

In the threat-barrier diagrams that follow the barriers are presented by vertical blue lines with thicker lines representing more effective barriers. The focus is on the short-term barriers. In some cases, green lines are included and refer to long-term barriers that may be an outcome of further investigations.

The primary focus is on the precautionary barriers.

Recommendations are discussed after the discussion of each of the risks considered.

6.2 Fracture of Macalloy bars

6.2.1 Background

The Macalloy bars were installed on the bottom flange of the 'sag' regions of the steel girders prior to the bridge opening. It was hypothesised in the draft Structure Management Plan that this was done to manage the risk of brittle fracture of the girders by applying a compression stress to the flanges that would be under tension under operational loads. This hypothesis has subsequently been strengthened via an extract from "Roads in the wilderness: Development of the main road network in far north Queensland: The first 100 years" (Ford, Lyall R, 2009), which states "The original design did not include post-tensioning, but after one span of Melbourne's King Street Bridge collapsed in July 1962 due to brittle fracture of the steel girders, the design of the Kuranda Bridge was checked and the post-tensioning added to provide additional strength."

Groups of either 2 or 4 Macalloy bars were used to post-tension the bottom flanges. In total, 64 Macalloy bars were installed with a total length of almost 2 km, as summarised in Table 1.

Table 1 Details of Macalloy bars used to post-tension the bottom flanges

Span No	Description	Type	Dia (inch)	Dia (mm)	Length (ft & in)	Length (m)	Bars per span	Bars per girder	Length per Span (m)
1	End span	Type 2	1.25	32	96' 3"	29.34	8	2	234.7
2	Suspended Span	Type 1	1.25	32	79' 8"	24.28	8	2	194.3
3	Continuous span	Type 3	1.25	32	109' 8"	33.43	16	4	534.8
4	Continuous span	Type 3	1.25	32	109' 8"	33.43	16	4	534.8
5	Suspended Span	Type 1	1.25	32	79' 8"	24.28	8	2	194.3
6	End span	Type 2	1.25	32	96' 3"	29.34	8	2	234.7
Total Number							64		1928

The prestressing bars were stressed to 110,000 lb (489 kN) after draw-in losses but before relaxation, shrinkage, creep and the like. This corresponds to a nominal stress of 618 MPa (force over nominal area before consideration of the threaded section). AS A144 (1963) indicates that Alloy steel Bars had a tensile strength of 989 MPa. The bars would have most likely been supplied to MP13 (1957) but a copy of this standard has not been located. This suggests the bars were stressed to 62% of their tensile strength.

Relaxation is anticipated to be of the order of 5% over the last 55 years. There is no creep or shrinkage of the steel girder but there will be some of the concrete deck. As the deck is above the neutral axis, the shrinkage of the deck may result in an additional tension rather than a loss of prestress.

Traffic loads will induce additional tension stresses in the bars. Future investigations should identify the magnitude of these live load stresses, but for the purpose of this preliminary review an increase of 50 MPa under service live loads has been estimated.

In addition, some Macalloy bars are worn on one side (or two sides) leading to reduced cross-sectional area of the bar and an eccentricity resulting in local bending stresses. The notch will also locally increase stresses because of the discontinuity and therefore increase the likelihood of fatigue. Again, further investigation is required to quantify the changes in stress.

Thus, if we assume the bars were jacked to 618 MPa (that is, as per drawings; relaxation and shrinkage cancel each other); a 50 MPa increase in stress due to live load and a further 20% increase from the effects of wear and stress concentrations, then the local in-service stress would be of the order of $1.2 \times (618 + 50)$ = 800 MPa or 80% of the ultimate tension strength.

The bars are showing signs of corrosion and have done so in the past. Thus, there is likely to be pitting corrosion, which also causes higher local stresses and stress corrosion cracking. The anchorages provide another potential area of corrosion that is difficult to inspect.

As noted, the stress in the bars will vary during the passage of heavy vehicles and consequently there is the potential for fatigue, especially at the notches induced by wear. Macalloy bars can fail in a brittle manner at notches such as fatigue cracks at room temperature as the transition temperature is well above ambient levels (Macalloy technical data).

6.2.2 Threat Barrier Diagram

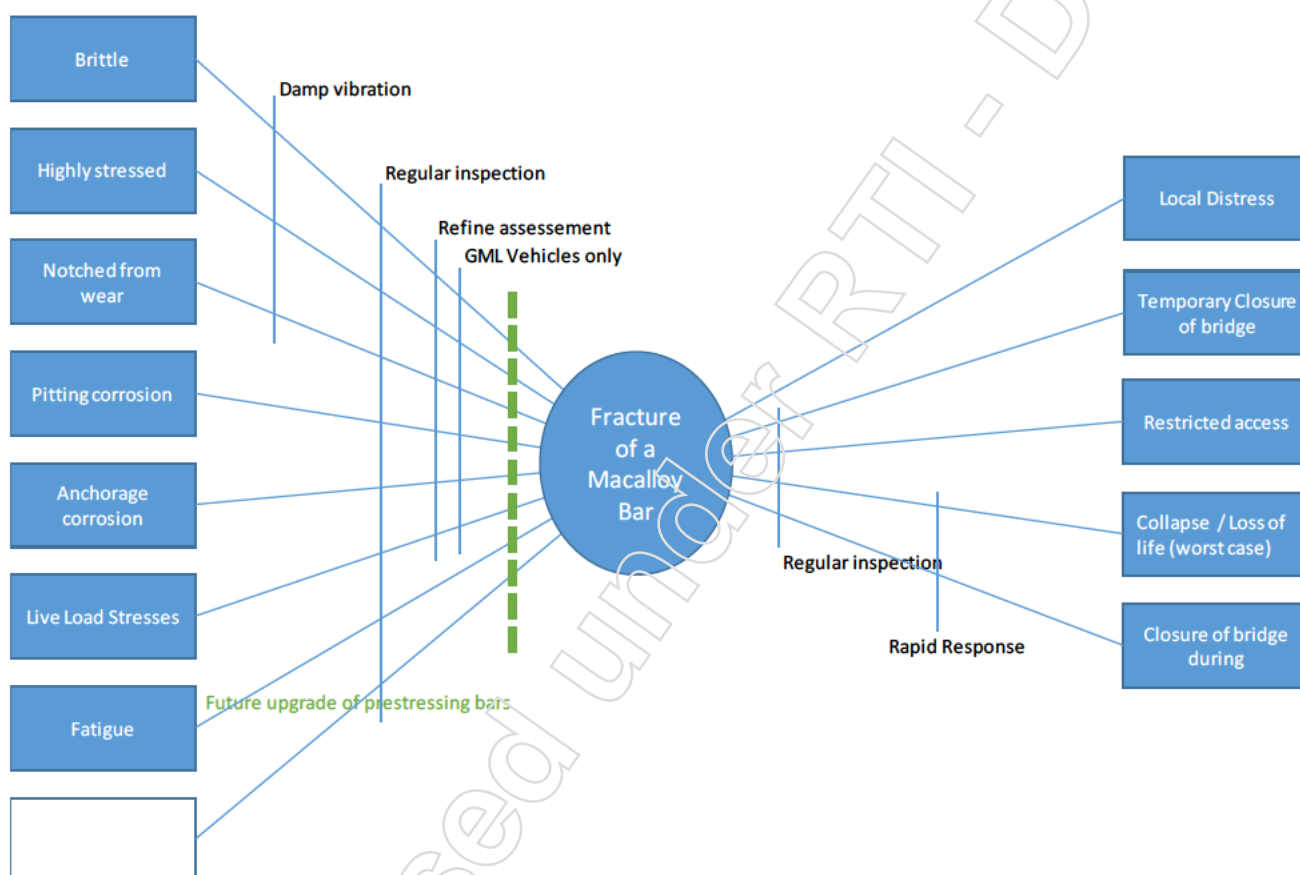
Threat - Barrier Diagram

Project: Barron River Bridge at Kuranda

Hazard: Wearing, corroding, highly stressed Macalloy bars

Loss of Control Fracture of Macalloy Bar

Credible threats	Precautionary Barriers	Loss of Control	Mitigation Barriers	Consequences
Threats that may	Actions to avoid LOC	LOC	Actions to reduce impact of consequences	Consequences of



Adapted from: "Risk and Reliability - Engineering Due Diligence", 9th Edition by r2a Due Diligence Engineers

6.2.2.1 Loss of control

Fracture of one or more of the 64 Macalloy bars.

6.2.2.2 Threats

Combined effects of:

- Highly stressed bars
- Wear at locations where Macalloy bars cross stiffeners / positioning brackets
- Intermittent corrosion / corrosion at anchorages
- Corrosion at anchorages

- Live load stresses
- Fatigue

6.2.2.3 Consequences

- Local distress: Large eccentric force released from one side of the thin web of the girder of leaving and unbalanced eccentric force applied to the thin web (see anchorage details in Figure 2).

Brittle forces result in a sudden force release resulting in dynamic effects as well as static. The stretch in these bars is also large (of the order of 3 mm / m or 100 mm in the 33 m long bars) and there will be a lot of energy released possibly resulting in substantial plastic deformations of web / flange, damage to the prestressing bar on the opposite side of the web leading to access restrictions due to loss of strengthening and deformation / loss of capacity of girder.

- Temporary closure of bridge during investigation / assessment of options (such as cars only, single lane operation...) / rehabilitation
- Restricted access
- Collapse – worst case scenario should distortion compromise load carrying capacity and a heavy load crosses the bridge. The fact that the bridge is redundant (4 girders) and bar anchorages are in regions of small moment and high shear reduces this risk.

6.2.2.4 Precautionary Barriers

Short-term only:

- GML vehicles only: Limit access to Regulation GML heavy vehicles (i.e., exclude permit vehicles): Reduces live load stresses in bars
- Refine assessment: Refine assessment by quantifying bar stresses & wear:
- Residual force e.g., lift off tests
- Traffic Loads e.g., strain measurement under traffic
- Environmental effects e.g., differential temperature, shrinkage
- Amount of wear in each bar e.g., inspection & measurement
- Material properties risk of brittle fracture
- Replace a sample of bars and test bars to inform risk
- Regular inspections unlikely to spot distress
- Damp vibrations: Damp the transverse vibrations (if possible) to reduce the wearing of the Macalloy bars as they repeatably vibrate against the stiffeners

Long-term options include:

- Replace prestressing bars: Removes effects of notches and corrosion as well as utilising modern materials that are more ductile and less susceptible to corrosion. Completion before next winter is prudent as cooler weather will likely increase stress levels in the bars and increase likelihood of brittle fracture.
- Upgrade prestressing bars: There may be an opportunity to increase ductility, durability and load carrying capacity through adding more bars with less prestress and making them act compositely with the girders, for example. It is noted that the Kings Bridge in Melbourne was also strengthened with external prestress, but the prestress was protected and arranged such that the loss of a tendon would be unlikely to damage the bridge.
- Alternate systems.

6.2.2.5 Mitigating Barriers

Given the expected brittle nature of these bars, it is unlikely that there will be any warning of a fracture. Thus, the mitigating barriers relate to minimising the time the potentially compromised bridge is open to traffic. These include:

- Regular inspections: Determine if bars are fractured and respond to limit the risk of failure due to overload on a compromised structure
- Monitor bridge for shocks / loss of force in the Macalloy bars
- Rapid closure protocols: Establish the protocols necessary to close the bridge with zero notice.

6.3 Stability of rocker bearings

6.3.1 Background

6.3.1.1 Description of bearings

The Barron River Bridge at Kuranda has 5 expansion bearings. One at each of the abutments, one in each of the two suspended spans and one between Pier 4 and the continuous girder over (refer Figure 3, Figure 4 and Figure 5).

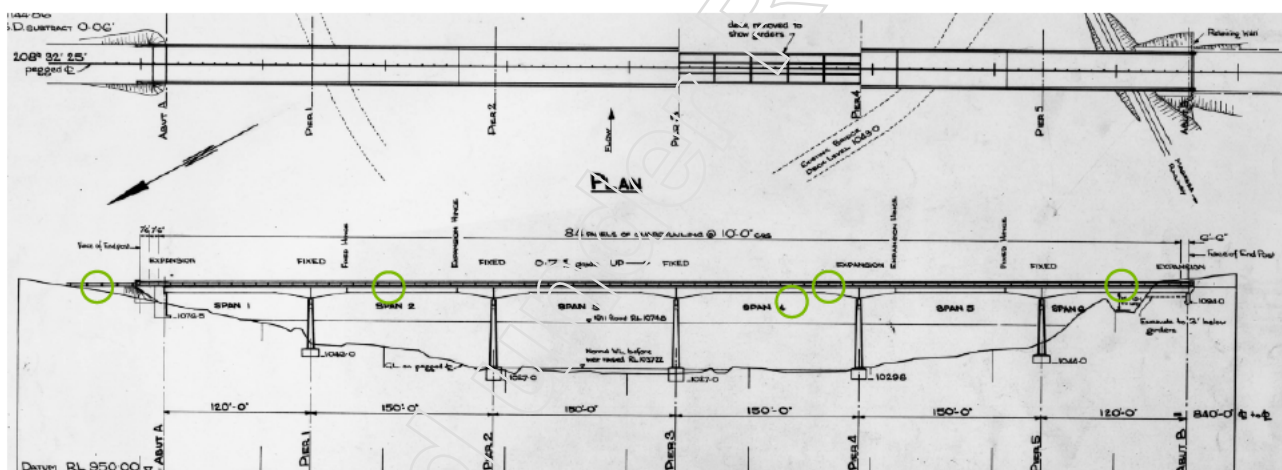


Figure 3 General Arrangement – expansion bearings highlighted



- (a) Rocker bearing with top portion of bolt corroded away
- (b) Inclined rocker bearing with missing bolt and possible wear of hole around the bolt that the bearing pivots around

Figure 4 Barron River Bridge: Rocker bearing at a suspended span expansion joint.

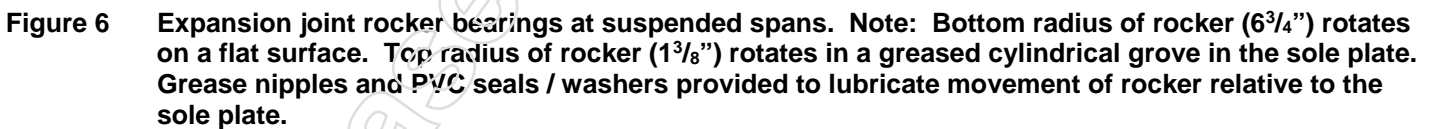


- (a) Fixed bearing at Pier 3 with corroded nuts to hold down bolts
- (b) Expansion rocker bearings at Pier 4

Figure 5 Barron River Bridge: Pier bearings

The piers are pinned to the girders via tall bearings with hinges at the top, except for Pier 4 which has an expansion bearing (refer Figure 3 and Figure 5).

There is a total of 20 steel expansion rocker bearings and 16 steel hinged bearings. Details of the suspended span rocker bearings are presented in Figure 6.



These rocker bearings are uncommon within TMR although they appear to have been common in North America in the 1960s. The USA examples were referred to as pintle rocker bearings with a pin (pintle) restraining the shoe from sliding over the masonry plate (refer Figure 4 and Figure 5). The Kuranda rockers are different in that the holding down bolts extend through an extension of the rocker shoe with lock nuts (refer Figure 4 and Figure 6).

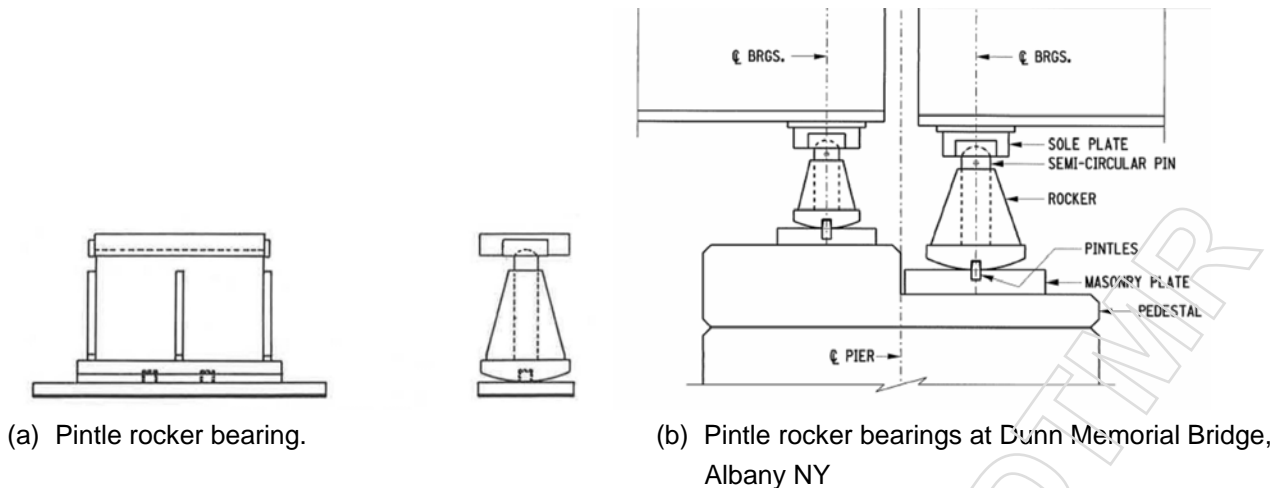


Figure 7 Pintle Rocker bearings (NYSDOT, 2005; Cohen & Wetzck, 2016)

6.3.1.3 Effective coefficient of friction

Marzon et al (1983) tested rocker bearing to determine their effective coefficient of friction and noted circumstances where the expected 2.5% coefficient of friction was considerably exceeded though rust build-up, debris on masonry plate or manufacturing errors in the matching cylindrical surfaces between the top of the rocker and the sole plate. Effective coefficients of friction up to 14% were recorded.

Movement of the rocker bearings requires slip between the matching cylindrical surfaces in the sole plate and rocker and hence friction will restrain the movement. The Kuranda bearings include two grease nipples to facilitate greasing the sliding interface. However, fretting corrosion evident in the Kuranda abutment rocker bearings indicates that the grease has not been fully effective. Furthermore, the fretting corrosion may be making the sliding surfaces uneven and further increasing the effective coefficient of friction.

The increasing effective coefficient of friction and the built up of rust and debris around the bearings can also lead to 'ratcheting', especially when associated with tall / flexible piers, as illustrated in Figure 8.

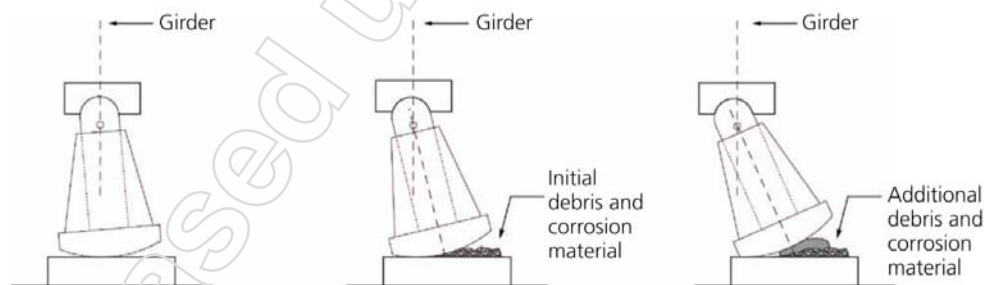


Figure 8 Ratcheting effect causing critical tilting of rocker bearings (Cohen & Wetzck, 2016)

The height of these bearings means the bridge could drop by the height of the bearing should its travel be exceeded.

6.3.1.4 Failures

Failures appear to be uncommon, although the two failures illustrated in Figure 9 and Figure 10 indicate all the bearings can collapse together and that spans can fall.



(a) 8 rocker bearings at a double expansion joint collapsed dropping main span by 625 mm (25 inches), which was wedged onto the edge of the pier.

(b) Topped rocker bearings

Figure 9 Rocker bearing failure at Dunn Memorial Bridge Interchange, Aibany NY, 27 July 2005 (NYSDOT, 2005; Cohen & Wetzck, 2016)



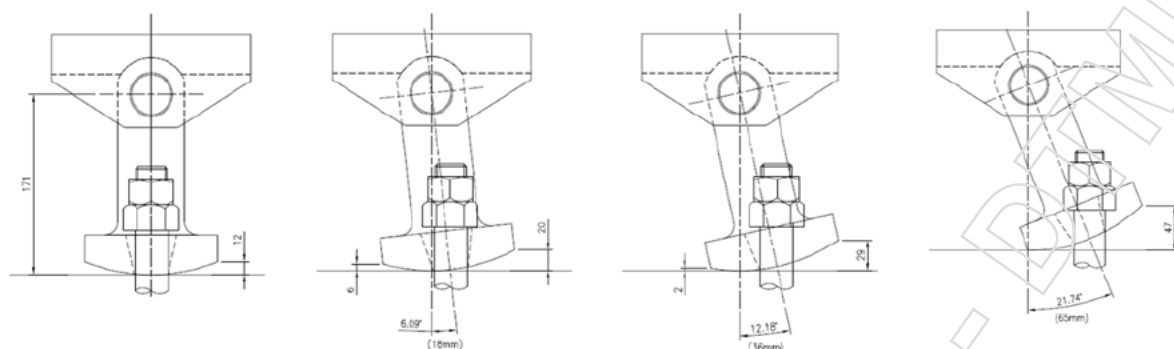
Figure 10 Rocker Bearing Collapse, Sullivan Square, Boston MA, 23 May 1952 (Getty images; Cohen & Wetzck, 2016)

6.3.1.5 Discussion

The steel rocker bearings have been corroding for many years, although they are currently in better condition in terms of rust and debris around the bearings than they were a decade ago (refer 2008 Level 2 Inspection Report).

The bearings continue to serve despite their inclination and loss of bolts in some locations (refer Figure 4 and Figure 5). For further details of bearings refer to the inspection reports and the draft SMP from 23 June 2018.

The articulation of the suspended span rocker bearings is illustrated in Figure 11. Note that the through bolts and nuts will contact the bearing shoe at modest travels and hence tend to restrain / redistribute the travel unless the bolts yield or fail or are lost to corrosion.



(a) 0 mm travel (b) 44 mm range (± 22 mm) – bolt using half of tapered hole in rocker, nuts at point of contact with rocker (c) 88 mm range (± 44 mm) – bolt against tapered hole in rocker, holding down bolts distorted (d) 140 mm range (± 71 mm) – unstable

Figure 11 Barron River Bridge: Suspended span expansion rocker bearing schematic for various amounts of travel.

AS 5100.2 recommends a serviceability limit state (SLS) bridge temperature range of 55°C (3°C to 58°C) for Kuranda. The corresponding axial thermal movements are summarised in Table 2, assuming the expansion bearings do not restrain movement (i.e., points of zero movement at Pier 1, centre of Span 3 & Pier 5). The SLS movements are increased by 25% for the ultimate limit state.

Table 2 Thermal movements at expansion joints

Expansion bearing	Length or bridge contributing to thermal movement	Range of thermal movement (AS5100.2)
	(m)	(mm)
Abut A	36.6	22
Span 2	68.6	42
Span 5	114.3	69
Abut B	36.6	22
Totals	256.1	155

Other influences on longitudinal bearing movements that need to be considered when assessing the toppling risks include:

- Bearing setup at the time of construction
- Traffic and pedestrian loads, especially given the large depth of the girders and haunches in the girders at the piers

- Differential temperature deformations
- Shrinkage and creep of the bridge deck
- Foundation movements
- Braking and acceleration forces
- Earthquakes
- Construction tolerances

The movements summarised in Table 2 indicate that the Span 5 expansion joint is likely the most vulnerable joint with the AS5100.2 estimated range of longitudinal movements being almost half the available range before other effects (to be quantified as part of proposed investigations) and margins are considered.

Measurements of gaps in the finger plates and the inclination of the bearings (9 May 2017 – 24°C at 9:00 AM) indicated:

- Substantial movement capacity remaining in the finger plate joints.
- Bearing inclinations consistent with expansion (assumes vertical bearings correspond to the typical position)
- The largest inclinations were measured at the Span 5 expansion joint and the smallest inclinations were measured at the abutments and broadly consistent with Table 2.
- The Span 5 rocker bearing inclinations were consistent with Figure 11 (b).

Cohen & Wetz (2016) quote a German designer as suggesting that only the middle third of the shoe be used to cover the maximum thermal expansion and contraction and that the outer thirds are safety precautions to prevent toppling. One-third of the Kuranda suspended span shoe corresponds to a travel of $2 \times 71/3 = 47$ mm or +/- 25 mm say, which corresponds to the approximate position of the bearings observed in photos.

Concerns have been expressed regarding the collapse of the bearings should the available travel be exceeded and the bearing 'topple-over' or the rocker slides on the base plate (masonry plate).

6.3.2 Threat Barrier Diagram

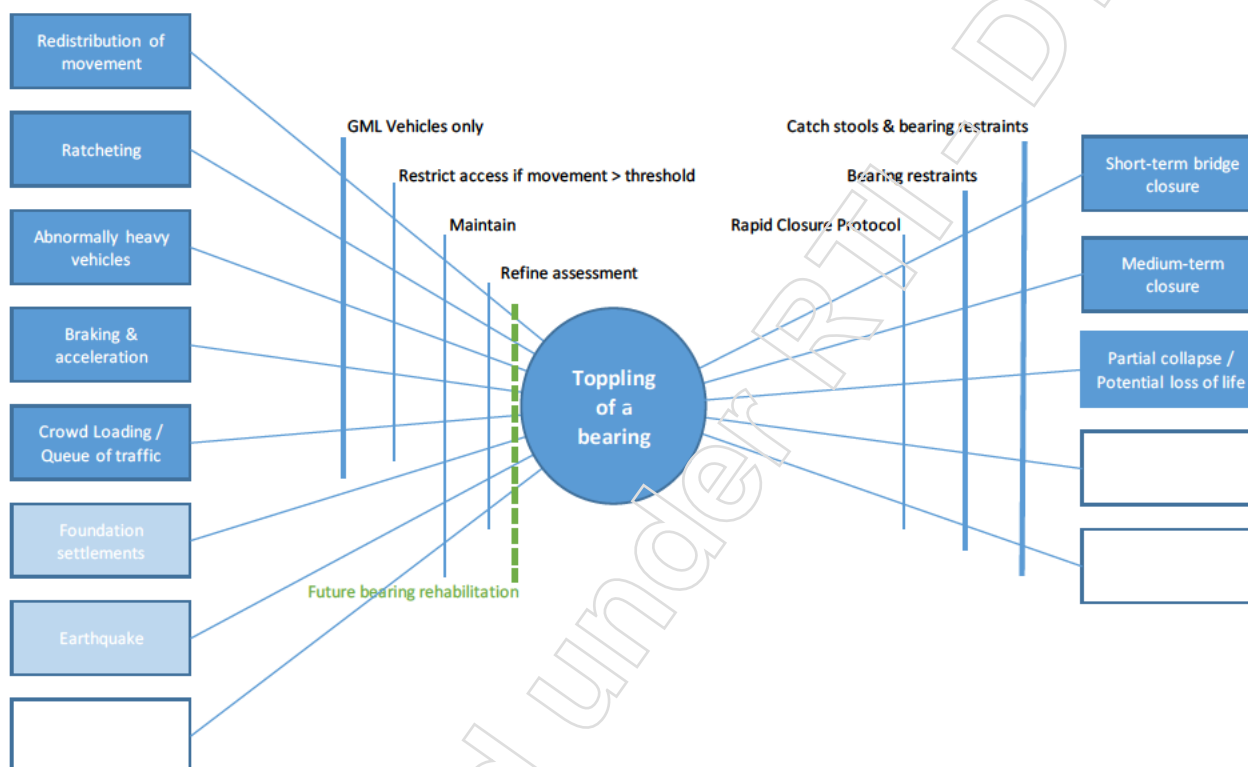
Threat - Barrier Diagram

Project: Barron River Bridge at Kuranda

Hazard: Deteriorated rocker bearings

Loss of Control Toppling of a bearing

Credible threats	Precautionary Barriers	Loss of Control	Mitigation Barriers	Consequences
Threats that may cause LOC	Actions to avoid LOC	LOC	Actions to reduce impact of consequences	Consequences of LOC



Adapted from: "Risk and Reliability - Engineering Due Diligence", 9th Edition by r2a Due Diligence Engineers

6.3.2.1 Loss of control

Toppling of a bearing: Bearings include expansion rocker bearings and pinned bearings at the piers.

6.3.2.2 Threats

- Redistribution of movement:** Should the friction in the bearings become too high, the movement may accumulate at another location and increase the risks of bearing toppling / sliding, the axial forces in the bridge decks and the forces resisted by the tall piers and their associated tall bearings. Increased bearing friction in expansion rocker bearings is caused by corrosion, debris / road grime build-up under the shoe and fretting corrosion in rocker to sole plate sliding surface.
- Ratcheting:** The process of increasing movements with each cycle. This was evident the Dunn St failure in NY, which included a pier that was flexible and cracked / yielded under the thermal cycle. This may not be the case at Kuranda. All the piers are reported as in Condition State 2, with no reported cracking above the water line.

3. Abnormally heavy vehicles: Larger vehicles induce larger bearing movements
4. Braking and acceleration: Longitudinal forces applied to the tops of tall piers will cause longitudinal movements in bearings
5. Crowd Loading / Queue of traffic: Crowd loads (e.g., starts of fun runs) and traffic queues from road maintenance / accidents could induce larger loading events than usual
6. Foundation settlements: Foundation settlements will induce longitudinal movements in bearings. Unlikely given history
7. Earthquake: Unlikely

6.3.2.3 Consequences

1. Short-term closure: Local effects only – Load is redistributed to the other bearings at the same joint (4 bearings per expansion joint)
2. Medium-term closure: Suspended spans drop onto halving joints but do not fall or severely damage supporting halving joint / cantilever.
3. Long-term closure / loss of life: Suspended span falls / partial collapse of bridge

6.3.2.4 Precautionary Barriers

Short-term only

1. Refine assessment: Quantify current condition and position of bearings and likely movements. Could include: Inspection / measurement; theoretical modelling to include longitudinal movements due to rotation, in-service movement monitoring
2. Maintain: Keep bearings clear of corrosion and debris. Grease sliding interface between sole plate and rocker.
3. Restrict access > threshold: Monitor movements and pre-emptively restrict access if movement exceeds a threshold. Options include: visual, inspections, camera on a stick, fixed cameras, remote surveillance cameras, movement monitoring, alarms.
4. GML vehicles only: Limit access to as-of-right heavy vehicles and therefore reduce abnormal movements. Prevent crowd loads on the bridge (crowd loads can be heavier than traffic loads). Avoid queues of traffic across bridge from road maintenance and where possible accidents.

Longer-term options include bearing upgrades.

6.3.2.5 Mitigating Barriers

1. Rapid closure protocols: Be prepared to close the bridge with zero notice.
2. Bearing restraints: Restrain rocker bearing shoe and masonry plates in locations where holding down bolts to the bearings have been compromised. Restraints could be friction grip bolted to steelwork without drilling, cutting or welding.
3. Catch Stools: Add catch stools to minimise consequences of rocker toppling

6.4 Vehicle effects exceed residual capacity

6.4.1.1 Background

The bridge is a long span bridge for the H20S16 design class (33 t truck) carrying heavier and longer loads (50 t B-doubles) than it was designed to carry. Experience has shown that these bridges tend to be operating at reduced margins.

A Tier 1 Bridge Assessment has been undertaken by KBR but is to a superseded assessment brief and has not been independently peer reviewed⁴. The assessment was made using standard assumptions including the presence of multiple vehicles simultaneously on the bridge. The assessment notes that no steel properties are specified on the drawings and assumes the yield strength of the steel in the girders is 170 MPa based on the likely design stresses of the era. The steel plates were supplied as Class D Plate to Australian Standard A33 (1937) for Class D Plate which specifies a yield strength of not less than 50% of the ultimate tensile strength (UTS) where 386 MPa < UTS < 455 MPa suggesting the 170 MPa assumed in the assessment could be conservative. This assessment identifies the following areas as operating at margins less than Australian Standard margins for GML semi-trailers (42.5 t)⁵:

- Girder bending (hog) over piers (minimum SAR⁶ ~ 0.6)
- Girder bending (sag) (minimum SAR ~ 0.8)
- Pier cantilever bending (hog) (minimum SAR ~ 0.8)

However, as discussed, the bridge was retro-fitted with Macalloy bars before opening seemingly out of concerns about brittle fracture and/or the capacity of the girders. The retrofitted Macalloy bars are now compromised through wear and corrosion. In addition, there are severely corroded bolts fixing the bearings into position. These factors are unlikely to have been considered fully in the assessments undertaken to date. A review of the material properties, including the risk of brittle fracture, is recommended along with a new assessment of the bridge.

The most onerous regulation mass general access vehicle accessing the bridge is the 19m long 50t B-double which has load effects 15% greater than the 42.5t semi-trailer. A line model comparison of the unfactored effects induced by various individual heavy vehicles is summarised in Table 3.⁷

Table 3 Line model comparison of effects induced by different vehicles

Vehicle	42.5 t semi-trailer effects / Vehicle effects
19m 50t B-double	0.87
10 x12t @1.8m platform	0.4
59.5t Low loader (Form 11)	0.72
Group 1 SRV	0.75
Group 2 SPV	0.77
24t Crane	1.6

⁴ A new independent higher-level assessment is recommended

⁵ Current access is for GML vehicles which include 50 t 19 m B-doubles and truck and dog.

⁶ SAR = Strength Assessment Ratio. A SAR of 0.6 means that the bridge has 60% of the capacity required for current loading as per AS 5100.7 based on standard assumptions such a live load factor = 2.0, dynamic load allowance = 40%, multiple vehicles on the bridge simultaneously, nominal material properties.

⁷ Extracted from email from TMR Structural Assessment of 11 September 2018.

Semi-trailers, 19 m B-doubles and truck and dogs have accessed this bridge for many years and so provide a benchmark for its past satisfactory performance.

Currently, the bridge is not on the 'do not cross' list for 48 t cranes nor in the Conditions Database for restriction on excess mass movements and so some permit vehicles could theoretically cross the bridge. Restricting access to vehicles that generate less effects than Regulation GML heavy vehicles (as-of-right general access vehicles) is helpful in managing the risks associated with vehicles heavier than the typical vehicles crossing the bridge.

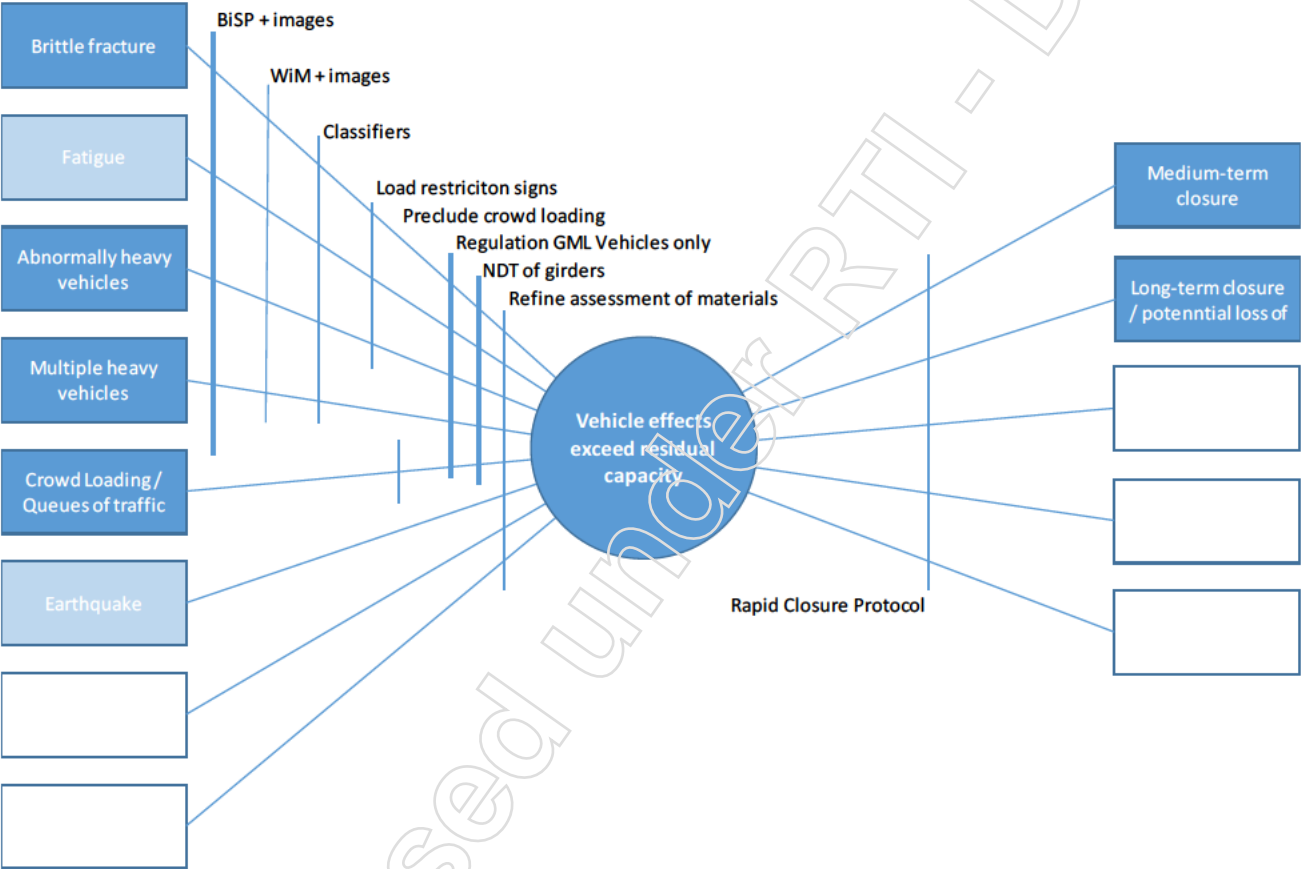
The Barron River Bridge at Kuranda provides two-lane two-way access. The relatively small numbers of heavy vehicles on this route and the two-way two-lane access across the bridge indicate that multiple vehicle events are infrequent but possible. This suggests that extreme multiple vehicle events may not have occurred in the past but could occur in the future and thus represent an ongoing risk.

6.4.1.2 Threat-Barrier Diagram

Threat - Barrier Diagram

Project: Barron River Bridge at Kuranda
Hazard: Potentially brittle steel in girders
Loss of Control Vehicle effects exceed residual capacity

Credible threats	Precautionary Barriers	Loss of Control	Mitigation Barriers	Consequences
Threats that may cause LOC	Actions to avoid LOC	LOC	Actions to reduce impact of consequences	Consequences of LOC



Adapted from: "Risk and Reliability - Engineering Due Diligence", 9th Edition by r2a Due Diligence Engineers

6.4.1.3 Loss of control

Vehicle effects exceed residual capacity

6.4.1.4 Threats

1. Brittle fracture: Steel properties are not well known. Strengthening after the brittle fracture induced collapse of Kings Bridge in Melbourne suggests concerns. Risk much higher if cracking in tension flange observed / detected.
2. Fatigue: Relatively light traffic indicates traffic unlikely to induce fatigue damage. However, the presence of notch inducing defects in the tension flanges may provide a crack initiator.

3. Abnormally heavy vehicles: Larger vehicles induce larger stresses
4. Multiple heavy vehicles: Combinations of heavy vehicles induce larger stresses in the bridge
5. Crowd Loading / Queues of traffic: Crowd loads (e.g., starts of fun runs) and traffic queues from road maintenance / accidents could induce larger loading events than usual

6.4.1.5 Consequences

1. Medium-term closure: Local effects only – Load is redistributed to other members / should the materials prove ductile
2. Long-term closure / potential loss of life: Partial collapse of bridge, particularly if the materials prove to be subject to brittle fracture

6.4.1.6 Precautionary Barriers

Short-term only

1. Refine assessment of materials: Investigate the material properties and the potential for brittle fracture of the steel in the girders / Macalloy bars at this location. Update the assessment.
2. NDT of girders: Undertake NDT of girders to identify cracking and / or crack inducing defects.
3. Regulation GML vehicles only: Limit access to as-of-right heavy vehicles and therefore reduce abnormal loads that may not be consistent with past performance. Avoid queues of traffic across bridge from road maintenance and where possible accidents.
4. Signs to advertise limits for heavy vehicle access
5. Prevent crowd loads on the bridge (crowd loads can be heavier than traffic loads).
6. Compliance Monitoring: Monitoring and compliance activities to help ensure only regulation GML vehicles are accessing the bridge. Monitoring options include:
 - Classifiers to identify non-conforming vehicle configurations
 - Weigh-in-motion with images of heavy vehicles
 - Calibrated BiSP (bridge in-service performance) monitoring of key components to quantify live load effects and record images of events inducing large effects

Longer-term options to be informed by refined assessment.

6.4.1.7 Mitigating Barriers

1. Rapid closure protocol: Establish the protocols necessary to close the bridge with zero notice.

7. Recommendations

7.1 Introduction

The recommendations that follow acknowledge:

1. The bridge has performed satisfactorily for over 50 years despite the concerns about brittle fracture, wearing Macalloy bars and deteriorated bearings.
2. Comparison with the 2008 Inspection Report indicates that the girders / bearings are likely to be better maintained now than a decade ago, although some bolts have been lost through corrosion and the residual stubs are likely to be continuing to corrode.
3. There are no proposed changes to the traffic loading (for example, GML to HML) on the route
4. There is a commitment to investigate and refine the assessment / risk management plans in the short-term.

7.2 Recommendations

The recommendations are summarised below. It is noted that the findings from some of the recommendations will inform other recommendations. For example, the material properties and the in-service response to traffic will inform the load carrying capacity. An indicative program is presented in Section 5 below.

1. Limit access to likely historic load levels:
 - 1.1. Regulation GML vehicles to be the upper bound for vehicles accessing this bridge until more refined assessment / rehabilitation works are complete. Access should not be granted for Class 1 vehicles which would include all Group 1 and Group 2 SPV's, platforms and load carrying combinations (including Form 11) subject to due diligence that the alternate routes are acceptable. Access for GML vehicles, including 50t B-doubles and truck and dogs, as well as 24t pick and carry cranes can continue.
 - 1.2. Implement a Communications Plan to inform interested stakeholders, including the transport industry. Utilise existing VMS signs to advise access restrictions
 - 1.3. Avoid queues of traffic across the bridge where possible. For example, position traffic control before the bridge in both directions.
 - 1.4. Exclude crowd loads occurring on the bridge.
2. Macalloy bar audit:
 - 2.1. Inspect bars to identify extent and magnitude of wear / damage
 - 2.2. Seek advice re risks associated with wear
 - 2.3. Review short-term risk assessment
3. Remove, replace and test a sample of Macalloy bars exhibiting signs of wear (within 3 months)
 - 3.1. Develop procedures to safely remove Macalloy bars. To include consideration of any further vehicle restrictions during removal and replacement of bars.
 - 3.2. Determine the force induced in the bars from heavy vehicle traffic
 - 3.3. Determine residual forces in a sample of bars

- 3.4. Replace the sample of bars with new bars
- 3.5. Test the residual fatigue life and residual capacity of the worn bars
- 3.6. Review short-term risk assessment
4. Bearing movement audit:
 - 4.1. Collect bearing and expansion joint position with enough detail and recoverable reference points to facilitate future measurements and the replacement of the bearings, should this be necessary (within 6 weeks).
 - 4.2. Theoretical modelling of longitudinal movements due to effects such as thermal effects; heavy vehicles; braking; and earthquake. Modelling to include the movements at the piers and joints due to the depth of the girders.
 - 4.3. Identify the scenarios that could cause the bridge bearings to topple and the appropriate precautions.
5. Bearing restraints:
 - 5.1. Restrain rocker bearing shoes and masonry plates in locations where the holding down bolts to the bearings have been compromised. Restraints could be friction grip bolted to steelwork without drilling, cutting or welding.
 - 5.2. Add catch stools to Span 5 rocker bearings.
6. Regularly maintain the bearings (routine): Keep bearings clear of corrosion and debris. Grease sliding interface between sole plate and rocker.
7. Investigate risks and longer-term risk management strategies associated with (within 6 months):
 - 7.1. Macalloy bars
 - 7.2. Bearing toppling (both fixed and expansion bearings)
 - 7.3. Girder materials and brittle fracture
 - 7.4. Load carrying capacity, including sensitivity to operational factors to inform access and risk management
8. Monitor in-service performance:
 - 8.1. Monitor movements of bearings / expansion joint (Span 5 say) due to traffic and environmental effects
 - 8.2. Monitor response of selected girders and Macalloy bars
 - 8.3. Collect images of vehicles inducing large events to support compliance and risk management.
 - 8.4. Quantify dynamic load effects and their sensitivity to speed to inform risk management and precautionary barriers such as speed restrictions.
9. Rapid closure protocol: Establish the protocols necessary to close the bridge with zero notice as part of the Communications Plan.

8. Risk Management & Investigations: Scope

8.1 Introduction

The Barron River Bridge at Kuranda is a large, tall, bespoke steel bridge. It was designed for a 33t truck (H20S16) and is now carrying much larger 50.5t B-double and truck and dog vehicles as well as cranes and possibly load platforms transporting indivisible loads.

The 45.7 m spans are long compared to the average span length of about 12 m being constructed during the 1960s, making it more susceptible to these longer heavier loads and hence is operating at reduced margins compared to Australian Standards.

The steel in the bridge was apparently not specified with potential brittle fracture in mind and following the collapse of the Kings Bridge in Melbourne due to brittle fracture, the girders were retrofitted with stressed Macalloy bars. This retrofit has been gradually compromised through vibration and wear of the bars.

The bearings are also deteriorating through corrosion and wear.

Figure 12 provides an overview of the proposed program of investigations and works. This program, risks and scope of works will be updated as new information is received. Supplementary investigations may be recommended depending on the findings of the initial investigations.

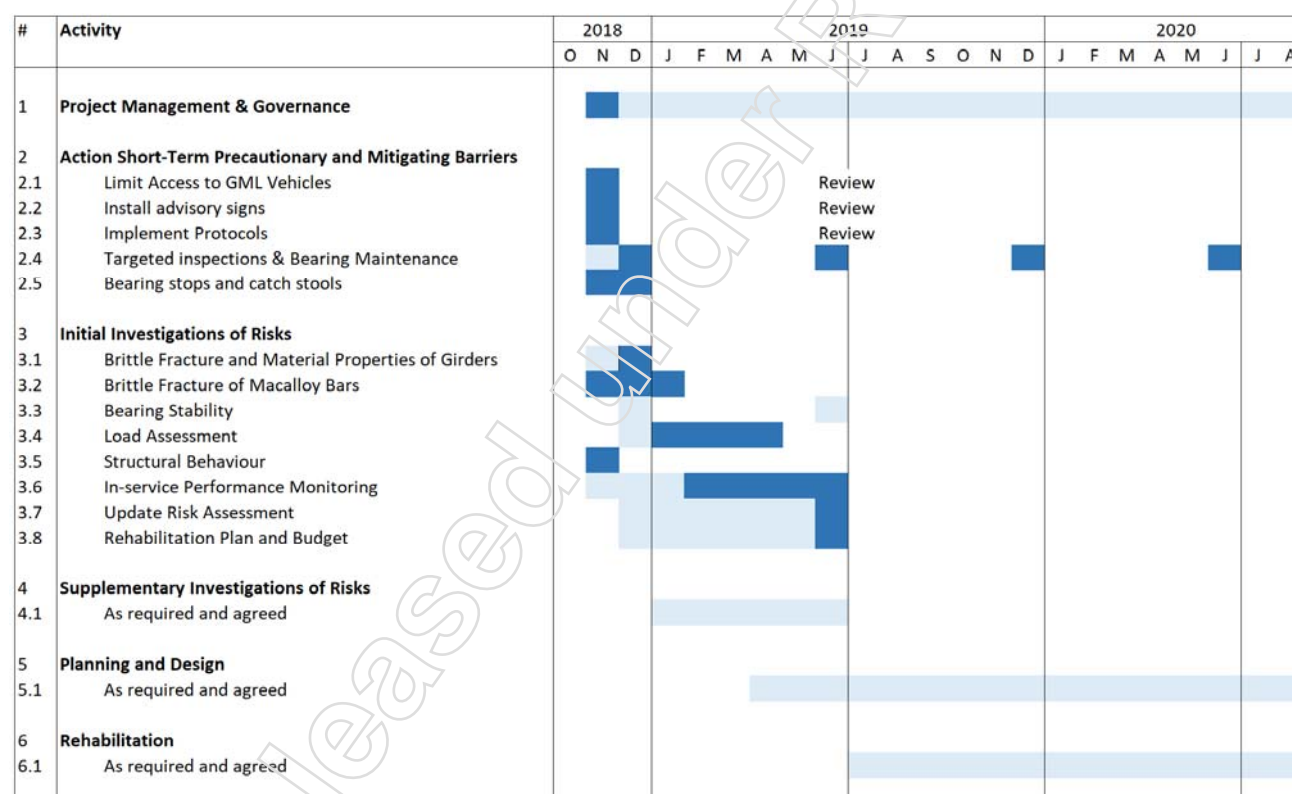


Figure 12 Indicative Program

The investigations are multi-faceted and interdependent. A more detailed program will be developed should the investigations proceed.

The scope of the different activities is discussed below. The budget estimate follows the discussion of the scope.

8.2 Project Management & Governance

8.2.1 Scope

- Establish
- Project Governance Group
- Program
- Project Team
- Risk Register
- Communication Plan
- Manage Investigations

8.3 Action Short-Term Precautionary and Mitigating Barriers

8.3.1 Introduction

The scope for the precautionary and mitigating barriers (refer Section 7) that are generic and can be implemented without further investigation is presented below.

8.3.2 Scope

- Limit access to Regulation GML Vehicles or equivalent.
- Add signs advising access restrictions.
- Protocols:
- Implement protocols to avoid queues of traffic across the bridge where possible.
- Implement protocols to exclude crowd loads occurring on the bridge.
- Implement protocols for escalation and rapid closure of the bridge
- Six monthly Targeted Level 2 Inspections
- Prepare guidelines for Targeted Level 2 Inspections
- Regular bearing maintenance
- Bearing stops & catch stools: Design, fabricate and install bearing stops and catch stools to:
- Restrain rocker bearing shoes and masonry plates in locations where the holding down bolts to the bearings have been compromised.
- Catch Span 5 rocker bearings should excessive movements occur.

8.4 Initial Investigations of Risks

8.4.1 Brittle Fracture and Materials Properties of Girders

8.4.1.1 Background

Refer Section 6.4 and 7.2.

8.4.1.2 Introduction

- Steel supplied to A33 Class D Plate, which is a relatively open standard with very limited chemical composition / material property requirements (for example, there is no ductility testing such as Charpy V-notch).
- The tension flanges were post-tensioned as a retrofit, most likely due to concerns about brittle fracture.
- The material properties are central to the assessment and management of the bridge.

8.4.1.3 Strategy

- Seek further historical information on the properties of the steel and the reasons for post-tensioning the bottom flanges.
- Seek advice from VicRoads re the management of the Kings Bridge (failed by brittle fracture and also post-tensioned).
- Collect a small sample of the steel and benchmark properties against modern standards for ductility / brittle fracture.
- Review the outcomes and identify further investigations as appropriate.

8.4.1.4 Objectives

- Investigate threat of brittle fracture to inform further targeted investigation and long-term management of bridge.
- Obtain steel material properties to inform load assessment and management of access.
- Update risk assessment and recommendations.

8.4.1.5 Scope

- Search archives (TMR, KBR...) and meet with the engineers involved (NR) to identify further information about the steel properties and the reason for the retrofit with the Macalloy Bars.
- Establish and benchmark material properties and ductility (Metallurgical / testing specialists):
- Collect steel samples from low stress areas (2/100 mm diameter cores from girder webs, 2/120 mm long x 20mm wide slices from girder flanges say) and in-situ hardness tests
- Test samples to establish:
 - Mechanical properties (Hardness, UTS, Yield, elongation, stress strain)
 - Brittle fracture potential
 - Charpy V-notch at operating temperatures at 15C below operating temperature
 - Chemical composition and microstructure
- Report material properties and ductility / brittle fracture assessment & recommendations
- Review outcomes and impacts
- Update Risk Assessment and Recommendations (including further investigations if required to be undertaken as part of the Supplementary Investigations – see also Section 8.5)

8.4.2 Brittle Fracture of Macalloy Bars

8.4.2.1 Introduction

- Risk of brittle fracture of bars due to wear / fatigue without warning.
- Potential for brittle fracture to damage girder due to eccentric brackets supported by the web. The drawings do not have a jacking sequence and so brackets may have been designed for bar to be jacked individually rather than in pairs. Forces exerted during a brittle failure will be dynamic and potentially more damaging than during jacking. If the brackets and girders can survive a brittle fracture, then the risks reduce substantially.
- 60 bars, almost 2,000 m in total length.

8.4.2.2 Strategy

- Remove a sample of the bars and subject the worn sections to fatigue tests corresponding to 5 years (say) of remaining life and then test to failure.
- Investigate the ability of the Macalloy bar anchorages to withstand the fracture of a bar.

8.4.2.3 Objective

- Improve understanding of the risks & consequences.
- Investigate the feasibility of delaying the replacement of the bars during the investigation phase.
- Recommendations

8.4.2.4 Scope

- Audit of Macalloy Bar Condition
- Investigate potential damage due to brittle fracture in one bar (dynamic finite element analysis)
- Determine residual force in bars
- Develop safe work method statement for the jacking and replacement of the bars
- Prepare jacking couplers to match old thread (epoxy mould)
- Lift-off tests to determine residual force in bars specialist contractor.
- Determine properties / remaining life of a sample of existing Macalloy bars
- Remove and replace two bars (by specialist contractor – scaffold under girder on Cairns end of the bridge, say).
- Measure bar wear
- Estimate fatigue cycles due to traffic using finite element model (Refer Section 8.4.5)
- Testing of worn bars under fatigue and then to ultimate
- Report, update risk assessment, recommendations

8.4.2.5 Alternate Strategy – Replace bars immediately

- An alternate strategy is to replace the bars immediately.
- Advantages:

- Reduces the risk as soon as possible
- Reduces the cost associated with the investigation phase (some of the work will have to be done as part of the replacement)
- Disadvantages:
 - Substantial cost now:
 - Like for like bar replacement cost of the order of \$300,000 + access. Previous estimates of access for painting were of the order of \$750,000 indicating a bar replacement cost in excess of \$1million.
 - If access is provided, it would be prudent to use the access for a range of activities and so time for planning would be helpful.
 - Cost efficiencies associated with multiple uses of access (for example: bearing replacement, painting) may be lost.
 - The work may need to be redone / augmented as alterations to the details of the prestressing bar installation (for example, removing wear points and improving corrosion resistance) and improving robustness in the event of a bar failure or improving assessment ratios may also be prudent.

8.4.3 Bearing Stability

8.4.3.1 Background

Refer Section 6.3 Stability of rocker bearings and Section 7.2 Recommendations.

This section focuses on the gathering field data and refining the assessment for planning longer-term risk management. Other aspects of the bearing stability investigations included in other sections are:

- Recommendations for implementing short-term measures are included in Section 8.3.
- Assess thermal and live load movements (included in Section 8.4.4)
- Identify the scenarios that could cause the bridge bearings to topple and the appropriate precautions (included in Section 8.4.4)

8.4.3.2 Objectives

- Gathering field data and refining the assessment for planning longer-term risk management

8.4.3.3 Scope

- Gather field data and refine assessment:
- Measure bearing and expansion joint movements – summer and winter (assumed to be part of regular bearing maintenance program and costs not included in this project)

8.4.4 Load Assessment

8.4.4.1 Background

Refer Section 6.4 and Section 7.2.

8.4.4.2 Objectives

- Inform long-term risks associated with heavy vehicle access and appropriate access management strategies considering:
- the material properties of the girders and Macalloy bars
- the ability of the tall piers and tall slender rocker bearings to support modern braking loads and environmental loads
- Provide information for a review of the imposed access restrictions.
- Identify locations that may be sensitive to fatigue damage.
- Identify components that may require strengthening to ensure long-term performance for current and aspirational traffic loads.

8.4.4.3 Strategy

- Procure an advanced assessment from engineers with expertise in the assessment of steel girders with stiffened webs, brittle fracture and fatigue.
- Assess for as-of-right and permit vehicles (see scope)
- Assess the piers and pier fixed bearings for longitudinal effects (braking, temperature, shrinkage...)

8.4.4.4 Scope

- Procure assessment. Assessment brief to include:
- Heavy Vehicle loads: Truck and Dog; Crane; LPT10; HLP320⁸
- Components to be assessed for vertical loads
- Deck slab (6.5 inch thick)
- Girders considering the measured material steel properties; web buckling; flange bends without stiffeners; unbonded stressed Macalloy Bars...
- Halving joints
- Bearings
- Pier headstocks
- Identify fatigue sensitive locations including locations with
 - Low fatigue detail classifications
 - Distortion induced fatigue,
 - Constraint Induced Fracture (CIF)
- Components to be assessed for vertical loads and longitudinal loads (braking and environmental effects)
- Fixed piers
- Fixed bearings at piers

⁸ Details of the assessment vehicles to be agreed with Structural Assessment prior to commencement of the assessment.

- Rocker bearings
- Components to be assessed for longitudinal movements
- Movements due to traffic and environmental effects
- Identification of the loading scenarios required to topple bearings
- Report
- Review assessment
- Review implications for access restrictions, general access and possible
- Update Risk Assessment and Recommendations (including further investigations if required to be undertaken as part of Supplementary Investigations – refer Section 8.5)

8.4.5 Structural Behaviour

8.4.5.1 Introduction

- This bridge is unique and incorporates many details that are not standard. A quality structural analysis model is essential for the technical management of this project.

8.4.5.2 Objectives

- Provide an independent structural analysis model to:
- inform / validate risks (Macalloy bars, bearing movements, assessment, brittle fracture);
- support / validate the investigations (for example, the independent review of the assessment, stresses in prestressing bars due to live load);
- inform assessment of permit applications; and
- the design / validation of temporary works for likely bearing replacements.

8.4.5.3 Scope

- Develop FE Model of Bridge
- FE Model (shell) - deck slab, girders, halving joints, bearing linkages, piers
- Loading: Self-weight, Ext P/S, Temperature (average and differential), shrinkage
- Loading: Truck and dog; Crane; LPT10⁹
- Validate & Document
- Investigate:
 - Movements at bearings: Displacement and rotation, SLS and ULS (elastic)
 - Stress in prestressing bars due to traffic
 - Stress hot spots - halving joints, hog regions, anchorages, sag regions

⁹ Details of the assessment vehicles to be agreed with Structural Assessment prior to commencement of the investigation.

8.4.6 In-service Performance:

8.4.6.1 Background

- Refer Section 6.4 and Section 7.2

8.4.6.2 Objectives

- Know the loads and the effects they induce in the girders (strain) and bearings (movement)
- Inform assessment:
- Independent validation of modelled behaviour
- Natural frequencies
- Fatigue spectra
- Improve credibility of the assessment and access management of the bridge (experience indicates freight vehicles may induce less damage than expected but vehicles carrying indivisible loads may generate effects larger than considered acceptable)
- Inform risk management:
- Bridge specific live load models incorporating actual heavy vehicles, drive lines, load levels and dynamic effects
- Identification and management of vehicles exceeding acceptable bridge response thresholds
- Quantify the movement of the bearings and 'stick-slip' actions associated with bearing operations.

8.4.6.3 Strategy

- Use instrumentation to monitor the response of the bridge and to trigger a camera to retrieve images of the heavy vehicles inducing large effects.

8.4.6.4 Scope

- Monitor movements of bearings / expansion joint (Span 5 say) due to traffic and environmental effects
- Monitor response of selected girders and Macalloy bars
- Collect images of vehicles inducing large events to support compliance and risk management.
- Calibrate the response with known vehicles
- Report

8.4.7 Update Risk Assessment

8.4.7.1 Scope

- Progressively update risk assessment with new information.

8.4.8 Rehabilitation Plan & Budget

8.4.8.1 Scope

- May flag items of importance that are critical for urgent action.
- Provide a clear statement of the scope and estimate of costs where the scope is clear

- Identify projects where there are potential efficiencies for doing them together
- Provide information to support funding applications.

8.5 Supplementary Investigations of Risks

Supplementary investigation of risks will depend on the outcomes of the Initial Investigations of Risks and approval of their scope. If recommended these investigations will not proceed unless agreed.

A brief discussion of follows:

Brittle Fracture and Material Properties: The initial investigation will inform the problem and likely lead to further investigation. If the test results are consistent with a low risk of brittle fracture, then the testing may need to be extended to include a larger sample of the steel supplied through a combination of NDT and further sample collection. If the samples indicate a concern about brittle fracture, then more extensive investigations may be required. As well as more extensive material sampling and testing, this could include ultrasonic or ACFM testing of the welds to identify cracks or defects that may induce cracks that are a precursor to brittle fracture.

Brittle Fracture of Macalloy Bars: It is possible that the initial investigation conclude that the risks are unacceptable and need to be managed in the short term.

Load Assessment: Further targeted assessment of specific issues may be appropriate.

In-service Performance Monitoring: Extension / retargeting of instrumentation may be necessary.

8.6 Budget Estimate

A budget estimate of costs for the Initial Investigation of Risks is summarised in Table 4. These costs are a guesstimate based on estimates of time, rates and discussion with industry.

Budget estimates for the supplementary investigations are not included as the scope is not yet defined.

Table 4 Budget Estimate of Costs

Item	Cost (Excluding GST)	Distribution
Project Management & Governance	\$ 147,000	16%
Action Short-Term Precautionary and Mitigating Barriers	\$ 158,400	18%
Brittle Fracture and Material Properties of Girders	\$ 44,200	5%
Brittle Fracture of Macalloy Bars	\$ 130,400	15%
Bearing Stability	\$ 20,000	2%
Load Assessment	\$ 122,00	14%
Structural Behaviour	\$ 28,800	3%
In-service Performance	\$ 156,200	18%
Update Risk Assessment	\$ 17,600	2%
Rehabilitation Plan & Budget Estimate	\$ 59,400	7%
Subtotal	\$ 884,000	100%
Contingency (20%)	\$ 176,800	
Total	\$ 1,060,800	

The costs include the costs of TMR Cairns, TMR Structures, RoadTek, Consultants and specialist contractors. The split between these groups is summarised in Table 5.

Table 5 Distribution of costs between groups

Group	Cost (Excluding GST)	Distribution
Management & Governance	\$ 147,000	16%
TMR Cairns	\$ 72,800	8%
TMR Structures	\$ 252,800	29%
RoadTek	\$ 69,000	8%
Traffic Control	\$ 32,400	4%
Under Bridge Inspection Unit	\$ 3,3000	4%
Consultants, Construction & Costs	\$ 277,000	31%
Subtotal	\$ 884,000	100%
Contingency (20%)	\$ 176,800	
Total	\$ 1,060,800	

10. Future Actions

10.1 Planning and Design

Not part of this report

Rehabilitation items may include:

- Girders & Macalloy Bars
- Bearings
- Headstocks
- Expansion Joints
- Guardrail
- Paint

Access will be an important consideration.

10.2 Rehabilitation

Not part of this report.

11. References

NYSDOT, 2005, "Structural Forensic Investigation Report: Partial Failure of Ramp AC, Dunn Memorial Bridge Interchange, BIN 109299A, City of Albany, Albany County, New York, July 27 2005", Prepared by New York State Department of Transport (NYSDOT), Albany, New York, October 20, 2005.

Julie Cohen & Volker Wetz, 2016, "Failures in US bridge rocker bearings", Proceedings of the Institution of Civil Engineers, Engineering History and Heritage, Volume 169 Issue EH3, 2016.

Ali Mazroi, Leon Ru-Liang Wang & Thomas M Murray, 1983, "Effective Coefficient of Friction of Steel Bridge Bearings", Transportation Research Record 903 pp 79-86.

Ford, Lyall R, 2009, "Roads in the wilderness: Development of the main road network in far north Queensland: The first 100 years", Book.

Robinson RM, Francis G & Procter T, 2018, "Engineering Due Diligence", r2a Due Diligence Engineers, 10th Edition, Updated 2018

Macalloy Bar Systems, "Macalloy Bars for Use in Post-tensioning applications – Design data", Sheffield, S9 2LN.

Structure Maintenance Schedule

M1

Sheet
1 of 16

Structure Id 7799

Name _____

Crossing Name Barron River

Alt. Name _____

Structure Type Bridge

Owner MR DEPARTMENT OF MAIN R

Construction Type Girder/Beam

District 403 Far North

Construction Material Steel

LGA Id 277 MAREEBA SHIRE COUNCIL

Inspector NR

Date 19-NOV-2020

Inspection Level 1 ☐ 2 ☒ 3 ☐

Overall Condition Rating 4

Underwater ☐

Vermin Screens ☐

Security Measures ☐

Road Section

Start

End

TDist

Id Description

S Cway S RPC

Dist RPC

Dist

Start

End

Inspector's Comments

Structure is in poor condition.

Structure undergoing investigations due to brittle failure/fatigue concerns. At time of inspection, girders at several sites have had lead coating removed for NDT testing (specifically MPI) of cracking at splice join welds. Cross girder-girder interfaces and stiffeners have also been examined for cracking at welds.

Steward's Comments

Vermin Screen Comments

Security Measures Comments

Total Maintenance Backlog Amount \$ 28660

Structure Maintenance Schedule					M1		Sheet 2 of 16	
Structure Id <u>7799</u>			Name _____					
Inspection Date <u>19-NOV-2020</u>			Inspection Level 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/>					
Defect Location and Details (from B2 forms)								
Component Location (Modification/Group/Component/Standard Number			O / A1 / B4 / 43S					
Component Description <u>Bearings</u>			Significance		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input type="checkbox"/>			
Defect Details			Condition State		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input type="checkbox"/>			
Active corrosion in B4 sole plate especially on the back face with flaking and loss of section up to 6mm (014, 015). Staining under coating on front face also. Recommend treatment of treatment of B4 sole plate. NB - steel components in structure typically have red lead coatings.								
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed	
100S1	Spot clean and paint steelwork	L/SUM	1	780	780	3	N	
945A2	Access using scaffolding	P/SUM	1	650	650	3	N	
					Sub-total \$ <u>1430</u>			
Defect Location and Details (from B2 forms)								
Component Location (Modification/Group/Component/Standard Number			O / A2 / J1 / 14S					
Component Description <u>Joint</u>			Significance		1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>			
Defect Details			Condition State		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input type="checkbox"/>			
2 steel plate anchors missing at side 2 lane - roughly at wheel paths (012). Steel plate slapping noisily under traffic. Recommend reestablishment of anchors.								
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed	
823	Replace/repair expansion joints (steel)	m	3.5	650	2275	3	N	
900A3	Traffic management (including TMP)	P/SUM	1	850	850	3	N	
					Sub-total \$ <u>3125</u>			
Defect Location and Details (from B2 forms)								
Component Location (Modification/Group/Component/Standard Number			O / AP1 / GR1 / 72S					
Component Description <u>Guard Rails</u>			Significance		1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>			
Defect Details			Condition State		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input type="checkbox"/>			
Single bolt connection to end posts in both GR (002 - typical). Requires provision of connections to current standards.								
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed	
72S4	Provide connections to end posts or rails	L/SUM	2	680	1360	3	N	
900A3	Traffic management (including TMP)	P/SUM	1	850	850	3	N	
					Sub-total \$ <u>2210</u>			

Structure Maintenance Schedule						M1		Sheet 3 of 16	
Structure Id <u>7799</u>				Name _____					
Inspection Date <u>19-NOV-2020</u>				Inspection Level 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/>					
Defect Location and Details (from B2 forms)									
Component Location (Modification/Group/Component/Standard Number				O <input type="checkbox"/> / P2 <input type="checkbox"/> / B1 <input type="checkbox"/> / 400					
Component Description <u>Bearings</u>				Significance		1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>			
Defect Details				Condition State		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input type="checkbox"/>			
Fixed bearings located on pier 2.									
B1 - CS3. Outside anchor nut has severe loss of section (037). Minor corrosion evident under coating. Previous L3 inspection recommendation of replace									
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed		
Sub-total \$						_____			
Defect Location and Details (from B2 forms)									
Component Location (Modification/Group/Component/Standard Number				O <input type="checkbox"/> / P3 <input type="checkbox"/> / B1 <input type="checkbox"/> / 400					
Component Description <u>Bearings</u>				Significance		1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>			
Defect Details				Condition State		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/>			
B1 - CS4. Lower attachment nut has nearly completely corroded away (047) with moderate corrosion in the hinge pin and upper attachments.									
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed		
Sub-total \$						_____			
Defect Location and Details (from B2 forms)									
Component Location (Modification/Group/Component/Standard Number				O <input type="checkbox"/> / P3 <input type="checkbox"/> / B4 <input type="checkbox"/> / 400					
Component Description <u>Bearings</u>				Significance		1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>			
Defect Details				Condition State		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/>			
B4 - CS4. Minor loss of section in lower attachments. Minor corrosion evident forming under recent spot treatment coating (049). Rust staining from hinge pin under coating. Upper attachments are untreated and have corrosion with moderate loss of section in nuts. Severe loss of section in sole plate-girder attachment on top of lower flange of girder (050).									
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed		
Sub-total \$						_____			

Structure Maintenance Schedule						M1		Sheet 4 of 16	
Structure Id <u>7799</u>				Name _____					
Inspection Date <u>19-NOV-2020</u>				Inspection Level 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/>					
Defect Location and Details (from B2 forms)									
Component Location (Modification/Group/Component/Standard Number				O <input type="checkbox"/> / P1 <input type="checkbox"/> / B1 <input type="checkbox"/> / 43S					
Component Description <u>Bearings</u>				Significance		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input type="checkbox"/>			
Defect Details				Condition State		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input type="checkbox"/>			
Fixed rocker bearings at halving joint 1, E1 of span 2 (026 - typical). B1 and B4 have been coated since previous inspection however moderate-severe loss of section remains in anchor nuts (027, 028). Corrosion evident under coating on undersides of both rockers and in sole plates.									
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed		
Sub-total \$					_____				
Defect Location and Details (from B2 forms)									
Component Location (Modification/Group/Component/Standard Number				O <input type="checkbox"/> / P1 <input type="checkbox"/> / B4 <input type="checkbox"/> / 43S					
Component Description <u>Bearings</u>				Significance		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input type="checkbox"/>			
Defect Details				Condition State		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input type="checkbox"/>			
Fixed rocker bearings at halving joint 1, E1 of span 2 (026 - typical). B1 and B4 have been coated since previous inspection however moderate-severe loss of section remains in anchor nuts (027, 028). Corrosion evident under coating on undersides of both rockers and in sole plates.									
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed		
Sub-total \$					_____				
Defect Location and Details (from B2 forms)									
Component Location (Modification/Group/Component/Standard Number				O <input type="checkbox"/> / P2 <input type="checkbox"/> / B1 <input type="checkbox"/> / 43S					
Component Description <u>Bearings</u>				Significance		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input type="checkbox"/>			
Defect Details				Condition State		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/>			
B1 - CS4. Lower attachment on downstream side has completely corroded away (033). Corrosion evident in hinge pin (034) - unable to determine extent of loss of section.									
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed		
Sub-total \$					_____				

Structure Maintenance Schedule						M1		Sheet 5 of 16				
Structure Id <u>7799</u>			Name _____									
Inspection Date <u>19-NOV-2020</u>			Inspection Level 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/>									
Defect Location and Details (from B2 forms)												
Component Location (Modification/Group/Component/Standard Number						O	/	P2	/	B4	/	43S
Component Description <u>Bearings</u>						Significance		1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input checked="" type="checkbox"/>	4 <input type="checkbox"/>	
Defect Details						Condition State		1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input checked="" type="checkbox"/>	
B4 - CS4. Lower attachment on downstream side has completely corroded away (036). Corrosion evident in hinge pin. Corrosion in hinge pin appears severe.												
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed					
Sub-total \$						_____						
Defect Location and Details (from B2 forms)												
Component Location (Modification/Group/Component/Standard Number						O	/	P4	/	B1	/	43S
Component Description <u>Bearings</u>						Significance		1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input checked="" type="checkbox"/>	4 <input type="checkbox"/>	
Defect Details						Condition State		1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input checked="" type="checkbox"/>	
Bearings 1-4 appear to have rotated to their tolerance limits. Refer to Sketch 14 for measurements at rocker-bed plates.												
B1 - CS4. Severe loss of section in anchor attachment on downstream side with active corrosion apparent under recent recoating (059). Active corrosion v												
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed					
Sub-total \$						_____						
Defect Location and Details (from B2 forms)												
Component Location (Modification/Group/Component/Standard Number						O	/	P4	/	B2	/	43S
Component Description <u>Bearings</u>						Significance		1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input checked="" type="checkbox"/>	4 <input type="checkbox"/>	
Defect Details						Condition State		1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input checked="" type="checkbox"/>	4 <input type="checkbox"/>	
Bearings 1-4 appear to have rotated to their tolerance limits. Refer to Sketch 14 for measurements at rocker-bed plates.												
B2 - CS3. Moderate loss of section in hinge pin nut with active corrosion. Minor loss of section in anchor attachments with active corrosion (061)												
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed					
Sub-total \$						_____						

Structure Maintenance Schedule						M1		Sheet 6 of 16						
Structure Id <u>7799</u>			Name _____											
Inspection Date <u>19-NOV-2020</u>			Inspection Level 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/>											
Defect Location and Details (from B2 forms)														
Component Location (Modification/Group/Component/Standard Number						O	/	P4	/	B3	/	43S		
Component Description <u>Bearings</u>						Significance	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input checked="" type="checkbox"/>	4	<input type="checkbox"/>
Defect Details						Condition State	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input checked="" type="checkbox"/>	4	<input type="checkbox"/>
Bearings 1-4 appear to have rotated to their tolerance limits. Refer to Sketch 14 for measurements at rocker-bed plates.														
B3 - CS3. Generally fine. Minor amounts of corrosion under recent recoating (062).														
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed							
Sub-total \$								_____						
Defect Location and Details (from B2 forms)														
Component Location (Modification/Group/Component/Standard Number						O	/	P4	/	B4	/	43S		
Component Description <u>Bearings</u>						Significance	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input checked="" type="checkbox"/>	4	<input type="checkbox"/>
Defect Details						Condition State	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input checked="" type="checkbox"/>	4	<input type="checkbox"/>
Bearings 1-4 appear to have rotated to their tolerance limits. Refer to Sketch 14 for measurements at rocker-bed plates.														
B4 - CS3. Generally fine. Minor spot corrosion.														
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed							
Sub-total \$								_____						
Defect Location and Details (from B2 forms)														
Component Location (Modification/Group/Component/Standard Number						O	/	P4	/	B5	/	43S		
Component Description <u>Bearings</u>						Significance	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input checked="" type="checkbox"/>	4	<input type="checkbox"/>
Defect Details						Condition State	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input type="checkbox"/>	4	<input checked="" type="checkbox"/>
Bearings 5-8 are rotated in opposite direction to bearings 1-4. Refer to Sketch 15 for measurements at rocker-bed plates.														
(Remaining) anchor bolts through rocker-bed plate possibly bent. Build up of dirt at rocker-bed plate interface requires cleaning.														
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed							
Sub-total \$								_____						

Structure Maintenance Schedule						M1		Sheet 7 of 16						
Structure Id <u>7799</u>			Name _____											
Inspection Date <u>19-NOV-2020</u>			Inspection Level 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/>											
Defect Location and Details (from B2 forms)														
Component Location (Modification/Group/Component/Standard Number						O	/	P4	/	B6	/	43S		
Component Description <u>Bearings</u>						Significance	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input checked="" type="checkbox"/>	4	<input type="checkbox"/>
Defect Details						Condition State	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input checked="" type="checkbox"/>	4	<input type="checkbox"/>
Bearings 5-8 are rotated in opposite direction to bearings 1-4. Refer to Sketch 15 for measurements at rocker-bed plates.														
(Remaining) anchor bolts through rocker-bed plate possibly bent. Build up of dirt at rocker-bed plate interface requires cleaning.														
Activity No	Description					Unit	Quantity	Unit Rate	Amount	Priority	Completed			
Sub-total \$ _____														
Defect Location and Details (from B2 forms)														
Component Location (Modification/Group/Component/Standard Number						O	/	P4	/	B7	/	43S		
Component Description <u>Bearings</u>						Significance	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input checked="" type="checkbox"/>	4	<input type="checkbox"/>
Defect Details						Condition State	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input checked="" type="checkbox"/>	4	<input type="checkbox"/>
Bearings 5-8 are rotated in opposite direction to bearings 1-4. Refer to Sketch 15 for measurements at rocker-bed plates.														
(Remaining) anchor bolts through rocker-bed plate possibly bent. Build up of dirt at rocker-bed plate interface requires cleaning.														
Activity No	Description					Unit	Quantity	Unit Rate	Amount	Priority	Completed			
Sub-total \$ _____														
Defect Location and Details (from B2 forms)														
Component Location (Modification/Group/Component/Standard Number						O	/	P4	/	B8	/	43S		
Component Description <u>Bearings</u>						Significance	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input checked="" type="checkbox"/>	4	<input type="checkbox"/>
Defect Details						Condition State	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input type="checkbox"/>	4	<input checked="" type="checkbox"/>
Bearings 5-8 are rotated in opposite direction to bearings 1-4. Refer to Sketch 15 for measurements at rocker-bed plates.														
(Remaining) anchor bolts through rocker-bed plate possibly bent. Build up of dirt at rocker-bed plate interface requires cleaning.														
Activity No	Description					Unit	Quantity	Unit Rate	Amount	Priority	Completed			
Sub-total \$ _____														

Structure Maintenance Schedule					M1		Sheet 8 of 16				
Structure Id <u>7799</u>		Name _____									
Inspection Date <u>19-NOV-2020</u>		Inspection Level 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/>									
Defect Location and Details (from B2 forms)											
Component Location (Modification/Group/Component/Standard Number					O	/	P1	/	J2	/	110
Component Description _____					Joint	Significance	1 <input type="checkbox"/>	2 <input checked="" type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	
Defect Details _____					Condition State	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input checked="" type="checkbox"/>	4 <input type="checkbox"/>		
Refers to compression seal joint with steel nosings at E1 of span 2. Compression seal is highly weathered and perishing (010). Spoils in joint. Nosings appear fair - gaps between nosings both sides 47mm (Temp. 27). Recommend replacement of compression seal.											
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed				
500O9	Replacement of compression joint seal expansion joints	EA	1	2250	2250	3	N				
900A3	Traffic management (including TMP)	P/SUM	1	850	850	3	N				
Sub-total \$					3100						
Defect Location and Details (from B2 forms)											
Component Location (Modification/Group/Component/Standard Number					O	/	P4	/	J3	/	110
Component Description _____					Joint	Significance	1 <input type="checkbox"/>	2 <input checked="" type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	
Defect Details _____					Condition State	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input checked="" type="checkbox"/>	4 <input type="checkbox"/>		
Refers to compression joint with steel nosing at E2 of span 5. Rubber gland is perishing with the gland breaking away in sections (011). Gland has separated from nosing at side 2 potentially allowing moisture ingress. Seal is also lifting at side 2 at the pedestrian footway. Steel plates at kerb joints fair. Requires replacement of compression seal.											
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed				
500O9	Replacement of compression joint seal expansion joints	EA	1	2250	2250	2	N				
900A3	Traffic management (including TMP)	P/SUM	1	850	850	2	N				
Sub-total \$					3100						
Defect Location and Details (from B2 forms)											
Component Location (Modification/Group/Component/Standard Number					O	/	S1	/	BR1	/	2S
Component Description _____					Bridge Barriers	Significance	1 <input checked="" type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	
Defect Details _____					Condition State	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input checked="" type="checkbox"/>		
All BR posts have insufficient thread at anchor bolts and lack washers (004 - typical). Base plates are recessed into kerbs. Mortar applied up to level with top of base plate - mortar missing/spalled away in many cases. Minor surface corrosion at lower portion of base plates typical. Delineation provided by retroreflective stickers on BR posts. Requires engineering input.											
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed				
Sub-total \$											

Structure Maintenance Schedule						M1		Sheet 9 of 16	
Structure Id <u>7799</u>			Name _____						
Inspection Date <u>19-NOV-2020</u>			Inspection Level 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/>						
Defect Location and Details (from B2 forms)									
Component Location (Modification/Group/Component/Standard Number			O / S2 / BR1 / 2S						
Component Description <u>Bridge Barriers</u>			Significance		1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>				
Defect Details			Condition State		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/>				
All BR posts have insufficient thread at anchor bolts and lack washers (004 - typical). Base plates are recessed into kerbs. Mortar applied up to level with top of base plate - mortar missing/spalled away in many cases. Minor surface corrosion at lower portion of base plates typical. Delineation provided by retroreflective stickers on BR posts. Requires engineering input.									
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed		
Sub-total \$					_____				
Defect Location and Details (from B2 forms)									
Component Location (Modification/Group/Component/Standard Number			O / S3 / BR1 / 2S						
Component Description <u>Bridge Barriers</u>			Significance		1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>				
Defect Details			Condition State		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/>				
All BR posts have insufficient thread at anchor bolts and lack washers (004, 005 - typical). Base plates are recessed into kerbs. Mortar applied up to level with top of base plate - mortar missing/spalled away in many cases. Minor surface corrosion at lower portion of base plates typical. Delineation provided by retroreflective stickers on BR posts. Requires engineering input.									
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed		
Sub-total \$					_____				
Defect Location and Details (from B2 forms)									
Component Location (Modification/Group/Component/Standard Number			O / S4 / BR1 / 2S						
Component Description <u>Bridge Barriers</u>			Significance		1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>				
Defect Details			Condition State		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/>				
All BR posts have insufficient thread at anchor bolts and lack washers (004, 005 - typical). Base plates are recessed into kerbs. Mortar applied up to level with top of base plate - mortar missing/spalled away in many cases. Minor surface corrosion at lower portion of base plates typical. Delineation provided by retroreflective stickers on BR posts. Requires engineering input.									
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed		
Sub-total \$					_____				

Structure Maintenance Schedule						M1	Sheet 10 of 16							
Structure Id <u>7799</u>			Name _____											
Inspection Date <u>19-NOV-2020</u>			Inspection Level 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/>											
Defect Location and Details (from B2 forms)														
Component Location (Modification/Group/Component/Standard Number						O	/	S5	/	BR1	/	2S		
Component Description <u>Bridge Barriers</u>						Significance	1	<input checked="" type="checkbox"/>	2	<input type="checkbox"/>	3	<input type="checkbox"/>	4	<input type="checkbox"/>
Defect Details						Condition State	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input type="checkbox"/>	4	<input checked="" type="checkbox"/>
All BR posts have insufficient thread at anchor bolts and lack washers (004, 005 - typical). Base plates are recessed into kerbs. Mortar applied up to level with top of base plate - mortar missing/spalled away in many cases. Minor surface corrosion at lower portion of base plates typical. Delineation provided by retroreflective stickers on BR posts. Requires engineering input.														
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed							
					Sub-total \$ _____									
Defect Location and Details (from B2 forms)														
Component Location (Modification/Group/Component/Standard Number						O	/	S6	/	BR1	/	2S		
Component Description <u>Bridge Barriers</u>						Significance	1	<input checked="" type="checkbox"/>	2	<input type="checkbox"/>	3	<input type="checkbox"/>	4	<input type="checkbox"/>
Defect Details						Condition State	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input type="checkbox"/>	4	<input checked="" type="checkbox"/>
All BR posts have insufficient thread at anchor bolts and lack washers (004, 005 - typical). Base plates are recessed into kerbs. Mortar applied up to level with top of base plate - mortar missing/spalled away in many cases. Minor surface corrosion at lower portion of base plates typical. Delineation provided by retroreflective stickers on BR posts. Requires engineering input.														
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed							
					Sub-total \$ _____									
Defect Location and Details (from B2 forms)														
Component Location (Modification/Group/Component/Standard Number						O	/	S2	/	D1	/	20C		
Component Description <u>Deck</u>						Significance	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input checked="" type="checkbox"/>	4	<input type="checkbox"/>
Defect Details						Condition State	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input checked="" type="checkbox"/>	4	<input type="checkbox"/>
Moderate spalls with exposed and corroded reo at soffit under finger joint in D2 and D4 (030 - typical). Requires treatment of reinforcement.														
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed							
140S1	Clean corroded reinforcing	L/SUM	1	1500	1500	2	N							
945A1	Access from deck (UBIU)	P/SUM	1	850	850	2	N							
900A3	Traffic management (including TMP)	P/SUM	1	850	850	2	N							
					Sub-total \$ _____ 3200									

Structure Maintenance Schedule					M1		Sheet 11 of 16	
Structure Id <u>7799</u>		Name _____						
Inspection Date <u>19-NOV-2020</u>		Inspection Level 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/>						
Defect Location and Details (from B2 forms)								
Component Location (Modification/Group/Component/Standard Number		O / S3 / D1 / 20C						
Component Description _____		Deck		Significance		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input type="checkbox"/>		
Defect Details _____		Condition State		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input type="checkbox"/>				
Small sections of spalling with exposed and corroded reinforcement in D1 at MS, D5 at E1 and in D4 at E1 likely due to poor cover. Requires squaring to behind reo, treatment of reo and covering with a reinstatement mortar.								
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed	
105C1	Cleaning and Priming Reinforcement	P/SUM	1	750	750	3	N	
100C4	Treatment Preparation Grade 4 - Squaring and Removal of Concrete (be	m2	1	1580	1580	3	N	
115C3	Reinstate repair area with concrete reinstatement mortar	m2	1	1455	1455	3	N	
945A1	Access from deck (UBIU)	P/SUM	1	2200	2200	3	N	
Sub-total \$					5985			
Defect Location and Details (from B2 forms)								
Component Location (Modification/Group/Component/Standard Number		O / S5 / D1 / 20C						
Component Description _____		Deck		Significance		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input type="checkbox"/>		
Defect Details _____		Condition State		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input type="checkbox"/>				
Spalling in all decks at E1 under finger joint with exposed and corroding reinforcement (070). Requires treating.								
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed	
100S1	Spot clean and paint steelwork	L/SUM	1	2500	2500	3	N	
900A3	Traffic management (including TMP)	P/SUM	1	850	850	3	N	
945A1	Access from deck (UBIU)	P/SUM	1	2000	2000	3	N	
Sub-total \$					5350			
Defect Location and Details (from B2 forms)								
Component Location (Modification/Group/Component/Standard Number		O / S1 / G3 / 22S						
Component Description _____		Girders		Significance		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/>		
Defect Details _____		Condition State		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/>				
Structure undergoing investigations due to brittle failure/fatigue concerns. Several sites have undergone testing, specifically welds at splice joints, cross girder-girder interfaces and at stiffeners.								
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed	
Sub-total \$								

Structure Maintenance Schedule						M1		Sheet 12 of 16				
Structure Id <u>7799</u>			Name _____									
Inspection Date <u>19-NOV-2020</u>			Inspection Level 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/>									
Defect Location and Details (from B2 forms)												
Component Location (Modification/Group/Component/Standard Number						O	/	S1	/	G4	/	22S
Component Description _____						Girders	Significance	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input checked="" type="checkbox"/>	
Defect Details _____						Condition State	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input checked="" type="checkbox"/>	4 <input type="checkbox"/>		
Structure undergoing investigations due to brittle failure/fatigue concerns. Several sites have undergone testing, specifically welds at splice joints, cross girder-girder interfaces and at stiffeners.												
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed					
Sub-total \$						_____						
Defect Location and Details (from B2 forms)												
Component Location (Modification/Group/Component/Standard Number						O	/	S2	/	G4	/	22S
Component Description _____						Girders	Significance	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input checked="" type="checkbox"/>	
Defect Details _____						Condition State	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input checked="" type="checkbox"/>	4 <input type="checkbox"/>		
Structure undergoing investigations due to brittle failure/fatigue concerns. Several sites have undergone testing, specifically welds at splice joints, cross girder-girder interfaces and at stiffeners. Refer to Sketch 18 - Post inspection Tech note and Sketch 19 - Summary Plans.												
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed					
Sub-total \$						_____						
Defect Location and Details (from B2 forms)												
Component Location (Modification/Group/Component/Standard Number						O	/	S4	/	G1	/	22S
Component Description _____						Girders	Significance	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input checked="" type="checkbox"/>	
Defect Details _____						Condition State	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input checked="" type="checkbox"/>	4 <input type="checkbox"/>		
Structure undergoing investigations due to brittle failure/fatigue concerns. Several sites have undergone testing, specifically welds at splice joints, cross girder-girder interfaces and at stiffeners. Refer to Sketch 18 - Post inspection Tech note and Sketch 19 - Summary Plans.												
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed					
Sub-total \$						_____						

Structure Maintenance Schedule						M1		Sheet 13 of 16	
Structure Id <u>7799</u>				Name _____					
Inspection Date <u>19-NOV-2020</u>				Inspection Level 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/>					
Defect Location and Details (from B2 forms)									
Component Location (Modification/Group/Component/Standard Number				O / S4 / G2 / 22S					
Component Description <u>Girders</u>				Significance		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/>			
Defect Details				Condition State		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input type="checkbox"/>			
Structure undergoing investigations due to brittle failure/fatigue concerns. Several sites have undergone testing, specifically welds at splice joints, cross girder-girder interfaces and at stiffeners. Refer to Sketch 18 - Post inspection Tech note and Sketch 19 - Summary Plans.									
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed		
Sub-total \$						_____			
Defect Location and Details (from B2 forms)									
Component Location (Modification/Group/Component/Standard Number				O / S4 / G3 / 22S					
Component Description <u>Girders</u>				Significance		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/>			
Defect Details				Condition State		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input type="checkbox"/>			
Structure undergoing investigations due to brittle failure/fatigue concerns. Several sites have undergone testing, specifically welds at splice joints, cross girder-girder interfaces and at stiffeners. Refer to Sketch 18 - Post inspection Tech note and Sketch 19 - Summary Plans.									
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed		
Sub-total \$						_____			
Defect Location and Details (from B2 forms)									
Component Location (Modification/Group/Component/Standard Number				O / S4 / G4 / 22S					
Component Description <u>Girders</u>				Significance		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/>			
Defect Details				Condition State		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input type="checkbox"/>			
Structure undergoing investigations due to brittle failure/fatigue concerns. Several sites have undergone testing, specifically welds at splice joints, cross girder-girder interfaces and at stiffeners. Refer to Sketch 18 - Post inspection Tech note and Sketch 19 - Summary Plans.									
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed		
Sub-total \$						_____			

Structure Maintenance Schedule						M1		Sheet 14 of 16				
Structure Id <u>7799</u>			Name _____									
Inspection Date <u>19-NOV-2020</u>			Inspection Level 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/>									
Defect Location and Details (from B2 forms)												
Component Location (Modification/Group/Component/Standard Number						O	/	S5	/	G1	/	22S
Component Description <u>Girders</u>						Significance			1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input checked="" type="checkbox"/>
Defect Details						Condition State			1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input checked="" type="checkbox"/>
Structure undergoing investigations due to brittle failure/fatigue concerns. Several sites have undergone testing, specifically welds at splice joints, cross girder-girder interfaces and at stiffeners. Refer to Sketch 18 - Post inspection Tech note and Sketch 19 - Summary Plans.												
Activity No	Description					Unit	Quantity	Unit Rate	Amount	Priority	Completed	
Sub-total \$									_____			
Defect Location and Details (from B2 forms)												
Component Location (Modification/Group/Component/Standard Number						O	/	S6	/	G1	/	22S
Component Description <u>Girders</u>						Significance			1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input checked="" type="checkbox"/>
Defect Details						Condition State			1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input checked="" type="checkbox"/>
Structure undergoing investigations due to brittle failure/fatigue concerns. Several sites have undergone testing, specifically welds at splice joints, cross girder-girder interfaces and at stiffeners. Refer to Sketch 18 - Post inspection Tech note and Sketch 19 - Summary Plans.												
Activity No	Description					Unit	Quantity	Unit Rate	Amount	Priority	Completed	
Sub-total \$									_____			
Defect Location and Details (from B2 forms)												
Component Location (Modification/Group/Component/Standard Number						O	/	S2	/	W	/	71O
Component Description <u>Waterway</u>						Significance			1 <input type="checkbox"/>	2 <input checked="" type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>
Defect Details						Condition State			1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input checked="" type="checkbox"/>	4 <input type="checkbox"/>
Significant localised build up S2 E2 on the downstream side relative to original readings (024, 031). Localised scours and build up in other areas. Refer to scour soundings report. Monitor.												
Activity No	Description					Unit	Quantity	Unit Rate	Amount	Priority	Completed	
Sub-total \$									_____			

Structure Maintenance Schedule						M1		Sheet 15 of 16						
Structure Id <u>7799</u>			Name _____											
Inspection Date <u>19-NOV-2020</u>			Inspection Level 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/>											
Defect Location and Details (from B2 forms)														
Component Location (Modification/Group/Component/Standard Number						O	/	S6	/	W	/	710		
Component Description <u>Waterway</u>						Significance	1	<input type="checkbox"/>	2	<input checked="" type="checkbox"/>	3	<input type="checkbox"/>	4	<input type="checkbox"/>
Defect Details						Condition State	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input checked="" type="checkbox"/>	4	<input type="checkbox"/>
Significant localised build up at E1 of downstream side (024, 073). Refer to scour soundings report. Monitor.														
Activity No	Description					Unit	Quantity	Unit Rate	Amount	Priority	Completed			
Sub-total \$ _____														
Defect Location and Details (from B2 forms)														
Component Location (Modification/Group/Component/Standard Number						ST	/	S3	/	G1	/	22S		
Component Description <u>Girders</u>						Significance	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input type="checkbox"/>	4	<input checked="" type="checkbox"/>
Defect Details						Condition State	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input checked="" type="checkbox"/>	4	<input type="checkbox"/>
Spot corrosion throughout stressing bars tending to worsen towards E2 (044 - typical). Protective coating failing at stressing bar ends at girders 2, 3 and 4 (045 - typical).														
Activity No	Description					Unit	Quantity	Unit Rate	Amount	Priority	Completed			
Sub-total \$ _____														
Defect Location and Details (from B2 forms)														
Component Location (Modification/Group/Component/Standard Number						ST	/	S4	/	G4	/	22S		
Component Description <u>Girders</u>						Significance	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input type="checkbox"/>	4	<input checked="" type="checkbox"/>
Defect Details						Condition State	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input checked="" type="checkbox"/>	4	<input type="checkbox"/>
Longitudinal stressing bars retro-fitted to either side of all girders. Attachments appear fair.														
Spot corrosion throughout stressing bars (044 - typical). Protective coating failing at stressing bar ends particularly at girders 4 (045 - typical).														
Activity No	Description					Unit	Quantity	Unit Rate	Amount	Priority	Completed			
Sub-total \$ _____														

Structure Maintenance Schedule					M1		Sheet 16 of 16	
Structure Id <u>7799</u>			Name _____					
Inspection Date <u>19-NOV-2020</u>			Inspection Level 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/>					
Defect Location and Details (from B2 forms)								
Component Location (Modification/Group/Component/Standard Number			ST / S6 / G1 / 22S					
Component Description <u>Girders</u>			Significance		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/>			
Defect Details			Condition State		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input type="checkbox"/>			
Longitudinal stressing bars retro-fitted to either side of all girders.								
Stressing bars removed and replaced in 2019 as part of investigations into fatigue (083).								
Activity No	Description	Unit	Quantity	Unit Rate	Amount	Priority	Completed	
120S2	Replace or install bolts	each	2	580	1160	3	N	
Sub-total \$					1160			

Structure Scour Soundings Report										B2/7		Sheet 1 Of 3					
Structure Id		7799				Name											
Crossing Name		Barron River				Alt. Name											
Structure Type		Bridge				Owner		MR DEPARTMENT OF MAIN R									
Construction Type		Girder/Beam				District		403 Far North									
Construction Material		Steel				LGA Id		277 MAREEBA SHIRE COUNCI									
Inspector		NR				Date		19-NOV-20									
Inspection Level 2		<input checked="" type="checkbox"/>		Programmed		<input type="checkbox"/>		Partial Inspection <input type="checkbox"/>									
Level 3		<input type="checkbox"/>		Exceptional		<input type="checkbox"/>		Underwater <input type="checkbox"/>									
Road Section										Start		End		TDist			
Id		Description		S Cway S		RPC		Dist		RPC		Dist		Start		End	
32A		CAIRNS - MAREEBA C		1 C		5		0.000		5		0.257		12.535		12.792	

Sounding Location				Permanent Reference Feature	Sounding Depth (m)							Condition State	Critical Scour Dip	Comments	
Modification	Group	Location	Side		Water Surface	Stream Bed									
						First	Previous	Rehab	Current	First Diff	Current Diff				
O	S1	E1	U	Top Of Ker				X	4.4	0.0	0.0	1		First Scour Survey: 17-MAR-2008 Last Stream Bed Rehab: 19-NOV-2020 Previous Scour Survey: 19-NOV-2020	
Side 2 = upstream side. Large difference from first reading likely due to relocation of sounding site. Current reading similar to previous readings - CS2. Rehab button used.															
O	S1	MS	U	Top Of Ker		8.0	8.2		8.2	0.2	0.0	2			
O	S1	E2	U	Top Of Ker		12.7	13.1		13.2	0.5	0.1	2			Localised scour from first readings - CS2.
O	S2	E1	U	Top Of Ker		12.7	14.0		14.1	1.4	0.1	2			Localised scour from first readings - CS2.
O	S2	MS	U	Top Of Ker		15.5	14.9		14.9	0.6	0.0	2			Localised build up from first readings - CS2.
O	S2	E2	U	Top Of Ker	17.6	20.7	20.5		20.2	0.5	0.3	2			Localised build up from first readings - CS2.
O	S3	E1	U	Top Of Ker	17.6	20.7	20.6		20.3	0.4	0.3	2			

Sounding Locations		Depth (metres)							
		CS 1		CS 2		CS 3		CS 4	
Group	Location (Abbreviation) (Describe Other (O) in comments)	Change in depth	Local scour depth	Change in depth	Local scour depth	Change in depth	Local scour depth	Change in depth	Local scour depth
Span	End1 (E1), Midspan (MS), End 2 (E2), Other (O)	<0.2	<0.5	0.2 to 0.49	0.5 to 1.99	0.5 to 1.0	2.0 to 4.0	>1.0	>4.0

Structure Scour Soundings Report

B2/7

Sheet

2 Of 3

Structure Id 7799

Name

Survey Date 19-NOV-20

Inspection Level 2 ☒

Level 3 ☐

Underwater ☐

Sounding Location				Permanent Reference Feature	Sounding Depth (m)							Condition State	Critical Scour Dip	Comments
Modification	Group	Location	Side		Water Surface	Stream Bed								
						First	Previous	Rehab	Current	First Diff	Current Diff			
O	S3	MS	U	Top Of Ker	17.8	21.0	21.2		21.6	0.6	0.4	2		Localised scour from first and reading - CS2.
O	S3	E2	U	Top Of Ker	18.0	20.0	21.1		21.4	1.4	0.3	2		Localised scour from first reading - CS2.
O	S4	E1	U	Top Of Ker	18.0	20.0	21.0		21.2	1.2	0.2	2		Localised scour from first reading - CS2.
O	S4	MS	U	Top Of Ker	18.1	21.0	20.8		21.0	0.0	0.2	2		
O	S4	E2	U	Top Of Ker	18.3	21.0	21.3		21.4	0.4	0.1	2		
O	S5	E1	U	Top Of Ker	18.3	21.0	21.5		21.3	0.3	0.2	2		
O	S5	MS	U	Top Of Ker		18.2	17.5		17.8	0.4	0.3	2		
O	S5	E2	U	Top Of Ker		15.7	15.8		15.9	0.2	0.1	2		
O	S6	E1	U	Top Of Ker		15.7	15.5		15.5	0.2	0.0	2		
O	S6	MS	U	Top Of Ker		6.6	6.7		6.8	0.2	0.1	2		
O	S6	E2	U	Top Of Ker		1.7	2.0		2.2	0.5	0.2	2		Localised scour from first reading - CS2.
O	S1	E1	D	Top Of Ker		4.8	5.0		5.0	0.2	0.0	2		Side 1 = downstream side.
O	S1	MS	D	Top Of Ker		9.1	8.5		8.5	0.6	0.0	2		Localised build up from first reading - CS2.
O	S1	E2	D	Top Of Ker		13.6	13.5		13.5	0.1	0.0	1		
O	S2	E1	D	Top Of Ker		14.2	14.0		14.2	0.0	0.2	2		
O	S2	MS	D	Top Of Ker		15.2	15.0		15.2	0.0	0.2	2		
O	S2	E2	D	Top Of Ker	17.6	21.0	20.3		18.2	2.8	2.1	3		Significant localised build up - CS3.
O	S3	E1	D	Top Of Ker	17.6	20.9	20.5		20.1	0.8	0.4	2		Localised build up from first reading - CS2.
O	S3	MS	D	Top Of Ker	17.8	20.6	21.4		21.4	0.8	0.0	2		Localised build up from first reading - CS2.
O	S3	E2	D	Top Of Ker	17.9	21.1	21.3		21.3	0.2	0.0	2		
O	S4	E1	D	Top Of Ker	17.9	21.2	21.6		22.0	0.8	0.4	2		Localised scour from first reading - CS2.

Structure Scour Soundings Report

B2/7

Sheet

3 Of 3

Structure Id 7799

Name

Survey Date 19-NOV-20

Inspection Level 2 ☒

Level 3 ☐

Underwater ☐

Sounding Location				Permanent Reference Feature	Sounding Depth (m)							Condition State	Critical Scour Dip	Comments
Modification	Group	Location	Side		Water Surface	Stream Bed								
						First	Previous	Rehab	Current	First Diff	Current Diff			
				Top of kerb, deck or concrete parapet										
O	S4	MS	D	Top Of Ker	18.1	21.3	20.8		20.4	0.9	0.4	2		Localised build up from first reading - CS2.
O	S4	E2	D	Top Of Ker	18.3	20.9	20.9		20.9	0.0	0.0	1		
O	S5	E1	D	Top Of Ker	18.3	21.8	21.0		21.0	0.8	0.0	2		Localised build up from first reading - CS2.
O	S5	MS	D	Top Of Ker		16.8	17.2		17.2	0.4	0.0	2		
O	S5	E2	D	Top Of Ker		16.2	15.0		14.9	1.3	0.1	2		Significant localised build up from first reading - CS2.
O	S6	E1	D	Top Of Ker		16.0	14.0		12.4	3.6	1.6	3		
Significant localised build up from first and previous readings - CS3.														
O	S6	MS	D	Top Of Ker		7.0	6.5		6.5	0.5	0.0	2		Localised build up from first reading - CS2.
O	S6	E2	D	Top Of Ker		2.6	2.0		2.0	0.6	0.0	2		Localised build up from first reading - CS2.

Structure Id <u>7799</u>	Name _____
Crossing Name <u>Barron River</u>	Alt. Name _____
Structure Type <u>Bridge</u>	Owner <u>MR DEPARTMENT OF MAIN R</u>
Construction Type <u>Girder/Beam</u>	District <u>403 Far North</u>
Construction Material <u>Steel</u>	LGA Id <u>277 MAREEBA SHIRE COUNCI</u>
Inspector <u>NR</u>	Date <u>19-NOV-2020</u>
Inspection Level 2 <input checked="" type="checkbox"/>	Programmed <input checked="" type="checkbox"/>
Level 3 <input type="checkbox"/>	Exceptional <input type="checkbox"/>
	Underwater <input type="checkbox"/>

Road Section	Start	End	TDist						
Id Description S Cway S RPC	Dist RPC	Dist	Start	End					
32A CAIRNS - MAREEBA C 1 C 5	0.000 5	0.257	12.535	12.792					

Film/Exposure Number	Sketch No	Location			Description	Id
		Modification	Group	Component		
001		O	AP1	AP	General view of approach	1560295
002		O	AP1	GR	Typical post connection in AP1 GR	1560296
003		O	A1	J1	A1 joint	1560297
004		O	S1	BR	Typical lack of thread in BR anchor bolts	1560298
005		O	S2	BR	Typical lack of thread in BR anchor bolts	1560299
006		O	S1	WS	View across deck	1560300
007		O	S1	K2	Survey marker S1 K2	1560301
008		O	A1	J2	Showing A1 J2	1560302
009		O	P1	J1	Showing P1 J1 - typical of fixed joints	1565723
010		O	P1	J2	Showing P1 J2	1565725
011		O	P4	J3	Showing P4 J3	1565727
012		O	A2	J1	Showing A2 joint	1565730
013		O	S6	BR	Spall in side 2 end post AP2	1565733
014		O	A1	B4	A1 B4	1565739
015		O	A1	B4	Corosion in A1 B4 bed plate	1565740
016		O	A1	A	View of A1	1565741
017		O	A1	A	Showing minor cracking in A1	1565742
018		O	S1	D	Example of spall in S1 deck	1565743
019		O	S1	G2	S1 G2 splice	1565744

Structure Id 7799 Name _____
 Inspection Date 19-NOV-2020 Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Film/Exposure Number	Sketch No	Location			Description	Id
		Modification	Group	Component		
					* Deck Surface (full width and alignment) * Side View (waterway, spans, piers, etc) * Underside (deck and pier construction) * Deficient Component and Major Defects * Undefined Elements	
020		O	S1	G3	S1 G3 splice 3	1565745
021		O	S1	G4	S1 G4 splice 3	1565746
022		O	P1	H	View of P1	1565747
023		O	S1	XG3	Fine cracking in weld at G2 interface	1565748
024		O	S1	W	General side view	1565749
025		O	P1	B	P1 fixed bearings	1565750
026		O	P1	B	Fixed halving joint S2 E1	1565752
027		O	P1	B1	Fixed rocker E1 at halving joint 1	1565754
028		O	P1	B4	Fixed rocker B4 at halving joint 1	1565756
029		O	P1	H	Minor spall in P1 H	1565758
030		O	S2	D	Spalling in S2 deck under finger joint	1565760
031		O	P2	H	View of P2	1565761
032		O	P2	B	Expansion halving joint S2 E2	1565763
033		O	P2	B1	P2 B1 at expansion HJ2	1565764
034		O	P2	1	Corrosion in hinge pin	1565765
035		O	P2	B2	P2 B1 at expansion HJ2	1565766
036		O	P2	B4	P2 B4 at expansion HJ2	1565767
037		O	P2	B1	P2 B1 at P2	1565768
038		O	P2	B4	P2 B4 at P2	1565769
039		O	S3	D	Example of spalls in S3 deck	1565770
040		O	S3	G	Example of surface discontinuities in S3 girders	1565771
041		O	S3	G	Example of corrosion at S3 splice welds	1565772
042		O	S3	G	Example of corrosion in S3 girders	1565773
043		O	S3	G	Example of corrosion in S3 girders	1565774
044		O	S3	XG	Typical spot corrosion in XG3 and stressing bars	1565775
045		ST	S3	G	Coating failure in stressing bar ends	1565776

Structure Id 7799

Inspection Date 19-NOV-2020

Name _____

Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Film/Exposure Number	Sketch No	Location			Description	Id
		Modification	Group	Component		
					* Deck Surface (full width and alignment) * Side View (waterway, spans, piers, etc) * Underside (deck and pier construction) * Deficient Component and Major Defects * Undefined Elements	
046		O	P3	H	View of P3	1565781
047		O	P3	B1	P3 B1	1565782
048		O	P3	B3	P3 B3	1565783
049		O	P3	B4	P3 B4	1565784
050		O	P3	B4	P3 B4	1565785
051		O	S4	D	Example of spalling in S4 deck	1565786
052		O	S4	G	Example of spot corrosion in S4 girders	1565787
053		O	S4	G1	Example of cracks in welds at S4 splice 2 in girders	1565788
054		O	S4	G2	Example of cracks in welds at S4 splice 2 in girders	1565789
055		O	S4	G	Example of corrosion at many splice welds S4	1565790
056		O	P4	H	View of P4	1565791
057		O	S4	G	Example of spot corrosion in S4 girders	1565792
058		O	P4	B	Showing expansion halving joint E1 of S5	1565793
059		O	P4	B1	P4 B1	1565796
060		O	P4	B1	P4 B1	1565797
061		O	P4	B2	P4 B2	1565798
062		O	P4	B3	P4 B3	1565799
063		O	P4	B4	P4 B4	1565800
064		O	P4	B5	P4 B5 downstream side	1565803
065		O	P4	B5	P4 B5 upstream side	1565806
066		O	P4	B6	P4 B6	1565808
067		O	P4	B7	P4 B7	1565810
068		O	P4	B8	P4 B8 upstream side	1565813
069		O	P4	B8	P4 B8 downstream side	1565816
070		O	S5	D	Example of spalling in S5 deck at finger joint	1565818
071		O	S5	G1	Example of fine cracking at splice 2 S5	1565820

Structure Id 7799

Inspection Date 19-NOV-2020

Name _____

Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Film/Exposure Number	Sketch No	Location			Description	Id
		Modification	Group	Component		
072		O	S5	G1	Crack in weld S5 G1-XG3 interface	1565821
073		O	P5	H	View of P5	1565822
074		O	P5	B	Showing fixed halving joint S5 E2	1565823
075		O	P5	B	Example of P5 bearing condition	1565824
076		O	P5	B	Showing P5 bearings on P5	1565825
077		O	S6	G2	Cracking at S6 G2-XG1 interface	1565826
078		O	S6	G1	Cracking in weld S6 G1 splice 3	1565827
079		O	A2	A	View of A2	1565828
080		O	A2	B3	A2 B3	1565829
081		O	A2	B4	A2 B4	1565830
082		O	S6	XG4	Example of cracking in S6 XG4	1565831
083		ST	S6	G1	Showing replaced stressing bar	1565832
084		ST	S6	G1	Example of loss of bolts in stressing bar attachments	1565833
085		O	S1	G3	Crack removal S1 G3 splice 3	1565834
086		O	S5	G1	Crack removal S5 G1 splice 2	1565835
087		O	S6	G1	Crack removal S6 G1 splice 3	1565836
Sketch 1-5		C	P1	J3	P1 J3 Finger Joint	1560353
Sketch 11-17					Rocker Bearing Measurements	1560355
Sketch 18					Post Inspection Tech note	1560288
Sketch 19					Summary plans	1560289
Sketch 20					Site Inspection: Bearings and Macalloy bars	1560290
Sketch 21		O	S1	G3	S1 G3 Splice 3	1560294
Sketch 22		O	S5	G1	S5 G1 Splice 2	1560292
Sketch 23		O	S6	G1	S6 G1 Splice 2	1560293
Sketch 24					Barron Kuranda NDT and cack removal	1565844
Sketch 25					LMAT NDT	1566263

Structure Id 7799

Name

Inspection Date 19-NOV-2020

Inspection Level 2 ☒Level 3 ☐Underwater ☐

Film/Exposure Number	Sketch No	Location			Description	Id
		Modification	Group	Component		
Sketch 6-10		O	P4	J2	P4 J2 Finger Joint	1560354

Name

Structure Id 7799

Inspection Date 19-NOV-2020

Inspection Level 2 ☒Level 3 ☐Underwater ☐

Pictures

** Not all images printed. Total size of images allowed for this report has been exceeded.

Id 1560288

Date 14-NOV-2020

Film / Exposure Number

Sketch No

Sketch 18

Description

Post Inspection Tech note

Mod Category Number Comp Code Comp No

Id 1560289

Date 14-NOV-2020

Film / Exposure Number

Sketch No

Sketch 19

Description

Summary plans

Mod Category Number Comp Code Comp No

Id 1560290

Date 14-NOV-2020

Film / Exposure Number

Sketch No

Sketch 20

Description

Site Inspection: Bearings and Macalloy bars

Mod Category Number Comp Code Comp No

Structure Id 7799

Name _____

Inspection Date 19-NOV-2020

Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Pictures

** Not all images printed. Total size of images allowed for this report has been exceeded.

Id 1560292

Date 14-NOV-2020

Film / Exposure Number

Sketch No

Sketch 22

Description

S5 G1 Splice 2

Mod Category Number Comp Code Comp No

O	S	5	G	1
---	---	---	---	---

Id 1560293

Date 14-NOV-2020

Film / Exposure Number

Sketch No

Sketch 23

Description

S6 G1 Splice 2

Mod Category Number Comp Code Comp No

O	S	6	G	1
---	---	---	---	---

Id 1560294

Date 14-NOV-2020

Film / Exposure Number

Sketch No

Sketch 21

Description

S1 G3 Splice 3

Mod Category Number Comp Code Comp No

O	S	1	G	3
---	---	---	---	---

Id 1560295

Date 14-NOV-2020

Film / Exposure Number

Sketch No

001

Description

General view of approach

Mod Category Number Comp Code Comp No

O	AP	1	AP	
---	----	---	----	--



Structure Id 7799

Name _____

Inspection Date 19-NOV-2020

Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Pictures

** Not all images printed. Total size of images allowed for this report has been exceeded.

Id 1560296

Date 14-NOV-2020

Film / Exposure Number

002

Sketch No

Description

Typical post connection in AP1 GR

Mod Category Number Comp Code Comp No

O	AP	1	GR	
---	----	---	----	--



Id 1560297

Date 14-NOV-2020

Film / Exposure Number

003

Sketch No

Description

A1 joint

Mod Category Number Comp Code Comp No

O	A	1	J1	
---	---	---	----	--



Structure Id 7799

Name _____

Inspection Date 19-NOV-2020

Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Pictures

** Not all images printed. Total size of images allowed for this report has been exceeded.

Id 1560298

Date 14-NOV-2020

Film / Exposure Number

004

Sketch No

Description

Typical lack of thread in BR anchor bolts

Mod Category Number Comp Code Comp No

O S 1 BR



Id 1560299

Date 14-NOV-2020

Film / Exposure Number

005

Sketch No

Description

Typical lack of thread in BR anchor bolts

Mod Category Number Comp Code Comp No

O S 2 BR



Id 1560300

Date 14-NOV-2020

Film / Exposure Number

006

Sketch No

Description

View across deck

Mod Category Number Comp Code Comp No

O S 1 WS



Structure Id 7799

Name _____

Inspection Date 19-NOV-2020

Inspection Level 2 ☒Level 3 ☐Underwater ☐

Pictures

** Not all images printed. Total size of images allowed for this report has been exceeded.

Id 1560301

Date 14-NOV-2020

Film / Exposure Number

007

Sketch No

Description

Survey marker S1 K2

Mod Category Number Comp Code Comp No

O	S	1	K	2
---	---	---	---	---



Id 1560302

Date 14-NOV-2020

Film / Exposure Number

008

Sketch No

Description

Showing A1 J2

Mod Category Number Comp Code Comp No

O	A	1	J2	
---	---	---	----	--



Id 1560353

Date 14-NOV-2020

Film / Exposure Number

Sketch 1-5

Sketch No

Description

P1 J3 Finger Joint

Mod Category Number Comp Code Comp No

O	P	1	J3	
---	---	---	----	--

Structure Id 7799

Name

Inspection Date 19-NOV-2020

Inspection Level 2 ☒

Level 3 ☐

Underwater ☐

Pictures

** Not all images printed. Total size of images allowed for this report has been exceeded.

Id 1560354

Date 14-NOV-2020

Film / Exposure Number

Sketch No

Sketch 6-10

Description

P4 J2 Finger Joint

Mod Category Number Comp Code Comp No

O P 4 J2

Id 1560355

Date 14-NOV-2020

Film / Exposure Number

Sketch No

Sketch 11-17

Description

Rocker Bearing Measurements

Mod Category Number Comp Code Comp No

Id 1565723

Date 14-NOV-2020

Film / Exposure Number

Sketch No

009

Description

Showing P1 J1 - typical of fixed joints

Mod Category Number Comp Code Comp No

O P 1 J1



Structure Id 7799

Name _____

Inspection Date 19-NOV-2020

Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Pictures

** Not all images printed. Total size of images allowed for this report has been exceeded.

Id 1565725

Date 14-NOV-2020

Film / Exposure Number

010

Sketch No

Description

Showing P1 J2

Mod Category Number Comp Code Comp No

O P 1 J2



Id 1565727

Date 14-NOV-2020

Film / Exposure Number

011

Sketch No

Description

Showing P4 J3

Mod Category Number Comp Code Comp No

O P 4 J3



Structure Id 7799

Name _____

Inspection Date 19-NOV-2020

Inspection Level 2 ☒Level 3 ☐Underwater ☐

Pictures

** Not all images printed. Total size of images allowed for this report has been exceeded.

Id 1565730

Date 14-NOV-2020

Film / Exposure Number

012

Sketch No

Description

Showing A2 joint

Mod Category Number Comp Code Comp No

O A 2 J1



Id 1565733

Date 14-NOV-2020

Film / Exposure Number

013

Sketch No

Description

Spall in side 2 end post AP2

Mod Category Number Comp Code Comp No

O S 6 BR



Structure Id 7799

Name

Inspection Date 19-NOV-2020

Inspection Level 2 ☒Level 3 ☐Underwater ☐

Pictures

** Not all images printed. Total size of images allowed for this report has been exceeded.

Id 1565739

Date 14-NOV-2020

Film / Exposure Number

014

Sketch No

Description

A1 B4

Mod Category Number Comp Code Comp No

O A 1 B 4



Id 1565740

Date 14-NOV-2020

Film / Exposure Number

015

Sketch No

Description

Corrosion in A1 B4 bed plate

Mod Category Number Comp Code Comp No

O A 1 B 4



Id 1565741

Date 14-NOV-2020

Film / Exposure Number

016

Sketch No

Description

View of A1

Mod Category Number Comp Code Comp No

O A 1 A



Structure Id 7799

Name _____

Inspection Date 19-NOV-2020

Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Pictures

** Not all images printed. Total size of images allowed for this report has been exceeded.

Id 1565742

Date 14-NOV-2020

Film / Exposure Number

017

Sketch No

Description

Showing minor cracking in A1

Mod Category Number Comp Code Comp No

O A 1 A



Id 1565743

Date 14-NOV-2020

Film / Exposure Number

018

Sketch No

Description

Example of spall in S1 deck

Mod Category Number Comp Code Comp No

O S 1 D



Id 1565744

Date 14-NOV-2020

Film / Exposure Number

019

Sketch No

Description

S1 G2 splice

Mod Category Number Comp Code Comp No

O S 1 G 2



Structure Id 7799

Name _____

Inspection Date 19-NOV-2020

Inspection Level 2 ☒Level 3 ☐Underwater ☐

Pictures

** Not all images printed. Total size of images allowed for this report has been exceeded.

Id 1565745

Date 14-NOV-2020

Film / Exposure Number

020

Sketch No

Description

S1 G3 splice 3

Mod Category Number Comp Code Comp No

O S 1 G 3



Id 1565746

Date 14-NOV-2020

Film / Exposure Number

021

Sketch No

Description

S1 G4 splice 3

Mod Category Number Comp Code Comp No

O S 1 G 4



Id 1565747

Date 14-NOV-2020

Film / Exposure Number

022

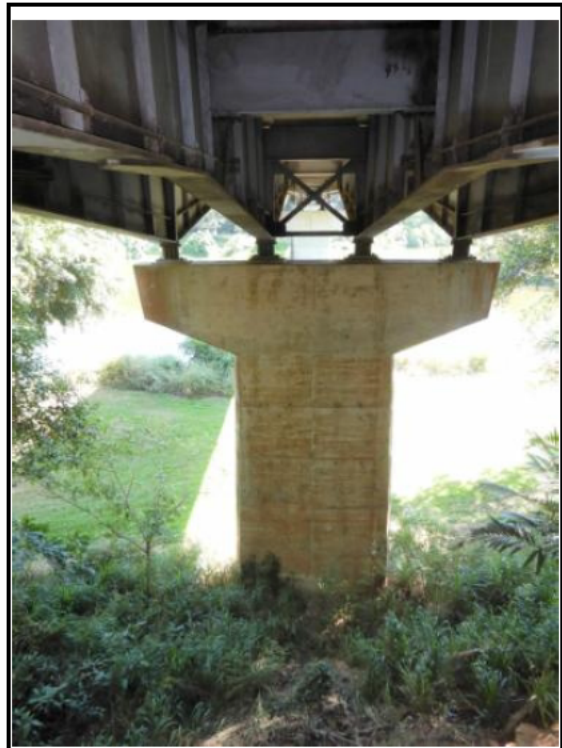
Sketch No

Description

View of P1

Mod Category Number Comp Code Comp No

O P 1 H



Structure Id 7799

Name _____

Inspection Date 19-NOV-2020

Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Pictures

** Not all images printed. Total size of images allowed for this report has been exceeded.

Id 1565748

Date 14-NOV-2020

Film / Exposure Number

023

Sketch No

Description

Fine cracking in weld at G2 interface

Mod Category Number Comp Code Comp No

O S 1 XG 3



Id 1565749

Date 14-NOV-2020

Film / Exposure Number

024

Sketch No

Description

General side view

Mod Category Number Comp Code Comp No

O S 1 W



Id 1565750

Date 14-NOV-2020

Film / Exposure Number

025

Sketch No

Description

P1 fixed bearings

Mod Category Number Comp Code Comp No

O P 1 B



Structure Id 7799

Name

Inspection Date 19-NOV-2020

Inspection Level 2 ☒Level 3 ☐Underwater ☐

Pictures

** Not all images printed. Total size of images allowed for this report has been exceeded.

Id 1565752

Date 14-NOV-2020

Film / Exposure Number

026

Sketch No

Description

Fixed halving joint S2 E1

Mod Category Number Comp Code Comp No

O P 1 B



Id 1565754

Date 14-NOV-2020

Film / Exposure Number

027

Sketch No

Description

Fixed rocker B1 at halving joint 1

Mod Category Number Comp Code Comp No

O P 1 B 1



Id 1565756

Date 14-NOV-2020

Film / Exposure Number

028

Sketch No

Description

Fixed rocker B4 at halving joint 1

Mod Category Number Comp Code Comp No

O P 1 B 4



Structure Id 7799

Name _____

Inspection Date 19-NOV-2020

Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Pictures

** Not all images printed. Total size of images allowed for this report has been exceeded.

Id 1565758

Date 14-NOV-2020

Film / Exposure Number

029

Sketch No

Description

Minor spall in P1 H

Mod Category Number Comp Code Comp No

O P 1 H



Id 1565760

Date 14-NOV-2020

Film / Exposure Number

030

Sketch No

Description

Spalling in S2 deck under finger joint

Mod Category Number Comp Code Comp No

O S 2 D



Id 1565761

Date 14-NOV-2020

Film / Exposure Number

031

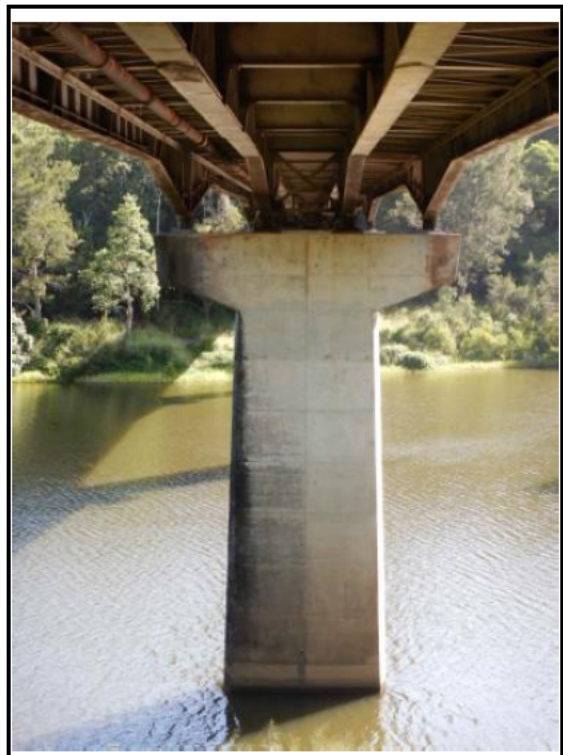
Sketch No

Description

View of P2

Mod Category Number Comp Code Comp No

O P 2 H



Structure Id 7799

Name _____

Inspection Date 19-NOV-2020

Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Pictures

** Not all images printed. Total size of images allowed for this report has been exceeded.

Id 1565763

Date 14-NOV-2020

Film / Exposure Number

032

Sketch No

Description

Expansion halving joint S2 E2

Mod Category Number Comp Code Comp No

O P 2 B



Id 1565764

Date 14-NOV-2020

Film / Exposure Number

033

Sketch No

Description

P2 B1 at expansion HJ2

Mod Category Number Comp Code Comp No

O P 2 B 1



Structure Id 7799

Name _____

Inspection Date 19-NOV-2020

Inspection Level 2 ☒Level 3 ☐Underwater ☐

Pictures

** Not all images printed. Total size of images allowed for this report has been exceeded.

Id 1565765

Date 14-NOV-2020

Film / Exposure Number

034

Sketch No

Description

Corrosion in hinge pin

Mod Category Number Comp Code Comp No

O	P	2		1
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Id 1565766

Date 14-NOV-2020

Film / Exposure Number

035

Sketch No

Description

P2 B1 at expansion HJ2

Mod Category Number Comp Code Comp No

O	P	2	B	2
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Structure Id 7799

Name

Inspection Date 19-NOV-2020

Inspection Level 2 ☒Level 3 ☐Underwater ☐

Pictures

** Not all images printed. Total size of images allowed for this report has been exceeded.

Id 1565767

Date 14-NOV-2020

Film / Exposure Number

036

Sketch No

Description

P2 B4 at expansion HJ2

Mod Category Number Comp Code Comp No

O P 2 B 4



Id 1565768

Date 14-NOV-2020

Film / Exposure Number

037

Sketch No

Description

P2 B1 at P2

Mod Category Number Comp Code Comp No

O P 2 B 1



Id 1565769

Date 14-NOV-2020

Film / Exposure Number

038

Sketch No

Description

P2 B4 at P2

Mod Category Number Comp Code Comp No

O P 2 B 4



Structure Id 7799

Name _____

Inspection Date 19-NOV-2020

Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Pictures

** Not all images printed. Total size of images allowed for this report has been exceeded.

Id 1565770

Date 14-NOV-2020

Film / Exposure Number

039

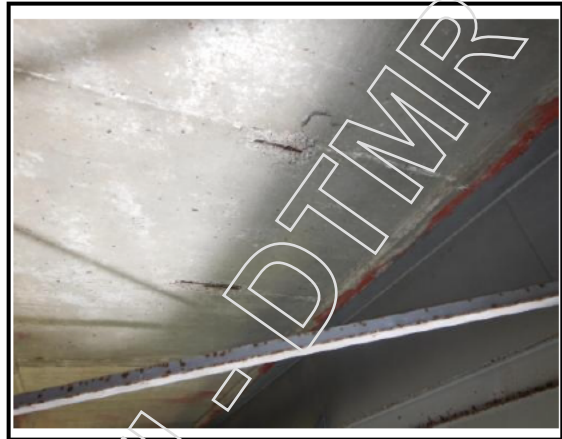
Sketch No

Description

Example of spalls in S3 deck

Mod Category Number Comp Code Comp No

O S 3 D



Id 1565771

Date 14-NOV-2020

Film / Exposure Number

040

Sketch No

Description

Example of surface discontinuities in S3 girders

Mod Category Number Comp Code Comp No

O S 3 G



Id 1565772

Date 14-NOV-2020

Film / Exposure Number

041

Sketch No

Description

Example of corrosion at S3 splice welds

Mod Category Number Comp Code Comp No

O S 3 G



Structure Id 7799

Name _____

Inspection Date 19-NOV-2020

Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Pictures

** Not all images printed. Total size of images allowed for this report has been exceeded.

Id 1565773

Date 14-NOV-2020

Film / Exposure Number

042

Sketch No

Description

Example of corrosion in S3 girders

Mod Category Number Comp Code Comp No

O S 3 G



Id 1565774

Date 14-NOV-2020

Film / Exposure Number

043

Sketch No

Description

Example of corrosion in S3 girders

Mod Category Number Comp Code Comp No

O S 3 G



Id 1565775

Date 14-NOV-2020

Film / Exposure Number

044

Sketch No

Description

Typical spot corrosion in XG3 and stressing bars

Mod Category Number Comp Code Comp No

O S 3 XG



Structure Id 7799

Name

Inspection Date 19-NOV-2020

Inspection Level 2 ☒Level 3 ☐Underwater ☐

Pictures

** Not all images printed. Total size of images allowed for this report has been exceeded.

Id 1565776

Date 14-NOV-2020

Film / Exposure Number

045

Sketch No

Description

Coating failure in stressing bar ends

Mod Category Number Comp Code Comp No

ST

S

3

G



Id 1565781

Date 14-NOV-2020

Film / Exposure Number

046

Sketch No

Description

View of P3

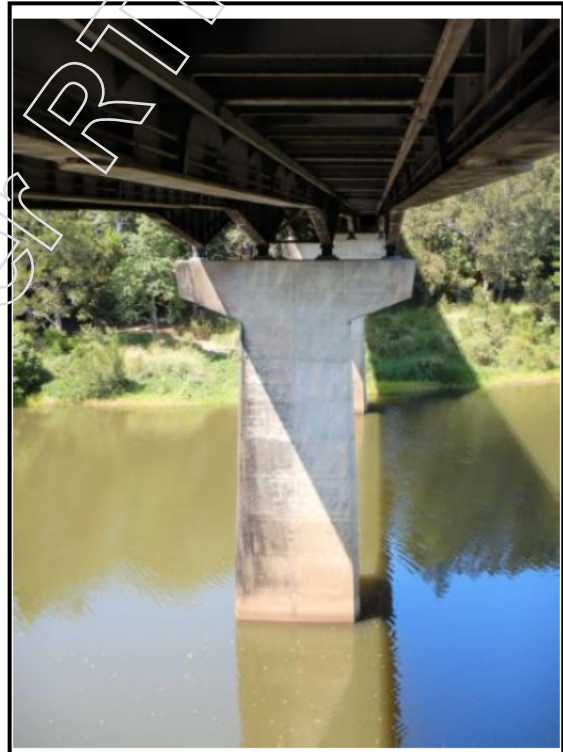
Mod Category Number Comp Code Comp No

O

P

3

H



Id 1565782

Date 14-NOV-2020

Film / Exposure Number

047

Sketch No

Description

P3 B1

Mod Category Number Comp Code Comp No

O

P

3

B

1



Structure Id 7799

Name

Inspection Date 19-NOV-2020

Inspection Level 2 ☒Level 3 ☐Underwater ☐

Pictures

** Not all images printed. Total size of images allowed for this report has been exceeded.

Id 1565783

Date 14-NOV-2020

Film / Exposure Number

048

Sketch No

Description

P3 B3

Mod Category Number Comp Code Comp No

O P 3 B 3



Id 1565784

Date 14-NOV-2020

Film / Exposure Number

049

Sketch No

Description

P3 B4

Mod Category Number Comp Code Comp No

O P 3 B 4



Id 1565785

Date 14-NOV-2020

Film / Exposure Number

050

Sketch No

Description

P3 B4

Mod Category Number Comp Code Comp No

O P 3 B 4



Structure Id 7799

Name _____

Inspection Date 19-NOV-2020

Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Pictures

** Not all images printed. Total size of images allowed for this report has been exceeded.

Id 1565786

Date 14-NOV-2020

Film / Exposure Number

051

Sketch No

Description

Example of spalling in S4 deck

Mod Category Number Comp Code Comp No

O S 4 D



Id 1565787

Date 14-NOV-2020

Film / Exposure Number

052

Sketch No

Description

Example of spot corrosion in S4 girders

Mod Category Number Comp Code Comp No

O S 4 G



Id 1565788

Date 14-NOV-2020

Film / Exposure Number

053

Sketch No

Description

Example of cracks in welds at S4 splice 2 in girders

Mod Category Number Comp Code Comp No

O S 4 G 1



Structure Id 7799

Name

Inspection Date 19-NOV-2020

Inspection Level 2 ☒Level 3 ☐Underwater ☐

Pictures

** Not all images printed. Total size of images allowed for this report has been exceeded.

Id 1565789

Date 14-NOV-2020

Film / Exposure Number

054

Sketch No

Description

Example of cracks in welds at S4 splice 2 in girders

Mod Category Number Comp Code Comp No

O S 4 G 2



Id 1565790

Date 14-NOV-2020

Film / Exposure Number

055

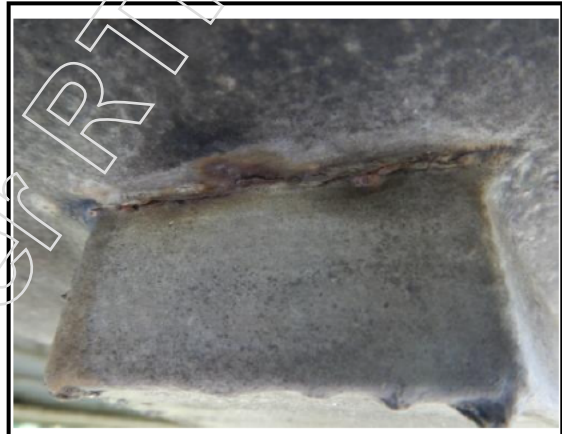
Sketch No

Description

Example of corrosion at many splice welds S4

Mod Category Number Comp Code Comp No

O S 4 G



Id 1565791

Date 14-NOV-2020

Film / Exposure Number

056

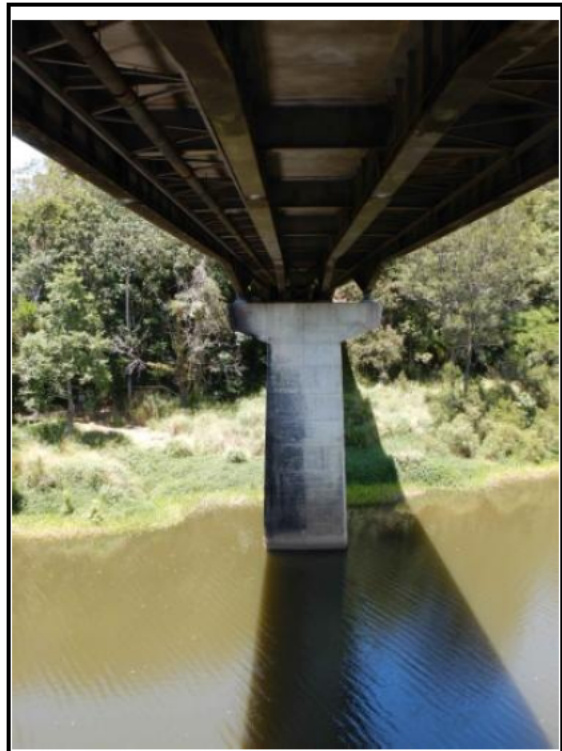
Sketch No

Description

View of P4

Mod Category Number Comp Code Comp No

O P 4 H



Structure Id 7799

Name

Inspection Date 19-NOV-2020

Inspection Level 2 ☒Level 3 ☐Underwater ☐

Pictures

** Not all images printed. Total size of images allowed for this report has been exceeded.

Id 1565792

Date 14-NOV-2020

Film / Exposure Number

057

Sketch No

Description

Example of spot corrosion in S4 girders

Mod Category Number Comp Code Comp No

O S 4 G



Id 1565793

Date 14-NOV-2020

Film / Exposure Number

058

Sketch No

Description

Showing expansion halving joint E1 of S5

Mod Category Number Comp Code Comp No

O P 4 B



Id 1565796

Date 14-NOV-2020

Film / Exposure Number

059

Sketch No

Description

P4 B1

Mod Category Number Comp Code Comp No

O P 4 B 1



Structure Id 7799

Name

Inspection Date 19-NOV-2020

Inspection Level 2 ☒Level 3 ☐Underwater ☐

Pictures

** Not all images printed. Total size of images allowed for this report has been exceeded.

Id 1565797

Date 14-NOV-2020

Film / Exposure Number

060

Sketch No

Description

P4 B1

Mod Category Number Comp Code Comp No

O P 4 B 1



Id 1565798

Date 14-NOV-2020

Film / Exposure Number

061

Sketch No

Description

P4 B2

Mod Category Number Comp Code Comp No

O P 4 B 2



Id 1565799

Date 14-NOV-2020

Film / Exposure Number

062

Sketch No

Description

P4 B3

Mod Category Number Comp Code Comp No

O P 4 B 3



Structure Id 7799

Name

Inspection Date 19-NOV-2020

Inspection Level 2 ☒Level 3 ☐Underwater ☐

Pictures

** Not all images printed. Total size of images allowed for this report has been exceeded.

Id 1565800

Date 14-NOV-2020

Film / Exposure Number

063

Sketch No

Description

P4 B4

Mod Category Number Comp Code Comp No

O P 4 B 4



Id 1565803

Date 14-NOV-2020

Film / Exposure Number

064

Sketch No

Description

P4 B5 downstream side

Mod Category Number Comp Code Comp No

O P 4 B 5



Id 1565806

Date 14-NOV-2020

Film / Exposure Number

065

Sketch No

Description

P4 B5 upstream side

Mod Category Number Comp Code Comp No

O P 4 B 5



Structure Id 7799

Name _____

Inspection Date 19-NOV-2020

Inspection Level 2 ☒

Level 3 ☐

Underwater ☐

Pictures

** Not all images printed. Total size of images allowed for this report has been exceeded.

Id 1565808

Date 14-NOV-2020

Film / Exposure Number

066

Sketch No

Description

P4 B6

Mod Category Number Comp Code Comp No

O P 4 B 6



Id 1565810

Date 14-NOV-2020

Film / Exposure Number

067

Sketch No

Description

P4 B7

Mod Category Number Comp Code Comp No

O P 4 B 7



Structure Id 7799

Name _____

Inspection Date 19-NOV-2020

Inspection Level 2 ☒

Level 3 ☐

Underwater ☐

Pictures

** Not all images printed. Total size of images allowed for this report has been exceeded.

Id 1565813

Date 14-NOV-2020

Film / Exposure Number

068

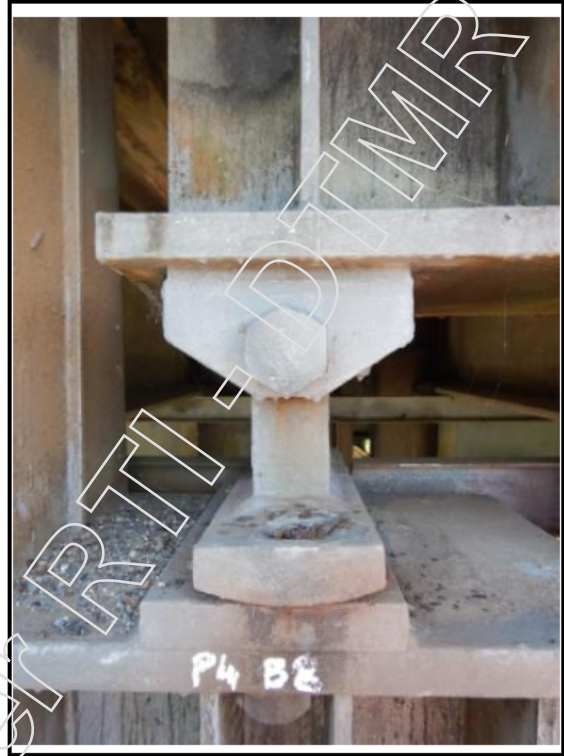
Sketch No

Description

P4 B8 upstream side

Mod Category Number Comp Code Comp No

O P 4 B 8



Id 1565816

Date 14-NOV-2020

Film / Exposure Number

069

Sketch No

Description

P4 B8 downstream side

Mod Category Number Comp Code Comp No

O P 4 B 8



Structure Id 7799

Name _____

Inspection Date 19-NOV-2020

Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Pictures

** Not all images printed. Total size of images allowed for this report has been exceeded.

Id 1565818

Date 14-NOV-2020

Film / Exposure Number

070

Sketch No

Description

Example of spalling in S5 deck at finger joint

Mod Category Number Comp Code Comp No

O S 5 D



Id 1565820

Date 14-NOV-2020

Film / Exposure Number

071

Sketch No

Description

Example of fine cracking at splice 2 S5

Mod Category Number Comp Code Comp No

O S 5 G 1



Id 1565821

Date 14-NOV-2020

Film / Exposure Number

072

Sketch No

Description

Crack in weld S5 G1-XG3 interface

Mod Category Number Comp Code Comp No

O S 5 G 1



Structure Id 7799

Name _____

Inspection Date 19-NOV-2020

Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Pictures

** Not all images printed. Total size of images allowed for this report has been exceeded.

Id 1565822

Date 14-NOV-2020

Film / Exposure Number

073

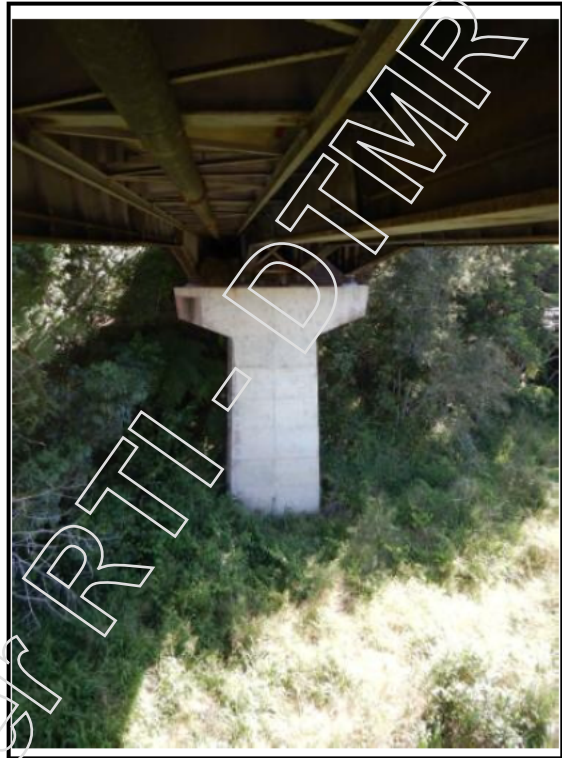
Sketch No

Description

View of P5

Mod Category Number Comp Code Comp No

O	P	5	H	
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Id 1565823

Date 14-NOV-2020

Film / Exposure Number

074

Sketch No

Description

Showing fixed halving joint S5 E2

Mod Category Number Comp Code Comp No

O	P	5	B	
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Structure Id 7799

Name

Inspection Date 19-NOV-2020

Inspection Level 2 ☒Level 3 ☐Underwater ☐

Pictures

** Not all images printed. Total size of images allowed for this report has been exceeded.

Id 1565824

Date 14-NOV-2020

Film / Exposure Number

075

Sketch No

Description

Example of P5 bearing condition

Mod Category Number Comp Code Comp No

O P 5 B



Id 1565825

Date 14-NOV-2020

Film / Exposure Number

076

Sketch No

Description

Showing P5 bearings on P5

Mod Category Number Comp Code Comp No

O P 5 B



Id 1565826

Date 14-NOV-2020

Film / Exposure Number

077

Sketch No

Description

Cracking at S6 G2-XG1 interface

Mod Category Number Comp Code Comp No

O S 6 G 2



Id 1565827

Date 14-NOV-2020

Film / Exposure Number

078

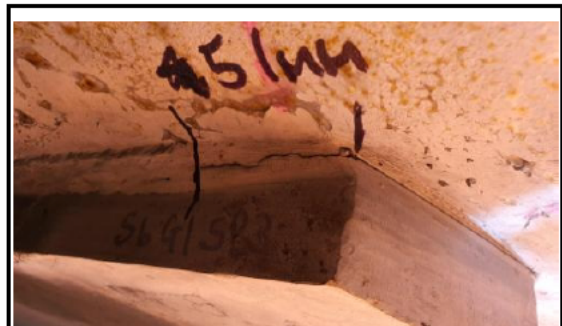
Sketch No

Description

Cracking in weld S6 G1 splice 3

Mod Category Number Comp Code Comp No

O S 6 G 1



Structure Id 7799

Name _____

Inspection Date 19-NOV-2020

Inspection Level 2 ☒Level 3 ☐Underwater ☐

Pictures

** Not all images printed. Total size of images allowed for this report has been exceeded.

Id 1565828

Date 14-NOV-2020

Film / Exposure Number

079

Sketch No

Description

View of A2

Mod Category Number Comp Code Comp No

O A 2 A



Id 1565829

Date 14-NOV-2020

Film / Exposure Number

080

Sketch No

Description

A2 B3

Mod Category Number Comp Code Comp No

O A 2 B 3



Structure Id 7799

Name

Inspection Date 19-NOV-2020

Inspection Level 2 ☒Level 3 ☐Underwater ☐

Pictures

** Not all images printed. Total size of images allowed for this report has been exceeded.

Id 1565830

Date 14-NOV-2020

Film / Exposure Number

081

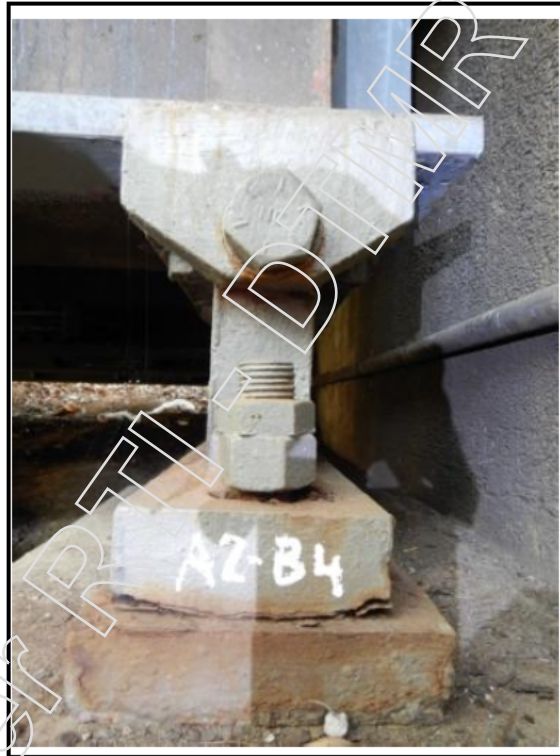
Sketch No

Description

A2 B4

Mod Category Number Comp Code Comp No

O A 2 B 4



Id 1565831

Date 14-NOV-2020

Film / Exposure Number

082

Sketch No

Description

Example of cracking in S6 XG4

Mod Category Number Comp Code Comp No

O S 6 XG 4



Id 1565832

Date 14-NOV-2020

Film / Exposure Number

083

Sketch No

Description

Showing replaced stressing bar

Mod Category Number Comp Code Comp No

ST S 6 G 1



Structure Id 7799

Name _____

Inspection Date 19-NOV-2020

Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Pictures

** Not all images printed. Total size of images allowed for this report has been exceeded.

Id 1565833

Date 14-NOV-2020

Film / Exposure Number

084

Sketch No

Description

Example of loss of bolts in stressing bar attachments

Mod Category Number Comp Code Comp No

ST S 6 G 1

Id 1565834

Date 14-NOV-2020

Film / Exposure Number

085

Sketch No

Description

Crack removal S1 G3 splice 3

Mod Category Number Comp Code Comp No

O S 1 G 3

Id 1565835

Date 14-NOV-2020

Film / Exposure Number

086

Sketch No

Description

Crack removal S5 G1 splice 2

Mod Category Number Comp Code Comp No

O S 5 G 1

Id 1565836

Date 14-NOV-2020

Film / Exposure Number

087

Sketch No

Description

Crack removal S6 G1 splice 3

Mod Category Number Comp Code Comp No

O S 6 G 1

Id 1565844

Date 14-NOV-2020

Film / Exposure Number

Sketch 24

Sketch No

Description

Barron Kuranda NDT and cack removal

Mod Category Number Comp Code Comp No

Level 2 Inspection Report - Photos & Sketches Record

B2/6

Sheet

39 Of 39

Structure Id 7799

Name

Inspection Date 19-NOV-2020

Inspection Level 2 ☒

Level 3 ☐

Underwater ☐

Pictures

** Not all images printed. Total size of images allowed for this report has been exceeded.

Id 1566263

Date 14-NOV-2020

Film / Exposure Number

Sketch No

Sketch 25

Description

LMAT NDT

Mod Category Number Comp Code Comp No

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Standard Procedure Exceptions Report							B2/4		Sheet 1 Of 1			
Structure Id <u>7799</u>				Name _____								
Crossing Name <u>Barron River</u>				Alt. Name _____								
Structure Type <u>Bridge</u>				Owner <u>MR</u>		<u>DEPARTMENT OF MAIN ROADS</u>						
Construction Type <u>Girder/Beam</u>				District <u>403</u>		<u>Far North</u>						
Construction Material <u>Steel</u>				LGA Id <u>277</u>		<u>MAREEBA SHIRE COUNCIL</u>						
Inspector <u>NR</u>				Date <u>19-NOV-2020</u>								
Inspection Level 2 <input checked="" type="checkbox"/>				Programmed <input checked="" type="checkbox"/>				Underwater <input type="checkbox"/>				
Level 3 <input type="checkbox"/>				Exceptional <input type="checkbox"/>								
Road Section				Start		End		TDist				
Id	Description			S	Cway	S	RPC	Dist	RPC	Dist	Start	End
32A	CAIRNS - MAREEBA			C	1	C	5	0.000	5	0.257	12.535	12.792
Component Location				Exception (X)								
Modification	Group	Component	Standard Number	Exposure Class	Undefined Component	Component Not Inspected	Less than 25% Comp Inspected	Other	Comments * Description of undefined component * Photograph/sketch references * Reason: component not inspected * Any other exceptions			
O	A1	F	59 C	3		X			Buried and unseen (016).			
O	P1	F	59 C	3		X			Buried and unseen (022).			
O	P2	F	59 C	3		X			Buried and unseen (031).			
O	P3	F	59 C	3		X			Buried and unseen (036).			
O	P4	F	59 C	3		X			Buried and unseen (056).			
O	P5	F	59 C	3		X			Buried and unseen (073).			
O	A2	F	59 C	3		X			Buried and unseen (079).			

Defective Components Report							B2/3		Sheet 1 Of 7	
Structure Id <u>7799</u>				Name _____						
Crossing Name <u>Barron River</u>				Alt. Name _____						
Structure Type <u>Bridge</u>				Owner <u>MR DEPARTMENT OF MAIN R</u>						
Construction Type <u>Girder/Beam</u>				District <u>403 Far North</u>						
Construction Material <u>Steel</u>				LGA Id <u>277 MAREEBA SHIRE COUNCI</u>						
Inspector <u>NR</u>				Date <u>19-NOV-2020</u>						
Inspection Level 2 <input checked="" type="checkbox"/>				Programmed <input checked="" type="checkbox"/>						
Level 3 <input type="checkbox"/>				Exceptional <input type="checkbox"/>				Underwater <input type="checkbox"/>		
Road Section				Start		End		TDist		
Id	Description	S Cway	S	RPC	Tdist	RPC	Tdist	Start	End	
32A	CAIRNS - MAREEBA	C 1	C	5	0.000	5	0.257	12.535	12.792	
Component Location				Exposure Class	Condition State	Description of Defect * Detailed Description * Estimated Quantity * "Other" action required * Urgency of action (what, who, when, how) * Recommended Testing * Reference of Sketches and Photos (Roll/Exposure Nos)	Required Action (X)			
Modification	Group	Component	Standard Number				Monitor	Level 3 Inspection	Other	
O	AP1	GR1	72 S	3	3					X
Single bolt connection to end posts in both GR (002 - typical). Requires provision of connections to current standards.										
O	S1	BR1	2 S	3	4			X		
All BR posts have insufficient thread at anchor bolts and lack washers (004 - typical). Base plates are recessed into kerbs. Mortar applied up to level with top of base plate - mortar missing/spalled away in many cases. Minor surface corrosion at lower portion of base plates typical. Delineation provided by retroreflective stickers on BR posts. Requires engineering input.										
O	P1	J2	11 O	3	3					X
Refers to compression seal joint with steel nosings at E1 of span 2. Compression seal is highly weathered and perishing (010). Spoils in joint. Nosings appear fair - gaps between nosings both sides 47mm (Temp. 27). Recommend replacement of compression seal.										
O	S2	BR1	2 S	3	4			X		
All BR posts have insufficient thread at anchor bolts and lack washers (004 - typical). Base plates are recessed into kerbs. Mortar applied up to level with top of base plate - mortar missing/spalled away in many cases. Minor surface corrosion at lower portion of base plates typical. Delineation provided by retroreflective stickers on BR posts. Requires engineering input.										
O	S3	BR1	2 S	3	4			X		
All BR posts have insufficient thread at anchor bolts and lack washers (004, 005 - typical). Base plates are recessed into kerbs. Mortar applied up to level with top of base plate - mortar missing/spalled away in many cases. Minor surface corrosion at lower portion of base plates typical. Delineation provided by retroreflective stickers on BR posts. Requires engineering input.										
O	S4	BR1	2 S	3	4			X		
All BR posts have insufficient thread at anchor bolts and lack washers (004, 005 - typical). Base plates are recessed into kerbs. Mortar applied up to level with top of base plate - mortar missing/spalled away in many cases. Minor surface corrosion at lower portion of base plates typical. Delineation provided by retroreflective stickers on BR posts. Requires engineering input.										
O	P4	J3	11 O	3	3					X
Refers to compression joint with steel nosing at E2 of span 5. Rubber gland is perishing with the gland breaking away in sections (011). Gland has separated from nosing at side 2 potentially allowing moisture ingress. Seal is also lifting at side 2 at the pedestrian footway. Steel plates at kerb joints fair. Requires replacement of compression seal.										
O	S5	BR1	2 S	3	4			X		
All BR posts have insufficient thread at anchor bolts and lack washers (004, 005 - typical). Base plates are recessed into kerbs. Mortar applied up to level with top of base plate - mortar missing/spalled away in many cases. Minor surface corrosion at lower portion of base plates typical. Delineation provided by retroreflective stickers on BR posts. Requires engineering input.										
O	S6	BR1	2 S	2	4			X		

Defective Components Report							B2/3		Sheet 2 Of 7		
Structure Id			7799		Name						
Inspection Date			19-NOV-2020		Inspection Level 2 <input checked="" type="checkbox"/>			Level 3 <input type="checkbox"/>		Underwater <input type="checkbox"/>	
Component Location				Exposure Class	Condition State	Description of Defect * Detailed Description * Estimated Quantity * "Other" action required * Urgency of action (what, who, when, how) * Recommended Testing * Reference of Sketches and Photos (Roll/Exposure Nos)	Required Action (X)				
Modification	Group	Component	Standard Number				Monitor	Level 3 Inspection	Other		
<p>All BR posts have insufficient thread at anchor bolts and lack washers (004, 005 - typical). Base plates are recessed into kerbs. Mortar applied up to level with top of base plate - mortar missing/spalled away in many cases. Minor surface corrosion at lower portion of base plates typical. Delineation provided by retroreflective stickers on BR posts. Requires engineering input.</p>											
O	A2	J1	14 S	3	3					X	
<p>2 steel plate anchors missing at side 2 lane - roughly at wheel paths (012). Steel plate slapping noisily under traffic. Recommend reestablishment of anchors.</p>											
O	A1	B4	43 S	3	3					X	
<p>Active corrosion in B4 sole plate especially on the back face with flaking and loss of section up to 6mm (014, 015). Staining under coating on front face also. Recommend treatment of treatment of B4 sole plate. NB - steel components in structure typically have red lead coatings.</p>											
O	S1	G3	22 S	3	4			X			
<p>Structure undergoing investigations due to brittle failure/fatigue concerns. Several sites have undergone testing, specifically welds at splice joints, cross girder-girder interfaces and at stiffeners.</p> <p>Initial visual inspection indicated cracking at welds in G2 splice 1 (019) and G3 splice 3 (020).</p> <p>Minor surface discontinuities noted in G3 splice 1, G4 splice 1, G2 splice 2, G2 splice 3 and G4 splice 3 (021 - typical). Refer to Sketch 18 - Post inspection Tech note and Sketch 19 - Summary Plans.</p> <p>MPI and ultrasonic testing post removal of lead coatings later showed cracking in S1 G3 splice 3 (lower) of up to 22mm in length and up to 4.6mm in depth. Minor cracking up to 2mm also found in S1 G4 splice 3 (lower) (refer to Sketch 25).</p> <p>Girders appear otherwise fair (016, 022) -. Refer to Sketch 18 for coating levels across structure.</p> <p>S1 G3 splice 3 (lower) identified as a "priority 1" crack. Post inspection weld was ground back at S1 G3 Splice 3. No apparent propagation of cracking into parent material was found (085, Sketch 21). Refer also to Sketch 24 - Barron Kuranda NDT and crack removal.</p>											
O	S1	G4	22 S	3	3			X			
<p>Structure undergoing investigations due to brittle failure/fatigue concerns. Several sites have undergone testing, specifically welds at splice joints, cross girder-girder interfaces and at stiffeners.</p> <p>Initial visual inspection indicated cracking at welds in G2 splice 1 (019) and G3 splice 3 (020).</p> <p>Minor surface discontinuities noted in G3 splice 1, G4 splice 1, G2 splice 2, G2 splice 3 and G4 splice 3 (021 - typical). Refer to Sketch 18 - Post inspection Tech note and Sketch 19 - Summary Plans.</p> <p>MPI and ultrasonic testing post removal of lead coatings later showed cracking in S1 G3 splice 3 (lower) of up to 22mm in length and up to 4.6mm in depth. Minor cracking up to 2mm also found in S1 G4 splice 3 (lower) (refer to Sketch 25).</p> <p>Girders appear otherwise fair (016, 022) -. Refer to Sketch 18 for coating levels across structure.</p> <p>S1 G3 splice 3 (lower) identified as a "priority 1" crack. Post inspection weld was ground back at S1 G3 Splice 3. No apparent propagation of cracking into parent material was found (085, Sketch 21). Refer also to Sketch 24 - Barron Kuranda NDT and crack removal.</p>											
O	P1	B1	43 S	3	3			X			
<p>Fixed rocker bearings at halving joint 1, E1 of span 2 (026 - typical). B1 and B4 have been coated since previous inspection however moderate-severe loss of section remains in anchor nuts (027, 028). Corrosion evident under coating on undersides of both rockers and in sole plates. Recommendations to replace anchor nuts in previous L3 report (17/12/2015) has yet to be carried out. B2 and B3 are in fair condition. Refer to Sketch 12 for measurements of gaps at rockers-sole plates.</p>											
O	P1	B4	43 S	3	3			X			

Defective Components Report										B2/3		Sheet 3 Of 7	
Structure Id				7799				Name					
Inspection Date				19-NOV-2020				Inspection Level 2 <input checked="" type="checkbox"/> Level 3 <input type="checkbox"/> Underwater <input type="checkbox"/>					
Component Location				Exposure Class	Condition State	Description of Defect * Detailed Description * Estimated Quantity * "Other" action required * Urgency of action (what, who, when, how) * Recommended Testing * Reference of Sketches and Photos (Roll/Exposure Nos)	Required Action (X)						
Modification	Group	Component	Standard Number				Monitor	Level 3 Inspection	Other				
<p>Fixed rocker bearings at halving joint 1, E1 of span 2 (026 - typical). B1 and B4 have been coated since previous inspection however moderate-severe loss of section remains in anchor nuts (027, 028). Corrosion evident under coating on undersides of both rockers and in sole plates. Recommendations to replace anchor nuts in previous L3 report (17/12/2015) has yet to be carried out. B2 and B3 are in fair condition. Refer to Sketch 12 for measurements of gaps at rockers-sole plates.</p>													X
O	S2	D1	20 C	3	3								
Moderate spalls with exposed and corroded reo at soffit under finger joint in D2 and D4 (030 - typical). Requires treatment of reinforcement.													
O	S2	G4	22 S	3	3						X		
<p>Structure undergoing investigations due to brittle failure/fatigue concerns. Several sites have undergone testing, specifically welds at splice joints, cross girder-girder interfaces and at stiffeners. Refer to Sketch 18 - Post inspection Tech note and Sketch 19 - Summary Plans.</p> <p>Initial visual inspection detected minor surface discontinuities in G1 splice 1, G4 splice 1, G1 splice 2, G2 at XG2 interface, G3 splice 3, and G4 splice 4 (refer to Sketch 19).</p> <p>MPI and ultrasonic testing post removal of lead coatings later showed cracking in: - S2 G4 splice 2 (lower) up to 3mm in length. Refer to Sketch 25.</p> <p>Girders appear otherwise fair (031). Possible breakdown of coating. Refer to Sketch 18 for coating levels across structure.</p>													
O	P2	B1	43 S	3	4						X		
B1 - CS4. Lower attachment on downstream side has completely corroded away (033). Corrosion evident in hinge pin (034) - unable to determine extent of loss of section.													
O	P2	B4	43 S	3	4						X		
B4 - CS4. Lower attachment on downstream side has completely corroded away (036). Corrosion evident in hinge pin. Corrosion in hinge pin appears severe.													
O	S2	W	71 C	3	3					X			
Significant localised build up S2 E2 on the downstream side relative to original readings (024, 031). Localised scours and build up in other areas. Refer to scour soundings report. Monitor.													
O	P2	B1	40 C	3	3						X		
Fixed bearings located on pier 2.													
<p>B1 - CS3. Outside anchor nut has severe loss of section (037). Minor corrosion evident under coating. Previous L3 inspection recommendation of replacement of anchor nuts yet to be carried out.</p> <p>B4 also has corrosion and minor loss of section in outside anchor nut (038).</p> <p>Bearings have been coated since previous L2 inspection.</p>													
O	S3	D1	20 C	3	3							X	
Small sections of spalling with exposed and corroded reinforcement in D1 at MS, D5 at E1 and in D4 at E1 likely due to poor cover. Requires squaring to behind reo, treatment of reo and covering with a reinstatement mortar.													
ST	S3	G1	22 S	3	3						X		
Spot corrosion throughout stressing bars tending to worsen towards E2 (044 - typical). Protective coating failing at stressing bar ends at girders 2, 3 and 4 (045 - typical).													
Stressing bars require cleaning and painting. NB: bars likely coated with lead based paint.													

Defective Components Report						B2/3	Sheet 4 Of 7	
Structure Id		7799		Name				
Inspection Date		19-NOV-2020		Inspection Level 2 <input checked="" type="checkbox"/>		Level 3 <input type="checkbox"/>		Underwater <input type="checkbox"/>
Component Location				Exposure Class	Condition State	Description of Defect * Detailed Description * Estimated Quantity * "Other" action required * Urgency of action (what, who, when, how) * Recommended Testing * Reference of Sketches and Photos (Roll/Exposure Nos)	Required Action (X)	
Modification	Group	Component	Standard Number				Monitor	Level 3 Inspection
O	P3	B1	40 O	3	4		X	
B1 - CS4. Lower attachment nut has nearly completely corroded away (047) with moderate corrosion in the hinge pin and upper attachments.								
O	P3	B4	40 O	3	4		X	
B4 - CS4. Minor loss of section in lower attachments. Minor corrosion evident forming under recent spot treatment coating (049). Rust staining from hinge pin under coating. Upper attachments are untreated and have corrosion with moderate loss of section in nuts. Severe loss of section in sole plate-girder attachment on top of lower flange of girder (050).								
O	S4	G1	22 S	3	3		X	
<p>Structure undergoing investigations due to brittle failure/fatigue concerns. Several sites have undergone testing, specifically welds at splice joins, cross girder-girder interfaces and at stiffeners. Refer to Sketch 18 - Post inspection Tech note and Sketch 19 - Summary Plans.</p> <p>Initial visual inspections showed fine cracks in the welds of the lower lap of splice 2 of all girders (053, 054 - typical). Refer to Sketch 19.</p> <p>Minor surface discontinuities also noted in all girders at Splice 3. Spot corrosion at many splice welds (055 - typical). Refer to Sketch 19.</p> <p>MPI and ultrasonic testing post removal of lead coatings later showed cracking in:</p> <ul style="list-style-type: none"> - S4 G1 splice 2 (lower) up to 5mm. - S4 G2 splice 2 (lower) with a depth of 0.9mm. - S4 G3 splice 2 (lower) of up to 5mm in length. - S4 G4 splice 3 (lower) up to 3mm. <p>Refer to Sketch 25 for testing results.</p> <p>Girders show a breakdown of coating with spot corrosion in several areas particularly in girders 2, 3 and 4 on the downstream faces (052, 057 - typical). Recommend cleaning and recoating as soon as feasible.</p> <p>NB: Steel components throughout structure have lead based coatings.</p>								
O	S4	G2	22 S	3	3		X	
<p>Structure undergoing investigations due to brittle failure/fatigue concerns. Several sites have undergone testing, specifically welds at splice joins, cross girder-girder interfaces and at stiffeners. Refer to Sketch 18 - Post inspection Tech note and Sketch 19 - Summary Plans.</p> <p>Initial visual inspections showed fine cracks in the welds of the lower lap of splice 2 of all girders (053, 054 - typical). Refer to Sketch 19.</p> <p>Minor surface discontinuities also noted in all girders at Splice 3. Spot corrosion at many splice welds (055 - typical). Refer to Sketch 19.</p> <p>MPI and ultrasonic testing post removal of lead coatings later showed cracking in:</p> <ul style="list-style-type: none"> - S4 G1 splice 2 (lower) up to 5mm. - S4 G2 splice 2 (lower) with a depth of 0.9mm. - S4 G3 splice 2 (lower) of up to 5mm in length. - S4 G4 splice 3 (lower) up to 3mm. <p>Refer to Sketch 25 for testing results.</p> <p>Girders show a breakdown of coating with spot corrosion in several areas particularly in girders 2, 3 and 4 on the downstream faces (052, 057 - typical). Recommend cleaning and recoating as soon as feasible.</p> <p>NB: Steel components throughout structure have lead based coatings.</p>								
O	S4	G3	22 S	3	3		X	
<p>Structure undergoing investigations due to brittle failure/fatigue concerns. Several sites have undergone testing, specifically welds at splice joins, cross girder-girder interfaces and at stiffeners. Refer to Sketch 18 - Post inspection Tech note and Sketch 19 - Summary Plans.</p> <p>Initial visual inspections showed fine cracks in the welds of the lower lap of splice 2 of all girders (053, 054 - typical). Refer to Sketch 19.</p> <p>Minor surface discontinuities also noted in all girders at Splice 3. Spot corrosion at many splice welds (055 - typical). Refer to Sketch 19.</p> <p>MPI and ultrasonic testing post removal of lead coatings later showed cracking in:</p>								

Defective Components Report							B2/3		Sheet 5 Of 7																																																								
Structure Id <u>7799</u>							Name _____																																																										
Inspection Date <u>19-NOV-2020</u>							Inspection Level 2 <input checked="" type="checkbox"/> Level 3 <input type="checkbox"/> Underwater <input type="checkbox"/>																																																										
Component Location				Exposure Class	Condition State	Description of Defect * Detailed Description * Estimated Quantity * "Other" action required * Urgency of action (what, who, when, how) * Recommended Testing * Reference of Sketches and Photos (Roll/Exposure Nos)	Required Action (X)																																																										
Modification	Group	Component	Standard Number				Monitor	Level 3	Inspection	Other																																																							
<p>- S4 G1 splice 2 (lower) up to 5mm. - S4 G2 splice 2 (lower) with a depth of 0.9mm. - S4 G3 splice 2 (lower) of up to 5mm in length. - S4 G4 splice 3 (lower) up to 3mm. Refer to Sketch 25 for testing results.</p> <p>Girders show a breakdown of coating with spot corrosion in several areas particularly in girders 2, 3 and 4 on the downstream faces (052, 057 - typical). Recommend cleaning and recoating as soon as feasible.</p> <p>NB: Steel components throughout structure have lead based coatings.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;">O</td> <td style="width: 15%;">S4</td> <td style="width: 15%;">G4</td> <td style="width: 15%;">22 S</td> <td style="width: 10%;">3</td> <td style="width: 10%;">3</td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> </tr> </table> <p>Structure undergoing investigations due to brittle failure/fatigue concerns. Several sites have undergone testing, specifically welds at splice joints, cross girder-girder interfaces and at stiffeners. Refer to Sketch 18 - Post inspection Tech note and Sketch 19 - Summary Plans.</p> <p>Initial visual inspections showed fine cracks in the welds of the lower lap of splice 2 of all girders (053, 054 - typical). Refer to Sketch 19.</p> <p>Minor surface discontinuities also noted in all girders at Splice 3. Spot corrosion at many splice welds (055 - typical). Refer to Sketch 19.</p> <p>MPI and ultrasonic testing post removal of lead coatings later showed cracking in:</p> <p>- S4 G1 splice 2 (lower) up to 5mm. - S4 G2 splice 2 (lower) with a depth of 0.9mm. - S4 G3 splice 2 (lower) of up to 5mm in length. - S4 G4 splice 3 (lower) up to 3mm. Refer to Sketch 25 for testing results.</p> <p>Girders show a breakdown of coating with spot corrosion in several areas particularly in girders 2, 3 and 4 on the downstream faces (052, 057 - typical). Recommend cleaning and recoating as soon as feasible.</p> <p>NB: Steel components throughout structure have lead based coatings.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;">ST</td> <td style="width: 15%;">S4</td> <td style="width: 15%;">G4</td> <td style="width: 15%;">22 S</td> <td style="width: 10%;">3</td> <td style="width: 10%;">3</td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> </tr> </table> <p>Longitudinal stressing bars retro-fitted to either side of all girders. Attachments appear fair.</p> <p>Spot corrosion throughout stressing bars (044 - typical). Protective coating failing at stressing bar ends particularly at girders 4 (045 - typical).</p> <p>Stressing bars require cleaning and painting. NB: bars likely coated with lead based paint.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;">O</td> <td style="width: 15%;">P4</td> <td style="width: 15%;">B1</td> <td style="width: 15%;">43 S</td> <td style="width: 10%;">3</td> <td style="width: 10%;">4</td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> </tr> </table> <p>Bearings 1-4 appear to have rotated to their tolerance limits. Refer to Sketch 14 for measurements at rocker-bed plates.</p> <p>B1 - CS4. Severe loss of section in anchor attachment on downstream side with active corrosion apparent under recent recoating (059). Active corrosion with severe loss of section in sole plate-girder attachment (060). Rust staining at rocker-bed plate interface. loss of section in hinge bolt (064). Anchor bolts through rocker-bed plate have completely corroded away on both faces (065).</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;">O</td> <td style="width: 15%;">P4</td> <td style="width: 15%;">B2</td> <td style="width: 15%;">43 S</td> <td style="width: 10%;">3</td> <td style="width: 10%;">3</td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> </tr> </table> <p>Bearings 1-4 appear to have rotated to their tolerance limits. Refer to Sketch 14 for measurements at rocker-bed plates.</p> <p>B2 - CS3. Moderate loss of section in hinge pin nut with active corrosion. Minor loss of section in anchor attachments with active corrosion (061).</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;">O</td> <td style="width: 15%;">P4</td> <td style="width: 15%;">B3</td> <td style="width: 15%;">43 S</td> <td style="width: 10%;">3</td> <td style="width: 10%;">3</td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> </tr> </table> <p>Bearings 1-4 appear to have rotated to their tolerance limits. Refer to Sketch 14 for measurements at rocker-bed plates.</p> <p>B3 - CS3. Generally fine. Minor amounts of corrosion under recent recoating (062).</p>											O	S4	G4	22 S	3	3						ST	S4	G4	22 S	3	3						O	P4	B1	43 S	3	4						O	P4	B2	43 S	3	3						O	P4	B3	43 S	3	3					
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Defective Components Report						B2/3	Sheet 6 Of 7		
Structure Id <u>7799</u>						Name _____			
Inspection Date <u>19-NOV-2020</u>						Inspection Level 2 <input checked="" type="checkbox"/> Level 3 <input type="checkbox"/> Underwater <input type="checkbox"/>			
Component Location				Exposure Class	Condition State	Description of Defect * Detailed Description * Estimated Quantity * "Other" action required * Urgency of action (what, who, when, how) * Recommended Testing * Reference of Sketches and Photos (Roll/Exposure Nos)	Required Action (X)		
Modification	Group	Component	Standard Number				Monitor	Level 3 Inspection	Other
O	P4	B4	43 S	3	3		X		
Bearings 1-4 appear to have rotated to their tolerance limits. Refer to Sketch 14 for measurements at rocker-bed plates. B4 - CS3. Generally fine. Minor spot corrosion.									
O	P4	B5	43 S	3	4		X		
Bearings 5-8 are rotated in opposite direction to bearings 1-4. Refer to Sketch 15 for measurements at rocker-bed plates. (Remaining) anchor bolts through rocker-bed plate possibly bent. Build up of dirt at rocker-bed plate interface requires cleaning. B5 - CS4. Active corrosion and severe loss of section in hinge nut with moderate-severe loss of section in hinge bolt (064). Anchor bolts through rocker-bed plate have completely corroded away on both faces (065).									
O	P4	B6	43 S	3	3		X		
Bearings 5-8 are rotated in opposite direction to bearings 1-4. Refer to Sketch 15 for measurements at rocker-bed plates. (Remaining) anchor bolts through rocker-bed plate possibly bent. Build up of dirt at rocker-bed plate interface requires cleaning. B6 - CS3. Severe loss of section in sole plate-girder nut top face. Little active corrosion otherwise (066).									
O	P4	B7	43 S	3	3		X		
Bearings 5-8 are rotated in opposite direction to bearings 1-4. Refer to Sketch 15 for measurements at rocker-bed plates. (Remaining) anchor bolts through rocker-bed plate possibly bent. Build up of dirt at rocker-bed plate interface requires cleaning. B7 - CS3. Moderate-severe loss of section in sole plate-girder nut top face. Little active corrosion otherwise (067).									
O	P4	B8	43 S	3	4		X		
Bearings 5-8 are rotated in opposite direction to bearings 1-4. Refer to Sketch 15 for measurements at rocker-bed plates. (Remaining) anchor bolts through rocker-bed plate possibly bent. Build up of dirt at rocker-bed plate interface requires cleaning. B8 - CS4. Active corrosion and moderate loss of section in hinge bolt. Anchor bolts through rocker-bed plate have completely corroded away on both faces (064, 065). Moderate loss of section in sole plate-girder nut top face.									
O	S5	D1	20 C	3	3			X	
Spalling in all decks at E1 under finger joint with exposed and corroding reinforcement (070). Requires treating.									
O	S5	G1	22 S	3	4			X	
Structure undergoing investigations due to brittle failure/fatigue concerns. Several sites have undergone testing, specifically welds at splice joints, cross girder-girder interfaces and at stiffeners. Refer to Sketch 18 - Post inspection Tech note and Sketch 19 - Summary Plans. Initial visual inspection found cracks in the welds of the lower lap of splice 1 of G1. Vertical crack also found in weld at XG3-G1 interface (072). Refer to Sketch 19. Minor surface discontinuities also noted in G4 splice 1, and all girders at splice 2 (071 - typical) Refer also to Sketch 19. MPI and ultrasonic testing post removal of lead coatings later showed cracking in: - S5 G1 at XG3 interface on upstream and downstream faces up to 35mm in length and up to 3.3mm in depth. - S5 G1 splice 2 (upper) up to 32mm in length and a depth up to 3.9mm. Refer to Sketch 25. Girders show a breakdown of coating with spot corrosion in several areas (052, 057 - typical). Recommend cleaning and recoating as soon as feasible. NB: Steel components throughout structure have lead based coatings.									

Defective Components Report						B2/3	Sheet 7 Of 7		
Structure Id <u>7799</u> Name _____ Inspection Date <u>19-NOV-2020</u> Inspection Level 2 <input checked="" type="checkbox"/> Level 3 <input type="checkbox"/> Underwater <input type="checkbox"/>									
Component Location				Exposure Class	Condition State	Description of Defect * Detailed Description * Estimated Quantity * "Other" action required * Urgency of action (what, who, when, how) * Recommended Testing * Reference of Sketches and Photos (Roll/Exposure Nos)	Required Action (X)		
Modification	Group	Component	Standard Number				Monitor	Level 3 Inspection	Other
S5 G1 splice 2 (upper) identified as a "priority 1" crack. Post inspection weld was ground back at S5 G1 Splice 2. No apparent propagation of cracking into parent material was found (086, Sketch 22). Refer also to Sketch 24 - Barron Kuranda NDT and crack removal.									
O	S6	G1	22 S	3	4		X		
Structure undergoing investigations due to brittle failure/fatigue concerns. Several sites have undergone testing, specifically welds at splice joints, cross girder-girder interfaces and at stiffeners. Refer to Sketch 18 - Post inspection Tech note and Sketch 19 - Summary Plans. Initial visual inspection detected cracking in the weld of the lower lap of splice 3 of G1 (078). Refer to Sketch 19 and Sketch 18. Minor cracking propagating from weld into cross girder 1 at G2 interface (077). MPI and ultrasonic testing post removal of lead coatings later showed cracking in: - S6 G1 splice 3 (lower) up to 53mm in length. Sample taken from G1 as part of investigations into potential brittle failure in 2019. S6 G1 splice 3 (lower) identified as a "priority 1" crack. Post inspection weld was ground back at S6 G1 Splice 3. No apparent propagation of cracking into parent material was found (087, Sketch 23). Refer also to Sketch 24 - Barron Kuranda NDT and crack removal.									
ST	S6	G1	22 S	3	3			X	
Longitudinal stressing bars retro-fitted to either side of all girders. Stressing bars removed and replaced in 2019 as part of investigations into fatigue (083). Stressing bar on upstream face of G1 has lost bolts in attachments at stiffeners 7 and 8 (084 - typical). Requires proper attachment. Refer also to Sketch 20 - 2019 Investigations into Bearings and Macalloy bars.									
O	S6	W	71 O	3	3	X			
Significant localised build up at E1 of downstream side (024, 073). Refer to scour soundings report. Monitor.									

Structure Condition Inspection Report

B2/1

Sheet

1 Of 13

Structure Id 7799

Name

Crossing Name Barron River

Alt. Name

Structure Type Bridge

Owner

MR DEPARTMENT OF MAIN ROADS

Construction Type Girder/Beam

District

403 Far North

Construction Material Steel

LGA Id

277 MAREEBA SHIRE COUNCIL

Inspector NR

Date 19-NOV-2020

Inspection Level 2 ☒

Programmed ☒

Undersize Components ☐

Level 3 ☐

Exceptional ☐

Underwater ☐

Road Section

Start

End

TDist

Id	Description	S	Cway	S	RPC	Dist	RPC	Dist	Start	End
32A	CAIRNS - MAREEBA	C	1	C	5	0.000	5	0.257	12.535	12.792

Overall Ratings

1

2

3

4

5

Comments

Original Structure (O)

X

Structure is in poor condition.

Structure undergoing investigations due to brittle failure/fatigue concerns. At time of inspection, girders at several sites have had lead coating removed for NDT testing (specifically MPI) of cracking at splice joint welds. Cross girder-girder interfaces and stiffeners have also been examined for cracking at welds.

MPI and ultrasonic testing post removal of lead coatings showed cracking in S1 G3 splice 3, S1 G4 splice 3, S4 G3 splice 2, S4 G2 splice 2, S4 G1 splice 2, S4 G4 splice 3, S5 G1 at XG3 interface, S5 G1 splice 2, S6 G1 splice 3 and S2 G4 splice 2. Refer to Sketch 25.

S1 G3 splice 3 (lower), S5 G1 splice 2 (upper) and S6 G1 splice 3 (lower) were identified as 'priority 1' issues and (post L2 inspection) underwent a crack removal process. Refer to Sketches 18-24 for findings to date.

Coating removal and further testing of splice weld cracking is ongoing. Remedial advice still pending.

Steel components show significant spot corrosion through degradation of coating particularly around spans 3 and 4.

Several bearings throughout structure have minor-severe loss of section through corrosion. Rocker bearings at both sides under finger joints show particularly severe corrosion to bearing components and attachments. Rocker bearings show excessive rotation, particularly at P4 and in expansion halving joint located at S5 E1. Refer to the B2/2 report, Sketches 11-17 (Rocker bearing measurements) and Sketch 20 (Barron River Site Measurements - 2019). Remedial actions recommended in the last L3 report (17 Feb 2015) have yet to be undertaken.

Compression seals at P1 J2 and P4 J3 are highly weathered and perishing. Recommend replacement.

All BR posts have insufficient thread at anchor bolts and lack washers. Base plates are recessed into kerbs with mortar applied up to level with top of base plates. Minor surface corrosion at lower portion of base plates typical.

Strengthening (St)

X

Longitudinal stressing bars retro-fitted to either side of all girders.

Coating and attachments appear generally fair. Spot corrosion through likely breakdown of coating particularly in spans 3 and 4.

Stressing bars at S6 G1 were removed for testing and replaced. 2 attachments on the upstream side of G1 (side 2) are missing anchor bolts.

Widening (WLn, WRn), Lengthening (L1, L2), Raised (Ra), Redecked (Re), Shortening (S1, S2), Strengthening (St)

Structure Condition Inspection Report

B2/2

Sheet

2 Of 13

Structure Id 7799

Name

Inspection Date 19-NOV-2020

Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Component Location				Exposure Class	Quantity	Unit	Quantity Per Condition State				Maintenance Req'd	Comments
Modification	Group	Component	Standard				1	2	3	4		
O	AP1	AP	70 O	3	1.0	EACH		1.0			X	
20m considered. Approach in generally fair condition - no settlement issues apparent (001). Minor sections of the WS piling away from the abutment nosing (003) potentially allow moisture penetration to superstructure.												
Recommend sealing with a rubberised sealant at next general service.												
O	AP1	GR	72 S	3	2.0	EACH			2.0			
Impact damage to GR1 as reported in last inspection has been repaired (001).												
GR1 height at 600mm at lowest point. Single bolt connection to end posts in both GR (002 - typical).												
Requires provision of connections to current standards.												
O	AP1	FY	4 O	3	20.0	LINM		20.0				Footway in fair condition. Leaf litter should be cleared away at next service.
O	AP1	PRO	53 O	3	180.0	M2		180.0				20m considered. No scours visible.
O	A1	J1	14 S	3	8.5	LINM		8.5				Sliding plate appears to be working as designed (003). Retaining bolts appear effective. Minor pitting in plate.
O	S1	BR	2 S	3	86.0	LINM				86.0		
All BR posts have insufficient thread at anchor bolts and lack washers (004, 005 - typical). Base plates are recessed into kerbs. Mortar applied up to level with top of base plate - mortar missing/spalled away in many cases.												
Minor surface corrosion at lower portion of base plates typical. Delineation provided by retroreflective stickers on BR posts.												
Requires engineering input.												
O	S1	K	3 C	3	73.0	LINM		73.0				
Minor transverse shrinkage cracks ranging from hairline-0.3mm. No spalls/exposed reo in top and side faces. Minor loss of fines throughout.												
Survey marker at side 2 kerb (007).												
Scuppers cleared during inspection. Scuppers have been treated since previous inspection - no active corrosion.												
O	S1	WS	1 C	3	310.0	M2		310.0			X	
Concrete WS shows loss of fines with minor transverse cracks (006, 008 - typical). Wearing surface all spans treated with an epoxy resin in 2009 - little evidence of treatment visible in cracks.												
All bollards at pedestrian walkway across all spans are now missing (006), offering no protection or delineation for pedestrian traffic under normal operation.												
During time of inspection all motor traffic has been reduced to single lane and directed down the centre of the bridge due to load concerns.												
Pedestrian concerns should be considered before reopening to two lanes.												
O	A1	J2	15 O	3	8.5	LINM		8.5				
Refers to fixed joint at E2 of span 1 (008).												
Joint sealant highly weathered with minor loss of seal.												
Consider replacement of sealant at next service.												
O	P1	J1	15 C	3	8.5	LINM		8.5			X	
Refers to fixed joint at E1 of span 2.												
Sealant highly weathered with minor loss of seal in a few instances (009 - typical).												
Consider replacement of sealant at next service.												

Structure Condition Inspection Report

B2/2

Sheet

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Structure Id 7799

Name

Inspection Date 19-NOV-2020

Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Component Location				Exposure Class	Quantity	Unit	Quantity Per Condition State				Maintenance Req'd	Comments
Modification	Group	Component	Standard				1	2	3	4		
O	P1	J2	11 O	3	8.5	LINM			8.5			

Refers to compression seal joint with steel nosings at E1 of span 2.

Compression seal is highly weathered and perishing (010). Spoils in joint.

Nosings appear fair - gaps between nosings both sides 47mm (Temp. 27).

Recommend replacement of compression seal.

O	P1	J3	14 S	3	8.5	LINM		8.5				
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Steel finger joint at E2 of span 2.

Measurements taken at finger joint gaps - refer to Sketches 1-5. No indication of excessive differentials.

Spoils in joint requiring clearing out at next service.

Moisture from catch drain directed onto outside expansion rocker bearings at halving joint beneath, potentially exacerbating existing corrosion issues. Redesign or provision of a splash shield should be considered.

O	P1	J4	15 O	3	8.5	LINM		8.5			X	
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Fixed joint at E2 of span 2.

Sealant highly weathered with minor loss of seal in a few instances (009 - typical).

Consider replacement of sealant at next service.

O	S2	BR	2 S	3	91.2	LINM				91.2		
---	----	----	-----	---	------	------	--	--	--	------	--	--

All BR posts have insufficient thread at anchor bolts and lack washers (004, 005 - typical). Base plates are recessed into kerbs. Mortar applied up to level with top of base plate - mortar missing/spalled away in many cases.

Minor surface corrosion at lower portion of base plates typical. Delineation provided by retroreflective stickers on BR posts.

Requires engineering input.

O	S2	K	3 C	3	91.2	LINM		91.2				
---	----	---	-----	---	------	------	--	------	--	--	--	--

Minor transverse shrinkage cracks ranging from hairline-0.3mm. No spalls/exposed reo in top and side faces. Minor loss of fines throughout.

Scuppers cleared during inspection. Scuppers have been treated since previous inspection - no active corrosion.

O	S2	WS	1 C	3	388.0	M2		388.0			X	
---	----	----	-----	---	-------	----	--	-------	--	--	---	--

Concrete WS shows loss of fines with minor transverse cracks (006, 008 - typical). Wearing surface all spans treated with an epoxy resin in 2009 - little evidence of treatment visible in cracks.

All bollards at pedestrian walkway across all spans are now missing (006), offering no protection or delineation for pedestrian traffic under normal operation.

During time of inspection all motor traffic has been reduced to single lane and directed down the centre of the bridge due to load concerns.

Pedestrian concerns should be considered before reopening to two lanes.

O	P2	J1	15 O	3	8.5	LINM		8.5			X	
---	----	----	------	---	-----	------	--	-----	--	--	---	--

Fixed joint at E1 of span 3.

Sealant highly weathered with minor loss of seal in a few instances (009 - typical).

Consider replacement of sealant at next service.

O	P2	J2	15 O	3	8.5	LINM		8.5				
---	----	----	------	---	-----	------	--	-----	--	--	--	--

Fixed joint at E2 of span 3.

Sealant highly weathered with minor loss of seal in a few instances (009 - typical).

Consider replacement of sealant at next service.

Structure Condition Inspection Report

B2/2

Sheet

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Structure Id 7799

Name

Inspection Date 19-NOV-2020

Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Component Location				Exposure Class	Quantity	Unit	Quantity Per Condition State				Maintenance Req'd	Comments
Modification	Group	Component	Standard				1	2	3	4		
O	S3	BR	2 S	3	91.2	LINM				91.2		

All BR posts have insufficient thread at anchor bolts and lack washers (004, 005 - typical). Base plates are recessed into kerbs. Mortar applied up to level with top of base plate - mortar missing/spalled away in many cases.

Minor surface corrosion at lower portion of base plates typical. Delineation provided by retroreflective stickers on BR posts.

Requires engineering input.

O	S3	K	3 C	3	91.2	LINM		91.2				
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Minor transverse shrinkage cracks ranging from hairline-0.3mm. No spalls/exposed reo in top and side faces. Minor loss of fines throughout.

Scuppers cleared during inspection. Scuppers have been treated since previous inspection - no active corrosion.

O	S3	WS	1 C	3	388.0	M2		388.0			X	
---	----	----	-----	---	-------	----	--	-------	--	--	---	--

Concrete WS shows loss of fines with minor transverse cracks (006, 008 - typical). Wearing surface all spans treated with an epoxy resin in 2009 - little evidence of treatment visible in cracks.

All bollards at pedestrian walkway across all spans are now missing (006), offering no protection or delineation for pedestrian traffic under normal operation.

During time of inspection all motor traffic has been reduced to single lane and directed down the centre of the bridge due to load concerns.

Pedestrian concerns should be considered before reopening to two lanes.

O	P3	J1	15 O	3	8.5	LINM		8.5			X	
---	----	----	------	---	-----	------	--	-----	--	--	---	--

Fixed joint at E1 of span 4.

Sealant highly weathered with minor loss of seal in a few instances (009 - typical).

Consider replacement of sealant at next service.

O	P3	J2	15 O	3	8.5	LINM		8.5			X	
---	----	----	------	---	-----	------	--	-----	--	--	---	--

Fixed joint at E2 of span 4.

Sealant highly weathered with minor loss of seal in a few instances (009 - typical).

Consider replacement of sealant at next service.

O	S4	BR	2 S	3	91.2	LINM				91.2		
---	----	----	-----	---	------	------	--	--	--	------	--	--

All BR posts have insufficient thread at anchor bolts and lack washers (004, 005 - typical). Base plates are recessed into kerbs. Mortar applied up to level with top of base plate - mortar missing/spalled away in many cases.

Minor surface corrosion at lower portion of base plates typical. Delineation provided by retroreflective stickers on BR posts.

Requires engineering input.

O	S4	K	3 C	3	91.2	LINM		91.2				
---	----	---	-----	---	------	------	--	------	--	--	--	--

Minor transverse shrinkage cracks ranging from hairline-0.3mm. No spalls/exposed reo in top and side faces. Minor loss of fines throughout.

Scuppers cleared during inspection. Scuppers have been treated since previous inspection - no active corrosion.

O	S4	WS	1 C	3	388.0	M2		388.0				
---	----	----	-----	---	-------	----	--	-------	--	--	--	--

Concrete WS shows loss of fines with minor transverse cracks (006, 008 - typical). Wearing surface all spans treated with an epoxy resin in 2009 - little evidence of treatment visible in cracks.

All bollards at pedestrian walkway across all spans are now missing (006), offering no protection or delineation for pedestrian traffic under normal operation.

During time of inspection all motor traffic has been reduced to single lane and directed down the centre of the bridge due to load concerns.

Pedestrian concerns should be considered before reopening to two lanes.

Structure Condition Inspection Report

B2/2

Sheet

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Structure Id 7799

Name

Inspection Date 19-NOV-2020

Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Component Location				Exposure Class	Quantity	Unit	Quantity Per Condition State				Maintenance Req'd	Comments
Modification	Group	Component	Standard				1	2	3	4		
O	P4	J1	15O	3	8.5	LINM		8.5			X	

Fixed joint at E1 of span 5.

Sealant highly weathered with minor loss of seal in a few instances (009 - typical).

Consider replacement of sealant at next service.

O	P4	J2	14S	3	8.5	LINM		8.5				
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Steel finger joint at E1 of span 5.

Measurements taken at finger joint gaps - refer to Sketches 6-10 No indication of excessive differentials.

Spoils in joint at E2 only requiring clearing out at next service. Moisture from catch drain directed onto outside expansion rocker bearings at halving joint beneath, potentially exacerbating existing corrosion issues.

Redesign or provision of a splash shield should be considered.

O	P4	J3	11O	3	8.5	LINM			8.5			
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Refers to compression joint with steel nosing at E2 of span 5.

Rubber gland is perishing with the gland breaking away in sections (011). Gland has separated from nosing at side 2 potentially allowing moisture ingress. Seal is also lifting at side 2 at the pedestrian footway.

Steel plates at kerb joints fair.

Requires replacement of compression seal.

O	P4	J4	15O	3	8.5	LINM		8.5			X	
---	----	----	-----	---	-----	------	--	-----	--	--	---	--

Fixed joint at E2 of span 5.

Sealant highly weathered with minor loss of seal in a few instances (009 - typical).

Consider replacement of sealant at next service.

O	S5	BR	2S	3	91.2	LINM				91.2		
---	----	----	----	---	------	------	--	--	--	------	--	--

All BR posts have insufficient thread at anchor bolts and lack washers (004, 005 - typical). Base plates are recessed into kerbs. Mortar applied up to level with top of base plate - mortar missing/spalled away in many cases.

Minor surface corrosion at lower portion of base plates typical. Delineation provided by retroreflective stickers on BR posts.

Requires engineering input.

O	S5	K	3C	3	91.2	LINM		91.2				
---	----	---	----	---	------	------	--	------	--	--	--	--

Minor transverse shrinkage cracks ranging from hairline-0.3mm. No spalls/exposed reo in top and side faces. Minor loss of fines throughout.

Scuppers cleared during inspection. Scuppers have been treated since previous inspection - no active corrosion.

O	S5	WS	1C	3	388.0	M2		388.0				
---	----	----	----	---	-------	----	--	-------	--	--	--	--

Concrete WS shows loss of fines with minor transverse cracks (006, 008 - typical). Wearing surface all spans treated with an epoxy resin in 2009 - little evidence of treatment visible in cracks.

All bollards at pedestrian walkway across all spans are now missing (006), offering no protection or delineation for pedestrian traffic under normal operation.

During time of inspection all motor traffic has been reduced to single lane and directed down the centre of the bridge due to load concerns.

Pedestrian concerns should be considered before reopening to two lanes.

O	P5	J1	15O	3	8.5	LINM		8.5			X	
---	----	----	-----	---	-----	------	--	-----	--	--	---	--

Fixed joint at E1 of span 6.

Sealant highly weathered with minor loss of seal in a few instances (009 - typical). Consider replacement of sealant at next service.

Structure Condition Inspection Report

B2/2

Sheet

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Structure Id 7799

Name

Inspection Date 19-NOV-2020

Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Component Location				Exposure Class	Quantity	Unit	Quantity Per Condition State				Maintenance Req'd	Comments
Modification	Group	Component	Standard				1	2	3	4		
O	S6	BR	2 S	2	74.0	LINM				74.0		* Location of item/condition * Description of defects by location type, magnitude, extent * References of sketches and photos (Roll/Exposure Nos)
All BR posts have insufficient thread at anchor bolts and lack washers (004, 005 - typical). Base plates are recessed into kerbs. Mortar applied up to level with top of base plate - mortar missing/spalled away in many cases. Minor surface corrosion at lower portion of base plates typical. Delineation provided by retroreflective stickers on BR posts. Requires engineering input.												
O	S6	K	3 C	3	74.0	LINM		74.0				
Minor transverse shrinkage cracks ranging from hairline-0.3mm. No spalls/exposed reo in top and side faces. Minor loss of fines throughout. Scuppers cleared during inspection. Scuppers have been treated since previous inspection - no active corrosion.												
O	S6	WS	1 C	3	310.0	M2		310.0				
Concrete WS shows loss of fines with minor transverse cracks (006, 008 - typical). Wearing surface all spans treated with an epoxy resin in 2009 - little evidence of treatment visible in cracks. All bollards at pedestrian walkway across all spans are now missing (006), offering no protection or delineation for pedestrian traffic under normal operation. During time of inspection all motor traffic has been reduced to single lane and directed down the centre of the bridge due to load concerns. Pedestrian concerns should be considered before reopening to two lanes.												
O	A2	J1	14 S	3	8.5	LINM		5.0	3.5			
2 steel plate anchors missing at side 2 lane - roughly at wheel paths (012). Steel plate slapping noisily under traffic. Recommend reestablishment of anchors.												
O	AP2	AP	70 O	3	1.0	EACH		1.0				20m considered. Approach is in fair condition.
O	AP2	GR	72 S	3	2.0	EACH	2.0					
GR has recently been replaced to standard (013). Guardrail is in good condition. Spall in end post at side 2 - covered in S6 BR.												
O	AP2	PRO	53 O	3	120.0	M2		120.0				20m considered.
O	A1	PED	44 O	3	4.0	EACH		4.0				
O	A1	B	43 S	3	4.0	EACH		3.0	1.0			
Rocker bearings - refer to Sketch 11 for rockers to bed plate measurements. Bearings generally in fair condition with minor rotation apparent. Active corrosion in B4 bed plate especially on the back face with flaking and loss of section up to 6mm (014, 015). Staining under coating on front face also. All bearings reportedly accepting grease. Recommend treatment of treatment of B4 bed plate. NB - steel components in structure typically have red lead coatings. Refer also to Sketch 20 - 2019 Investigations into Bearings and Macalloy bars.												
O	A1	A	50 O	3	1.0	EACH		1.0				
Abutment in generally fair condition (016). Several vertical shrinkage cracks hairline-0.1mm (017). Water staining on abutment front face.												
O	A1	F	59 C	3	1.0	EACH	X	X	X	X		Buried and unseen (016).

Structure Condition Inspection Report

B2/2

Sheet

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Structure Id 7799

Name

Inspection Date 19-NOV-2020

Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Component Location				Exposure Class	Quantity	Unit	Quantity Per Condition State				Maintenance Req'd	Comments
Modification	Group	Component	Standard				1	2	3	4		
O	S1	D	20 C	3	354.0	M2		354.0			X	* Location of item/condition * Description of defects by location type, magnitude, extent * References of sketches and photos (Roll/Exposure Nos)
Very little cracking generally. Hairline-0.1mm cracking in D5 at E1 and MS shows no change since 2001 inspection. Minor spalls with exposed reo in D5 at MS (018 - typical) and at D1 E2. Treat at next opportunity. Scuppers have been treated since previous inspection and show no active corrosion.												
O	S1	G	22 S	3	4.0	EACH		2.0	1.0	1.0		
Structure undergoing investigations due to brittle failure/fatigue concerns. Several sites have undergone testing, specifically welds at splice joins, cross girder-girder interfaces and at stiffeners. Initial visual inspection indicated cracking at welds in G2 splice 1 (019) and G3 splice 3 (020). Minor surface discontinuities noted in G3 splice 1, G4 splice 1, G2 splice 2, G2 splice 3 and G4 splice 3 (021 - typical). Refer to Sketch 18 - Post inspection Tech note and Sketch 19 - Summary Plans. MPI and ultrasonic testing post removal of lead coatings later showed cracking in S1 G3 splice 3 (lower) of up to 22mm in length and up to 4.6mm in depth. Minor cracking up to 2mm also found in S1 G4 splice 3 (lower) (refer to Sketch 25). Girders appear otherwise fair (016, 022) -. Refer to Sketch 18 for coating levels across structure. S1 G3 splice 3 (lower) identified as a "priority 1" crack. Post inspection weld was ground back at S1 G3 Splice 3. No apparent propagation of cracking into parent material was found (085, Sketch 21). Refer also to Sketch 24 - Barron Kuranda NDT and crack removal.												
ST	S1	G	22 S	3	4.0	EACH		4.0				Longitudinal stressing bars retro-fitted to either side of all girders. Coating and attachments appear fair.
O	S1	XG	31 C	3	1.0	EACH		1.0			X	Very minor spalls with exposed reo in underside of XG1 in bay 4 from poor cover. Treat at next convenience.
O	S1	XG	31 S	3	4.0	EACH		4.0				
Cross girders are in generally fair condition - possible breakdown of the protective coating due to the age of the structure. NB: coating includes a lead based paint. Fine cracking in weld in XG3 at G2 interface (023) should be monitored.												
O	S1	W	71 O	3	1.0	EACH		1.0				Localised scours relative to original readings on both sides (022, 024). Refer to scour soundings report.
O	P1	B	40 O	3	4.0	EACH		4.0				
Fixed bearings located on Pier 1. No significant defects in bearings - protective coating appears sound (025 - typical). Refer also to Sketch 20 - 2019 Investigations into Bearings and Macalloy bars.												
O	P1	PED	44 O	3	4.0	EACH		4.0				
O	P1	H	54 C	3	1.0	EACH		1.0			X	
Headstock is in fair condition (022). No cracking at cantilever arms. 1 minor spall on face 1 near E2 (029) - treat and cover at next convenience.												
O	P1	C	56 C	3	1.0	EACH		1.0				No significant defects (022).
O	P1	F	59 C	3	1.0	EACH	X	X	X	X		Buried and unseen (022).

Structure Condition Inspection Report

B2/2

Sheet

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Structure Id 7799

Name

Inspection Date 19-NOV-2020

Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Component Location				Exposure Class	Quantity	Unit	Quantity Per Condition State				Maintenance Req'd	Comments
Modification	Group	Component	Standard				1	2	3	4		
O	P1	B	43 S	3	4.0	EACH		2.0	2.0			

Fixed rocker bearings at halving joint 1, E1 of span 2 (026 - typical).

B1 and B4 have been coated since previous inspection however moderate-severe loss of section remains in anchor nuts (027, 028). Corrosion evident under coating on undersides of both rockers and in bed plates.

Recommendations to replace anchor nuts in previous L3 report (17/12/2015) have yet to be carried out.

B2 and B3 are in fair condition.

Refer to Sketch 12 for measurements of gaps at rockers-sole plates.

Refer also to Sketch 20 - 2019 Investigations into Bearings and Macalloy bars.

O	S2	D	20 C	3	442.0	M2		440.0	2.0			
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Moderate spalls with exposed and corroded reo at soffit under finger joint in D2 and D4 (030 - typical). Requires treatment of reinforcement.

Deck otherwise in fair condition with no significant cracking or spalling.

Scuppers have been treated since previous inspection and show no active corrosion.

O	S2	G	22 S	3	4.0	EACH		3.0	1.0			
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Structure undergoing investigations due to brittle failure/fatigue concerns. Several sites have undergone testing, specifically welds at splice joints, cross girder-girder interfaces and at stiffeners. Refer to Sketch 18 - Post inspection Tech note and Sketch 19 - Summary Plans.

Initial visual inspection detected minor surface discontinuities in G1 splice 1, G4 splice 1, G1 splice 2, G2 at XG2 interface, G3 splice 3, and G4 splice 4 (refer to Sketch 19).

MPI and ultrasonic testing post removal of lead coatings later showed cracking in:
- S2 G4 splice 2 (lower) up to 3mm in length. Refer to Sketch 25.

Girders appear otherwise fair (031). Possible breakdown of coating. Refer to Sketch 18 for coating levels across structure.

ST	S2	G	22 S	3	4.0	EACH		4.0				
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Longitudinal stressing bars retro-fitted to either side of all girders. Attachments appear fair. Spot corrosion in stressing bars. Refer also to Sketch 20 - 2019 Investigations into Bearings and Macalloy bars.

O	S2	XG	31 S	3	8.0	EACH		8.0				
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Cross girders appear generally fair. Possible breakdown of protective coating. Minor surface discontinuities noted in G2 at XG2 interface - refer to Sketch 19.

O	P2	B	43 S	3	4.0	EACH		2.0		2.0		
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Rocker bearings at expansion halving joint at E2 of span 2 (032).

Refer to Sketch 13 for measurements at rockers to bed plates. All bearings show rotation.

B1 - CS4. Lower attachment on downstream side has completely corroded away (033). Corrosion evident in hinge pin (034) - unable to determine extent of loss of section.

B2 - CS2. Appears fair (035). No apparent corrosion issues.

B3 - CS2. Appears fair. No apparent corrosion issues.

B4 - CS4. Lower attachment on downstream side has completely corroded away (036). Corrosion evident in hinge pin. Corrosion in hinge pin appears severe.

Remedial actions recommended in previous L3 report ((17/12/2015) have yet to be carried out.

Bearings have been coated since previous L2 inspection.

Refer also to Sketch 20 - 2019 Investigations into Bearings and Macalloy bars.

NB: B1 and B4 are positioned directly under the finger joint catch drain which directs water onto bearings.

O	S2	W	71 O	3	1.0	EACH			1.0			
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Significant localised build up S2 E2 on the downstream side relative to original readings (024, 031). Localised scours and build up in other areas. Refer to scour soundings report. Monitor.

Structure Condition Inspection Report

B2/2

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Structure Id 7799

Name

Inspection Date 19-NOV-2020

Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Component Location				Exposure Class	Quantity	Unit	Quantity Per Condition State				Maintenance Req'd	Comments
Modification	Group	Component	Standard				1	2	3	4		
O	P2	B	40 O	3	4.0	EACH		3.0	1.0			

Fixed bearings located on pier 2.

B1 - CS3. Outside anchor nut has severe loss of section (037). Minor corrosion evident under coating. Previous L3 inspection recommendation of replacement of anchor nuts yet to be carried out.

B4 also has corrosion and minor loss of section in outside anchor nut (038).

Bearings have been coated since previous L2 inspection.

O	P2	PED	44 O	3	4.0	EACH		4.0				
O	P2	H	54 C	3	1.0	EACH		1.0				Fair condition (031). No signs of cracking at cantilever arms.
O	P2	C	56 C	3	1.0	EACH		1.0				Fair condition (031)
O	P2	F	59 C	3	1.0	EACH	X	X	X	X		Buried and unseen (031).
O	S3	D	20 C	3	442.0	M2		440.5	1.5			

Small sections of spalling with exposed and corroded reinforcement in D1 at MS, D5 at E1 and in D4 at E1 likely due to poor cover. Requires squaring to behind reo, treatment of reo and covering with a reinstatement mortar.

Scuppers have been treated since previous inspection and show no active corrosion.

O	S3	G	22 S	3	4.0	EACH		4.0			X	
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Structure undergoing investigations due to brittle failure/fatigue concerns. Several sites have undergone testing, specifically welds at splice joints, cross girder-girder interfaces and at stiffeners. Refer to Sketch 18 - Post inspection Tech note and Sketch 19 - Summary Plans.

Minor surface discontinuities noted in G1 splice 1, G4 splice 1, G1 splice 2, G2 at XG2 interface, G4 splice 2, G3 splice 3 (040 - typical) and G4 splice 4 (refer to Sketch 19). Spot corrosion at many splice welds (041 - typical).

Girders show a breakdown of coating with spot corrosion in several areas especially towards E2 and in particular girders 2 and 3. Minor corrosion in bottom flanges of G2 and G3 at E2 (042, 043 - typical) with no significant loss of section. Previous attempts at painting over in select areas appear to be failing. Requires cleaning and recoating as soon as feasible.

NB: Steel components throughout structure have lead based coatings.

ST	S3	G	22 S	3	4.0	EACH		1.0	3.0			
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Longitudinal stressing bars retro-fitted to either side of all girders. Attachments appear fair.

Spot corrosion throughout stressing bars tending to worsen towards E2 (044 - typical). Protective coating failing at stressing bar ends at girders 2, 3 and 4 (045 - typical).

Stressing bars require cleaning and painting. NB: bars likely coated with lead based paint.

O	S3	XG	31 S	3	6.0	EACH		6.0			X	
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Spot corrosion forming on cross girders typically worsening towards E2 of span (044) requiring spot treatment.

Minor surface discontinuity reported in XG2 at G2 interface (refer to Sketch 19).

Cross girder attachments appear sound.

O	S3	W	71 O	3	1.0	EACH		1.0				
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Localised scours on upstream side and localised build up on downstream relative to original readings (024, 046). Refer to scour soundings report.

Structure Condition Inspection Report

B2/2

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Structure Id 7799

Name

Inspection Date 19-NOV-2020

Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Component Location				Exposure Class	Quantity	Unit	Quantity Per Condition State				Maintenance Req'd	Comments
Modification	Group	Component	Standard				1	2	3	4		
O	P3	B	40 O	3	4.0	EACH		2.0		2.0		

Fixed bearings on top of pier 3 (046). Bearings have had spot treatment since previous inspection.

B1 - CS4. Lower attachment nut has nearly completely corroded away (047) with moderate corrosion in the hinge pin and upper attachments.

B2 - CS2. Fair condition.

B3 - CS2. Minor corrosion evident under coating - spot treatment appears to be failing (048). Requires cleaning and retreating.

B4 - CS4. Minor loss of section in lower attachments. Minor corrosion evident forming under recent spot treatment coating (049). Rust staining from hinge pin under coating. Upper attachments are untreated and have corrosion with moderate loss of section in nuts. Severe loss of section in sole plate-girder attachment on top of lower flange of girder (050).

Refer also to Sketch 20 - 2019 Investigations into Bearings and Stiffeners.

Remedial actions recommended in previous L3 report (17 Feb 2015) have yet to be carried out.

O	P3	H	54 C	3	1.0	EACH		1.0				Headstock is in fair condition (046). No cracking found in cantilever arms.
O	P3	C	56 C	3	1.0	EACH		1.0				No significant issues (046).
O	P3	F	59 C	3	1.0	EACH	X	X	X	X		Buried and unseen (036).
O	S4	D	20 C	3	442.0	M2		442.0			X	

Deck is generally sound.

Minor spalls with exposed and corroded reinforcement in D1 under side 1 kerb (051 - typical). Treat at earliest convenience.

Minor cracking ranging from hairline-0.2mm in D2 E1-MS.

Scuppers have been treated since previous inspection and show no active corrosion.

O	S4	G	22 S	3	4.0	EACH			4.0			
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Structure undergoing investigations due to brittle failure/fatigue concerns. Several sites have undergone testing, specifically welds at splice joints, cross girder-girder interfaces and at stiffeners. Refer to Sketch 18 - Post inspection Tech note and Sketch 19 - Summary Plans.

Initial visual inspections showed fine cracks in the welds of the lower lap of splice 2 of all girders (053, 054 - typical). Refer to Sketch 19.

Minor surface discontinuities also noted in all girders at Splice 3. Spot corrosion at many splice welds (055 - typical). Refer to Sketch 19.

MPI and ultrasonic testing post removal of lead coatings later showed cracking in:

- S4 G1 splice 2 (lower) up to 5mm.
- S4 G2 splice 2 (lower) with a depth of 0.9mm.
- S4 G3 splice 2 (lower) of up to 5mm in length.
- S4 G4 splice 3 (lower) up to 3mm.

Refer to Sketch 25 for testing results.

Girders show a breakdown of coating with spot corrosion in several areas particularly in girders 2, 3 and 4 on the downstream faces (052, 057 - typical). Recommend cleaning and recoating as soon as feasible.

NB: Steel components throughout structure have lead based coatings.

ST	S4	G	22 S	3	4.0	EACH		3.0	1.0			
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Longitudinal stressing bars retro-fitted to either side of all girders. Attachments appear fair.

Spot corrosion throughout stressing bars (044 - typical). Protective coating failing at stressing bar ends particularly at girders 4 (045 - typical).

Stressing bars require cleaning and painting. NB: bars likely coated with lead based paint.

O	S4	XG	31 S	3	6.0	EACH		6.0			X	
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Spot corrosion forming on cross girders throughout span (044 - typical). Requires spot treatment.

Cross girder attachments are sound.

O	S4	W	71 O	3	1.0	EACH		1.0				Localised scours and build up both sides relative to original readings (024, 056). Refer to scour soundings report.
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Structure Condition Inspection Report										B2/2	Sheet 11 Of 13	
Structure Id		7799			Name							
Inspection Date		19-NOV-2020			Inspection Level 2		<input checked="" type="checkbox"/>	Level 3	<input type="checkbox"/>	Underwater	<input type="checkbox"/>	
Component Location				Exposure Class	Quantity	Unit	Quantity Per Condition State				Maintenance Req'd	Comments
Modification	Group	Component	Standard				1	2	3	4		
O	P4	B	43 S	3	8.0	EACH			5.0	3.0		
<p>Bearings 1-4 refer to rocker bearings located on Pier 4. Bearings 1-4 appear to have rotated to their tolerance limits. Refer to Sketch 14 for measurements at rocker-bed plates.</p> <p>B1 - CS4. Severe loss of section in anchor attachment on downstream side with active corrosion apparent under recent recoating (059). Active corrosion with severe loss of section in sole plate-girder attachment (060). Rust staining at rocker-bed plate interface.</p> <p>B2 - CS3. Moderate loss of section in hinge pin nut with active corrosion. Minor loss of section in anchor attachments with active corrosion (061)</p> <p>B3 - CS3. Generally fine. Minor amounts of corrosion under recent recoating (062).</p> <p>B4 - CS3. Generally fine. Minor spot corrosion.</p> <p>Bearings 5-8 refer to rocker bearings at expansion halving joint E1 of span 5 (058). Bearings 5-8 are rotated in opposite direction to bearings 1-4. Refer to Sketch 15 for measurements at rocker-bed plates.</p> <p>NB: B5 and B8 are positioned directly under the finger joint catch drain which directs water onto bearings.</p> <p>(Remaining) anchor bolts through rocker-bed plate possibly bent. Build up of dirt at rocker-bed plate interface requires cleaning.</p> <p>B5 - CS4. Active corrosion and severe loss of section in hinge nut with moderate-severe loss of section in hinge bolt (064). Anchor bolts through rocker-bed plate have completely corroded away on both faces (065).</p> <p>B6 - CS3. Severe loss of section in sole plate-girder nut top face, Little active corrosion otherwise (066).</p> <p>B7 - CS3. Moderate-severe loss of section in sole plate-girder nut top face, Little active corrosion otherwise (067).</p> <p>B8 - CS4. Active corrosion and moderate loss of section in hinge bolt. Anchor bolts through rocker-bed plate have completely corroded away on both faces (064, 065). Moderate loss of section in sole plate-girder nut top face.</p> <p>Remedial actions recommended in L3 inspection (2015) yet to be carried out.</p> <p>Refer also to Sketch 20 - 2019 Investigations into Bearings and stressing bars.</p>												
O	P4	PED	44 O	3	4.0	EACH		4.0				
O	P4	H	54 C	3	1.0	EACH		1.0				Headstock is in fair condition (056). No cracking at cantilver arms.
O	P4	C	56 C	3	1.0	EACH		1.0				No significant issues (056).
O	P4	F	59 C	3	1.0	EACH	X	X	X	X		Buried and unseen (056).
O	S5	D	20 C	3	442.0	M2		438.0	4.0			
<p>Spalling in all decks at E1 under finger joint with exposed and corroding reinforcement (070 - typical). Requires treating.</p> <p>Rest of deck appears sound.</p> <p>Scuppers have been treated since previous inspection and show no active corrosion.</p>												
O	S5	G	22 S	3	4.0	EACH		3.0		1.0		
<p>Structure undergoing investigations due to brittle failure/fatigue concerns. Several sites have undergone testing, specifically welds at splice joins, cross girder-girder interfaces and at stiffeners. Refer to Sketch 18 - Post inspection Tech note and Sketch 19 - Summary Plans.</p> <p>Initial visual inspection found cracks in the welds of the lower lap of splice 1 of G1. Vertical crack also found in weld at XG3-G1 interface (072). Refer to Sketch 19.</p> <p>Minor surface discontinuities also noted in G4 splice 1, and all girders at splice 2 (071 - typical) Refer also to Sketch 19.</p> <p>MPI and ultrasonic testing post removal of lead coatings later showed cracking in:</p> <ul style="list-style-type: none"> - S5 G1 at XG3 interface on upstream and downstream faces up to 35mm in length and up to 3.3mm in depth. - S5 G1 splice 2 (upper) up to 32mm in length and a depth up to 3.9mm. <p>Refer to Sketch 25.</p> <p>Girders show a breakdown of coating with spot corrosion in several areas (052, 057 - typical). Recommend cleaning and recoating as soon as feasible.</p> <p>NB: Steel components throughout structure have lead based coatings.</p> <p>S5 G1 splice 2 (upper) identified as a "priority 1" crack. Post inspection weld was ground back at S5 G1 Splice 2. No apparent propagation of cracking into parent material was found (086, Sketch 22). Refer also to Sketch 24 - Barron Kuranda NDT and crack removal.</p>												

Structure Condition Inspection Report

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Structure Id 7799

Name

Inspection Date 19-NOV-2020

Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Component Location				Exposure Class	Quantity	Unit	Quantity Per Condition State				Maintenance Req'd	Comments
Modification	Group	Component	Standard				1	2	3	4		
ST	S5	G	22 S	3	4.0	EACH		4.0				Longitudinal stressing bars retro-fitted to either side of all girders. Attachments appear fair.
O	S5	XG	31 S	3	8.0	EACH		8.0				
Cross girders are generally in fair condition with attachments generally sound.												
Vertical crack found in weld at XG3-G1 interface (072). Refer to Sketch 19. Monitor.												
O	P5	B	43 S	3	4.0	EACH		4.0				
Fixed rocker bearings at fixed having joint E2 of S5 (074).												
Refer to Sketch 16 for measurements at rocker-bed plate.												
Bearings have been coated since previous inspection (075).												
Minor active corrosion in B1 upper attachment on upstream side and at rocker-bed plate interface in B4 - recommend further treatment.												
O	S5	W	71 O	3	1.0	EACH		1.0				Localised build up on downstream side relative to first readings (024, 073). Refer to scour soundings report.
O	P5	B	40 O	3	4.0	EACH		4.0				
Fixed bearings on pier 5.												
No significant defects (076).												
O	P5	PED	44 O	3	4.0	EACH		4.0				
O	P5	H	54 C	3	1.0	EACH		1.0				Headstock is in fair condition (073). No cracking at cantilever arms.
O	P5	C	56 C	3	1.0	EACH		1.0				
O	P5	F	59 C	3	1.0	EACH	X	X	X	X		Buried and unseen (073).
O	S6	D	20 C	3	354.0	M2		354.0				
Deck appears sound.												
Scuppers have been treated since previous inspection and show no active corrosion.												
O	S6	G	22 S	3	4.0	EACH		3.0		1.0		
Structure undergoing investigations due to brittle failure/fatigue concerns. Several sites have undergone testing, specifically welds at splice joins, cross girder-girder interfaces and at stiffeners. Refer to Sketch 18 - Post inspection Tech note and Sketch 19 - Summary Plans.												
Initial visual inspection detected cracking in the weld of the lower lap of splice 3 of G1 (078). Refer to Sketch 19 and Sketch 18.												
Minor cracking propagating from weld into cross girder 1 at G2 interface (077).												
MPI and ultrasonic testing post removal of lead coatings later showed cracking in: - S6 G1 splice 3 (lower) up to 53mm in length.												
Sample taken from G1 as part of investigations into potential brittle failure in 2019.												
S6 G1 splice 3 (lower) identified as a "priority 1" crack. Post inspection weld was ground back at S6 G1 Splice 3. No apparent propagation of cracking into parent material was found (087, Sketch 23). Refer also to Sketch 24 - Barron Kuranda NDT and crack removal.												
ST	S6	G	22 S	3	4.0	EACH		3.0	1.0			
Longitudinal stressing bars retro-fitted to either side of all girders.												
Stressing bars removed and replaced in 2019 as part of investigations into fatigue (083).												
Stressing bar on upstream face of G1 has lost bolts in attachments at stiffeners 7 and 8 (084 - typical). Requires proper attachment.												
Refer also to Sketch 20 - 2019 Investigations into Bearings and Macalloy bars.												

Structure Condition Inspection Report

B2/2

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Structure Id 7799 Name _____
Inspection Date 19-NOV-2020 Inspection Level 2 ☒ Level 3 ☐ Underwater ☐

Component Location				Exposure Class	Quantity	Unit	Quantity Per Condition State				Maintenance Req'd	Comments
Modification	Group	Component	Standard				1	2	3	4		
O	S6	XG	31 S	3	3.0	EACH		3.0				
Minor cracking propagating from weld into cross girder 1 at G2 interface (077).												
Cross girders otherwise fair with sound attachments.												
O	S6	XG	31 C	3	1.0	EACH		1.0				Minor vertical cracking in concrete cross girder at A2 between all girders up to 0.3mm (082).
O	S6	W	71 O	3	1.0	EACH			1.0			Significant localised build up at E1 of downstream side (024, 073). Refer to scour soundings report. Monitor.
O	A2	B	43 S	3	4.0	EACH		4.0			X	
Rocker bearings on A2.												
Refer to Sketch 17 for measurements at rocker-bed plate.												
Bearings are all in fair condition (079) with minor rust staining under recent coating in bed plate of B3 (080) and minor corrosion in underside of rocker and in bed plate of B4 (081).												
Recommend cleaning and repainting.												
O	A2	PED	44 O	3	4.0	EACH		4.0				
O	A2	A	50 C	3	1.0	EACH		1.0				Abutment is in fair condition. No cracking or spalling noted (079).
O	A2	F	59 C	3	1.0	EACH	X	X	X	X		Buried and unseen (079).