

Memorandum

То	Erle Bencich
Сору	Mark Smith, Kathie Ragg
From	Rem Markland
Office	Greymouth
Date	19 June 2024
File/Ref	6-WWES5.02
Subject	Totara Rail Bridge - Summary Assessment 2024

Dear Erle,

As requested, we have completed the summary assessment review for the Totara Rail Bridge. This summary report is to aid Westland District Council (WDC) with determining an appropriate management strategy for this pedestrian structure.

This assessment review was undertaken by Tiaan Kramer, WSP Principal Bridge and Civil Structures Engineer with technical review completed by Anthony Rooke, WSP Team Leader Structures Asset Management and supported by Rem Markland, WSP Senior Engineering Technician. All personnel were involved in the previous assessment of the structure in August 2023.

1.1 Background & Scope

WSP completed a visual inspection, assessment and reporting of the Totara Rail Bridge for WDC in August, 2023¹. An immediate recommendation of this report was to undertake timber drilling to better understand the condition of all hardwood components and provide greater confidence in the large number of component repair/replacement identified. A timber drilling investigation was completed by an external Contractor, Liddell Contracting² circa 2023.

WSP has undertaken a comparison of the timber drilling findings with the visual inspection completed August 2023 in order to update "Priority Groups of Main Truss Members Results" (listed in Table 4 of original report). This memorandum summarises our findings.

1.2 Structure Assessment Summary

1.2.1 Comparison Results

The results of the comparison between WSP's previous visual assessment and Liddell's drilling records are as follows:

¹ 6-WWES3.98 Totara Rail Bridge Assessment 2023_FINAL

² Drilling notes were provided to WSP from WDC to use for reference in completing this summary report, but as WSP were not involved in the drilling investigation they have not been thoroughly reviewed or relied upon for information accuracy.

It is to be noted that WSP has not been involved in the drilling investigation works or MSQA. Therefore, the drilling notes supplied by Liddell were only used for reference to these works and were not relied upon for information accuracy. In addition, Liddell's findings did not adopt the same priority classification as WSP's report. It was subsequently assumed that priorities classified as "Urgent" and "High" is equivalent to Liddel's "Replacement" classification.

	WSP's Priority	Liddel's Priority	
Members	Urgent & High	Replace	Repair
Top Chord	1	16	0
Bottom Chord (pier to pier)	4	n/a	n/a
Struts	30	23	1
Hanger/tension rod	19	35	0
Transom	3	2	6
Deck Cross Bracing	47	26	0
Timber Brace	5	14	0

Table A: Original Table 4 comparison of the main truss member priority groups

In addition to the main truss member results, Liddel also recorded the member condition of components not summarised in the original Table 4. These are presented in the table below:

 Table B: Recommendation comparison of components not included in the original summarised Table 4

	WSP's Priority	Liddel's Priority	
Members	Replace	Replace	Repair
Timber Thrust Blocks, A-Blocks & Saddle Blocks	29	24	5
Road Beams	2	5	1
Corbels	2	7	1
Solid Blocking & tie Rods	2	4	4
Pier components	15	14	0

These results show that the findings of Liddel's investigation are notably worse than what WSP's visual inspection showed. This subsequently reinforces the previous recommendations made by WSP.

In addition, it was also observed that Liddel's only appeared have drilled a sample of timber members and commented on some steel members. We draw this conclusion on the basis that only 267 of 836 total components (32%) have been commented on in their drilling records. While not clear, their investigation appeared to be focussed on the defective components identified in WSP's visual assessment report. This means that there may still be a significant number of timber components with internal decay that haven't been identified.

1.2.1 Cost Estimates

WSP compiled a cost estimate for repair/strengthening as part of the original visual assessment report (see Table C below for a copy of the original cost estimate).

		Total cost			
	Immediate	6 months	2 – 10 years	10+ years	over 10+
					years
Cost estimate	\$150k	\$1.814M	\$1.530M	\$2.125M	\$5.619M

 Table C: Original Cost Estimate for Strengthening or Repair Work

These costs will likely be higher due to the increased number of components requiring replacement as identified in Liddel's report.

1.2.1 Summary & Recommendations

As a result, WSP still uphold the recommendations and priorities provided in the original report 6-WWES3.98 Totara Rail Bridge Assessment 2023 dated 21 August 2023. These are:

- A present value end of life (PVEOL) or similar assessment should be undertaken to compare maintenance costs with the cost of establishing an alternative crossing. Given the amount of current deterioration of the bridge and strengthening required, the PVEOL should be used to compare the cost of any repairs against the value of the bridge. As the bridge is now utilised as a cycleway bridge, the replacement value for a cycleway bridge is roughly \$2.03M3. Total sum cost of remedial works and future inspections will exceed the replacement value of a cycleway bridge.
- Discussions should be held with Heritage New Zealand Pouhere Taonga (HNZPT) regarding the heritage status of this structure. Strengthening or repair work may be influenced by this as work may result in loss of the historic fabric and character of the bridge. The bridge is not listed as a heritage structure with HNZPT, nor identified as a Historic Place in the WDC District Plan. However, as it was built in the 1800's, it still holds heritage value.
- The existing bridge is potentially at risk to other vulnerabilities which were not investigated or discussed during this visual assessment. Examples of vulnerabilities could include risk to scour, or seismic loading, pile reduction due to abrasion (below the current bed level) and pile damage due to log loading given its demanding operating environment.
- A new structure could be constructed in a location less vulnerable to the environment. This could be further upstream with a cycleway diversion. This investigation is highly recommended to be carried out as a matter of priority.
- Repairs consisting of steel augmentation with protective coating systems would require first minor maintenance within 15-20 years at best in this environment and would add to the ongoing future maintenance costs.

In the interest of public safety we recommend Council considers closing the structure until the Recommendations above are carried out. The bridge should remain closed while the various options are explored.

Kind regards,

Runnafor

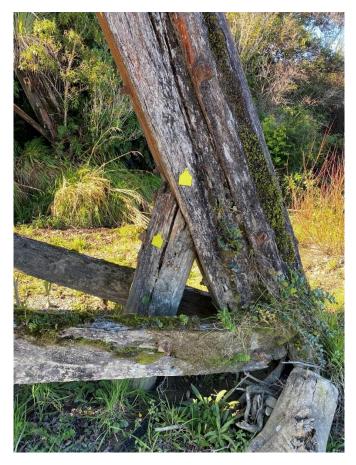
Rem Markland Senior Engineering Technician



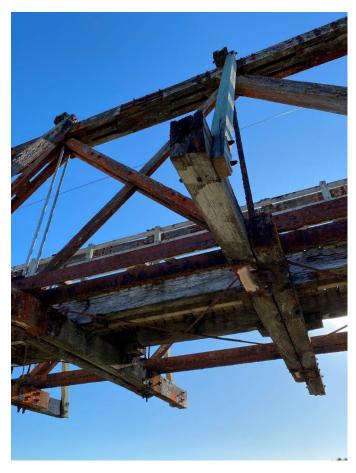
Top Cord Surface loss Saddle block split in timber and timber decay.



Raking pile timber split and timber decay.



Raking pile timber surface decay



Transom end timber decay.



Raking pile timber decay.



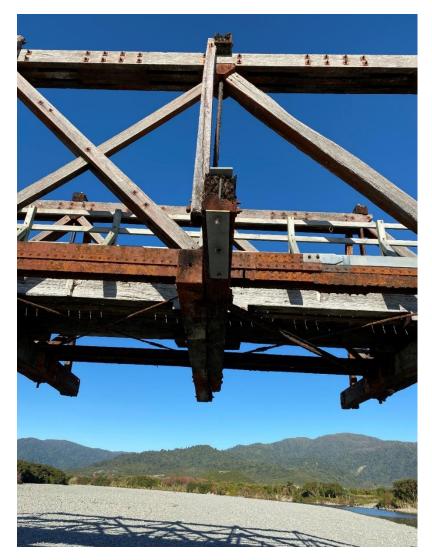
Transom Timber decay and timber split



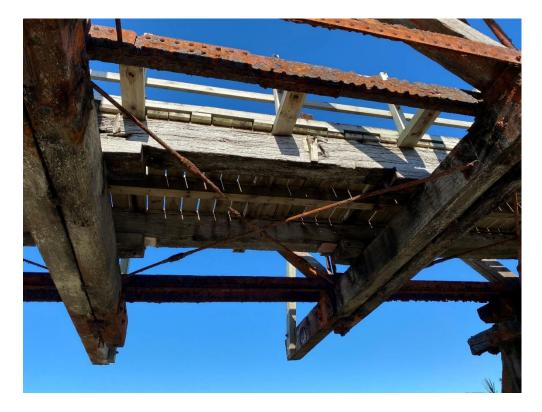
Cross bracing corroded away.



Timber loss and decay.



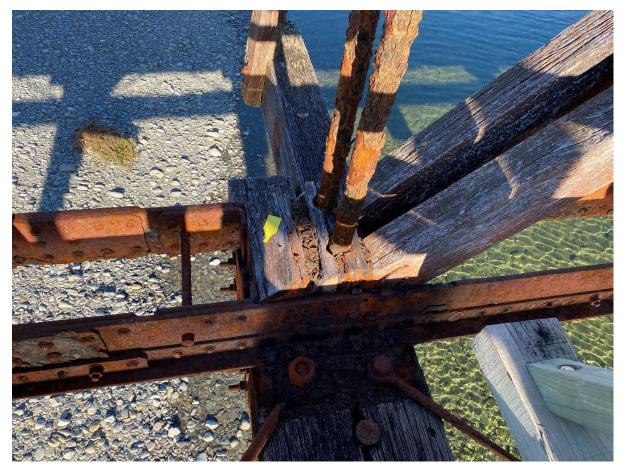
Previous repair to transom end. More timber decay present



Steel cross bracing needs replacing



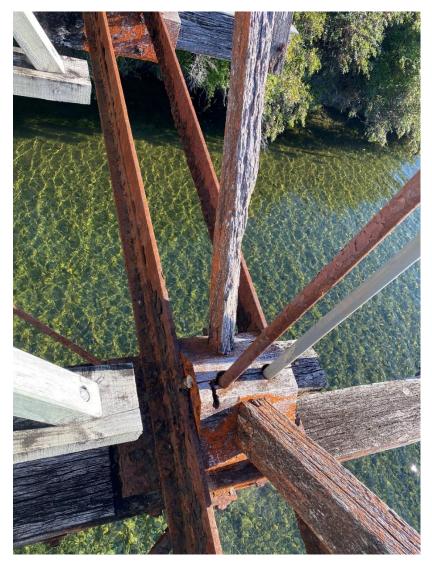
Transom timber end decay Bottom cord corroded. Previous repair visible



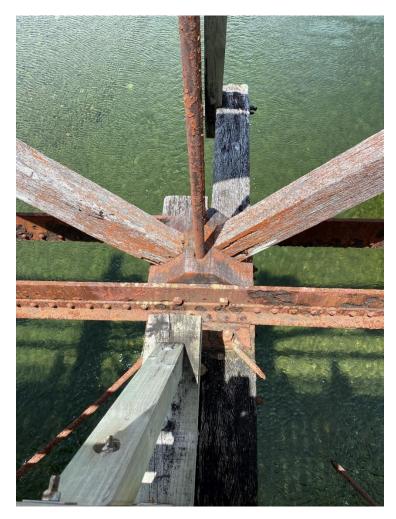
Timber thrust block decay and timber split. Steel tension rods corroded.



Steel cross bracing corroded. Needs replacing



Loss of section on timber strut.



Steel cross bracing corroded. Needs replacing



Saddle block needs replacing.



Saddle block split



Bottom cord corroded, needs replacing



Bottom cord corroded, needs replacing. Cross bracing corroded needs replacing



Saddle block decay and split.



Tension rods corroded. Previous repair to transom. Needs more repairs. Decay to timber strut.



Saddle block timber split.



Centre strut timber decay.



Bottom cord corroded. Needs replacing



Bottom cord corroded. Needs replacing.



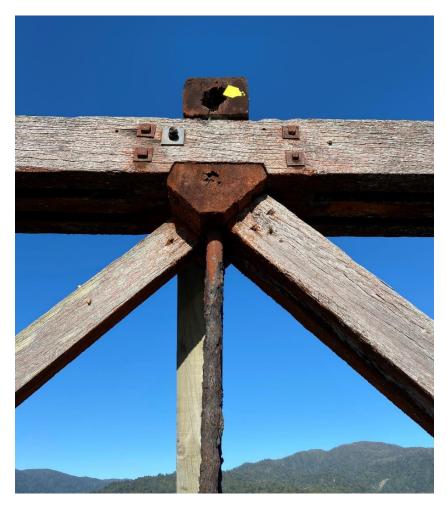
Tension rods corroded. Needs replacing



Saddle block timber decay. Tension rod corroded.



Bottom cord corroded. Previous repair visible.



Saddle block with tunnel rot.



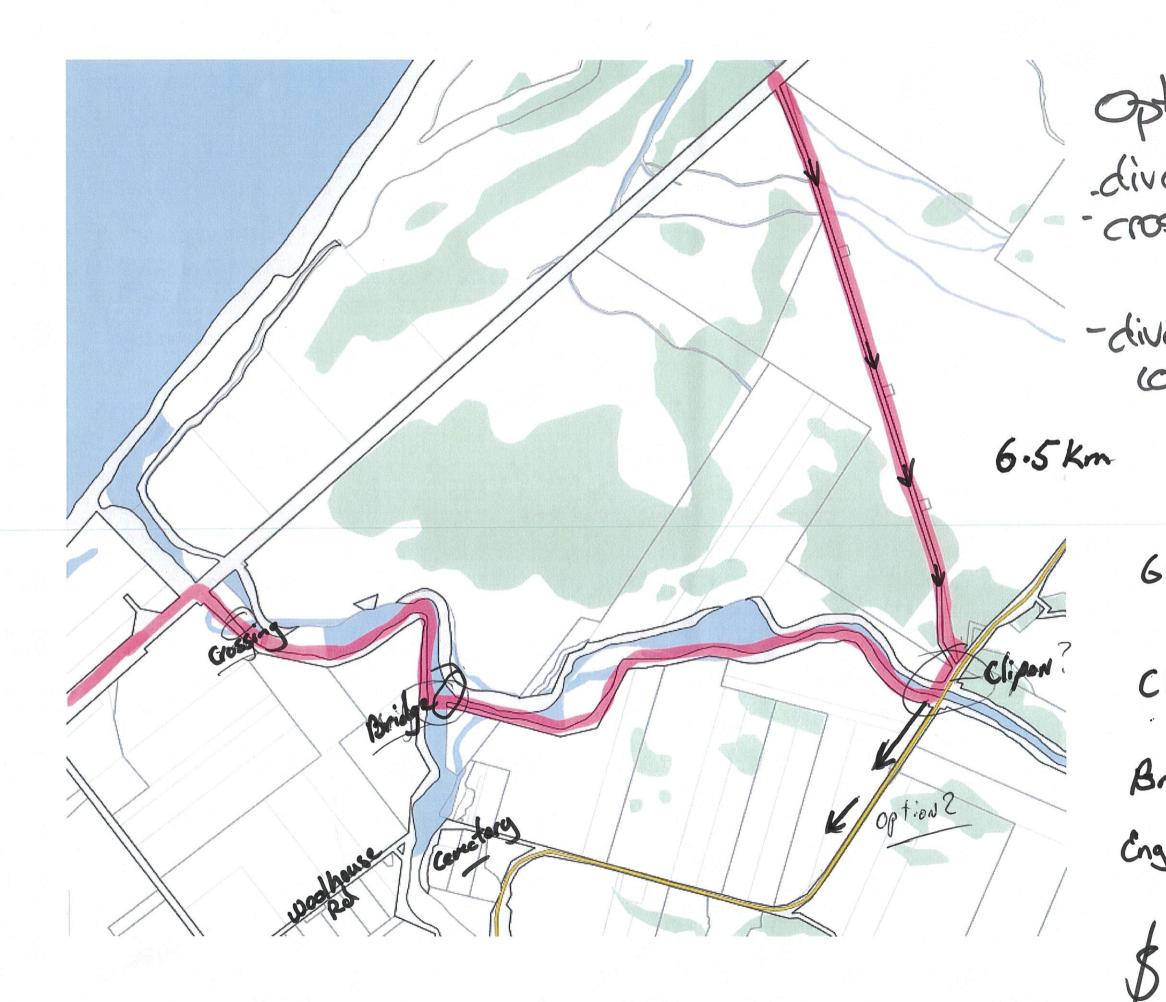
Surface loss on timber strut



Tiber A block with tunnel rot.

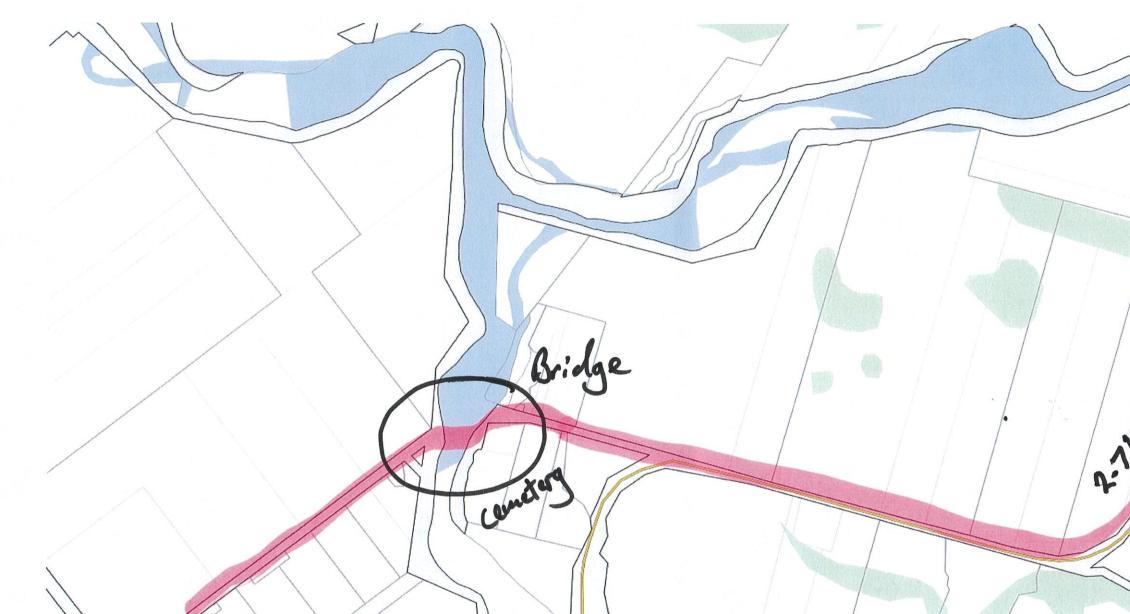


Timber thrust block with timber decay.



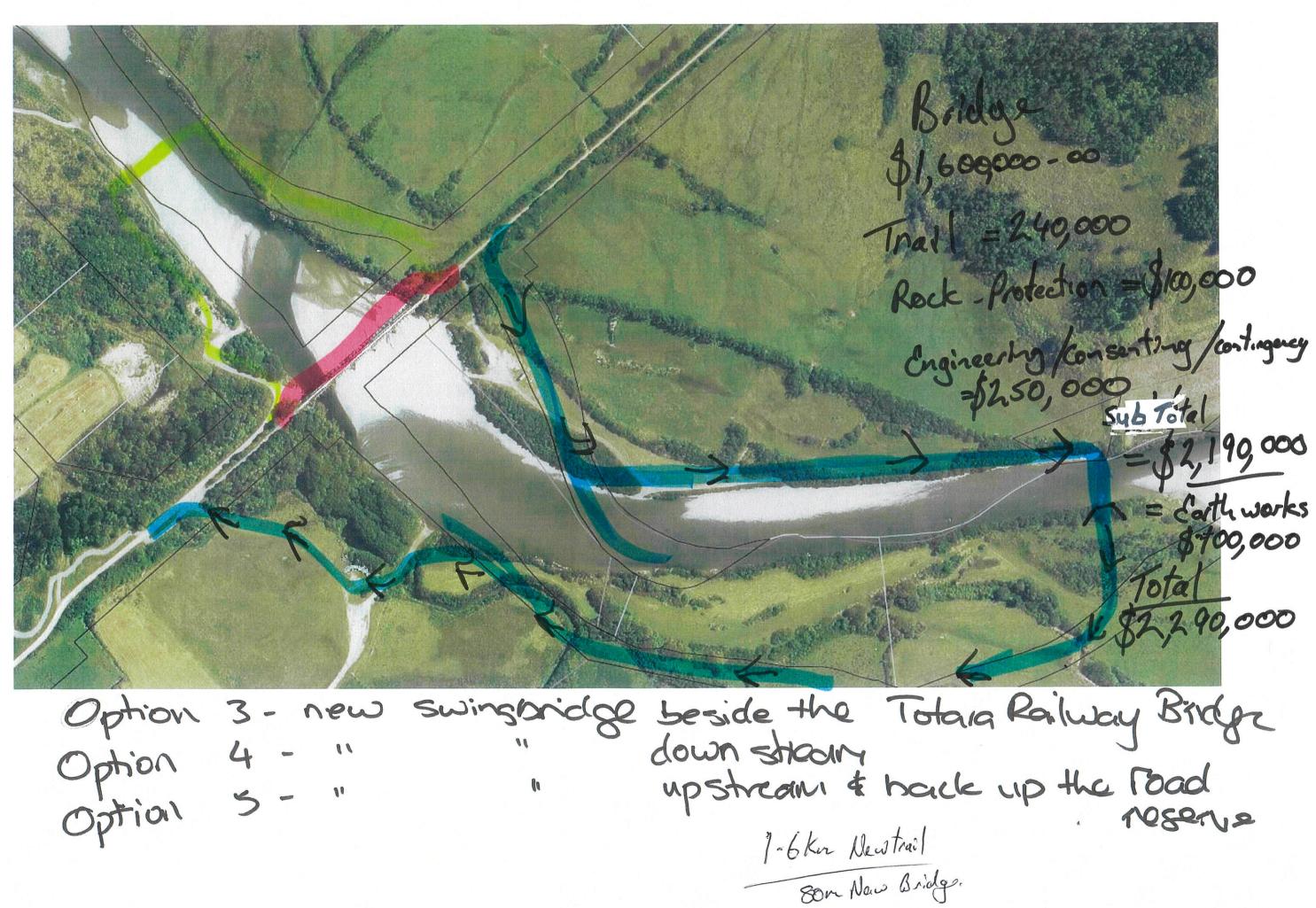
Option 1 divert to Papakanci Rd cross Totava bridge Chighway) - perhaps a clipson -divert back to original course via road reserve

Trail Est Cost 6500m@\$150per/m =\$975,000-00 Clip on (if Viable) 60 meters \$ 600,000 Bridge = 1,400,000 70 meters Engineering / consenting contingency =\$300,000 53,275,000-00



Option 2 - divert dawn Papakamai Rol - cross highway Totava bridge (clip-ort?) - statenighway - Cor across private land)?? - Jown the Woolhouse Rol

Bridge ClipON \$600,000 Inail = 5-2km 5200@\$150 = \$780,000 Bridge Est 95m = \$1,900,000 Engineering/consenting/ontingney =\$200,000 3,580,000



option 3

Project Number: 6-WWES3.98

Totara Rail Bridge Visual Assessment 2023

21 August 2023

CONFIDENTIAL







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Mark Smith



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Revision	Date	Author	Reviewed by	Approved by	Status
0	21/8/2023	E Wilson	A Kuek	M Smith	FINAL

Revision Details

Revision	Details

This report ('Report') has been prepared by WSP exclusively for Westland District Council ('Client') in relation to the visual assessment of the Totara River Rail Bridge ('Purpose') and in accordance with the Offer of Service with the Client dated 17 March 2023. The findings in this Report are based on and are subject to the assumptions specified in the Offer of Service dated 17 March 2023. WSP accepts no liability whatsoever for any reliance on or use of this Report, in whole or in part, for any use or purpose other than the Purpose or any use or reliance on the Report by any third party.

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Executive Summary

The current condition of the Totara River Rail Bridge was inspected and assessed based on the pedestrian/cyclist demand load it is subjected to. This involved a structural assessment of the main truss members to determine the allowable section loss through decay, and a site inspection to visually estimate the current condition of each member.

The cost estimate schedule for repair work is shown in *Table 1* below. The cost estimate schedule was developed using rough cost estimates for the main truss components, and high-level estimates for other cost components not assessed through this scope of work.

No specific investigation or design was undertaken for this scope of work.

Table 1. Totara Bridge Cost Schedule Estimate for Strengthening or Repair Work

Time			ne		Total cost
	Immediate	6 months	2 – 10 years	10+ years	over 10+ years
Cost estimate	\$150k	\$1.814M	\$1.530M	\$2.125M	\$5.619M

Recommendations

- Drilling is strongly recommended to determine the specific condition of each member.
- A present value end of life (PVEoL) assessment to compare maintenance costs over time against replacement cost is recommended.
- Heritage aspects and requirements should be discussed with Heritage New Zealand Pouhere Taonga (HNZPT) and considered in respect to repairs to the structure.

Other Considerations

- The bridge will remain to be subject to vulnerabilities not identified during this work, such as scour, seismic loading, pile reduction due to abrasion (below the current bed level) and pile damage due to log loading given its demanding operating environment.
- A new structure could be in a location less vulnerable to the environment. This could be further upstream with a cycleway diversion.
- Repairs consisting of steel augmentation with protective coating systems would require first minor maintenance within 15-20 years at best in this environment and would add to the ongoing future maintenance costs.

1 Introduction

1.1 Scope of Works

WSP NZ Ltd (WSP) was engaged by Westland District Council (WDC) to investigate and assess the current condition of the Totara River Rail Bridge (Totara bridge). The purpose of this work is to understand the remaining life of the structure, particularly the main truss members, and to determine recommended improvements to ensure the main truss members are structurally adequate for the pedestrian/cyclist load demand they are subjected to. The scope of works carried out involved the following.

- 1 Structural Assessment on the main truss members to identify required capacity.
- 2 Visual inspection of the bridge members to assess current condition.
- 3 Developing a cost estimate schedule for repair work required.

1.2 Previous Inspection

In 2010, MWH undertook a baseline Structural Condition Assessment on the Totara bridge for WDC. The tabled site notes established during this baseline assessment were utilised for the current scope of works to identify the magnitude of member condition deterioration. The previous assessment report conducted by MWH can be found in Appendix A.

1.3 Bridge Inspection

The inspection was carried out over three days on 10, 11, and 12 May 2023 respectively. The inspection consisted of systematically inspecting each member from the cycleway bridge deck, and the riverbed where practicable. Site notes from the previous MWH inspection component condition schedules were updated during the inspection, utilising this as a condition baseline from 13 years ago. The truss components were inspected in detail and the other components inspected in less stringent detail.

2 Bridge Description

The Totara bridge is located approximately 3 km from Ross, in the Westland Region. The bridge was built circa 1909 and once formed part of the Hokitika to Ross Railway Line which closed in 1980. The Totara bridge is now a part of the West Coast Wilderness Cycle Trail. Figure 1 below shows the general location of the bridge, in relation to the Ross township.



Figure 1: Aerial image mapping of site location of Totara River Rail Bridge - (QGIS NZ Imagery Basemap, (Nov 2016))

Totara bridge is around 130m meters in length and comprises of nine spans; the first two spans at each end are simply supported timber land spans and the central five spans are typical Howe Trusses designed by the New Zealand Public Works Department. The central truss spans are around 24.4 m in length each. The bridge is predominantly constructed with imported Mixed Australian Hardwood (MAH) beams and piles and have been in service for 114 years.

The naming convention adopted for this assessment was to label the supports "A" through to "J", with "A" the northernmost abutment, closest to Hokitika and on the true right of the river, and "J" the southernmost abutment, closest to Ross on the true left of the river. The spans of the bridge were labelled as the supports they spanned; from span "AB" between support "A" and "B" and so on.

Figure 2 below is a photo of the bridge towards the upstream direction, also showing the current location of the river channel, and the vegetation around the outside supports.

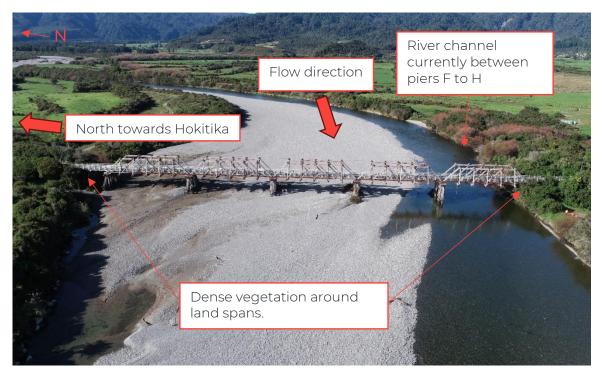


Figure 2. Overview photo of the Totara Bridge showing general site conditions

As seen in Figure 2 above, the central five spans are truss spans which were the main consideration for this structural assessment. These five truss spans assumed the typical design as shown in the elevation below (Figure 3). Also in this figure are the component labels adopted from the MWH assessment and used as naming convention.

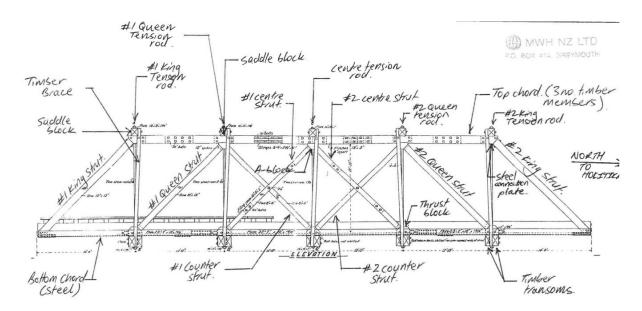


Figure 3. Typical truss elevation showing naming conventions.

3 Structural Assessment

3.1 Structural Assessment Threshold Capacities

The structural assessment was undertaken to determine the threshold section capacity of the main truss members. The threshold capacities for each member can be seen below in *Table 2*. They reflect the tolerance against section loss/decay and represent the minimum acceptable

residual capacity of each member to provide adequate strength for the cycleway load demand. The full assessment report can be found in Appendix B. The assessment only considered the main truss members and did not consider secondary members or connections.

Member	Threshold Capacity
Top Chord	55%
Bottom Chord	50%
King Strut	70%
Queen Strut	75%
Centre Strut	55%
Counter Strut	50%
Hanger/tension rod	50%
Transom	55%
Deck Cross Bracing	50%
Timber Brace	50%

Table 2. Minimum Required Threshold Capacities Determined through Structural Assessment of Main Truss Members Under Pedestrian/Cyclist Loading Demand

4 Bridge Inspection

Member condition was visually estimated (i.e. interior defects cannot be quantified) during the site inspection. As condition was only visually assessed on site, specific investigation such as drilling will be required to determine specific condition.

4.1 Inspection Methodology

During the site inspection, the deterioration of each member was visually estimated as a percentage of its original condition. Member conditions were allocated into four priority categorisations, which reflect the level of deterioration and/or the capacity requirements determined form the structural assessment. The four priorities, timeframes for intervention, and descriptions are listed below.

1 Urgent Priority – to be repaired or replaced within 6 months.

Critical deterioration of the member, requiring immediate replacement due to extent of section loss or other visible defects.

OR

Impact on member capacity, estimated as greater than 10% below the threshold capacity, requires further investigation¹.

2 High Priority – to be repaired or replaced within 2 years.

Deterioration is visually significant and requires further investigation in the immediate future. This may show that repair /replacement is required. *OR*

Impact on member capacity, estimated as 0% to 10% below the threshold capacity, requires further investigation¹.

3 Medium Priority – to be repaired or replaced between 2 – 10 years.

¹ Further investigation of timber components likely to require drilling.

Minor repair required or monitor through future inspections. *OR*

Impact on member capacity, estimated as 0% to 20% above the threshold capacity.

4 Low Priority – to be repaired or replaced in 10+ years or as deterioration progresses. Lightly deteriorated members.

OR

Impact on member capacity, estimated as greater than 20% above the threshold capacity.

Members identified in the urgent or high priority level should undergo specific investigation to determine capacity of the member. If threshold capacity has been reached, repair or replacement is required. It is anticipated that the condition of specific elements proposed for repair is verified at the time of scoping for each tranche of repair work.

4.2 Site Inspection Exclusions

The main objective was to inspect and assess the truss elements. The simply supported spans and substructure were also inspected, but in less detail. There are several aspects which were excluded from the site inspection as listed below.

- Timber members were not drilled to determine interior deterioration. Members were only visually inspected.
- The existing ground below piles was not excavated for inspection.
- Road beams were only inspected from the riverbed due to the cycleway deck covering the deck from above.
- Span GH was not inspected from the riverbed due to the river channel, with span FG inspected from the edge of the river channel.
- The packers between the pile cap and the beam corbels, perpendicular to the corbels were generally not inspected due to not easily being visible.
- The top side of the top chords were unable to be visually inspected. UAV footage was able to be reviewed to confirm their condition.
- The cycleway elements appear to generally be in good condition; however, they were not inspected in detail as they are beyond the scope of the work.

4.3 Site Inspection Results

The full set of site notes from the site inspection is included in Appendix C. General comments from the site visit, and deterioration trends observed since the previous inspection are provided below in Table 3. Appendix D includes photos which demonstrate defects and signs of decay typically observed during the site inspection.

Member	Comments
All timber members	Significant deterioration and end decay, especially where in permanent shade.
	Timber elements weathered on top surfaces, ponding water leading to decay.
	Decay in timber components is often internal and not visible on the surface. Drilling required to quantify degree of deterioration.
All steel components	Since last inspection, the steel components have deteriorated significantly. Many deck plan bracing rods broken, bottom

Table 3. General Site Comments

Member		Comments		
		chord and hanger rod members at or approaching critical levels of deterioration.		
		Note that deterioration of steel components is easier to assess visually.		
Trusses	Hanger/vertical tension rod	Tension rod corrosion advancing. Bottom plates of tension rods corroded.		
	Timber Saddle block	Significant deterioration saddle block end decay in downstream faces.		
		Downstream ends of saddle blocks heavily decayed (>50%).		
	Bottom Chord	Significant deterioration.		
Beams	Corbels	Significant deterioration of packers below beam corbels.		
		Corbels had corroded bolts and nuts.		
	Deck bracing	Significant deterioration bracing (plan) rods.		
		Bracing couplers heavily corroded.		
Piers	Pile	Top of piles decayed.		
		Vegetation debris on piers E, F, G causing minor local scour currently.		
		Possible bank escarpment around Pier H but currently well vegetated above.		
		Dry bed level approx. 600 mm below bottom of whalings at bridge, slight local depression compared to upstream and downstream.		
	Whalings	Significant deterioration whaling timbers.		
	Pile cap	Significant deterioration of pier cap timbers (end splitting), and packers between pile caps decayed.		

The sum of the members for each priority group is shown in Table 4 below. Truss members which were replaced since the previous inspection were not included as they had not yet exhibited signs of deterioration.

Table 4 Priorit	v Groups	of Main	Truss	Members Results
	, croaps	orrann	11055	

	Priority			
Member	Urgent	High	Moderate	Low
Top Chord	0	1	15	24
Bottom Chord (pier to pier)	0	4	6	0
Struts	10	20	26	24
Hanger/tension rod	6	13	40	29
Transom	0	3	9	38

	Priority			
Member	Urgent	High	Moderate	Low
Deck Cross Bracing	40	7	9	3
Timber Brace	0	5	4	19
Sum	56	53	109	137

5 Cost Estimates

5.1 Rough Order Cost to Strengthen

Without undertaking specific design, only rough order cost estimates can be provided. The rough order cost for repairing each member types were developed and are shown below in Table 5.

Table 5. Rough Order Unit Costs for Member Repair

Item	Rough Order Unit Costs (+/- 25%)
Preliminary & General	10% of the overall project costs.
Access for repairs	\$100k
Cranage	\$100k (estimated as \$1k/day for 100 days)
Top Chord	\$7k (each)
Bottom Chord	\$45k (per side)
King Strut	\$8.5k (each)
Queen Strut	
Centre Strut	
Counter Strut	
Hanger	\$5.5k (each)
Transom	\$15k (each)
Deck Plan Cross Bracing	\$5.5k per brace rod (single)
Timber Brace	\$3.5k (each)

The rough order costs listed above will require review when specific investigation and design has been carried out to increase accuracy. The rough order costs for access and cranage of components are indicative only and will be subject to change based on specific work to be undertaken during each tranche of repair work. Repetitive access to spans during each tranche of work will reincur the cost of establishing access.

The rough order unit costs in Table 5 above were used to estimate the rough order cost for each of the four priority categories, and these are shown in Table 6. The number of components requiring strengthening or repair is subject to change following specific investigation, such as drilling, to determine specific component condition.

Table 6. Rough Order Costs for E	Each Priority Group
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		Priority (timeframe)			
ltem		Urgent (6 months)	High (2 years)	Moderate (2-10 years)	Low (10+ years)
Preliminary & General		\$68k	\$94k	\$191k	\$234k
Access for repairs ²		\$200k	\$200k	\$200k	\$200k
	Top Chord	\$0	\$7k	\$105k	\$168k
	Bottom Chord	\$0	\$180k	\$270k	\$0
	Struts	\$85k	\$170k	\$221k	\$204k
Members	Hanger/tension rod	\$33k	\$72k	\$220k	\$160k
	Transom	\$0	\$45k	\$135k	\$570k
	Deck Cross Bracing	\$220k	\$39k	\$50k	\$17k
	Timber Brace	\$0	\$18k	\$14k	\$67k
SUM		\$606k	\$821k	\$1.367M	\$1.558M

5.2 Cost Estimate Schedule

The basis used to develop the cost estimate schedule is described below.

- It is strongly recommended to undertake drilling to specifically investigate the condition of each member. Results from drilling are required to accurately scope and design repair requirements. From detailed design a more accurate strengthening or replacement schedule can be developed.
- To reduce cost incurred for access and cranage, it is recommended to undertake the urgent and high priority work simultaneously. The potential economic benefit of grouping these works could be around \$200k or potentially more due to time and resource efficiencies.
- For preliminary budgeting, it is recommended to allocate a percentage of the expected cost of repair work under the moderate priority as contingency for members which, following drilling investigation, may become high priority work.
- Strengthening costs have been estimated for the main truss members only. In addition to these costs, secondary components, connections, the sub-structure, piles, simply supported spans etc will also have strengthening or replacement needs. A high-level estimate for the strengthening or replacement has been allocated for these components but remain indicative until further investigation is undertaken to determine specific condition and required work. A high-level estimate of \$250k in the high priority timeframe (2 years), and \$300k in the moderate priority timeframe (2-10 years) has been allocated. These are high level estimates made under the assumption these components do not urgently need repair, and reflects continuation of deterioration over time, with a greater number of components requiring strengthening in the two-to-ten-year timeframe.
- It should be noted that the piles are of concern and the cost of underpinning, if required, would significantly increase the overall cost.

² The access and cranage costs represent site costs which will be incurred during each tranche of repair work, the estimated costs are indicative only and will be subject to change based on specific work which will be undertaken during each tranche of repair work.

On the basis listed above, the cost estimate schedule shown is shown in Table 7 below was developed.

Timeframe	Description	Cost Estimate
Immediate	\$150k – indicative cost for recommended drilling investigation.	\$150k
6 months	 \$606k – Urgent priority components. \$821k – High priority components. Recommend undertaking high priority work at the same time as the urgent priority for economic efficiencies. \$137k – 10% of moderate priority components. This is a contingency amount in place for the components which may move from moderate to high priority following drilling investigation. \$250k – indicative estimate for the urgent or high priority components of the secondary truss components, the substructure, simply supported spans etc. 	\$1.814M
2-10 years	 \$1.230M – Moderate priority components minus the 10 percent considered in the first tranche of repair works. Residual moderate components will likely hold up and not require strengthening or replacement until further along towards the 10-year timeframe. \$300k – indicative estimate for the moderate priority components of the secondary truss components, the substructure, simply supported spans etc. Ongoing monitoring should be undertaken to ensure rate of deterioration does not increase requiring earlier intervention. 	\$1.530M
10+ years	\$2.125M – Low priority components which are at low risk of reaching threshold capacity.Ongoing monitoring should be undertaken to ensure rate of deterioration does not increase requiring earlier intervention.	\$2.125M
TOTAL	Excluding detailed design and construction monitoring.	\$5.619M

Table 7. Cost Estimate Schedule for Required Strengthening

Please note, the rough cost estimates are within +/- 25% accuracy. The high-level estimates for the other cost components are indicative only.

6 Assessment Summary

General findings from the visual site investigation identified all timber members had significant deterioration and end decay, especially where in permanent shade. Since the previous inspection undertaken by MWH in 2010, the steel components have deteriorated significantly. Many deck plan bracing rods are broken, the bottom chord and hanger rod members are at or approaching critical levels of deterioration.

The cost estimate schedule developed for the bridge is shown in Table 6 above and has been developed from visual site inspection, rough order unit costs for repairing the main truss members, and high-level estimates for other cost components. Drilling is required to specifically identify the condition of each component to determine components requiring strengthening or replacement. The cost estimate schedule is subject to change following specific investigation and design.

7 Recommended Actions

- Drilling is strongly recommended to specifically identify the condition of each component to determine which components require strengthening or replacement. The cost estimate schedule is subject to change following specific investigation and design.
- A present value end of life (PVEOL) or similar assessment should be undertaken to compare maintenance costs with the cost of establishing an alternative crossing. Given the amount of current deterioration of the bridge and strengthening required, the PVEOL should be used to compare the cost of any repairs against the value of the bridge. As the bridge is now utilised as a cycleway bridge, the replacement value for a cycleway bridge is roughly \$2.03M³. Total sum cost of remedial works and future inspections will exceed the replacement value of a cycleway bridge.
- Discussions should be held with Heritage New Zealand Pouhere Taonga (HNZPT) regarding the heritage status of this structure. Strengthening or repair work may be influenced by this as work my result in loss of the historic fabric and character of the bridge. The bridge is not listed as a heritage structure with HNZPT, nor identified as a Historic Place in the WDC District Plan. However, as it was built in the 1800's it holds heritage value.

7.1 Other Considerations

- The existing bridge is potentially at risk to other vulnerabilities which were not investigated or discussed during this visual assessment. Examples of vulnerabilities could include risk to scour, or seismic loading, pile reduction due to abrasion (below the current bed level) and pile damage due to log loading given its demanding operating environment.
- A new structure could be in a location less vulnerable to the environment. This could be further upstream with a cycleway diversion.
- Repairs consisting of steel augmentation with protective coating systems would require first minor maintenance within 15-20 years at best in this environment and would add to the ongoing future maintenance costs.

³ Replacement Value (non-depreciated, based on cycleway dimensions) Deck area = 2m wide x 145m long = 290m2

Replacement rate = \$7,000/m2 (From Waka Kotahi valuation rates June 2022) Replacement value = \$2.03M

Waka Kotahi valuation rates are likely higher than the cost of a cycle bridge but provide an indicative value for the cost estimate for a replacement cycleway bridge.

Appendix A MWH Assessment Report



REPORT

Totara River Bridge Structural Condition Assessment - Preliminary

Prepared for Westland District Council AUGUST 2010



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This disclaimer shall apply notwithstanding that the report may be made available to other persons for an application for permission or approval to fulfil a legal requirement.

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REVISION SCHEDULE

Rev No	Date	Description	Prepared By	Reviewed By	Approved By
1	Dec 09	Draft for Client Comment	JD	JS	J Strange
2	Aug 10	Final	JD	JS	J Strange



WESTLAND DISTRICT COUNCIL

Totara River Bridge Structural Condition Assessment – Preliminary

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- Pier Pile Plan
- Truss Elevation
- (3 pages total)

Appendix B:

• Typical Construction Drawing – 80ft Howe Truss

(1 page)

- Appendix C: Inspection Results Trusses (10 pages)
- Appendix D: Inspection Results Transoms (2 pages)
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1 Executive Summary

This report was prepared for the Westland District Council to assess the structural condition of the Totara River Bridge.

The on-site visual condition assessment showed that there are considerable variations in the condition of the various structural members. A large portion of the structural members are in sound condition and require only treatment to treat decay and weathering that has occurred and to prolong the life of the members. A small portion of the members have undergone significant decay and corrosion and now require replacement. The remaining members require further investigation to determine if treatment or replacement is required.

Intrusive investigations and detailed structural analysis were not carried out as part of this assessment.

We recommend the following processes be carried out to determine the extent and cost of renewal and maintenance works on the bridge:

- 1. Carry out a structural assessment
- 2. Carry out intrusive investigation
- 3. Prepare recommendations for remedial and maintenance works to the bridge
- 4. Prepare rough order cost estimates for the renewal and maintenance works

2 Introduction

As requested by Westland District Council, MWH New Zealand Ltd carried out a visual baseline inspection of the Totara River Bridge.

The Totara River Bridge formed part of the Hokitika to Ross Railway Line which was closed in 1980. Westland District Council are proposing to use this bridge as a pedestrian / cycle bridge as part of a proposed cycle way between Hokitika and Ross.

3 Inspection

A visual baseline inspection was carried out over eight days on 19, 20, 21, 23, and 27 October and 03, 25, and 26 November. The inspection was carried out by John Strange and Jason Davidson. Assistance for inspection was provided by the following:

- Dean Arthur (Due West Ltd) assistance with safety ropes and lines for all work at heights.
- Dave Hawes (Department of Conservation) assisted with the inspection on 19 October to provide input into inspection and recording techniques, based on his previous experience with similar structures whilst working for NZ Rail and the Department of Conservation.

4 Bridge Description

The Totara River Bridge is the southernmost rail bridge on the old Hokitika to Ross Railway. The Railway was opened on 01 April 1909 following completion of the Totara River Bridge and closed 71 years later in November 1980¹. Some time following the closure of the railway from Hokitika to Ross, the railway lines and decking on the Totara River Bridge were removed.

^{1.} Mahinapua Creek Railway Bridge - Conservation Plan prepared by Chris Cochran, 30 July 1999



Following removal of the decking (sleepers) only the main longitudinal beams were left remaining. The bridge currently has a timber barrier / balustrade fixed to the downstream beam (refer Figure 4-4). We understand that the Westland District Council had this installed to enable walking access to be maintained across the bridge as the bridge is regularly used by a local farmer to access his land and livestock on the northern side of the Totara River.

The Totara River Bridge is a nine span timber bridge constructed predominantly of what we understand to be Australian Hardwood timbers, and "steel" bracing and tension members. There was a transition from the use of black iron to steel during the period from 1880 to 1910 and during this period it was common for both materials to be used in construction.

The bridge is made up of nine spans with the first two spans constructed using simply supported timber beams and the central five spans, being much longer are Howe Trusses. Figure 4-1 on the following page shows a typical Howe Truss and Table 4-1 below shows the construction of each span.

Span Number	Structure Description
Span #1	Simply supported timber beams
Span #2	Simply supported timber beams
Span #3	Howe Truss (Standard Railway 80ft truss)
Span #4	Howe Truss (Standard Railway 80ft truss)
Span #5	Howe Truss (Standard Railway 80ft truss)
Span #6	Howe Truss (Standard Railway 80ft truss)
Span #7	Howe Truss (Standard Railway 80ft truss)
Span #8	Simply supported timber beams
Span #9	Simply supported timber beams

Table 4-1 : Bridge Spans

The bridge superstructure is supported on timber piers. The timber piers supporting the longer Howe truss spans (river spans) consist of ten piles and the piers supporting the shorter simply supported spans (land spans) and forming the abutment walls consist of five and three piles respectively. Figures 4-2 and 4-3 on the following pages show typical piers supporting both river and land spans.

The hardwood piles forming the piers appear to have been driven and all piles generally have markings to enable the depth of pile below ground level to be determined.

A plan of the bridge which outlines the numbering system for the piers and spans etc is included in Appendix A of this report and Appendix B includes a typical drawing of an 80ft span Howe Truss.



Figure 4-1 : Typical Howe Truss Span (Span 6 – Downstream)



Figure 4-2 : Typical End Span (Spans 8 and 9 – Southern End)

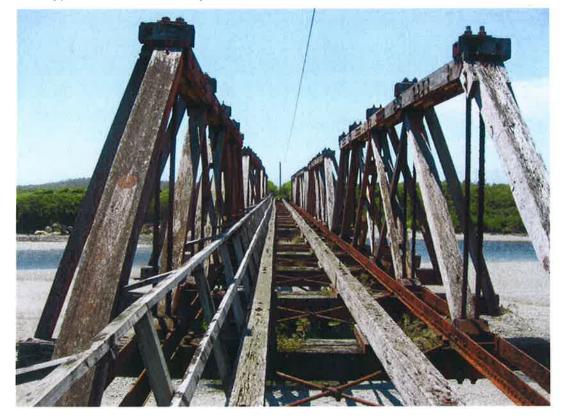






Figure 4-3 : Typical River Pier (Pier No. 7)

Figure 4-4 : Typical View North Along Bridge





5 Bridge Inspection

5.1 Inspection Methodology

The structural inspection of the bridge involved visually inspecting all members / elements. In addition to the visual inspections, timber members were "hammer tested" to check for signs of internal decay. This involved striking the timber members with a hammer and listening to the pitch of the sound which alters with changes in timber density. Intrusive investigations were not carried out as part of these inspections.

In addition to this, excavations were carried out by Westroads Ltd with an excavator down alongside a number of piles to check the condition of these piles at and below existing ground level.

This inspection methodology was used to classify members into the following three categories:

- 1. *Member sound, treatment only required*: Members in this category are typically sound and may or may not exhibit one or more of the following signs of decay:
 - No, or limited, signs of centre decay
 - No, or limited, sign of end decay
 - Minor isolated pocket decays
 - Minor surface weathering / decay
 - Minor splitting and associated decay
 - Corrosion of steel members

In some instances, an assumption has been made during the inspection as to the required member capacity for the intended future use of the structure. Taking this into account some members with greater decay / corrosion have been classed as "sound – treatment only" if they appear to have a sufficient amount of redundancy. For example a steel member with corrosion that has reduced the cross section considerably but which is likely to have sufficient redundancy for the intended future use of the structure.

- 2. *Further investigation required*: Members in this category are suspect and exhibit one or more of the following signs of decay:
 - Signs of centre decay where the extent of the decay is unknown (i.e. dull sound)
 - Significant end decay extending into / along member where the extent is unknown
 - Significant pocket decays where the depth / extent is unknown
 - Significant splitting and / or decay where the depth / extent is unknown
 - Heavy corrosion of steel members

Further investigation is likely to involve core drilling of timbers to assess the extent of any decay and in a number of cases will also include a structural load assessment to determine the required size of members.

- 3. *Member requires replacement*: Members in this category are typically heavily decayed or corroded. The following criteria has been used to classify members into this category and further investigation (i.e. structural calculations) may be required to confirm assumptions that have been made:
 - Steel members with >50% loss of cross section
 - Timber members that are decayed to an extent where treatment is no longer an option, i.e. large centre decays reducing cross section

The above classifications do take into account the intended future use of the structure, being a pedestrian / cycle bridge. These classifications therefore take account of the significant redundancies in some members and some assumptions have been made on site as to the required capacity / size of some members for the intended future use of this structure.



Figures 5-1 to 5-4 below and on the following pages show the classification of some structural members.

Figure 5-1 : Top Chord of Timber Trusses – Minor Weathering / Splitting Only, "Sound"

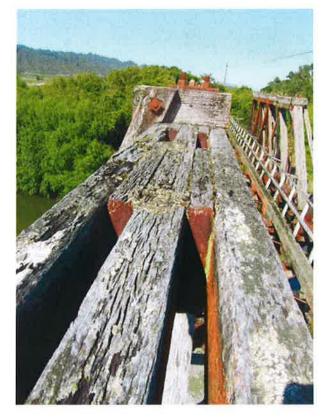


Figure 5-2 : Saddle Block – Large Centre Decay Back Beyond Tension Rod, "Requires Replacement"; A-Block (Top Thrust Block), "Sound"

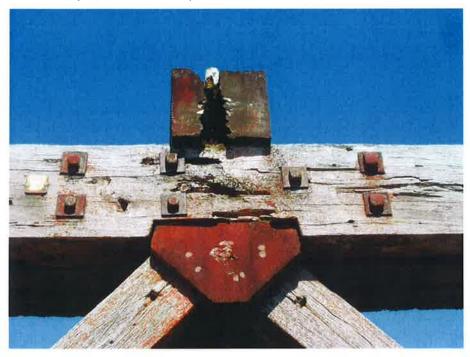




Figure 5-3 : Lateral Braces – Members Completely Decayed at Ends, "Requires Replacement"



Figure 5-4 : King Strut – Significant Surface Decay, Pocket Decay and Splitting, "Investigate Further"





The structural inspections were carried out by John Strange (Senior Engineer) and Jason Davidson (Structural Engineer). Dave Hawes (Department of Conservation) also spent one day (19 October 2009) on site assisting with the structural inspections.

5.2 Inspection Results

The structural inspection of the bridge showed that there is considerable variation in the condition of the various structural elements. When this structure was in service it was subject to regular checks and maintenance by Railways. When timber members were replaced by Railways, the date was chiselled into the surface of the new timber to indicate its age. There are a large number of timber members that have been replaced with dates ranging from 1928 for the earliest replacements to 1978 for the last members replaced before closure of the railway line. A number of those members replaced have been replaced with second hand members, denoted by an "SH" chiselled into the face of the member with the date of replacement. Many of these timber members that have been replaced, and particularly those replaced toward the end of the bridges service period, are in noticeably better condition than those older timber members.

As a result of the exposed location of the bridge in close proximity to the sea, some elements have undergone significant weathering, particularly where they face the prevailing westerly winds. Steel elements including cross bracing, tension rods, bottom truss chord and bolts are typically heavily corroded. Timber members show various signs of decay including surface decay and weathering (particularly on faces exposed to the prevailing weather), small isolated pocket decays typically where there are penetrations in the wood surface allowing moisture into the timber, end decays where the ends of the timber members are exposed to the weather and centre decays where the softer centre of the hardwood timber members have started to decay.

Detailed inspection results are included in Appendices C, D, E and F of this report.

6 Recommendations

We recommend that to more accurately quantify the extent and cost of remedial and maintenance works required to bring this structure up to a standard suitable for a pedestrian / cycle bridge, the following works be carried out:

1. Structural Assessment:

Carry out a desktop structural assessment to determine required sizes of members (steel and timber) for the future intended purpose of the structure.

This would include modelling the bridge to assess loads through individual members and connections and enable treatment or replacement of members to be more accurately quantified.

2. Intrusive Investigation:

Following determination of member and connection requirements by structural assessment, those members currently classified as "investigate further" could be investigated by intrusive methods to confirm whether or not they meet structural requirements. If so they would be reclassified as "treatment required" and if not would be reclassified as "require replacement".

Investigation would involve carrying out core drilling of timber members.

3. Recommendations for Renewal / Maintenance Works

Prepare recommendations for renewal and maintenance works. These recommendations would be classified as immediate, short term and long term

4. Rough Order Cost Estimates

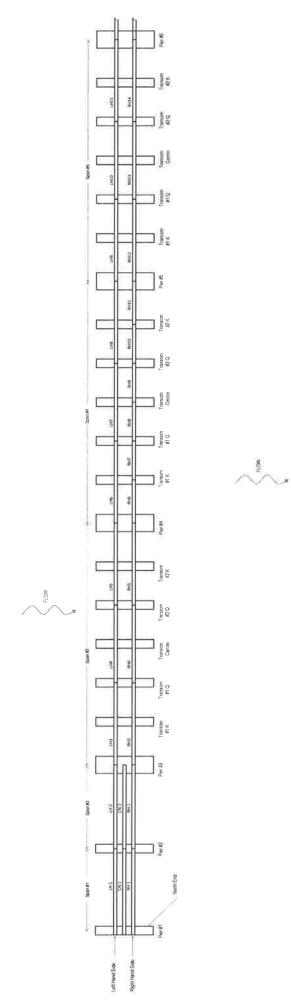
Prepare rough order cost estimates for renewal and maintenance works.

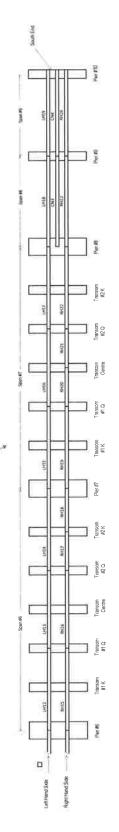


Appendix A:

- Indicative Plan of Totara River Bridge
- Pier Pile Plan
- Truss Elevation
 - (3 pages total)





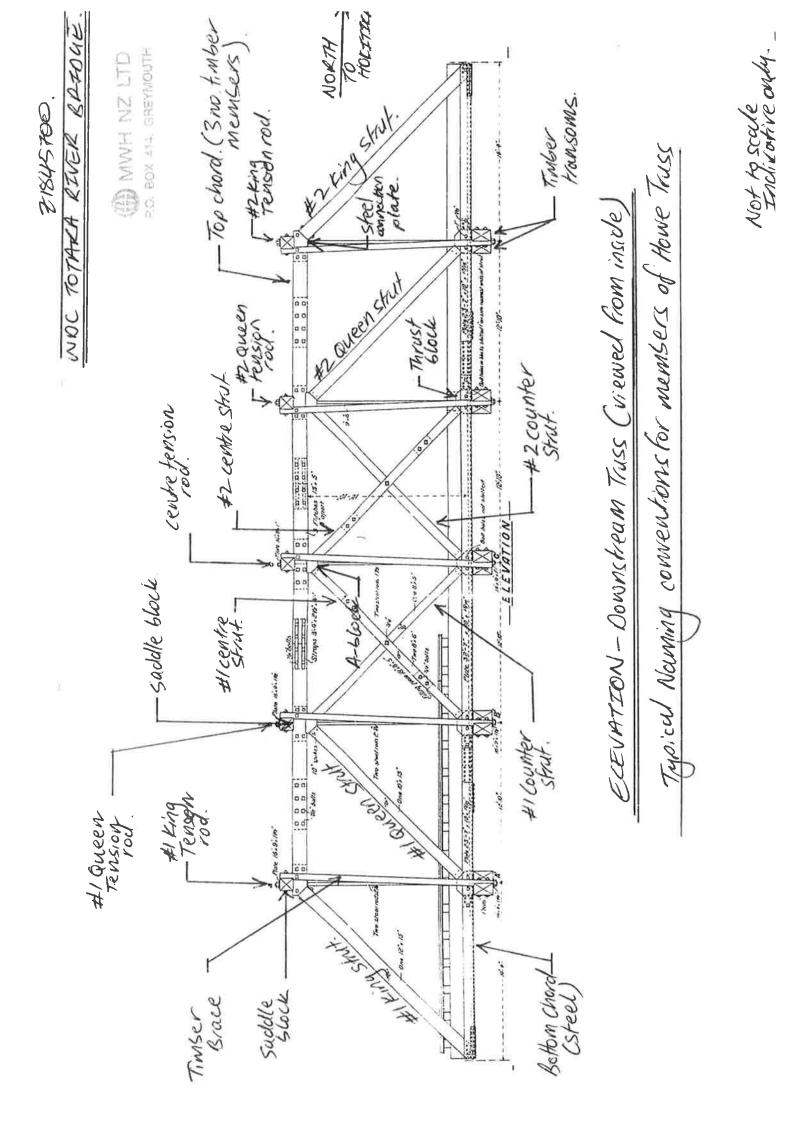


PLAN - TOTARA RIVER BRIDGE

August 2010 ambis A. Plan doox

Our rel: 218487

(∰ MWH		IC TO HURA PLAN -	KIVER BUDE	PROJECT NO.	ENU	184570 MSCRA	Convention
	PREPARED BY	JKD.		DA	TE	\cup	
BUILDING A BETTER WORLD	CHECKED BY				TE	4	
	REF/DWGS			SH	IEET/	OF	/
	LUPSTREAM PIE#S #6 #7 #8 DOWNSTREAM		×1 #2 1 0 0 0 0 0	Lugheam cut-water pile.	DIAN-TYOTTAN ATIED OTED		

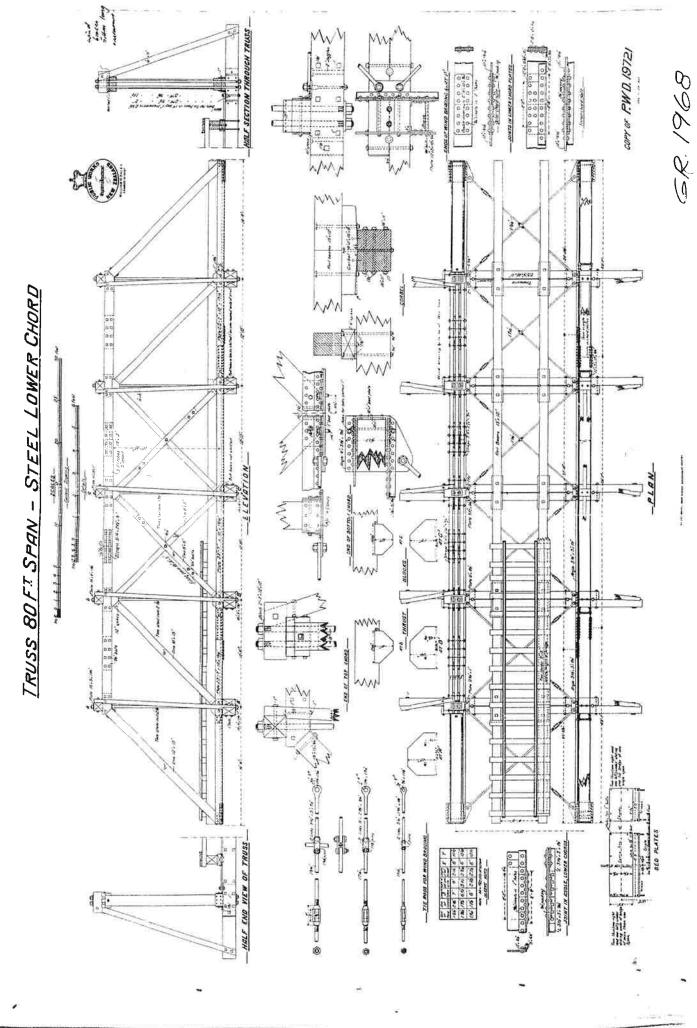




Appendix B:

 Typical Construction Drawing – 80ft Howe Truss

(1 page)



IS DE AN AD ID OD CO DE CD DE LD ID OT AT AF IT OF CO DE CO DE FE IF DE AT AT



Appendix C: Inspection Results – Trusses (10 pages)

Definition of terminology used

- "PDK" Pocket Decay
- "EDK" End Decay
- "CDK" Centre Decay

pan	Side	Structural Element	Structural Assessment / Recommendation			Estimated	Comments	
			Sound /			% of		
			Treatment	Investigate		Original		
			only	Further	Replace	Capacity		
	-							
3	LH	Timber Struts						
-		#1 - King Strut				50%	Significant weathering and deep cracking top surface; bottom half section sound; large PDK at base	
-	-	#1 - Queen Strut				50%	Heavy weathering and deep cracking top surface; bottom half section sound;	
_	-	#1 - Counter Strut				0070	Large split through centre; large PDK at base	
	<u> </u>						Bottom sounds drummy; PDK inside face; splitting	
_		#1 - Centre Strut - Inside				-	Large PDK at base; top surface weathering and splitting	
_	<u> </u>	- Outside	-	•		-		
		#2 - Centre Strut - Inside		•			Sounds drummy,	
		- Outside		•			PDK inside face; sounds drummy at top	
		#2 - Counter Strut		•			Vertical splitting at top; sounds drummy	
		#2 - Queen Strut				50%	PDK top face; weathering and splitting top face	
_		#2 - King Strut	•			50%	Large horizontal split inside lace; significant weathering / splitting on top surface	
	-							
	-	Vertical Steel Tension Rods						
_	-	#1 - King Rods - Inside				80%	Heavily corroded	
_	-	- Outside				70%	Heavily corroded	
_	-					-	Heavily conceed	
_		#1 - Queen Rods - Inside	· ·			70%		
_		- Outside	•			70%	Heavily corroded	
		#1 - Centre Rods - Inside	•			50%	Heavily corroded	
		- Outside				50%	Heavily corroded	
		#2 - Queen Rods - Inside	•			80%	Heavily corroded	
		- Outside	•			60%	Heavily corroded	
		#2 - King Rods - Inside				90%	Heavily corroded	
		- Outside				70%	Heavily corroded	
-	-				-			
-		Timber Thrust Blocks						
_								
_	<u> </u>	#1 - King Timber Thrust Block	· ·	12	-		Large PDK at outside rod	
	_	#1 - Queen Timber Thrust Block		•			Laige PDK at outside rou	
_		Centre Timber Thrust Block	•					
_		#2 - Queen Timber Thrust Block	•					
		#2 - King Timber Thrust Block	•					
_								
		Timber A-Blocks						
		#1 - Queen A-Block	•					
-	-	Centre A-Block	•					
-	-	#2 - Queen A-Block						
-		WZ GOOTA DIOGR						
_	_	Timber Saddle Blocks			-		Lassa CDK asynda hallaw	
		#1 - King Saddle Block			•		Large CDK; sounds hollow	
		#1 - Queen Saddle Block					Weathered with large splits on top; sounds drummy	
		Centre Saddle Block		•			Large CDK inside end	
		#2 - Queen Saddle Block		•			CDK inside end; otherwise appears sound	
		#2 - King Saddle Block	•				Typical EDK and weathering; otherwise sound	
-		Top Chord						
-		#1 King - #1 Queen - Inside			•		Large PDK; significant weathering	
_								
_		- Middle						
_		- Outside	-	•		-		
_		#1 Queen - Centre - Inside	•				Plasiforstworthering	
	-	- Middle	•				Significant weathering	
		- Outside	•				Significant weathering	
		Centre - #2 Queen - Inside	•				Surface weathering	
		- Middle	•					
		- Outside		•			Sounds drummy	
		#2 Queen - #2 King - Inside	•					
		- Middle		•			EDK at king strut, large PDK near #2 queen	
	-	- Outside	1				Sounds Drummy	
	-	- 0/010100		<u> </u>				
-		Rottom Chard						
_		Bottom Chord				0.00/	Heavy corrosion, King strul seatings at piers sound	
1		Steel Bottom Chord	•			80%	noury concerning the occurring out proto counter	
	-	Steel Connection Plates						
		#1 King Strut to top chord	•			70%	Heavily corroded; bolts gone	
		#2 King Strut to top chord	•			80%	Heavily corroded; bolts gone	
					-			
		Timber Braces						
-		#1 - King Timber Brace			•		EDK top end	
-	-			-			EDK top end	
		#1 - Queen Timber Brace		-			EDK top end; connection to saddle block OK, bolt / nuts corroded	
		Centre Timber Brace	•					
		#2 - Queen Timber Brace					EDK top end	
		#2 - King Timber Brace		1		1	EDK top end	

Span	Side	Structural Element	Re	tural Assessn commendati		Estimated	Comments
			Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
-	-				Replace	Gupueny	
1	RH	Timber Struts					
-		#1 - King Strut					Sounds Drummy
_		#1 - Queen Strut	-	•			Replaced 1966; Sounds drummy lower portion
_	-	#1 - Counter Strut		100			Vertical splitting through top surface full length
_		#1 - Centre Strut - Inside		•		-	PDK at thrust block; Splitting and Pad top surface
_		- Outside			-		PDK outside face around bolts
-		#2 - Centre Strut - Inside	-	•			
	-	- Outside					
-	-	#2 - Counter Strut				-	PDK outside face; vertical splitting
		#2 - Queen Strut		•	-		Surface weathering; dull sound at base
		#2 - King Strut		•			Surface weathering; insect holes noted near top
		HE Ming Out			<u> </u>		
-		Vertical Steel Tension Rods				-	
-		#1 - King Rods - Inside				70%	
		- Outside				70%	
	-	#1 - Queen Rods - Inside				80%	
-	-	- Outside		-		90%	
-		#1 - Centre Rods - Inside	•			80%	
_		- Outside				80%	
-		#2 - Queen Rods - Inside				70%	
	-	- Outside				70%	
		#2 - King Rods - Inside				30%	
		- Outside	-			30%	
	-	000000			-	1	
		Timber Thrust Blocks				1	
-		#1 - King Timber Thrust Block			•		Significant decay top surface; large PDK between rods and on outside of rods
-		#1 - Queen Timber Thrust Block					
	-	Centre Timber Thrust Block					
		#2 - Queen Timber Thrust Block	•				
-		#2 - King Timber Thrust Block	•		-		
	-					÷	
-	-	Timber A-Blocks					
		#1 - Queen A-Block					
-		Centre A-Block				1	
		#2 - Queen A-Block	•	-			
	-				-	1	
-		Timber Saddle Blocks	-		-	1	
1		#1 - King Saddle Block		(-		Large CDK inside end
1		#1 - Queen Saddle Block	•				Typical EDK and weathering
-	-	Centre Saddle Block	•				CDK inside end; significant decay / weathering on top surface
		#2 - Queen Saddle Block				1	
		#2 - King Saddle Block		•		1	Small CDK inside end; several PDK's on northern face
-						1	
		Top Chord				1	
		#1 King - #1 Queen - Inside		•		1	Remove vegetation at end and investigate further
		- Middle	1	•			Replaced 1950; remove vegetation at end and investigate further
		- Outside	1	•			Remove vegetation at end and investigate further
		#1 Queen - Centre - Inside	•				Significant surface decay top surface
		- Middle					
		- Outside	•				
		Centre - #2 Queen - Inside		1	-		Surface decay inside face
		- Middle	•				Weathered
		- Outside	•				Weathered
	-	#2 Queen - #2 King - Inside		•			Replaced 1933 (second hand); large PDK inside face at bolt group
	-	- Middle	•				Weathered
		- Outside					Weathered
	-	Bottom Chord					
		Steel Bottom Chord	•			60 - 80%	Heavy corrosion, King strut sealings at piers sound
	_						
-		Steel Connection Plates	-				
		#1 King Strut to top chord				60%	Heavy corrosion; bolts gone
		#2 King Strut to top chord				90%	Heavy corrosion; bolls gone
	-					1	
	-	Timber Braces	-				
· · · · · · · · · · · · · · · · · · ·	_	#1 - King Timber Brace		-		1	EDK top end
	-						EDK top end
		#1 - Queen Timber Brace					EDK top end; large PDK (approx, half section gone)
		#1 - Queen Timber Brace Centre Timber Brace #2 - Queen Timber Brace			•		EDK top end; large PDK (approx. half section gone) EDK top end; extensive splitting throughout

Span	\$ide	Structural Element	Structural Assessment / Recommendation			Estimaled	Comments	
			Sound / Treatment only	Investigate Further	Replace	% of Original Capacity		
4	LH	Timber Struts						
		#1 - King Strut	•			50%	Significant weathering / cracking top surface; small PDK at base; top half of section sounds dull	
		#1 - Queen Strut	•			50%	Significant weathering / cracking top surface; small PDK at base; top half of section sounds dull	
		#1 - Counter Strut					Small PDK inside face at base; splitting in top surface	
		#1 - Centre Strut - Inside	•				Some splitting along inside face	
-	-	- Outside	•		-		Some surface splitting	
_	-	#2 - Centre Strut - Inside					PDK on top surface	
-	-	- Outside					Some splitting top surface	
-	-	#2 - Counter Strut					Split in top surface full length of member	
	-	#2 - Queen Strut	100			1	Deep splitting / weathering in top surface	
		#2 - King Strut	•				Replaced 1944	
_	-	#2 • King Stut	<u> </u>					
		Vertical Steel Tension Rods			-			
-	-				-	0.00/	Heavy corroded	
-		#1 - King Rods - Inside	· ·			80%	Heavy corroded	
_	-	- Outside				80%	Heavy conduct	
		#1 - Queen Rods - Inside	•		-	60%	Heavy corroded	
_	-	- Outside	•			80%		
		#1 - Centre Rods - Inside	· ·			90%	Heavy corroded Heavy corroded	
		- Outside	•			60%		
		#2 - Queen Rods - Inside	•			70%	Heavy corroded	
		- Outside	•			70%	Heavy corroded	
		#2 - King Rods - Inside	•			60%	Heavy corroded	
		- Outside	•			60%	Heavy corroded	
		Timber Thrust Blocks						
		#1 - King Timber Thrust Block	•					
		#1 - Queen Timber Thrust Block						
_		Centre Timber Thrust Block	•					
		#2 - Queen Timber Thrust Block	•					
	-	#2 - King Timber Thrust Block						
-					<u> </u>			
-	-	Timber A-Blocks		1				
-	-	#1 - Queen A-Block					Small CDK	
-		Centre A-Block	•					
-	-	#2 - Queen A-Block		•			CDK approx. 120mm diameter	
-	-	WZ - QUEEN A-DIOCK			-			
-	-	Timber Saddle Blocks				-		
-	-	#1 - King Saddle Block	· ·			-	CDK inside end approx. 50mm diameter	
-	-		1			+	Surface decay on lop extending down into saddle block	
-		#1 - Queen Saddle Block					CDK inside end approx. 40mm diameter	
-	_	Centre Saddle Block				-		
-	-	#2 - Queen Saddle Block	1				CDK inside end approx. 20mm diameter; Pad at drill holes on northern face.	
-	_	#2 - King Saddle Block	<u> </u>					
_		Tan Chard				-		
_		Top Chord	-				Weathered	
_	-	#1 King - #1 Queen - Inside	•		-		Replaced 1933 (second hand); weathered	
_		- Middle	· ·	-			Weathered	
		- Outside	•				Weathered	
							Weathered	
		#1 Queen - Centre - Inside	1.00				I Meanielen	
		- Middle	•			-	Large DDK of and or Bitch (approx, balf another missing)	
		- Middle - Outside		•			Large PDK at end or flitch (approx_half section missing)	
		- Middle - Outside Centre - #2 Queen - Inside	•	•				
		- Middle - Outside Centre - #2 Queen - Inside - Middle	·	•			PDK top surface and inside face; weathered	
		- Middle - Outside Centre - #2 Queen - Inside - Middle - Outside	•	•			PDK top surface and inside face; weathered PDK top surface; weathered	
		- Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside	·	•			PDK top surface and inside face; weathered PDK top surface; weathered Weathered	
		- Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle	•				PDK top surface and inside face; weathered PDK top surface; weathered Weathered Significant weathering and Isolated PDK	
		- Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside	•	•			PDK top surface and inside face; weathered PDK top surface; weathered Weathered	
		- Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle	•				PDK top surface and inside face; weathered PDK top surface; weathered Weathered Significant weathering and Isolated PDK	
		- Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord	•				PDK top surface and inside face; weathered PDK top surface; weathered Weathered Significant weathering and Isolated PDK Significant weathering and Isolated PDK; dozy near #2 king Timber brace connection.	
		- Middle - Outside Centre - #2 Queen - Inside - Middle #2 Queen - #2 King - Inside - Middle - Outside	•			80%	PDK top surface and inside face; weathered PDK top surface; weathered Weathered Significant weathering and Isolated PDK	
		- Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord	•			80%	PDK top surface and inside face; weathered PDK top surface; weathered Weathered Significant weathering and Isolated PDK Significant weathering and Isolated PDK; dozy near #2 king Timber brace connection.	
		- Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord	•			80%	PDK top surface and inside face; weathered PDK top surface; weathered Weathered Significant weathering and Isolated PDK Significant weathering and Isolated PDK; dozy near #2 king Timber brace connection.	
		- Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord Steel Bottom Chord	•			80%	PDK top surface and inside face; weathered PDK top surface; weathered Weathered Significant weathering and Isolated PDK Significant weathering and Isolated PDK; dozy near #2 king Timber brace connection. Typically heavily corroded, King strut seatings at piers sound Heavily corroded; bolts gone	
		- Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord Steel Bottom Chord Steel Connection Plates #1 King Strut to top chord	•				PDK top surface and inside face; weathered PDK top surface; weathered Weathered Significant weathering and Isolated PDK Significant weathering and Isolated PDK; dozy near #2 king Timber brace connection. Typically heavily corroded, King strut seatings at piers sound	
		- Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord Steel Bottom Chord Steel Connection Plates	• • • • • • • • • •			90%	PDK top surface and inside face; weathered PDK top surface; weathered Weathered Significant weathering and Isolated PDK Significant weathering and Isolated PDK; dozy near #2 king Timber brace connection. Typically heavily corroded, King strut seatings at piers sound Heavily corroded; bolts gone	
		- Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord Steel Bottom Chord Steel Connection Plates #1 King Strut to top chord #2 King Strut to top chord	• • • • • • • • • •			90%	PDK top surface and inside face; weathered PDK top surface; weathered Weathered Significant weathering and Isolated PDK Significant weathering and Isolated PDK; dozy near #2 king Timber brace connection. Typically heavily corroded, King strut seatings at piers sound Heavily corroded; bolts gone	
		- Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord Steel Bottom Chord Steel Bottom Chord Steel Connection Plates #1 King Strut to top chord #2 King Strut to top chord Timber Braces	•			90%	PDK top surface and inside face; weathered PDK top surface; weathered Weathered Significant weathering and Isolated PDK Significant weathering and Isolated PDK; dozy near #2 king Timber brace connection. Typically heavily corroded, King strut seatings at piers sound Heavily corroded; bolts gone	
	· · · · · ·	Middle Outside Centre - #2 Queen Inside Outside Steel Bottom Chord Steel Bottom Chord Steel Connection Plates #1 King Strut to top chord #2 King Strut to top chord Timber Braces #1 - King Timber Brace	• • • •			90%	PDK top surface and inside face; weathered PDK top surface; weathered Weathered Significant weathering and Isolated PDK Significant weathering and Isolated PDK; dozy near #2 king Timber brace connection. Typically heavily corroded, King strut seatings at piers sound Heavily corroded; bolts gone Heavily corroded; bolts gone	
	· · · · · ·	Middle Outside Centre - #2 Queen Inside Outside Outsi	• • • • •			90%	PDK top surface and inside face; weathered PDK top surface; weathered Weathered Significant weathering and Isolated PDK Significant weathering and Isolated PDK; dozy near #2 king Timber brace connection. Typically heavily corroded, King strut seatings at piers sound Heavily corroded; bolts gone	
	· · · · · ·	Middle Outside Centre - #2 Queen Inside Outside Steel Bottom Chord Steel Bottom Chord Steel Connection Plates #1 King Strut to top chord #2 King Strut to top chord Timber Braces #1 - King Timber Brace	• • • •			90%	PDK top surface and inside face; weathered PDK top surface; weathered Weathered Significant weathering and Isolated PDK Significant weathering and Isolated PDK; dozy near #2 king Timber brace connection. Typically heavily corroded, King strut seatings at piers sound Heavily corroded; bolts gone Heavily corroded; bolts gone	

Span	Side	Structural Element	Structural Assessment / Recommendation			Estimated	Comments	
			Sound / Treatment only	Investigate Further	Replace	% of Original Capacity		
					Ttopiado	2.4 .		
4	RH	Timber Struts						
-		#1 - King Strut					Significant surface weathering top surface; several PDK top surface	
		#1 - Queen Strut	•			-	Weathered top surface	
		#1 - Counter Strut		•			Split and PDK top surface	
_		#1 - Centre Strut - Inside	•				Some vertical cracking noted	
_		- Outside					Some vertical cracking noted	
_		#2 - Centre Strut - Inside		•			Some surface decay and splitting at base	
		- Outside		•			Large vertical split full length; surface decay	
_		#2 - Counter Strut	•				Splitting in top surface full length	
		#2 - Queen Strut					Cracking in top surface; sounds hollow from 1m below A-block	
[#2 - King Strut	•				Weathered top surface; isolated PDK inside surface	
_	-					-		
	-	Vertical Steel Tension Rods						
		#1 - King Rods - Inside	•			50%	Heavily corroded	
		- Outside	•			40%	Heavily corroded	
-		#1 - Queen Rods - Inside	•	1		30%	Heavily corroded	
		- Outside		1		30%	Heavily corroded	
	-	#1 - Centre Rods - Inside	•			40%	Heavily corroded	
		- Outside	•			40%	Heavily corroded	
		#2 - Queen Rods - Inside	•			70%	Heavily corroded	
_		- Outside				70%	Heavily corroded	
		#2 - King Rods - Inside	•			70%	Heavily corroded	
		- Outside			-	70%	Heavily corroded	
		Timber Thrust Blocks						
	-	#1 - King Timber Thrust Block	•					
		#1 - Queen Timber Thrust Block	•					
	-	Centre Timber Thrust Block	•					
		#2 - Queen Timber Thrust Block						
-		#2 - King Timber Thrust Block						
				1		1		
		Timber A-Blocks						
-	-	#1 - Queen A-Block						
	-	Centre A-Block	•			1		
_		#2 - Queen A-Block					Small CDK inside end	
-	-		<u> </u>					
		Timber Saddle Blocks						
		#1 - King Saddle Block					Small CDK and splitting inside end; significant EDK outside end to beyond brace connection	
_		#1 - Queen Saddle Block	•				EDK outside end	
	-	Centre Saddle Block					Advanced CDK	
_		#2 - Queen Saddle Block		•			Small CDK inside end; significant EDK outside end to beyond Timber brace connection; sounds hollow	
		#2 - King Saddle Block	ļ	•			Large CDK inside end up to 150mm diameter; surface decay; sounds hollow; investigate and treat / replace	
		Top Chord			<u> </u>			
_	-	#1 King - #1 Queen - Inside		•			Weathered; sounds hollow	
		- Middle					Large PDK inside face approx. 50mm deep; weathered	
	-	- Outside				-	Large PDK, approx half cross section missing	
		#1 Queen - Centre - Inside	•					
-		- Middle						
-		- Outside					EDK at splice connection	
		Centre - #2 Queen - Inside					Weathered	
_	_	- Middle					Weathered	
	-	- Midule - Outside				1	Weathered; small PDK top surface	
		#2 Queen - #2 King - Inside		•			Weathered; split; PDK inside flitch below saddle; sounds hollow	
_	_	- Middle	•			1	Weathered; split	
-	-	- Middle - Outside					Weathered; split	
	-	Cutolut		1				
		Bottom Chord						
		Steel Bottom Chord				70%	Moderale to heavy corrosion, King strul seatings at piers sound	
_		Pteel Connection Dist.						
	-	Steel Connection Plates						
		#1 King Strul to top chord				70%	Heavily corroded	
		#2 King Strut to top chord	·			/0%		
		Timber Braces				-		
-		#1 - King Timber Brace					PDK at base; weathered and splitting	
		#1 - Queen Timber Brace					Large split from top end through bolted connection; install split bolt	
		Centre Timber Brace						
_		#2 - Queen Timber Brace		•			Significant cracking; hollow sound	
							Split in end; large PDK at connection to transom	

Span	Side	Structural Element	Re	tural Assessn commendati		Estimated	Comments
			Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
	LH	Timber Struts	-				
9		#1 - King Strut					Significant weathering / cracking lop surface; small PDK at base; top half of section sounds dull
-		#1 - Queen Strut	•			50%	Weathered top surface with large splits down centre; PDK and split on underside
-	-	#1 - Counter Strut	-	•		0010	PDK top surface
-		#1 - Centre Strut - Inside	•	-	<u> </u>		Vertical splitting full length; some horizontal splitting on sides
-	-	- Outside		•	-		Significant vertical splitting and decay of top surface; horizontal splitting inside face
-		#2 - Centre Strut - Inside			•		Large horizontal crack full length; significant surface decay and PDK
_		- Outside		1			Significant splitting and PDK at base; large split at top
		#2 - Counter Strut		•			PDK at thrust block; splitting at base; sounds dull
-		#2 - Queen Strut	-			70%	PDK at base; significant weathering and cracking top surface approx 1/4 depth
		#2 - King Strut	•				Surface weathering on top surface
		Vertical Steel Tension Rods					
		#1 - King Rods - Inside	•			90%	Heavily corroded
		- Outside	•			90%	Heavily corroded
		#1 - Queen Rods - Inside				90%	Heavily corroded
	_	- Outside	•			70%	Heavily corroded
_		#1 - Centre Rods - Inside	•			80%	Heavily corroded Heavily corroded
_	-	- Outside	•			60%	Heavily corroded
_		#2 - Queen Rods - Inside	·			60% 60%	Heavily corroded
-		- Outside #2 - King Rods - Inside	*			80%	Heavily corroded
-		#2 - King Rods - Inside - Outside	- ·		-	90%	Heavily corroded
_		- Qualde					
		Timber Thrust Blocks					
		#1 - King Timber Thrust Block	•				
		#1 - Queen Timber Thrust Block	•				
		Centre Timber Thrust Block					Some splitting and compression occurring
		#2 - Queen Timber Thrust Block	•				
		#2 - King Timber Thrust Block	•				
	0	Timber A-Blocks					
		#1 - Queen A-Block	•				Small CDK inside end
		Centre A-Block	•				Small CDK inside end; small PDK al strut
		#2 - Queen A-Block	•				Large CDK inside end approx, 100mm diameter
-							
_		Timber Saddle Blocks					A READING THE REAL PROPERTY OF THE REAL PROPERTY OF THE REAL
_		#1 - King Saddle Block	•				Small CDK; large vertical split; treat and provide horizontal split bolts CDK approx. 80mm diameter inside end
_		#1 - Queen Saddle Block	•				CDK approx. comminicance inside end
_	-	Centre Saddle Block #2 - Queen Saddle Block	•				Large CDK extending to top chord of truss (approx. 150mm diameter), extends to vertical tie rod
-		#2 - Queen Saddle Block #2 - King Saddle Block		•	<u> </u>		Soft end: sounds dull
-	_	HZ - King Gaddle Block	-		1		
		Top Chord				1	
-		#1 King - #1 Queen - Inside	•		<u> </u>		
		- Middle	•				
		- Outside	•				Replaced 1940
		#1 Queen - Centre - Inside					Large PDK, approx. half section missing
		- Middle					Large PDK and split through side; sounds drummy
		- Outside	•				
		Centre - #2 Queen - Inside					Large vertical split approx. 50mm deep
		- Middle	•				
		- Outside					887 - A 11 - 7 1 - 10
		#2 Queen - #2 King - Inside		•			CDK at south end; large vertical spilt
		- Middle					Significant weathering; PDK inside face Large PDK inside face, approx. half section gone;
_	_	- Outside	-				Large For inside lace, approx. Itali section gone,
		Detter Chart					
_		Bottom Chord Steel Bottom Chord				70%	Heavily corroded, King strut seatings at piers sound
_	-	oreer Bottom Cholo	· ·			10%	native serversed, ming were countige achieve counter
-	-	Steel Connection Plates				1	
-		#1 King Strut to top chord				60%	Heavily corroded; bolts gone
		#2 King Strut to top chord				50%	Heavily corroded; boits gone
-	-	a ning or at to top onor a	1			0070	
		Timber Braces				-	
		#1 - King Timber Brace				1	EDK to beyond fixing bolt to saddle block
		#1 - Queen Timber Brace	•				
		Centre Timber Brace	•		1		Some end splitting
-		#2 - Queen Timber Brace		•			CDK approx. 60mm diameter at top
							Large PDK south face; large split

Span	Side	Structural Element	Re	tural Assessn commendatio		Estimated	Comments
			Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
1					1		
5	RH	Timber Struts					
	1	#1 - King Strut		•			Weathered top surface; decay to approximately half depth of member
1		#1 - Queen Strut	•				Minor splitting in top surface
		#1 - Counter Strut	•				
-	-	#1 - Centre Strut - Inside				1	Vertical splitting in lower half
	-	- Outside			-		Vertical splitting in lower half
-	-	#2 - Centre Strut - Inside					
_							
_	-	- Outside	· ·				
		#2 - Counter Strut	·				Durfere deven attend de la la seconda a passible CDV
U		#2 - Queen Strut					Surface decay at top; dull sound in lower portion, possible CDK
		#2 - King Strut	•				
		Vertical Steel Tension Rods					
		#1 - King Rods - Inside	•		1	90%	Heavily corroded
		- Outside	•			90%	Heavily corroded
		#1 - Queen Rods - Inside	•			70%	Heavily corroded
-		- Outside	•			70%	Heavily corroded
_		#1 - Centre Rods - Inside	•			70%	Heavily corroded
-		- Outside		1		70%	Heavily corroded
-	-	#2 - Queen Rods - Inside				50%	Heavily corroded
-							Heavily corroded
_		- Outside	· ·			70%	Heavily corroded
		#2 - King Rods - Inside	•			60%	
		- Outside	· ·			60%	Heavily corroded
	l						
		Timber Thrust Blocks					
		#1 - King Timber Thrust Block	•				
		#1 - Queen Timber Thrust Block	•	1			
	-	Centre Timber Thrust Block	•			-	PDK top surface and inside contact area for #2 Counter Strut
		#2 - Queen Timber Thrust Block				-	
-		#2 - King Timber Thrust Block			-		
		#2 - King Timber Thrust Block					
	-						
		Timber A-Blocks					
		#1 - Queen A-Block	•				
		Centre A-Block	•				
	1	#2 - Queen A-Block	•				Small CDK inside end
-							
		Timber Saddle Blocks					
-		#1 - King Saddle Block	•				CDK inside end approx 50mm diameter; EDK outside end
		#1 - Queen Saddle Block	•		-	-	EDK oulside end
-	-	Centre Saddle Block		-			Small CDK and vertical split inside end; EDK outside end
		#2 - Queen Saddle Block	•	+			CDK inside end; EDK outside end
-		#2 - King Saddle Block					CDK inside end approx. 70mm diameter; EDK outside end; PDK northern face
	-	#2 - King Saudie Block					
_	_						
		Top Chord					
_		#1 King - #1 Queen - Inside	•			-	
	-	- Middle	· ·		-	·	200- L. DOV
		- Outside		•			PDK top surface approx 300mm long; PDK on underside
	0	#1 Queen - Centre - Inside	•				
	1	- Middle	•				Replaced 1976
		- Outside		•			PDK to half section depth
		Centre - #2 Queen - Inside	•				
		- Middle	•				
		- Outside		1	-		
-	-	#2 Queen - #2 King - Inside					Replaced 1933 (second hand)
-		- Middle	+				
	-	- Middle - Outside			-		
_	-	- Outside					
_	_						
		Bottom Chord			-	00.000	Heavily corroded, King strut seatings at piers sound
		Steel Bottom Chord	•		-	60-80%	nicavity conforced, mily suit searings at preis sound
		Steel Connection Plates					
	0	#1 King Strut to top chord	•			60%	Heavily corroded; steel delaminating at edges
		#2 King Strut to top chord	•			60%	Heavily corroded; steel delaminating at edges
_	-			1	1		
		Timber Braces	1	1	1	-	
		#1 - King Timber Brace			1		EDK at top connection; nut missing from bolled connection; extensive splitting
-						-	Nut missing from bolt connecting to transom
	-	#1 - Queen Timber Brace				-	EDK and vertical split at top
		Centre Timber Brace	•				and following pill of the
		10 0 T : T					
		#2 - Queen Timber Brace #2 - King Timber Brace					

Span	Side	Structural Element	Re	tural Assessn commendation		Estimated	Comments
			Sound /			% of	
			Treatment only	Investigate Further	Replace	Original Capacity	
_			onity	artiful	Keplace	Copacity	
6	LH	Timber Struts					
-	-						
		#1 - King Strut	•			70%	Significant surface weathering and PDK in lop surface; top 1/4 section no longer contributing to strength
		#1 - Queen Strut		•			Advanced surface decay top surface; splitting in top surface approx. 100mm deep
	-						Significant splitting on top surface and inside face, full length; PDK top surface; top 1/3 section no longer
		#1 - Counter Strut				60%	contributing to strength
		#1 - Centre Strut - Inside	•		l		Splitting in top surface; PDK near top
		- Oulside	-				Splitting in top surface; PDK top surface and outside face
_		#2 - Centre Strut - Inside		•			PDK at base; weathering of top surface
_		- Oulside					Weathering of top surface
		#2 - Counter Strut	•				Weathering and splitting of top surface; PDK top surface; some splitting in side at top
		#2 - Queen Strut	•				PDK and thrust block; weathered top surface
		10 1/2 01 1					Replaced 1928; advance surface decay on top surface; PDK on sides and top surface; horizontal splil bolls at
-	_	#2 - King Strut					
_		Martinal Charl Transies Dade					
_		Vertical Steel Tension Rods #1 - King Rods - Inside	· ·		<u> </u>	70%	Heavily corroded
_	-	- Outside				80%	Heavily conorded
_		#1 - Queen Rods - Inside				60%	Heavily corroded
	-	- Outside	- ·		-	60%	Heavily corroded
_		#1 - Centre Rods - Inside				70%	Heavily corroded
-		- Outside	•			50%	Heavily corroded
_		#2 - Queen Rods - Inside	•			70%	Heavily corroded
		- Outside	•			70%	Heavily corroded
	1	#2 - King Rods - Inside				95%	Light surface corrosion only
		- Outside	•			60%	Heavily corroded
	1						
	1	Timber Thrust Blocks					
		#1 - King Timber Thrust Block					
		#1 - Queen Timber Thrust Block			· · · · · ·		Significant splitting and decay
_		Centre Timber Thrust Block	•				
	-	#2 - Queen Timber Thrust Block					
		#2 - King Timber Thrust Block					Significant decay across top in line of tension rods.
		·					
_		Timber A-Blocks			-		
		#1 - Queen A-Block	•				Small CDK inside end
		Centre A-Block	•				Small CDK inside end
-		#2 - Queen A-Block	•			-	
	_	Taba Order Direta		-			
_		Timber Saddle Blocks #1 - King Saddle Block		•	<u> </u>		Significant EDK (approx 1/3 of end) extending to top surface; dull sound at top
_		#1 - Queen Saddle Block			<u> </u>		Replaced 1967; small CDK inside end; soft
-	_	Centre Saddle Block					CDK inside end approx. 80mm diameter extending to base of saddle block
-		#2 - Queen Saddle Block		•			CDK inside end extending up to top surface
		#2 - King Saddle Block		•			EDK inside end (approx. 1/3 of end); dull sound on northern face
	-		-			1	
		Top Chord					
-		#1 King - #1 Queen - Inside	*				
Ì		- Middle	•				Weathered
		- Outside	•				Weathered
		#1 Queen - Centre - Inside	•				
		- Middle	•				Weathered
		- Outside	•	1			Weathered
		Centre - #2 Queen - Inside	•				Horizontal splitting inside face
		- Middle	•				Isolated PDK
		- Outside		. <u>.</u>			PDK inside face, approx. 50% loss of section
		#2 Queen - #2 King - Inside	•				Weathered
		- Middle	•				Weathered; PDK
		- Outside	<u>⊢ · </u>	-			
			-				
		Bottom Chord				7011	Heavily corroded, King strut seatings at piers sound
_		Steel Bottom Chord	•			70%	ו והמאוד ההוקורמה נאווק מושג מהמווקמ מג אוכוס משמוח
		0	-			-	
_	-	Steel Connection Plates				700/	Heavily corroded; boils gone
		#1 King Strut to top chord	•			70%	Heavily corroded; boils gone
	_	#2 King Strul to top chord	· ·			80%	100ml 0010404, 1010 3010
	_	Timber Breese				-	
_		Timber Braces #1 - King Timber Brace					Splitting and surface decay at base; nut missing from bolt connecting to saddle
		INCL - MIDULUTIDEL HEACE	•			-	Large split through centre; PDK outside edge near base; nut missing from bolt connecting to saddle
-			-				ILARGE Shill Infolion centre. PUK outside edde near pase, our missing from doir connecting to saugie
		#1 - Queen Timber Brace	•			_	
			•		•		Large split through centre, PDR outside edge near base, nut missing from bolt connecting to saddle Top end completed decayed

Span	Side	Structural Element		tural Assessn ecommendatio		Estimated	Comments
			Sound / Treatment only	Investigate Further	Dealers	% of Original Capacity	
_			Ciny .		Replace	Capacity	
6	RH	Timber Struts					
-	-	#1 - King Strut	•	-			Replaced 1977
		#1 - Queen Strut	•				Replaced 1965
_		#1 - Counter Strut	•				
_	-	#1 - Centre Strut - Inside					Surface weathering
	-	- Outside			-		Surface weathering
		#2 - Centre Strul - Inside	•				Surface weathering
	-	- Outside				-	Surface weathering
	-	#2 - Counter Strut	•			-	
		#2 - Queen Strut		•			Some hollowing in bottom end; PDK top surface
-		#2 - King Strut	•		1	1	
_							
		Vertical Steel Tension Rods		1			
-		#1 - King Rods - Inside	•			60%	Heavily corroded
_		- Outside				80%	Heavily corroded
		#1 - Queen Rods - Inside				70%	Heavily corroded
		- Outside				70%	Heavily corroded
		#1 - Centre Rods - Inside		1		80%	Heavily corroded
	-	- Outside				80%	Heavily corroded
-	-	#2 - Queen Rods - Inside				95%	Very light surface corrosion
-		- Outside		-		80%	Heavily corroded
-	-	#2 - King Rods - Inside				90%	Light corrosion only
-		- Outside	1.			70%	Heavily corroded
		- Outside				10/0	
-	-	Timber Thrust Blocks	-			1	
-		#1 - King Timber Thrust Block	•	-			
		#1 - Queen Timber Thrust Block					Small section missing from top outside of outside tie rod
	-	Centre Timber Thrust Block	.				
-	-	#2 - Queen Timber Thrust Block					
			+				CDK started on outside face
		#2 - King Timber Thrust Block	⁰				
-	_			-			
-	_	Timber A-Blocks					
_	_	#1 - Queen A-Block	•				CDK inside end approx, 80mm diameter
_		Centre A-Block	•				CDA inside and approx. Comministration
_	_	#2 - Queen A-Block	•	-			
						-	
_		Timber Saddle Blocks					EDK at Timber brace connection
	-	#1 - King Saddle Block	*				Vertical split through inside face
		#1 - Queen Saddle Block	· ·				PDK; outside tension rod loose due to saddle block crushing
	_	Centre Saddle Block	-		•		EDK at Timber brace connection
_	-	#2 - Queen Saddle Block	•				Significant EDK at outside end; up to 20% CDK inside end
_		#2 - King Saddle Block	•				Significant EDR at buside end, up to 20% ODR made end
	_						
		Top Chord	-				Solition and SDK too surface: EDK and coultern and
_	_	#1 King - #1 Queen - Inside	•	-		-	Splitting and PDK top surface; EDK and southern end
	-	- Middle	•			1	
		- Outside	•				Calification outdood
		#1 Queen - Centre - Inside	•				Splitting in top surface
_	-	- Middle	•				
		- Outside	•	-			РДК
		Centre - #2 Queen - Inside	•		-		
		- Middle	•				
		- Outside	•				
		#2 Queen - #2 King - Inside	•				
		- Middle	•				
		- Outside	•				
		Bottom Chord					1. 111
		Steel Bottom Chord	•			80-90%	Light to moderate corrosion, King strut seatings at piers sound
		Steel Connection Plates			1		
		#1 King Strut to top chord	•			70%	Heavily corroded; bolts gone
		#2 King Strut to top chord	•			70%	Heavily corroded; bolts gone
		Timber Braces					
		#1 - King Timber Brace	•				Significant splitting and PDK
		#1 - Queen Timber Brace	•				Split through centre at top end
		Centre Timber Brace			•		EDK top end
		#2 - Queen Timber Brace	1		•		EDK top end; large split through centre
		#2 - King Timber Brace		-			

pan	Side	Structural Element	Re	tural Assessn ecommendation		Estimated	Comments
			Sound /			% of	
			Treatment	Investigate		Original	
			only	Further	Replace	Capacity	
7	LH	Timber Struts					
		#1 - King Strut	•			70%	Extensive surface weathering and splitting
		#1 - Queen Strul					
		#1 - Counter Strut	•				
-		#1 - Centre Strul - Inside			•		Large PDK inside face; splitting
-		- Outside	•				Splitting and associated PDK; ropey top surface
_							Vertical splitting top surface; small PDK at base
_		#2 - Centre Strut - Inside	•				
		- Outside	•				Vertical splitting top surface
		#2 - Counter Strut	•				PDK both ends; some horizontal splitting; weathering and surface decay on top surface
		#2 - Queen Strut	•				Replaced 1960; Splitting and PDK top surface
		#2 - King Strut	•			70%	Vertical splitting and PDK top surface up to 60mm deep
-			+				
-		Vertical Steel Tension Rods				+	
_	_		-			0.001	Light surface corrosion
_		#1 - King Rods - Inside	•			95%	
		- Outside	•			60%	Heavily corroded
		#1 - Queen Rods - Inside	•			20%	Heavily corroded
		- Outside	•			40%	Heavily corroded
		#1 - Centre Rods - Inside	•			20%	Heavily corroded
-	-	- Outside				40%	Heavily corroded
	-		-	-		-	Heavily corroded
	-	#2 - Queen Rods - Inside	•			70%	
		- Outside	•			95%	Light surface corrosion
		#2 - King Rods - Inside	•			80%	Heavily corroded
		- Outside	•			90%	Heavily corroded
-			1			1	
-	-	Timber Thrust Blocks			-	1	
-			-	-		-	
_		#1 - King Timber Thrust Block	•				Devend head (realized): DDK teo autoop ampli DDK inside of inside rad
	1	#1 - Queen Timber Thrust Block					Second hand (replaced); PDK top surface; small PDK inside of inside rod
		Centre Timber Thrust Block	•				
		#2 - Queen Timber Thrust Block	•				
		#2 - King Timber Thrust Block	•	-			Second hand (replaced); Some decay along lop through centre
-			-			+	
-		T 1 4 51 41					
_		Timber A-Blocks					P-IXith same descurse the edge
		#1 - Queen A-Block					Split with some decay south edge
		Centre A-Block	•			1	Small CDK inside end; small PDK behind strut
		#2 - Queen A-Block	•		Ū		Small CDK and some splitting through end
	-						
-		Timber Saddle Blocks					
-	-		-	•	-		Large split inside end from top to centre; Significant EDK outside end; sounds hollow
_		#1 - King Saddle Block					Large EDK extending full depth; sounds hollow underneath bolts
_		#1 - Queen Saddle Block		•			
		Centre Saddle Block			•		Large CDK inside end full depth of saddle
		#2 - Queen Saddle Block					CDK starting at inside end with vertical crack
		#2 - King Saddle Block					Large CDK inside end through centre extending to top surface; outside end similar; sounds very hollow
_	_				•		
- 11		,, ,			•		
-					•		
		Top Chord			•		Paulanard 1060: come splitting and PDK inside face
		Top Chord #1 King - #1 Queen - Inside	•		•		Replaced 1960; some splitting and PDK inside face
		Top Chord #1 King - #1 Queen - Inside - Middle	•		•		
		Top Chord #1 King - #1 Queen - Inside - Middle - Outside	•				Significant weathering and PDK inside face
		Top Chord #1 King - #1 Queen - Inside - Middle	•		•		
		Top Chord #1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside	•				Significant weathering and PDK inside face
		Top Chord #1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside - Middle	•		•		Significant weathering and PDK inside face
		Top Chord #1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside - Middle - Outside	•				Significant weathering and PDK inside face Large PDK inside face Small PDK on top; splitting on inside face
		Top Chord #1 King - #1 Queen - Inside - Middle #1 Queen - Centre - Inside - Middle - Outside Centre - #2 Queen - Inside	• • • • •				Significant weathering and PDK inside face Large PDK inside face Small PDK on top; splitting on inside face Replaced 1960; Large split on inside face
		Top Chord #1 King - #1 Queen - Inside - Middle #1 Queen - Centre - Inside - Middle - Outside Centre - #2 Queen - Inside - Middle	• • • • • •				Significant weathering and PDK inside face Large PDK inside face Small PDK on top; splitting on inside face
		Top Chord #1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside - Middle Centre - #2 Queen - Inside - Middle - Outside - Outside	• • • • •				Significant weathering and PDK inside face Large PDK inside face Small PDK on top; splitting on inside face Replaced 1960; Large split on inside face Replaced 1960
		Top Chord #1 King - #1 Queen - Inside - Middle #1 Queen - Centre - Inside - Middle - Outside Centre - #2 Queen - Inside - Middle	• • • • • •				Significant weathering and PDK inside face Large PDK inside face Small PDK on top; splitting on inside face Replaced 1960; Large split on inside face Replaced 1960 Replaced 1960; PDK and splitting inside face
		Top Chord #1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside - Middle Centre - #2 Queen - Inside - Middle - Outside - Outside	• • • • • • •				Significant weathering and PDK inside face Large PDK inside face Small PDK on top; splitting on inside face Replaced 1960; Large split on inside face Replaced 1960 Replaced 1960; PDK and splitting inside face Replaced 1960
		Top Chord #1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside - Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle	• • • • • • • • • • • •				Significant weathering and PDK inside face Large PDK inside face Small PDK on top; splitting on inside face Replaced 1960; Large split on inside face Replaced 1960 Replaced 1960; PDK and splitting inside face
		Top Chord #1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside - Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside	· · · · · · · · · · · · · · · · · · ·				Significant weathering and PDK inside face Large PDK inside face Small PDK on top; splitting on inside face Replaced 1960; Large split on inside face Replaced 1960 Replaced 1960; PDK and splitting inside face Replaced 1960
		Top Chord #1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside - Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside	· · · · · · · · · · · · · · · · · · ·				Significant weathering and PDK inside face Large PDK inside face Small PDK on top; splitting on inside face Replaced 1960; Large split on inside face Replaced 1960 Replaced 1960; PDK and splitting inside face Replaced 1960
		Top Chord #1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside - Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord	· · · · · · · · · · · · · · · · · ·				Significant weathering and PDK inside face Large PDK inside face Small PDK on top; splitting on inside face Replaced 1960; Large split on inside face Replaced 1960 Replaced 1960 Replaced 1960 Weathered top surface
		Top Chord #1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside - Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside	· · · · · · · · · · · · · · · · · · ·			70-80%	Significant weathering and PDK inside face Large PDK inside face Small PDK on top; splitting on inside face Replaced 1960; Large split on inside face Replaced 1960 Replaced 1960 Replaced 1960 Weathered top surface
		Top Chord #1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside - Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord	· · · · · · · · · · · · · · · · · ·			70-80%	Significant weathering and PDK inside face Large PDK inside face Small PDK on top; splitting on inside face Replaced 1960; Large split on inside face Replaced 1960 Replaced 1960 Replaced 1960 Weathered top surface
		Top Chord #1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside - Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord	· · · · · · · · · · · · · · · · · ·			70-80%	Significant weathering and PDK inside face Large PDK inside face Small PDK on top; splitting on inside face Replaced 1960; Large split on inside face Replaced 1960 Replaced 1960 Replaced 1960 Weathered top surface
		Top Chord #1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside - Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord Steel Bottom Chord	· · · · · · · · · · · · · · · · · · ·				Significant weathering and PDK inside face Large PDK inside face Small PDK on top; splitting on inside face Replaced 1960; Large split on inside face Replaced 1960 Replaced 1960 Replaced 1960 Weathered top surface
		Top Chord #1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside - Middle Centre - #2 Queen - Inside - Middle Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord Steel Bottom Chord Steel Connection Plates #1 King Strut to top chord	· · · · · · · · · · · · · · · · · · ·			70%	Significant weathering and PDK inside face Large PDK inside face Small PDK on top; splitting on inside face Replaced 1960; Large split on inside face Replaced 1960 Replaced 1960 Replaced 1960 Weathered top surface Heavily corroded; Up to 50% loss in section between #2 King Rods and pier, King strut seatings at piers sou
		Top Chord #1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside - Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord Steel Bottom Chord	· · · · · · · · · · · · · · · · · · ·				Significant weathering and PDK inside face Large PDK inside face Small PDK on top; splitting on inside face Replaced 1960; Large split on inside face Replaced 1960 Replaced 1960 Weathered top surface Heavily corroded; Up to 50% loss in section between #2 King Rods and pier, King strut seatings at piers so
		Top Chord #1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside - Middle - Outside Centre - #2 Queen - Inside - Middle - Outside - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord Steel Bottom Chord Steel Connection Plates #1 King Strut to top chord #2 King Strut to top chord	· · · · · · · · · · · · · · · · · · ·			70%	Significant weathering and PDK inside face Large PDK inside face Small PDK on top; splitting on inside face Replaced 1960; Large split on inside face Replaced 1960 Replaced 1960 Replaced 1960 Weathered top surface Heavily corroded; Up to 50% loss in section between #2 King Rods and pier, King strut seatings at piers sou
		Top Chord #1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside - Middle Centre - #2 Queen - Inside - Middle Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord Steel Bottom Chord Steel Connection Plates #1 King Strut to top chord	· · · · · · · · · · · · · · · · · · ·			70%	Significant weathering and PDK inside face Large PDK inside face Small PDK on top; splitting on inside face Replaced 1960; Large split on inside face Replaced 1960 Replaced 1960 Weathered top surface Heavily corroded; Up to 50% loss in section between #2 King Rods and pier, King strut seatings at piers sor Heavily corroded; bolls gone Heavily corroded; bolls gone
		Top Chord #1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside - Middle - Outside Centre - #2 Queen - Inside - Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord Steel Bottom Chord Steel Bottom Chord Steel Connection Plates #1 King Strut to top chord #2 King Strut to top chord Timber Braces	· · · · · · · · · · · · · · · · · · ·			70%	Significant weathering and PDK inside face Large PDK inside face Small PDK on top; splitting on inside face Replaced 1960; Large split on inside face Replaced 1960 Replaced 1960 Replaced 1960 Weathered top surface Heavily corroded; Up to 50% loss in section between #2 King Rods and pier, King strut seatings at piers sou
		Top Chord #1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside - Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord Steel Bottom Chord Steel Bottom Chord Steel Bottom Chord Steel Connection Plates #1 King Strut to top chord #2 King Strut to top chord Timber Braces #1 - King Timber Brace				70%	Significant weathering and PDK inside face Large PDK inside face Small PDK on top; splitting on inside face Replaced 1960; Large split on inside face Replaced 1960 Replaced 1960 Weathered top surface Heavily corroded; Up to 50% loss in section between #2 King Rods and pier, King strut seatings at piers sou Heavily corroded; bolls gone Heavily corroded; bolls gone
		Top Chord #1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside - Middle - Outside Centre - #2 Queen - Inside - Middle - Outside K2 Queen - #2 King - Inside - Middle - Outside Bottom Chord Steel Bottom Chord Steel Bottom Chord Steel Connection Plates #1 King Strut to top chord #2 King Strut to top chord Timber Braces #1 - King Timber Brace #1 - Queen Timber Brace	· · · · · · · · · · · · · · · · · · ·			70%	Significant weathering and PDK inside face Large PDK inside face Small PDK on top; splitting on inside face Replaced 1960; Large split on inside face Replaced 1960; PDK and splitting inside face Replaced 1960 Weathered top surface Heavily corroded; Up to 50% loss in section between #2 King Rods and pier, King strut seatings at piers so Heavily corroded; bolts gone Heavily corroded; bolts gone Large cracks; Large PDK below saddle block Large CDK at top (splice in short section at top?)
		Top Chord #1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside - Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord Steel Bottom Chord Steel Bottom Chord Steel Bottom Chord Steel Connection Plates #1 King Strut to top chord #2 King Strut to top chord Timber Braces #1 - King Timber Brace				70%	Significant weathering and PDK inside face Large PDK inside face Small PDK on top; splitting on inside face Replaced 1960; Large split on inside face Replaced 1960; PDK and splitting inside face Replaced 1960; Weathered top surface Heavily corroded; Up to 50% loss in section between #2 King Rods and pier, King strut seatings at piers sou Heavily corroded; bolts gone Heavily corroded; bolts gone Large cracks; Large PDK below saddle block

Span	Side	Structural Element		ural Assessn commendation		Estimated	Comments
			Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
7	RH	Timber Struts					
		#1 - King Strut					No. 18
		#1 - Queen Strut	•				Significant surface cracking top surface
		#1 - Counter Strut	•				
	-	#1 - Centre Strut - Inside				<u> </u>	Some cracking and isolated PDK Some cracking and isolated PDK
	-	- Outside	(•)				2
_	_	#2 - Centre Strul - Inside					Split at top
	_	- Outside					Split with PDK at top
		#2 - Counter Strut			•		Significant loss of section at bottom end through decay otherwise sound; splice in a short length?
-		#2 - Queen Strut					Replaced 1933 (second hand); surface decay inside face
_	_	#2 - King Strul					Replaced 1933 (Second Hand), Sundee deed) inside lade
	-						
		Vertical Steel Tension Rods					
	-	#1 - King Rods - Inside	•			95%	Light surface corrosion only
		- Outside	•			95%	Light surface corrosion only
		#1 - Queen Rods - Inside				50%	Heavily conoded
	-	- Outside	•			50%	Heavily corroded
	-	#1 - Centre Rods - Inside	•			95%	Light surface corrosion only
		- Outside			ļ	50%	Heavily corroded
		#2 - Queen Rods - Inside				40%	Heavily corroded
		- Outside				40%	Heavily corroded
		#2 - King Rods - Inside	•			90%	Light corrosion only
		- Outside	•			90%	Light corrosion only
		Timber Thrust Blocks					
		#1 - King Timber Thrust Block					
	_	#1 - Queen Timber Thrust Block	- (•)				
		Centre Timber Thrust Block	((6)				
		#2 - Queen Timber Thrust Block	(•)				
		#2 - King Timber Thrust Block					
		Timber A-Blocks					
		#1 - Queen A-Block			•		CDK; PDK and splitting on counter strut side; signs of compression; replace within 5yrs
	1	Centre A-Block	() ()				Small PDK around strut
		#2 - Queen A-Block	1.966				
		Timber Saddle Blocks					
		#1 - King Saddle Block			•		CDK; PDK top at top
		#1 - Queen Saddle Block			•		Large CDK inside end; replace within 5 years
		Centre Saddle Block	•			_	EDK outside end
		#2 - Queen Saddle Block	2.0C				Some surface decay and weathering
		#2 - King Saddle Block					EDK outside end
	-						
		Top Chord					
		#1 King - #1 Queen - Inside	1				PDK inside and outside faces at #1 Queen A-block
		the second se					
		- Middle	•				
		- Middle - Outside	۲		•		Large PDK around bolts; completely gone near #1 Queen A-block
					:		Large PDK around bolts; completely gone near #1 Queen A-block PDK inside and outside faces at #1 Queen A-block
		- Outside					PDK inside and outside faces at #1 Queen A-block
		- Outside #1 Queen - Centre - Inside					
		- Outside #1 Queen - Centre - Inside - Middle			·		PDK inside and outside faces at #1 Queen A-block
		- Outside #1 Queen - Centre - Inside - Middle - Outside Centre - #2 Queen - Inside	•		·		PDK inside and outside faces at #1 Queen A-block
		- Outside #1 Queen - Centre - Inside - Middle - Outside	•		·		PDK inside and outside faces at #1 Queen A-block
		- Outside #1 Queen - Centre - Inside - Middle - Outside Centre - #2 Queen - Inside - Middle - Outside	•		·		PDK inside and outside faces at #1 Queen A-block Large PDK around bolts; completely gone near #1 Queen A-block
		- Outside #1 Queen - Centre - Inside - Middle - Outside Centre - #2 Queen - Inside - Middle	•		·		PDK inside and outside faces at #1 Queen A-block Large PDK around bolts; completely gone near #1 Queen A-block
		- Outside #1 Queen - Centre - Inside - Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside	•		·		PDK inside and outside faces at #1 Queen A-block Large PDK around bolts; completely gone near #1 Queen A-block PDK around bolts
		- Outside #1 Queen - Centre - Inside - Middle - Outside Centre - #2 Queen - Inside - Middle #2 Queen - #2 King - Inside - Middle	•		·		PDK inside and outside faces at #1 Queen A-block Large PDK around bolts; completely gone near #1 Queen A-block PDK around bolts
		- Outside #1 Queen - Centre - Inside - Middle - Outside Centre - #2 Queen - Inside - Middle #2 Queen - #2 King - Inside #1 Outside - Middle - Outside	•		·		PDK inside and outside faces at #1 Queen A-block Large PDK around bolts; completely gone near #1 Queen A-block PDK around bolts
		- Outside #1 Queen - Centre - Inside - Middle - Outside Centre - #2 Queen - Inside - Middle #2 Queen - #2 King - Inside - Middle	•		·	60%	PDK inside and outside faces at #1 Queen A-block Large PDK around bolts; completely gone near #1 Queen A-block PDK around bolts
		Outside O	•			60%	PDK inside and outside faces at #1 Queen A-block Large PDK around bolts; completely gone near #1 Queen A-block PDK around bolts Replaced 1974 (second hand)
		Outside O	•			60%	PDK inside and outside faces at #1 Queen A-block Large PDK around bolts; completely gone near #1 Queen A-block PDK around bolts Replaced 1974 (second hand)
		Outside Steel Bottom Chord Steel Connection Plates	•				PDK inside and outside faces at #1 Queen A-block Large PDK around bolts; completely gone near #1 Queen A-block PDK around bolts Replaced 1974 (second hand)
		Outside Outside Inside Outside Steel Bottom Chord Steel Connection Plates #1 King Strut to top chord				70%	PDK inside and outside faces at #1 Queen A-block Large PDK around bolts; completely gone near #1 Queen A-block PDK around bolts Replaced 1974 (second hand) Heavily corroded, King strut seatings at piers sound
		Outside Steel Bottom Chord Steel Connection Plates	•				PDK inside and outside faces at #1 Queen A-block Large PDK around bolts; completely gone near #1 Queen A-block PDK around bolts Replaced 1974 (second hand) Heavily corroded, King strut seatings at piers sound Heavily corroded; bolts gone
		Outside Outside Inside Outside Inside Outside Outside Inside Outside Outside Inside Outside Inside Outside Inside Outside Inside Outside Inside Outside Inside Inside Outside Inside Inside				70%	PDK inside and outside faces at #1 Queen A-block Large PDK around bolts; completely gone near #1 Queen A-block PDK around bolts Replaced 1974 (second hand) Heavily corroded, King strut seatings at piers sound Heavily corroded; bolts gone
		Outside #1 Queen - Centre Inside Outside Outside Outside Outside Outside Outside Outside #2 Queen - #2 King Inside Outside #2 Queen - #2 King Outside #2 Queen - #2 King Outside Bottom Chord Steel Bottom Chord Steel Connection Plates #1 King Strut to top chord #2 King Strut to top chord Timber Braces			•	70%	PDK inside and outside faces at #1 Queen A-block Large PDK around bolts; completely gone near #1 Queen A-block PDK around bolts PDK around bolts Replaced 1974 (second hand) Heavily corroded, King strut seatings at piers sound Heavily corroded; bolts gone Heavily corroded; bolts gone
		Outside #1 Queen - Centre Inside Middle Outside Outside Outside Outside Outside Outside Outside Outside #2 Queen - #2 King Inside Outside Bottom Chord Steel Bottom Chord Steel Bottom Chord #1 King Strut to top chord #2 King Strut to top chord Timber Braces #1 - King Timber Brace				70%	PDK inside and outside faces at #1 Queen A-block Large PDK around bolts; completely gone near #1 Queen A-block PDK around bolts Replaced 1974 (second hand) Heavily corroded, King strut seatings at piers sound Heavily corroded; bolts gone
		Outside O			•	70%	PDK inside and outside faces at #1 Queen A-block Large PDK around bolts; completely gone near #1 Queen A-block PDK around bolts Replaced 1974 (second hand) Heavily corroded, King strut seatings at piers sound Heavily corroded; bolts gone Heavily corroded; bolts gone Large PDK at end
		Outside #1 Queen - Centre Inside Middle Outside Outside Outside Outside Outside Outside Outside Outside #2 Queen - #2 King Inside Outside Bottom Chord Steel Bottom Chord Steel Bottom Chord #1 King Strut to top chord #2 King Strut to top chord Timber Braces #1 - King Timber Brace			•	70%	PDK inside and outside faces at #1 Queen A-block Large PDK around bolts; completely gone near #1 Queen A-block PDK around bolts PDK around bolts Replaced 1974 (second hand) Heavily corroded, King strut seatings at piers sound Heavily corroded; bolts gone Heavily corroded; bolts gone



Appendix D: Inspection Results – Transoms (2 pages)

Definition of terminology used

- "PDK" Pocket Decay
- "EDK" End Decay
- "CDK" Centre Decay

TOTARA RIVER BRIDGE - TRANSOMS

200						
		Sound / Treatment only	Further Investigation	Replace	Original Capacity	
3 LH	#1 King Transom	•				Bolts heavily corroded
RH	#1 King Transom	•				Replaced 1960
H	#1 Queen Transom	•				Condition of bolts is mixed
RH	#1 Queen Transom	•				Replaced 1944; PDK downstream end
H	Centre Transom	•				Weathered
RH	Centre Transom	•				Replaced 1977 (second hand); PDK top surface between road beams
3	#2 Queen Transom	•				Replaced 1977
RH	#2 Queen Transom	•				Replaced 1960
H	#2 King Transom	•				Replaced 1977; small surface defect top surface between RH truss and RH road beam
RH	#2 King Transom	•				Replaced 1967 (second hand)
4 LH	#1 King Transom		•			large CDK; Sounds hollow under road beams
RH	#1 King Transom		•			Significant EDK upstream end; sounds hollow under truss
5	#1 Queen Transom		•			Sounds hollow under LH road beam
RH	#1 Queen Transom	•				Honey combing and surface decay downstream end; large split between RH road beam and RH truss; small CDK upstream end
E	Centre Transom		•			Sounds hollow under LH road beam
표	Centre Transom	•				Isolated PDK south face; surface weathering and decay
3	#2 Queen Transom		•			Replaced 1960; large CDK downstream end extending back to thrust block; EDK upstream end; large PDK northern face between RH road beam and RH truss
RH	#2 Queen Transom		•			Replaced 1960; EDK upstream end; condition of bolts is mixed
В	#2 King Transom	•				Condition of bolts is mixed
RH	#2 King Transom	•				
5 LH	#1 King Transom	•				Replaced 1975
표	#1 King Transom	•				Some horizontal splitting downstream end; condition of bolts is mixed
H	#1 Queen Transom	•				Replaced 1977
F	#1 Queen Transom	•				Split through top at upstream end
3	Centre Transom	•				Replaced 1944
RH	Centre Transom	•				Split through top at upstream end
E	#2 Queen Transom					
표	#2 Olieen Transom		•			Significant EDK upstream end extending up to 1.5m from end; extensive surface decay on top surface; member collapsing inward; (likely replacement required)
3	#2 King Transom	•				Condition of bolts is mixed; 5 splice bolts between transoms are missing
표						

TOTARA RIVER BRIDGE - TRANSOMS

B H #1 King Transom Sound / Further Original RH #1 King Transom • Purther Criginal RH #1 King Transom • Purther Criginal RH #1 King Transom • Purther Criginal RH #1 Uueen Transom • Purther Criginal RH #1 Oueen Transom • Purther Criginal RH #1 Oueen Transom • Purther Criginal RH #1 Oueen Transom • Purther Criginal RH #2 Oueen Transom • • Purther Criginal RH #2 Oueen Transom • • Purther Purther RH #2 Cueen Transom • • Purther Purther RH #2 Cueen Transom • • Purther Purther RH #1 King Transom • • Purther Purther RH #1 King Transom • • Purther Purther RH #1 Conten Transom	Snan Side	Structural Flement	Structural Asses	sement / Recon		Estimated % Comments	amments
Sound / Treatment only Further Orginal #1 King Transom • • • #1 Queen Transom • • • #2 Centre Transom • • • #2 Cueen Transom • • • #2 King Transom • • • #2 King Transom • • • #1 King Transom • •<					Т		
#1 King Transom Treatment only Investigation Replace Capacity #1 King Transom • • • • • #1 King Transom • • • • • • #1 King Transom • • • • • • • #1 Queen Transom • • • • • • • #1 Queen Transom • • • • • • • #2 Cutre Transom • • • • • • • #2 King Transom • • • • • • • #1 King Transom • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • •				Further		Original	
#1 King Transom • • • • #1 King Transom • • • • #1 King Transom • • • • #1 Gueen Transom • • • • #1 Queen Transom • • • • #2 King Transom • • • • #2 King Transom • • • • #2 King Transom • • • • #1 King Transom • • • • #1 King Transom • • • • #1 King Transom • • • • • #1 Queen Transom • • • • • • #1 Queen Transom • • • • • • • • • • </td <td></td> <td></td> <td></td> <td></td> <td>Replace</td> <td>Capacity</td> <td></td>					Replace	Capacity	
#1 King Transom • • • #1 King Transom • • • #1 Queen Transom • • • #2 Centre Transom • • • #2 Queen Transom • • • #2 King Transom • • • #1 King Transom • • • #1 Gueen Transom • • • #1 Gueen Transom • • #1 Queen Transom • • • #1 Queen Transom • • • #1 Queen Transom • • • #2 King Transom • • • #2 Queen							
#1 King Transom • • • • #1 Queen Transom • • • • #1 Queen Transom • • • • #1 Queen Transom • • • • Centre Transom • • • • Dentre Transom • • • • #2 Queen Transom • • • • #2 King Transom • • • • #2 King Transom • • • • #2 King Transom • • • • #1 Queen Transom • • • • #1	6 LH	#1 King Transom	•				PDK top surface; EDK upstream end; condition of bolts mixed
#1 Queen Transom • • • • #1 Queen Transom • • • • Centre Transom • • • • Centre Transom • • • • Centre Transom • • • • #2 King Transom • • • • #1 King Transom • • • • #1 King Transom • • • • #1 Queen Transom • • • • #1 Queen Transom • • • • #1 Queen Transom • • • • • #1 Queen Transom • • • • • • #1 Queen Transom • • • • • • • • • •	RH	#1 King Transom	•				rd splitting upstream end
#1 Queen Transom • • • • Centre Transom • • • • Centre Transom • • • • #2 Gueen Transom • • • • #2 King Transom • • • • #1 King Transom • • • • #1 King Transom • • • • #1 Queen Transom • • • • #1 Queen Transom • • • • #1 Queen Transom • • • • #2 Queen Transom • • • • • #2 King Transom • • • • • • #1 Queen Transom • • • • • • • #2 King Transom	Н	#1 Queen Transom	•				splaced 1944; condition of bolts is mixed
Centre Transom • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • •	RH	#1 Queen Transom	•				
Centre Transom • • • #2 Queen Transom • • • #2 King Transom • • • #2 King Transom • • • #1 Queen Transom • • • #2 Queen Transom • • • • #2 Queen Transom • • • • #2 Ming Transom • • • • • #2 Ming Transom • • • • • <	Н	Centre Transom	•				large CDK / EDK upstream end; surface decay / weathering on top surface
#2 Queen Transom • • • • #2 Queen Transom • • • • #2 King Transom • • • • #2 King Transom • • • • #1 King Transom • • • • #1 King Transom • • • • #1 Ucuen Transom • • • • #1 Queen Transom • • • • #1 Queen Transom • • • • #2 Queen Transom • • • • #2 Queen Transom • • • • #2 King Transom • • • • #2 King Transom • • • • #2 King Transom • • • • • #2 King Transom • • • • • • #2 King Transom • • • • • • #2 King Transom • <td>RH</td> <td>Centre Transom</td> <td>•</td> <td></td> <td></td> <td></td> <td>Weathered; large horizontal split through side at upstream end - install vertical split bolts</td>	RH	Centre Transom	•				Weathered; large horizontal split through side at upstream end - install vertical split bolts
#2 Queen Transom • • • #2 King Transom • • • #2 King Transom • • • #2 King Transom • • • #1 Queen Transom • • • #1 Queen Transom • • • #1 Queen Transom • • • #2 Queen Transom • • • #2 Queen Transom • • • #2 King Transom • • • #2 Ming Transom • • • #2 King Transom • • •	Н	#2 Queen Transom	•				Splitting downstream end; significant horizontal splitting upstream end - install vertical split bolts
#2 King Transom • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • •	RH	#2 Queen Transom	•				eathered
#2 King Transom • • • #1 Queen Transom • • • #1 Queen Transom • • • #1 Queen Transom • • • #2 Queen Transom • • • #2 Queen Transom • • • #2 King Transom • • • #2 King Transom • • •	H	#2 King Transom		•			CDK downstream end; large PDK south face; PDK upstream face; hollow sound from LH truss to end
#1 King Transom • • • #1 Queen Transom • • • #1 Queen Transom • • • #1 Queen Transom • • • #2 King Transom • • • #2 King Transom • • •	RH	#2 King Transom	•				Weathered; splitting on north and south face with associated decay
#1 King Transom • • • • #1 King Transom • • • • #1 Queen Transom • • • • #1 Queen Transom • • • • • #1 Queen Transom • • • • • • #1 Queen Transom • • • • • • #1 Queen Transom • • • • • • • #2 Queen Transom • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • •							
#1 King Transom • • • • #1 Queen Transom • • • • #1 Queen Transom • • • • #1 Queen Transom • • • • • #1 Queen Transom • • • • • Centre Transom • • • • • #2 Queen Transom • • • • • #2 Queen Transom • • • • • • #2 King Transom • • • • • • • #2 King Transom • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • <td< td=""><td>7 LH</td><td>#1 King Transom</td><td></td><td>•</td><td></td><td></td><td>nall EDK upstream end; splitting; sounds drummy</td></td<>	7 LH	#1 King Transom		•			nall EDK upstream end; splitting; sounds drummy
#1 Queen Transom • • • #1 Queen Transom • • • #1 Queen Transom • • • Centre Transom • • • Centre Transom • • • #2 Queen Transom • • • #2 Queen Transom • • • #2 King Transom • • • #2 King Transom • • •	RH	#1 King Transom	•				
#1 Queen Transom • • • Centre Transom • • • Centre Transom • • • K2 Queen Transom • • • #2 Queen Transom • • • #2 King Transom • • •	[CH	#1 Queen Transom	•				arge CDK downstream end; significant weathering; PDK
Centre Transom • • • Centre Transom • • • • #2 Queen Transom • • • • #2 Queen Transom • • • • #2 Queen Transom • • • • #2 King Transom • • • • #2 King Transom • • • •	RH	#1 Queen Transom	•				large CDK upstream end; splitting both ends; horizontal split and downstream end requires vertical split botts
Centre Transom • • • #2 Queen Transom • • • #2 Queen Transom • • • #2 King Transom • • •	H	Centre Transom		•			Significant weathering; large PDK upstream end; sounds drummy
#2 Queen Transom • • #2 Queen Transom • • #2 King Transom • •	RH	Centre Transom	•				Horizontal split through centre at downstream end; install vertical split bolts
#2 Queen Transom • • • • • • • • • • • • • • • • • • •	H	#2 Queen Transom	•				eplaced 1977
#2 King Transom • • • • • • • • • • • • • • • • • • •	RH	#2 Queen Transom		•			Significant EDK upstream end in horizontal plane, extending back under truss; large PDK south face; significant weathering; soft
#9 Kina Transom	E	#2 King Transom	•				urface weathering
	RH	#2 King Transom	•				PDK upstream end; significant weathering



Appendix E: Inspection Results – Road Beams, Corbels and Deck Bracing (9 pages)

Definition of terminology used

- "PDK" Pocket Decay
- "EDK" End Decay
- "CDK" Centre Decay

Structural Eleme	opt		Structural Assessment / Recommendation			Comments
Structural Eleme	ent	Sound / Treatment only	Investigate Further	Replace	Estimated % of Original Capacity	
Road Beams	LH1				Significant weathering and splitting; large PDK outside face; PDK top surface and outside face near pier #2; vegetation growing on top	
	LH2		•			Significant weathering and splitting; PDK inside and outside face a northern end; PDK top surface; - bottom half of section appears sound
	LH3	•				Numerous PDK top surface and both sides; significant horizontal splitting through sides over top 1/2 to 2/3 section depth
	LH4	•				Weathering and splitting top surface; minor horizontal cracking in sides; numerous PDK top surface
	LH5	•				Replaced 1974; diagonal splitting on side and PDK both sides of beam at #2 Queen corbel ; PDK at northern end; drummy sound a pier #4 end
	LH6		•			Large PDK at north end extending from top to within 150mm of base (2/3 section gone); significant weathering and splitting; numerous PDK top surface; large PDK between #1 King and #1 Queen transoms approx. 40mm deep; dull sound at southern end
	LH7					Weathering , splitting and surface decay on top and both sides; numerous PDK on top surface and on sides
	LH8					Significant weathering; significant splitting both sides; PDK inside and outside faces; evidence of insect attack; hollow sound at north end - estimate top half of beam not contributing structurally
	LH9			•		Significant weathering and surface decay all faces; evidence of insect attack; large PDK top surface at north end; PDK sides and underside
	LH10					Replaced 1960; large PDK inside face at south end; isolated PDK top and outside face; weathering and splitting on outside face; vertical splitting on top; evidence of insect attack;
	LH11		•			Replaced 1933 (second hand); top surface weathering and splitting; large PDK inside face and significant vertical splitting at south end; significant weathering south end - <i>Investigate south end</i>
	LH12	•				Typical surface weathering
	LH13	•				Typical surface weathering and splitting; isolated PDK top surface evidence of insect attack
	LH14		•			Weathering and isolated PDK to top surface and sides; horizontal splitting to sides; top 1/4 depth sounds drummy to end of corbel a south end; large horizontal split to end of corbel at north end
	LH15	·				Replaced 1966; weathering, splitting and isolated PDK top surfac significant weathering and surface decay, outside face; PDK both ends; sounds drummy at ends - Assume top 1/4 section does not contribute structurally
	LH16		•			Weathering and PDK, top surface; split and associated PDK, and large split in side with associated decay at south end; - Investigate south end

Structural Element		ural Assessn commendatio		Estimated % of Original Capacity	Comments
	Sound / Treatment only	Treatment Investigate only Further	Replace		
LH17 LH18					Vertical and horizontal cracking with associated decay at north end hollow sound at north end; numerous PDK top surface; splitting and PDK to sides - Investigate further (likely replacement) Replaced 1966
LH19					Replaced 1940; advanced surface decay and weathering on top and sides; soft sound at south end
CN1		•			Significant weathering and splitting; PDK on downstream face at cross member; vegetation growing on top; hollow sound at pier #2 end
CN2	•				Significant weathering and splitting; PDK top surface and inside face; horizontal split and CDK at pier #3
CN3		•			Significant weathering, splitting and associated decay top and downstream face; isolated PDK upstream face; probable end decay at pier #9 - Investigation end south end and PDK at mid span (upstream face)
CN4					Surface weathering; general decay; PDK on sides; horizontal spli at north end - Likely redundant
RH1		•			Significant weathering and splitting; splitting and associated PDK on inside face; - bottom half of beam appears sound
RH2	•				Weathering and vertical splitting top surface; minor horizontal splitting and weathering to sides
RH3	•		· · · · · · · · · · · · · · · · · · ·		Weathering and splitting top surface; minor horizontal cracking in
RH4	•				sides; numerous PDK top surface
RH5		•			Significant splitting and associated PDK in top and both sides; evidence of insect attack; large PDK / EDK at pier #4 end
RH6		•			Advanced surface decay and weathering; numerous PDK top surface; horizontal splitting through top half of section; estimate t 1/4 of section not contributing structurally; soft surface and dull sound at south end;
RH7	•				
RH8	•				Replaced (est. 1950 - 1965, barrier post covering date); isolated PDK top surface; weathering and horizontal splitting on sides
RH9					Replaced 1950; numerous small PDK top surface; weathering an PDK outside face; large PDK approx. 600 long x 40 deep and approx. 1/3 section depth on outside face
RH10	•				
RH11		•			Weathering and decay both sides; large split and PDK at south e extending full width of section; horizontal split inside face at north end
RH12			•		Several large PDK along member - Parts of beam may be reused elsewhere
RH13					Weathering and splitting; large PDK on outside face at north end extending to end of corbel; large vertical split from north end to fin bolt; sounds hollow at north end.

Structural Eleme	ent		ural Assessn commendatio		Estimated	Comments
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
	RH14		•			Significant weathering and splitting and associated PDK on top and both sides; large horizontal split at south end with PDK; large vertical split at north end; PDK over #2 King corbel (both sides of beam); sounds drummy both ends
	RH15		•			Weathering and associated decay to top surface; PDK south end and sounds hollow; top half sounds drummy at north end; dull sound inside face between #1 King and #1 Queen transoms - Assume top 1/4 of member does not contribute structurally
	RH16					Weathering and associated PDK top surface; weathered sides; splitting resulting in loose segments at top corners of beam.
	RH17	•				Replaced 1963
	RH18	•				Replaced 1940; extensive weathering and decay on outside face; weathering and PDK top surface; worm holes outside face
	RH19		•			Significant weathering and splitting and associated PDK on top surface; large PDK to half width of member over #1 King transom; significant splitting at south end, sounds drummy out to end of corbel
	RH20					Splitting and decay on top surface and sides; PDK and horizontal split outside face at south end.
	RH21	•				Replaced 1968; minor weathering
	RH22		•			Large PDK / EDK at both ends; Large PDK top surface at #2 King transom; significant weathering outside face; horizontal splitting north end
	RH23	•				EDK south end; weathering, splitting and associated decay to top surface; large horizontal split at north end (approx. 600 long, near centre); hollow sound at north end
	RH24	•				General weathering only

Structural Eleme	nt		tural Assessn commendati		Estimated % of Original Capacity	Comments
		Sound / Treatment only	Investigate Further	Replace		
Corbels						
Pier # 2	LH Corbel	•				
	Centre Corbel	•				
	RH Corbel		•			CDK southern end; large PDK outside face
Pier # 3	LH Corbel					Cracking at end and small CDK starting; surface weathering and cracking on outside face
	Centre Corbel		•			EDK southern end; PDK both sides; honeycombing of upstream and downstream sides; evidence of possible insect attack
	RH Corbel	•				Splitting at ends; CDK southern end
#1 King	LH Corbel	•				PDK at sides; surface decay
	RH Corbel			•		PDK inside and outside extending in under beams; EDK - Replace within 5yrs
						DDK at sides of same subording in under bogme
#1 Queen	LH Corbel		•			PDK at sides of corbel extending in under beams
<u></u>	RH Corbel	•				CDK starting at southern end
Centre	LH Corbel	•				PDK at fixing to transom
	RH Corbel	•				PDK at fixing to transom
						Deplaced 1066
#2 Queen	LH Corbel	•				Replaced 1966 PDK at sides
	RH Corbel	•				
#2 King	LH Corbel	.				Replaced 1977 (second Hand); large vertical split at northern end - Replace corroded splitter bolts
#2 King	RH Corbel	· ·			<u> </u>	Splitting at ends; PDK at fixings to transom
			1			
		-				
Pier #4	LH Corbel	•				CDK southern end; significant splitting and PDK outside face
	RH Corbel	•				Replaced 1944
#1 King	LH Corbel	•				Replaced 1966
	RH Corbel					Replaced 1965
#1 Queen	LH Corbel	•				PDK inside face near centre
	RH Corbel	•				PDK top surface and inside and outside faces
Centre	LH Corbel	•				PDK both sides
	RH Corbel	•				PDK inside vertical face; surface decay and soft on sides
#2 Queen	LH Corbei	•				PDK outside face at base
	RH Corbel	•				PDK outside face; large area of decay on inside top and side.
#2 King	LH Corbel	•				PDK both side above transom; PDK top surface inside face
	RH Corbel	•				Weathering and splitting; PDK both sides above transom

Structural Elemer	nt		tural Assessm commendation		Estimated % of Original Capacity	Comments
		Sound / Treatment only	Investigate Further	Replace		
Pier #5	LH Corbel					Replaced 1960; split at north end near centre; weathering and softening on outside surface; horizontal split inside face
	RH Corbel		•			Replaced 1977 (second hand); weathered
#1 King	LH Corbel	•				PDK outside face overtop of transoms; decay at base of corbel over LH transom extending approx. 150mm over transom (20mm deep); split along inside top edge; large PDK inside face
	RH Corbel		•			Significant weathering and decay inside face; large diagonal crack and associated decay extending from top surface down under beam - Investigate further when beam is replaced
#1 Queen	LH Corbel RH Corbel	•				Small EDK north end; PDK both sides overtop of transoms Weathering on outside face; PDK inside and outside faces
Centre	LH Corbel			1		PDK inside and outside face; weathering and softening to outside surface
	RH Corbel					Typical weathering; PDK outside face; split and PDK linking spike holes on inside face
#2 Queen	LH Corbel	•				Typical weathering and splitting; PDK over LH transom
	RH Corbel	•				Split on inside face; weathered outside face
#2 King	LH Corbel RH Corbel	•				Typical weathering and splitting
Pier #6	LH Corbel					CDK / EDK at south end; weathered outside face; horizontal split and associated PDK outside face; significant splitting and decay to inside face; splitting at north end
	RH Corbel					CDK both ends; significant weathering and splitting both sides
#1 King	LH Corbel					Surface decay to top surface extending in under beams (both sides); vertical split through centre at north end; - Install horizontal split bolt at north end
	RH Corbel	•				
#1 Queen	LH Corbel		•			Significant amount of decay at top extending in under beam (both sides of corbel) Surface decay at top (inside face)
	RH Corbel	•				
Centre	LH Corbel		•			Decay at top surface extending in under beam (both sides of corbel); extensive PDK both sides
	RH Corbel		•			Decay at top surface extending in under beam (both sides of corbel); - Likely replace

Structural Elemer	nt		tural Assessn commendation		Estimated % of Original Capacity	Comments
		Sound / Treatment only	Investigate Further	Replace		
#2 Queen	LH Corbel		•			Advanced decay at top on outside - Likely replace
	RH Corbel	•				
#2 Kina	LH Corbel	•				
#2 King	RH Corbel	•				Decay to contract surface with transoms on inside face
Pier #7	LH Corbel					Decay along bottom edge in contact with packers (inside face)
	RH Corbel	•				Weathered
#1 King	L L Corbol					Weathering; isolated PDK
#1 \\ing	LH Corbel RH Corbel	•				Weathering; splitting and PDK on outside
#1 Queen	LH Corbel			•		Large CDK at both ends (full depth); large crack and associated decay under beam
	RH Corbel	•				PDK inside face around spikes; splitting and PDK outside face; - Vegetation in the way on inside at transom
Centre	LH Corbel	•				Top surface decay on outside; some isolated PDK
	RH Corbel	•				Top surface cracking and associated decay; some isolated PDK
#2 Queen	LH Corbel	•	1			Top decay on outside extending under beam; some PDK
	RH Corbel	•				Replaced 1960; weathered
#2 King	LH Corbel	•				End splitting and weathering; split bolts both ends
	RH Corbel	•				Large vertical split separating two halves with split bolt at north end; sounds drummy but likely due to split - Install split bolt at south end
Pier #8	LH Corbel		•			Manmade vertical cut on south side near outside edge of pier, still approx. 600mm seating for beam; decay
						Replaced 1967 (second hand); surface decay upstream face
	Centre Corbel	•				Isolated PDK inside face; large horizontal split and PDK under beam RH22
	RH Corbel		•		-	- Investigate PDK under beam (otherwise sound)
Pier #9	LH Corbel	_	•			Splitting and EDK both ends; numerous PDK on sides
	Centre Corbel	•				Surface decay and splitting both ends
	RH Corbel		•			CDK / PDK and splitting both ends

Structural Elemer	nt		ural Assessn commendati		Estimated	Comments
		Sound / Treatment Investigate only Further		Replace	% of Original Capacity	
Cross Brasing (Solid Blocking ar	d Tio Dodo				
cross bracing, a	Solid Blocking at					
Span #1	Solid Blocking			•		4 no. at 1/3 points; various states of decay; blocks falling out - Replace / reinstate
	Tie Rods	•				Rods generally ok; some nuts missing - <i>Replace nuts</i>
						4 no. at 1/3 points; various states of decay; blocks falling out
Span #2	Solid Blocking			•		- Replace / reinstate
	Tie Rods					Rods generally ok; some nuts missing - <i>Replace nuts</i>
Span #3	Cross Bracing					
Pier #3 to #1K	LH			•	30%	
	RH	•				Sound
#1K to #1Q	LH	•				Sound
	RH	•			50%	
#1Q to Centre	LH	•				Sound
	RH			•		1/2 rod missing from centre to #1Q transom
Centre to #2Q	LH	•			80%	
	RH	•			80%	
#2Q to #2K						Sound through centre
	RH			•		Ends sound
#2K to Pier #4				•	20%	Sound through centre
	RH			•	40%	Heavily corroded at pier end; otherwise sound

Structural Eleme	nt		ural Assessn commendation		Estimated	Comments	
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity		
Span #4	Cross Bracing						
Pier #4 to #1K	1 LL			•	40%		
FIEI #4 10 # IN	RH					40% at pier end; 70% under LH beam; otherwise sound	
#1K to #1Q				•		25% under LH beam; otherwise sound	
#11/10#102					2070		
	RH			•		10% at #1K transom; 50% under RH beam; otherwise sound	
#1Q to Centre	LH	•			70%		
	RH	•			70%		
Centre to #2Q	LH	•			50%		
	RH	•			70%		
#2Q to #2K	LH	•			50%		
	RH	•			50%		
#2K to Pier #5	LH	•			60%		
	RH			•	5%	5% and 25% at ends, otherwise sound	
Span #5	Cross Bracing						
Pier #5 to #1K	LH			•	0%	Almost gone at King Transom; 30% at pier end	
	RH	•			70%		
#1K to #1Q	LH			•	0%	Eyes at end sound; rest of rod completely gone	
	RH	•			50%		
#1Q to Centre	LH	•			60%		
	RH			•		10% at centre transom end; 50% along rod; sound at #1Q transom	
Centre to #2Q	LH	•			60%	Sound at ends	
	RH				50%	50% at coupler under LH beam; 60% under RH beam; otherwise sound	
#2Q to #2K		•			70%		
	RH	•				Railway iron replacement; heavily corroded along full length	
#2K to Pier #6	LH			•		20% and 40% at ends; 70% along rod	
	RH			•	40%	40% at #2K end; 80% along rod	

Structural Elemer	nt		ural Assessn commendation		Estimated	Comments	
		Sound / Treatment Investigate only Further		Replace	% of Original Capacity		
Span #6	Cross Bracing						
Pier #6 to #1K		•				Sound	
	RH			•		Completely gone at #1K end; 80% along rod	
#1K to #1Q		•			70%		
	RH			•	20%	20% both ends; 40% along rod	
#1Q to Centre	LH					60% at coupler under LH beam; 80% under RH beam; otherwise sound	
	RH	•			60%	60% under beams; otherwise sound	
Centre to #2Q	LH	•			70%	Sound at ends	
	RH	•			60%	60% under beams; otherwise sound	
#2Q to #2K	LH		0	•	<10%	<10% at #2K transom; 30% at coupler under LH beam; otherwise sound	
	RH			•		Almost completely gone at #2K end; otherwise sound - Replace from centre to #2K end	
#2K to Pier #7	LH	•			60%		
	RH	•			50%		
Span #7	Cross Bracing						
Pier #7 to #1K	14			•	<10%	<10% at #1K transom; remaining rod >60%	
	RH	•			80%		
#1K to #1Q				•		30% and 40% at ends; 60% along rod	
	RH			•	30%	30% at #1Q end; remaining rod >80%	
#1Q to Centre		•			80%	Railway iron replacement	
	RH	•			70%		
Centre to #2Q	LH				0%	Rod completely gone at centre transom end; 50% along rod; sound at #2Q end	
	RH			•	40%	sound at eyes	
#2Q to #2K		•			60%		
	RH			•		30% under RH beam; 50% under LH beam; sound at ends	
#2K to Pier #8	LH			•	30%	30% at pier end; 70% under LH beam	
	RH	•				Sound	
						4 no. at 1/3 points; various states of decay; blocks falling out; one block missing	
Span #8	Solid Blocking	•				- Replace / reinstate	
	Tie Rods	•				Rods generally ok; some nuts missing - <i>Replace nuts</i>	
Span #9	Solid Blocking	•				4 no. at 1/3 points; various states of decay; blocks falling out - Replace / reinstate	
	Tie Rods	•				Rods generally ok; some nuts missing - <i>Replace nu</i> ts	



Appendix F: Inspection Results – Piers (8 pages)

Definition of terminology used

- "PDK" Pocket Decay
- "EDK" End Decay
- "CDK" Centre Decay

Pier Number	Structural Element		ural Assessn commendati		Estimated	Comments
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
1	Piles					
	Upstream Pile	•				PDK at top where previously drilled; general splitting and weathering
	Centre Pile	•			1	Surface soft but sound underneath; general weathering
	Downstream Pile	•				Surface splitting; EDK at top where previously drilled; excavation around pile showed pile sound below ground
	Pile Cap	•				CDK both ends; significant weathering and splitting; appears sound over piles
	Abutment Walls - Timber facing			•		Top part collapsing; ends gone; otherwise appears ok; top part needs replacing
	Abutment Walls - Vertical Railway Irons	•			60%	Extensive corrosion
2	Piles	-				
	Upstream Pile	•				Surface splitting and weathering; PDK under pile cap, at top of pile, and several small isolated PDK along pile
	Centre Pile					Vertical splitting and weathering; small loss of outer section at ground level; excavation around pile showed pile sound below ground
	Downstream Pile					Large vertical splits in top 1/3 pile; hollow sound at top likely due to splitting; large PDK at top; excavation around pile showed pile sound below ground
	Upstream Cut Water Pile	•				EDK and splitting at top
	Downstream Cut Water Pile					Large CDK / EDK at top
	Raker Studs					
	Upstream Raker Stud	•				Significant weathering; top surface has honeycomb effect and worm hole
	Downstream Raker Stud		•		-	Surface decay and weathering to downstream face; PDK / EDK at base
	Diagonal Bracing					
	Cross bracing				70%	Steel railway iron; varying amounts of corrosion
	Whaling's					
	Whaling's	•			50%	Steel railway irons; heavily corroded
	Pile Cap					Replaced 1975

Pier Number	Structural Element	Structural Assessment / Recommendation			Estimated	Comments
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
3	Piles					
	Pile #1	•				Vertical splitting above whalers
	Pile #2	•				Vertical splitting above whalers
	Pile #3	•				Deep splits / pockets on north face from spikes
	Pile #4					Vertical splitting above whalers
	Pile #5	•				Replaced 1961
						Splitting; weathering; block bolted to outside face at top to support pile
	Pile #6	•				cap
	Pile #7		•			Large CDK just above whaler; sound at ground and cap - Consider splicing in section of pile or redundant
	Pile #8		•			Large CDK just above whaler; sound at ground and cap - Consider splicing in section of pile or redundant
	Upstream cut-water pile		•			Has sunk approx 600mm; significant splitting and decay at top
	Downstream cut-water pile	•				Splitting and small EDK at top
	Raker Studs					
	Upstream Raker Stud				1	Has come free of fixing at top due to sinking cut-water pile; large split an EDK at top; large split upstream face; weathered
	Downstream Raker Stud			•		Splitting, surface weathering and significant decay downstream face; large CDK / EDK at base - <i>Probable replacement</i>
	Discovel Preside					
	Diagonal Bracing Cross Bracing	•			70%	Railway iron cross bracing; varying amounts of corrosion
	Whaling's					
	Whaling's	•				All present; individual assessment of each whaler not carried out
	Pile Caps					
	Pile Cap #1	•				Replaced 1975; EDK downstream end
	Pile Cap #2					Splitting and associated CDK downstream end; EDK and splitting upstream end
	Pile Cap #3	•				Splitting and EDK starting downstream end; EDK upstream end
	Pile Cap #4			•		Large end section gone downstream end; large PDK along length and extensive decay upstream end - Replace or consider redundant
	0 - the la					
	Corbels					Depleced 1975 accord hand: vertical calit path and
	LH Truss Corbel - Inside - Outside	•		-		Replaced 1975 second hand; vertical split north end PDK outside face; weathered
	RH Truss Corbel - Inside	•				Replaced 1975 second hand; minor end splitting
	- Outside					EDK and splitting both ends
	Packers Between Pile Cap and Beam Corbel					
	Perpendicular to corbel	•				4 no. total; weathered
	Parallel to corbel	•	•			Weathered but generally sound except for packer under LH corbel which has significant decay - Consider packing or replacement

2

Pier Number	Structural Element	Structural Assessment / Recommendation			Estimated	Comments
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
4	Piles					
	Pile #1		•			Extensive CDK at top; vertical splitting above whalers at spike locations
	Pile #2					Major splitting and decay on outside face and other areas; sound at base and top
	Pile #3	•				Vertical splitting above whalers
	Pile #4	•				Advanced EDK at top; vertical splitting above whalers
	Pile #5		•			Splitting and associated decay on outside face due to spikes; sounds drummy above whaler; possible CDK
	Pile #6		•			Splitting and associated decay on outside face going into centre due to spikes; possible CDK
	Pile #7					Splitting and associated decay outside face but appears sounds; sounds drummy at top - Investigate top further
	Pile #8	•			-	EDK at top; splitting and associated decay due to spike holes
	Upstream cut-water pile		•			Significant CDK / EDK
	Downstream cut-water pile	•				
	Raker Studs					
	Upstream Raker Stud					Packer missing at top; significant splitting and decay on north face; large split and CDK at base - Possible replacement
	Downstream Raker Stud		<u> </u>			Weathering and splitting on sides and downstream face
	Diagonal Bracing					
	Cross bracing	•			50%	Heavily corroded railway irons
	Whaling's					All access to dividual accessment of each wholes not period out
-	Whaling's	•				All present; individual assessment of each whaler not carried out
	Pile Caps					
	Pile Cap #1	•				Small EDK downstream end
	Pile Cap #2	•				Small EDK downstream end
	Pile Cap #3	•				Replaced 1960
	Pile Cap #4	•				Replaced 1967 second hand
	Corbels					
	LH Truss Corbel - Inside					
	- Outside					
	RH Truss Corbel - Inside					Splitting at south end
	- Outside	•				EDK both ends
	Packers Between Pile Cap					
	and Beam Corbel	1			1	
	LH Beam	•				

Pier Number	Structural Element	Structural Assessment / Recommendation			Estimated	Comments
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
	Piles					
5	Pile #1		•			EDK at top; typical splitting and decay on outside face - worst pile of group therefore recommend investigating
	Pile #2	•				Typical splitting and decay on outside face
	Pile #3	•				Typical splitting and decay on outside face
	Pile #4		•			Large split and associated decay on outside face due to spike holes; CDK; excavation around pile showed pile sound below ground - Investigate or may be redundant
	Pile #5		•			EDK at top; deep splitting and associated decay all around pile; numerou drill holes from previous investigations
	Pile #6	•				Minor splitting and associated decay
	Pile #7	•				Typical splitting and decay on outside face; excavation around pile showed pile sound below ground
	Pile #8					EDK at top; evidence of insect attack; significant splitting and associated decay
	Upstream cut-water pile	•				Splitting and EDK at top
	Downstream cut-water pile	•				Significant EDK at top, full of soil
	Raker Studs Upstream Raker Stud					Califica and EDK at top
	Upstream Raker Stud	•				Splitting and EDK at top Significant weathering / splitting and associated decay; EDK at base;
	Downstream Raker Stud		•			possible CDK at connection to cut-water pile
	Diagonal Bracing					
	Brace #1	•			50%	Heavily corroded railway irons
	Brace #2	•		-	50%	Heavily corroded railway irons
	Whaling's					
	Whaling's	•				Whalers all there; soil + vegetation on top of whalers; individual assessment of each whaler not carried out
	Pile Caps					
	Pile Cap #1	•				Replaced 1977; minor splitting downstream end only
	Pile Cap #2	•				
	Pile Cap #3	•				Replaced 1977; minor splitting downstream end only
	Pile Cap #4	•		· · · · · · · · · · · · · · · · · · ·		EDK downstream end
	Corbels					
	LH Truss Corbel - Inside - Outside	•				
	RH Truss Corbel - Inside	•				
	- Outside	•				Small EDK and splitting south end
	Packers Between Pile Cap and Beam Corbel					
	LH Beam	•				Typical sound; packer directly under and parallel to corbel is sound but packer on outside is not
	RH Beam					Small amount of decay on downstream packer // to corbel - not supporti corbel; otherwise typically sound

Pier Number	Structural Element	Structural Assessment / Recommendation			Estimated	Comments
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
	Piles					
0	r lles					Vertical split at top; timber on outside covering spike lines; isolated
	Pile #1	•				honeycombing
	Pile #2					EDK at top; typical splitting outside face; multiple drill holes; small amour of decay at each seating; excavation around pile showed pile sound below ground
_	Pile #3	•			4	Decay below whaler at seating on inside of pile
_	Pile #4	•				Typical splitting outside face
	Pile #5	•				Significant EDK at top; vertical splitting on outside face; minor splitting elsewhere
	Pile #6					Minor honeycombing through midsection; minor splitting
	Pile #7					Minor splitting and decay; excavation around pile showed pile sound below ground
	Pile #8	•				Minor splitting on outside face; excavation around pile showed pile sound below ground
	Upstream cut-water pile					
	Downstream cut-water pile	•				EDK at top; appears sound at attachment to raking stud
	Raker Studs					
	Upstream Raker Stud					Minor splitting along lines of spikes Fenders in good condition, SH61 (inside), SH77 (outside / upstream)
	Downstream Raker Stud			•	30%	Significant CDK; decay on downstream face to 1/2 depth - Replace or consider redundant
	Diagonal Bracing					
	Cross bracing	•			50%	Steel railway irons; varying amounts of corrosion
	croco bracing			-	5078	
	Whaling's			-	r	
	Whaling's	•				All present; vegetation on top; generally appear sound
	Pile Caps					
	Pile Cap #1	•				Replaced 1944
	Pile Cap #2	•				Replaced 1977
_	Pile Cap #3	•			1	Replaced 1977
	Pile Cap #4	•				
	Corbels					
_	LH Truss Corbel - Inside	•				EDK both ends
	- Outside	•				Replaced 1967
	RH Truss Corbel - Inside - Outside	•	•			Vertical split north end; large CDK south end Replaced 1960; vertical split north end
	Packers Between Pile Cap and Beam Corbel					
	LH Beam					Typically 2 no. parallel to corbel and 4 no. perpendicular; packer #1 perpendicular to corbel dozy; others typically sound
	RH Beam	•				

Pier Number	Structural Element	Structural Assessment / Recommendation			Estimated	Comments
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
					1	
7	Piles					
	Pile #1					Isolated weathering and honeycombing; timber covering spike holes
	Pile #2					Typical splitting on outside face from spikes up to 100mm deep; surface decay and weathering; packer missing at top to cap - Reinstate packer at top to pile cap
	Pile #3					Typical splitting on outside face from spikes; lower 2/3 of pile has advanced surface decay and splitting; advanced decay at top below cap - Further assess decay at top when treating
	Pile #4	•				Minor splitting at top; typical splitting and decay
	Pile #5				70%	Split running approx. 1m down pile from backside of seating at top; typica splitting due to spikes - Replace split bolt at top
	Pile #6					Vertical split extending down from cap seat; split bolt corroded; typical vertical splitting on outside face extending into core - Replace split bolt at top
	Pile #7	•				Large split and EDK at top; outside face covered in timber; large vertical split extends down approx. 600mm from cap seating; split bolt corroded - Replace split bolt at top
	Pile #8	•				Large split and EDK at top; vertical split and Pad behind brace connection at top; typical splitting on outside face
	Upstream cut-water pile	•				
	Downstream cut-water pile	•				Minor splitting and weathering; some EDK
-	Raker Studs					
	Upstream Raker Stud	•				EDK / CDK at base; weathering and splitting on sides and upstream fac
	Downstream Raker Stud	•				Splitting in side due to spikes; weathering, splitting and decay on downstream face; packer at top about to fall out
	Diagonal Bracing					
	Cross bracing	•			50%	Timber; PDK behind pile connections
	Whaling's					
	Whaling's	•				All present; sound condition
	Pile Caps					
	Pile Cap #1	•				
	Pile Cap #2					Replaced 1933 second hand
	Pile Cap #3	•				Replaced 1975
	Pile Cap #4	•				Replaced 1975
	Corbels					
	LH Truss Corbel - Inside	•				Replaced 1967 second hand; minor end splitting
	- Outside	•				Replaced 1967 second hand; minor end splitting
	RH Truss Corbel - Inside	•				
	- Outside	•				Vertical split at south end
	Packers Between Pile Cap and Beam Corbel					
	LH Beam	•				General weathering only
	RH Beam	•				

Pier Number	Structural Element	Structural Assessment / Recommendation			Estimated	Comments
annodi		Sound / Treatment	Investigate		% of Original	
		only	Further	Replace	Capacity	
8	Piles					The local sector balling and sold from
	Pile #1	•			1	Typical vertical splitting on outside face
	Pile #2	· ·			70%	Typical vertical splitting on outside face
	Pile #3	•			70%	Typical vertical splitting on outside face, significant split on downstream face starting above whaler
	Pile #4	•			50%	Top filled with pitch; vertical splitting on outside face through mid section through to CDK - Estimate only 50% of pile contributing due to splitting
	Pile #5	•			70%	EDK at top; splitting through mid section due to spikes; vertical splitting on backside approx, 30mm deep
	Pile #6				70%	Full length splits on backside approx. 70mm deep; large vertical splits or outside extending into pile centre; excavation around pile showed pile sound below ground
	Pile #7					Minor splitting only
	Pile #8					Top filled with pitch; vertical splitting on outside face through mid section through to CDK - Estimate only 50% of pile contributing due to splitting
	Upstream cut-water pile					Splitting and hollow at top; heavily decayed - Replace or consider redundant
	Downstream cut-water pile			•		Splitting and hollow at top; heavily decayed - Replace or consider redundant
	Raker Studs					
	Upstream Raker Stud	•				Splitting along lines of spikes; decayed over lower section where previously buried in vegetation
	Downstream Raker Stud	•				Splitting along lines of spikes; decayed over lower section where previously buried in vegetation
	Diagonal Bracing					
	Cross bracing	•			70%	Varying amounts of corrosion; railway iron braces
	Whaling's				-	
	Whaling's		•			Buried in soil - not assessed, may be redundant
	Dila Casa					
	Pile Caps Pile Cap #1					Advanced EDK upstream end; extensive PDK and splitting back to RH truss corbel at downstream end
_	Pile Cap #2	•				Splitting at upstream end; general weathering and splitting and EDK at downstream end
	Pile Cap #3	•				Splitting at upstream end; general weathering and splitting and EDK at downstream end
_	Pile Cap #4	•				Replaced 1978; EDK downstream end
	Corbels					
	LH Truss Corbel - Inside	•				Vertical splits at both ends
	- Outside					Replaced 1967 second hand
	0010/00					Large CDK / EDK north end; significant decay all way along
	RH Truss Corbel - Inside - Outside		•			- Investigate further, likely replace Replaced 1967 second hand
	- Outside	•				
	Packers Between Pile Cap and Beam Corbel					
	Perpendicular to corbel	•				#1 packer rotten at downstream end in under corbel - Rotten packer likely redundant
	Parallel to corbel					Sound under beams; downstream packer completely rotten - Rotten packer likely redundant

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Pier Number	Structural Element	Structural Assessment / Recommendation			Estimated	Comments
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
0	Piles					
3	Upstream Pile					Splitting and EDK at top; vertical splitting and associated decay further down; sounds drummy
	Centre Pile					Significant splitting full length; sounds drummy but likely due to splitting; small EDK at top; excavation around pile showed pile sound below ground
	Downstream Pile	•				Minor splitting and decay; small EDK at top
	Upstream Cut Water Pile					
	Downstream Cut Water Pile					Large CDK / EDK at top; significant weathering, splitting and decay; appears reasonably sound at connection to raking stud
	Raker Studs			-		
	Upstream Raker Stud			•		Splitting and decay at top; highly decayed at base
	Downstream Raker Stud					Large vertical split and decay at top; significant weathering and decay or sides and downstream face
	Diagonal Bracing					in the second
	Cross bracing	•			80%	Light to moderate corrosion; railway iron braces
	Whaling's					
	Whaling's			•		Timber splitting and decayed through centre; south side buried under so effectively not doing anything - Replace or may be redundant as pier is on river bank not subject to an water flow
	Pile Cap			•		Heavily decayed
	Piles Upstream Pile	•				Spliced at ground level 1966; splice split at top; top of splice section sounds hollow; EDK at top of original pile; original pile - pile surface sol and wet below ground level, otherwise sound
	Centre Pile					Replaced 1966; some splitting
	Downstream Pile	•				Splitting down to ground level; excavation around pile showed pile soun below ground
	Pile Cap	•				Replaced 1944; splitting and EDK both ends; typical weathering
	Abutment Walls - Timber facing			•		Various states of decay; collapsing at upstream end
	Abutment Walls - Vertical Railway Irons			•		4 no. railway irons; various states of decay / corrosion

8

Appendix B WSP Structural Assessment Report



25 July 2023

Rem Markland WSP 23 High Street Greymouth 7805

Totara Rail Bridge Load Assessment

6-WWES3.98

Dear Rem,

This letter report outlines the results of our load assessment on Totara Rail Bridge located near Ross.

WSP Greymouth requested on behalf of Westland District Council (WDC) that we carry out an assessment of the truss components to determine the permanent and live load demand on the structure. The assessment had to provide the undeteriorated capacity of members to determine the tolerance against section loss/decay. The intention is for these results to be used as an estimated intervention threshold for deteriorated members.

The assessment was restricted to the original truss structure and only pedestrian/cyclist live load was considered.

Bridge Description

The Totara Rail Bridge is located on the West Coast Wilderness Cycle Trail approximately 3 km from Ross, in the Westland Region. It comprises nine spans with the first two spans at each end constructed using simply supported timber beams. The central five spans are Howe Trusses with a span length of 24.4 m (80 ft). The assessment only considers the truss spans.

A general location plan and elevation of the bridge is shown in Figures 1 to 3.

The truss of this bridge appears to be of the same arrangement as a typical Howe Truss designed by the New Zealand Public Works Department (refer Figure 4).

Assessment Criteria

Our assessment was completed in accordance with the following documents:

- Section 7 of the Waka Kotahi NZ Transport Agency Bridge Manual, 3rd Edition, including Amendments 1, 2, 3 and 4 (Bridge Manual)
- NZS 3404: Part 1: 1997 (including Amendments 1, and 2)
- AS 1720: Part 1: 2010





Figure 1: General location of Totara Bridge.



Figure 2: Elevation of Totara Bridge.



Figure 3: Deck Approach of Totara Bridge.

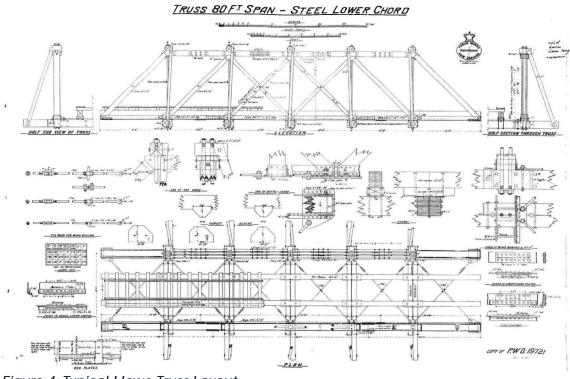


Figure 4: Typical Howe Truss Layout



wsp.com/nz



Material strengths and factors

The material strengths assumed in our assessment were taken from the previous John Greenfields analysis of the truss (date of assessment unknown). Ironbark was adopted as the applicable timber with a calculated allowable compression strength of 7.4 MPa. The nominal strength was back calculated, as based on a load factor of 1.35 and a strength factor of 0.7 and found to be 14.3 MPa. The nearest comparable timber stress grade from AS 1720: Part 1 was found to be MGP 10 and was subsequently adopted for the assessment (refer to Table H3 of AS 1720.1). See Table 1 for the assumed timber strengths.

Wrought iron was adopted for the steel members as based on John Greenfields analysis (see Table 1 for assumed yield strength).

Other material factors applicable to the timber and steel capacity calculations were based on the requirements of AS 1720.1 and NZS 3404, respectively and are listed in Table 2.

Material	Characteristic Action	Strength (MPa)
Timber MGP 10	Compression parallel to grain	16
	Bending	14
	Tension parallel to grain	6.1
Wrought Iron	Yield strength	205

Table 1: Material strengths adopted for the assessment.

Material	Factor	Value
Wrought Iron	Strength reduction	0.8
Timber	Strength reduction	0.7
	k ₁ - load duration factor	1.0
	k ₄ - moisture condition (seasoned)	1.0
	k ₆ - temperature	1.0
	k_{9} - strength sharing factor (varies as based on slenderness)	varies
	k ₁₂ - stability factor (varies as based on slenderness)	varies
	p _b - material constant bending	0.75
	p _c - material constant compression	0.96

Structural Condition

The assessment was based on the undeteriorated capacity of the members, with the intention to establish the tolerance against section loss/decay.

Structural Convention

The same naming convention as previously used in the assessment by John Greenfields was also adopted for this exercise, see Figure 5 for the convention.

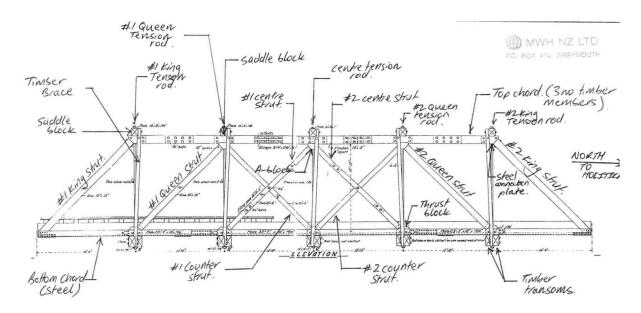


Figure 5: Structural convention

Typical Member Sizes

The truss member sizes were based on the typical section dimensions measured as part of the condition inspection. These are listed in Table 3.

Member	Material	Typical Dimensions (mm)	
Top Chord	Timber	360 x 300	
Bottom Chord	Wrought Iron	280 x 22 plate	
		82 x 82 x 22 angle	
King Strut	Timber	360 x 300	
Queen Strut	Timber	320 x 250	
Centre Strut	Timber	200 x 140	
Counter Strut	Timber	210 x 115	
Hanger	Wrought Iron	2 no. 80 ø	
Transom	Timber	2 no. 440 x 310	
Cross Bracing	Wrought Iron	28 ø	
Timber Brace	Timber	250 x 150	

It is to be noted that the assessment was based on the main truss members only, and that verification of the connections did not form part of the scope.

Load Demands

The dead load of the truss and walkway were based on the following material unit weights:

- Timber truss members (Ironbark) = 1200 kg/m³
- Wrought Iron members = 7850 kg/m³



Timber walkway = 650 kg/m³

The pedestrian live loading was based on 5 kN/m² as per section 3.4.14 of the Bridge Manual.

The following load factors were used:

- Dead load, $\Upsilon_D = 1.2$
- Pedestrian live load, Υ_L = 1.5

Assessment Results

Table 4 provides a summary of the assessment results that relate to the truss members. It shows the undeteriorated member capacities against the calculated load demands. The factor of safety percentages have been capped at 200%. The table also shows the threshold sectional condition factor that will trigger further action (this includes additional investigations such as drilling of timber members, repair or replacement). It is to be noted that this condition factor does not relate to the overall condition of a member but to the most deteriorated specific section/location along a member. This means for example that if the overall condition of a top chord member is rated at say 90% but the end bearing is showing severe decay to a condition rating of 50%, further action may be required. The same goes for any connections, splices, packers, and thrust blocks associated with a specific truss member. Further action will be required if any of these components have a condition rating less than the listed value for the associated truss member.

Member	Capacity (kN) ¹	Load Demand (kN) 1	Factor of Safety (%)	Threshold Sectional Condition Factor
Top Chord	1040	418	> 200%	55%
Bottom Chord	-1240	-420	> 200%	50%
King Strut	720	346	> 200%	70%
Queen Strut	380	200	190%	75%
Centre Strut	170	53	> 200%	55%
Counter Strut	-103	-17	> 200%	50%
Hanger	-1657	-214	> 200%	50%
Transom	177	95	186%	55%
Cross Bracing	-101	-25	> 200%	50%
Timber Brace	112	10	> 200%	50%

Table 4: Summary of truss member results

¹ A negative sign indicates a tension force.

Conclusions and Recommendations

This assessment report forms part of the investigation into the current condition of Totara Rail Bridge. The main aim of the investigation is to inform the structural investigations, improvements, repairs, or replacement management plan for the bridge.



The member conditions recorded as part of the visual inspection programme can subsequently be compared against the sectional condition listed in Table 4, which provides an estimated intervention threshold for deteriorated members. An indicative investigation, repair or replacement schedule/forward works programme can subsequently be developed on the basis of the recorded assessment results.

It is important to note that the threshold condition factors listed in Table 4 do not relate to the general condition rating of a member but to the rating of specific member defects. Investigations, repairs or replacements should therefore be managed on a weakest point basis and not on the overall/general condition of a member.

The assessment showed that the undeteriorated strength of the truss members carry substantial reserve capacity given that it was originally built as a rail bridge and now only utilised as a pedestrian / cycle bridge. However, severe deterioration of the truss members/components has been recorded and it is recommended that the results of Table 4 are utilised to identify these elements as part of the development of the forward works programme.

We trust that the above meets your requirements. If we can be of any further assistance, then please do not hesitate to contact us.

Regards.

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Appendix C Site Inspection Notes



				T	russ SPAN C - D (Upstream)
Span	Side	Structural Element		Estimated %	Comments
				Original	#1 North (Hoki)
		CD UPSTREAM		Capacity	#2 South (Ross)
CD	US	Timber Struts			
					Significant weathering and deep cracking top surface; bottom half section sound; large PDK
		#1 - King Strut		50%	at base; splitting inside face
		#1 - Queen Strut		50%	Heavy weathering and deep cracking top surface; bottom half section sound;
		#1 - Counter Strut		75%	Large split through centre; large PDK at base
		#1 - Centre Strut	- Inside	80%	Bottom sounds drumy; PDK inside face; splitting
			- Outside	50-75%	Large PDK at base; top surface weathering and splitting
		#2 - Centre Strut	- Inside	50-75%	Sounds drummy
			- Outside	70%	PDK inside face; sounds drummy at top
		#2 - Counter Strut		50-75%	Vertical splitting throughout; sounds drummy
		#2 - Queen Strut		50%	PDK top face; weathering and splitting top face
		#2 - King Strut		50%	Large horizontal split inside face; significant weathering / splitting on top surface
	1	1			
CD	US	Vertical Steel Tens	sion Rods		
		#1 - King Rods	- Inside	80%	Heavily corroded
			- Outside	60%	Heavily corroded
		#1 - Queen Rods	- Inside	70%	Heavily corroded
			- Outside	60%	Heavily corroded
		#1 - Centre Rods	- Inside	>90%	New
			- Outside	>90%	New
		#2 - Queen Rods	- Inside	80%	Heavily corroded
			- Outside	50%	Heavily corroded
		#2 - King Rods	- Inside	90%	Heavily corroded
			- Outside	70%	Heavily corroded
CD	US	Timber Thrust Block	s		
		#1 - King Thrust Block		75-90%	
		#1 - Queen Thrust Blo	ck	50-75%	Large PDK at outside rod
		Centre Thrust Block		75-90%	
		#2 - Queen Thrust Blo	ck	75-90%	
		#2 - King Thrust Block		75-90%	PDK at outside rod
CD	US	Timber A-Blocks			
		#1 - Queen A-Block		75-90%	
		Centre A-Block		75-90%	
		#2 - Queen A-Block		75-90%	
CD	116	Timber Saddle Block			
CD	US			<f00 <="" td=""><td>Large CDK; sounds hollow</td></f00>	Large CDK; sounds hollow
		#1 - King Saddle Block		<50%	Weathered with large splits on top; sounds drummy; end PDK
		#1 - Queen Saddle Block		50-75%	Large CDK inside end
		Centre Saddle Block		50-75%	CDK inside end CDK inside end; otherwise appears sound
		#2 - Queen Saddle Block #2 - King Saddle Block		50-75%	Typical EDK and weathering; otherwise sound
				75-90%	

				T	russ SPAN C - D (Upstream)
CD	US	Top Chord			
		#1 King - #1 Queen	- Inside	<50%	Large PDK; significant weathering
			- Middle	50-75%	
			- Outside	50-75%	
		#1 Queen - Centre	- Inside	75-90%	Replaced 1960
			- Middle	75-90%	Significant weathering
			- Outside	75-90%	Significant weathering
		Centre - #2 Queen	- Inside	75-90%	
			- Middle	75-90%	
			- Outside	50-75%	Sounds drummy
		#2 Queen - #2 King	- Inside	75-90%	
			- Middle	50-75%	EDK at king strut; large PDK near #2 queen; PDK throughout
			- Outside	50-75%	Sounds Drummy
CD	US	Steel Connection Pla	ites		
		#1 King Strut to top ch	iord	70%	Heavily corroded; bolts gone
		#2 King Strut to top ch	ord	80%	Heavily corroded; bolts gone
CD	US	Timber Braces			
		#1 - King Timber Brac	e	>90%	New
		#1 - Queen Timber Bra	ace	>90%	New
				<50%	EDK top end; connection to saddle block OK, bolt / nuts corroded - Section loss at bottom
		Centre Timber Brace		< <u>50</u> %	connection; split
		#2 - Queen Timber Bra	ace	>90%	New
		#2 - King Timber Brac	е	>90%	New
CD	US	Bottom Cord (Steel)			
		Pier - #1 King	- Inside	50-75%	Bottom flange ineffective
			- Outside	50-75%	Web Strengthened
		#1 King - #1 Queen	- Inside	50-75%	Splice plate corrosion
			- Outside	50-75%	Mostly strengthened (Up to splice plate)
		#1 Queen - Centre	- Inside	50-75%	Minor pockets of corrosion
			- Outside	50-75%	Heavy web corrosion
		Centre - #2 Queen	- Inside	50-75%	Moderate corrosion
			- Outside	50-75%	Heavy corrosion
		#2 Queen - #2 King	- Inside	50-75%	Moderate to heavy corrosion
			- Outside	50-75%	Heavy corrosion
		#2 King - Pier	- Inside	50-75%	Moderate to heavy corrosion
			- Outside	50-75%	Heavy corrosion



Span \$	Side	Structural Element			
				Estimated %	Comments
				Original	#1 North (Hoki)
		CD DOWNSTREAM		Capacity	#2 South (Ross)
CD	DS	Timber Struts		50 750/	
		#1 - King Strut		50-75%	Sounds Drummy - PDK Throughout
		#1 - Queen Strut		50-75%	Replaced 1966; Sounds drummy lower portion
		#1 - Counter Strut		75-90%	Vertical splitting through top surface full length
		#1 - Centre Strut	- Inside	50-75%	PDK at thrust block; Splitting and PDK top surface
			- Outside	75-90%	PDK outside face around bolts
		#2 - Centre Strut	- Inside	<50%	PDK Throughout
			- Outside	75-90%	
		#2 - Counter Strut		75-90%	PDK outside face; vertical splitting
		#2 - Queen Strut		50-75%	Surface weathering; dull sound at base
		#2 - King Strut		50-75%	Surface weathering; insect holes noted near top
CD	DS	Vertical Steel Tensior	n Rods		
	20	#1 - King Rods	- Inside	70%	
			- Outside	60%	
		#1 - Queen Rods	- Inside	60%	
			- Outside	>90%	New
		#1 - Centre Rods	- Inside	80%	
			- Outside	90%	
		#2 - Queen Rods	- Inside	>90%	New
			- Outside	90%	
		#2 - King Rods	- Inside	30%	
			- Outside	30%	
			Outoldo		
CD	DS	Timber Thrust Blocks	6		
		#1 - King Thrust Block		75-90%	
		#1 - Queen Thrust Blog	ck	75-90%	
		Centre Thrust Block		75-90%	
		#2 - Queen Thrust Bloo	ck	75-90%	
		#2 - KingThrust Block		<50%	Significant decay top surface; large PDK between rods and on outside of rods; heavy top section loss
CD	DS	Timber A-Blocks			
	50	#1 - Queen A-Block		75-90%	
		Centre A-Block		75-90%	
		#2 - Queen A-Block		75-90%	
CD	DS	Timber Saddle Blocks	S		
		#1 - King Saddle Block	(50-75%	Small CDK inside end; several PDK's on northern face
		#1 - Queen Saddle Blo	ock	75-90%	PDK on Top
		Centre Saddle Block		75-90%	CDK inside end; significant decay / weathering on top surface
		#2 - Queen Saddle Blo	ock	75-90%	Typical EDK and weathering
		#2 - King Saddle Block		50-75%	Large CDK inside end

				Tr	uss SPAN C - D (Downstream)
CD	DS	Top Chord			
		#1 King - #1 Queen	- Inside	50-75%	Replaced 1933 (second hand); large PDK inside face at bolt group
			- Middle	75-90%	Weathered
			- Outside	75-90%	Weathered
		#1 Queen - Center	- Inside	75-90%	Surface decay inside face - Loss of section
			- Middle	75-90%	Weathered
			- Outside	75-90%	Weathered
		Centre - #2 Queen	- Inside	75-90%	Significant surface decay top surface - Loss of section
			- Middle	75-90%	PDK Decay
			- Outside	75-90%	Splitting
		#2 Queen - #2 King	- Inside	50-75%	Remove vegetation at end and investigate further - EDK around bolts
			- Middle	50-75%	Replaced 1950; remove vegetation at end and investigate further
			- Outside	50-75%	Remove vegetation at end and investigate further
CD	DS	Steel Connection Pla	ates		
		#1 King Strut to top ch	nord	90%	Heavy corrosion; bolts gone
		#2 King Strut to top ch	nord	60%	Heavy corrosion; bolts gone
CD	DS	Timber Braces			
		#1 - King Timber Brac	e	75-90%	PDK at connection to transom
		#1 - Queen Timber Br	ace	>90%	New
		Centre Timber Brace		>90%	New
		#2 - Queen Timber Br	ace	>90%	New
		#2 - King Timber Brac	e	>90%	New
CD	DS	Bottom Chord			
		Pier - #1 King	- Inside	50-75%	Heavy Corrosion
			- Outside	50-75%	Heavy
		#1 King - #1 Queen	- Inside	50-75%	Heavy
			- Outside	50-75%	Heavy
		#1 Queen - Centre	- Inside	50-75%	Moderate
			- Outside	50-75%	Moderate
		Centre - #2 Queen	- Inside	50-75%	Moderate
			- Outside	50-75%	Moderate
		#2 Queen - #2 King	- Inside	50-75%	Heavy
			- Outside	50-75%	Heavy but Strengthened
		#2 King - Pier	- Inside	50-75%	Heavy
			- Outside	50-75%	Heavy but Strengthened

WESTLAND

					Truss SPAN D - E (Upstream)
Span	Side	Structural Element		Estimated %	Comments
				Original	#1 North (Hoki)
		DE UPSTREAM		Capacity	#2 South (Ross)
DE	US	Timber Struts			
		#1 - King Strut		50%	Significant weathering / cracking top surface; small PDK at base; top half of section sounds dull
		#1 - Queen Strut		50%	Significant weathering / cracking top surface; small PDK at base; top half of section sounds dull
-		#1 - Counter Strut		75-90%	Small PDK inside face at base; splitting in top surface; PDK inside face at top by bolt
		#1 - Centre Strut	- Inside	75-90%	Some splitting along inside face; splitting and PDK throughout
			- Outside	75-90%	Some surface splitting; splitting and PDK throughout
		#2 - Centre Strut	- Inside	75-90%	PDK on top surface; splitting and PDK throughout
			- Outside	75-90%	Some splitting top surface; splitting and PDK throughout
		#2 - Counter Strut		75-90%	Split in top surface full length of member; EDK at top
		#2 - Queen Strut		50-75%	Deep splitting / weathering in top surface
		#2 - King Strut		75-90%	Replaced 1944; weathered
DE	US	Vertical Steel Tensio			
		#1 - King Rods	- Inside	70%	Heavy corroded
			- Outside	60%	Heavy corroded
		#1 - Queen Rods	- Inside	60%	Heavy corroded
			- Outside	80%	Heavy corroded
		#1 - Centre Rods	- Inside	80%	Heavy corroded Heavy corroded
		#2 - Queen Rods	- Outside - Inside	50%	Heavy corroded
		#2 - Queen Rous	- Inside - Outside	70% 70%	Heavy corroded
		#2 - King Rods	- Inside	60%	Heavy corroded
		#2 - King Kous	- Outside	60%	Heavy corroded
			Outoide	0070	
DE	US	Timber Thrust Blocks			
		#1 - King Thrust Block		75-90%	
		#1 - Queen Thrust Blo	ck	75-90%	
		Centre Thrust Block		75-90%	
		#2 - Queen Thrust Blo	ck	75-90%	
		#2 - King Thrust Block		75-90%	
DE	US	Timber A-Blocks		75.000/	
		#1 - Queen A-Block		75-90%	Small CDK
		Centre A-Block		75-90%	CDK approx. 120mm diameter
├──		#2 - Queen A-Block		50-75%	
DE	US	Timber Saddle Block	(S		
		#1 - King Saddle Block		75-90%	CDK inside end approx. 50mm diameter
		#1 - Queen Saddle Blo		75-90%	Surface decay on top extending down into saddle block
<u> </u>				75-90%	CDK inside end approx. 40mm diameter
——		#2 - Queen Saddle Block	ock	75-90%	Weathered on top
		#2 - King Saddle Block		75-90%	CDK inside end approx. 20mm diameter; PDk at drill holes on northern face.
L				1	

					Truss SPAN D - E (Upstream)
DE	US	Top Chord			
		#1 King - #1 Queen	- Inside	75-90%	Weathered
			- Middle	75-90%	Replaced 1933 (second hand); weathered
				75-90%	Weathered
		#1 Queen - Centre	- Inside	75-90%	Weathered; PDK
			- Middle	75-90%	Weathered
			- Outside	50-75%	Large PDK at end or flitch (approx. half section missing) - Check UAV?
		Centre - #2 Queen	- Inside	75-90%	
			•	75-90%	PDK top surface and inside face; weathered
			- Outside	75-90%	PDK top surface; weathered
		#2 Queen - #2 King	- Inside	75-90%	Weathered
			- Middle	75-90%	Significant weathering and Isolated PDK
			- Outside	50-75%	Significant weathering and Isolated PDK; dozy near #2 king windbrace connection.
DE	US	Steel Connection Pla	ates		
		#1 King Strut to top ch	hord	90%	Heavily corroded; bolts gone
		#2 King Strut to top ch	hord	80%	Heavily corroded; bolts gone
DE	US	Timber Braces			
		#1 - King Timber Brace		75-90%	Organic growth from splits centre; heavy decay at bottom
		#1 - Queen Timber Brace		75-90%	Nuts missing from bolts
		Centre Timber Brace		75-90%	Section loss at bottom; decay lower section
		#2 - Queen Timber Br	ace	50-75%	Large PDK at base; bolts fully corroded; surface splitting at centre
		#2 - King Timber Brac	ce	75-90%	Split at bolt otherwise sound; mid-splice
DE	US	Bottom Chord			
		Pier - #1 King	- Inside	50-75%	Heavy corrosion
			- Outside	50-75%	Heavy corrosion
		#1 King - #1 Queen	- Inside	50-75%	Heavy corrosion
			- Outside	50-75%	Heavy corrosion
		#1 Queen - Centre	- Inside	50-75%	Moderate corrosion
			- Outside	50-75%	Moderate corrosion
		Centre - #2 Queen	- Inside	50-75%	Moderate corrosion
			- Outside	50-75%	Moderate corrosion
		#2 Queen - #2 King	- Inside	50-75%	Heavy corrosion including splice plate
			- Outside	50-75%	Heavy corrosion including splice plate; bolts cracked and corroded
		#2 King - Pier	- Inside	50-75%	Moderate corrosion
			- Outside	50-75%	Heavy corrosion



				Т	russ SPAN D - E (Downstream)
Span	Side	Structural Element		Estimated %	Comments
				Original	#1 North (Hoki)
				Capacity	#2 South (Ross)
DE	DS	Timber Struts			
DE	03			75.000/	Significant surface weathering top surface; several PDK top surface.
		#1 - King Strut #1 - Queen Strut		75-90%	Weathered top surface
		#1 - Counter Strut		75-90%	Split and PDK top surface; bottom edge splitting; bottom decaying inside face
		#1 - Centre Strut	- Inside	50-75%	Some vertical cracking noted
			- Inside - Outside	75-90% 75-90%	Some vertical cracking noted; Some vertical cracking noted; PDK inside face
		#2 - Centre Strut	- Inside	50-75%	Some surface decay and splitting at base
			- Outside	50-75%	Large vertical split full length; surface decay
		#2 - Counter Strut			Splitting in top surface full length; edge decay inside face
				75-90%	
		#2 - Queen Strut		50-75%	Cracking in top surface; sounds hollow from 1m below A-block; PDK inside face; likely CDK
		#2 - King Strut		75-90%	Weathered top surface; isolated PDK inside surface
DE	DS	Vertical Steel Tensio	n Podo		
DE	03			>000/	New
		#1 - King Rods	- Inside	>90%	Heavily corroded
		#1 - Queen Rods	- Outside - Inside	40%	Heavily corroded
		#1 - Queen Rods		30%	Heavily corroded
		#1 Cantra Dada	- Outside	30%	New
		#1 - Centre Rods	- Inside	>90%	New
		#2 Overe Dede	- Outside	>90%	Heavily corroded
		#2 - Queen Rods	- Inside	60%	Heavily corroded
		#0 King Dada	- Outside	60%	Heavily corroded
		#2 - King Rods	- Inside	70%	-
			- Outside	70%	Heavily corroded
DE	DS	Timber Thrust Block	(S		
	1	#1 - King Portal Thrust Block 75-90%			
		#1 - King Thrust Block		75-90%	
		#1 - Queen Thrust Blo		75-90%	
		Centre Thrust Block 75-			
		#2 - Queen Thrust Blo	ock	75-90%	
		#2 - Gueen must block 75-90 % #2 - KingThrust Block 75-90%			
		#2 - King Portal Thrus		75-90%	
		_			
DE	DS	Timber A-Blocks			
	<u> </u>	#1 - Queen A-Block		75-90%	СДК
		Centre A-Block		75-90%	
		#2 - Queen A-Block		75-90%	
DE	DS	Timber Saddle Block	(S		
		#1 - King Saddle Block 75-90%			Small CDK and splitting inside end; significant EDK outside end to beyond brace connection; top decay
	1	#1 - Queen Saddle Blo		75-90%	EDK outside end
	1	Centre Saddle Block		75-90%	Advanced decay all round
	1	50-75%			Small CDK inside end; significant EDK outside end to beyond windbrace connection; sounds hollow
		#2 - Queen Saddle Blo	ock		Indiow

				1	Truss SPAN D - E (Downstream)
DE	DS	Top Chord			
		#1 King - #1 Queen	- Inside	50-75%	Weathered; sounds hollow
		-	- Middle	50-75%	Large PDK inside face approx. 50mm deep; weathered
			- Outside	50-75%	Large PDK, approx half cross section missing
		#1 Queen - Centre	- Inside	75-90%	
			- Middle	75-90%	Bottom surface decay
			- Outside	75-90%	EDK at splice connection; vegetation growing from splice connection
		Centre - #2 Queen	- Inside	75-90%	Weathered
			- Middle	75-90%	Weathered
			- Outside	75-90%	Weathered; small PDK top surface; advancing surface decay
		#2 Queen - #2 King	- Inside	50-75%	Weathered; split; PDK inside flitch below saddle; sounds hollow
		<u>_</u>	- Middle	75-90%	Weathered; split
			- Outside	75-90%	Weathered; split
DE	DS	Steel Connection Pla	ates		
		#1 King Strut to top cl	hord		Heavily corroded
		#2 King Strut to top cl	hord	70%	Heavily corroded
DE	DS	Timber Braces			
		#1 - King Timber Brace 75-90%		75-90%	PDK at base; weathered and splitting
		#1 - Queen Timber Br	- Queen Timber Brace		Large split from top end through bolted connection; install split bolt; loose bottom bolt; some organice growth
		Centre Timber Brace		75-90%	Surface decay and splitting
		#2 - Queen Timber Brace		50-75%	Significant cracking; hollow sound
		#2 - King Timber Brac	ce	<50%	Split in end; large PDK at connection to transom; one bolt at bottom ineffective
DE	DS	Bottom chord (Steel)			
		Pier - #1 King	- Inside	70%	Heavy isolated corrosion
			- Outside	50%	Heavy corrosion
		#1 King - #1 Queen	- Inside	50%	Heavy corrosion
			- Outside	80%	Heavy corrosion
		#1 Queen - Centre	- Inside	50-75%	Moderate corrosion
			- Outside	50-75%	Moderate corrosion
		Centre - #2 Queen	- Inside	50-75%	Moderate isolated heavy
			- Outside	50-75%	Heavy corrosion at centre thrust bock
		#2 Queen - #2 King	- Inside	50-75%	Heavy Corrosion
		1	- Outside	50-75%	Heavy Corrosion
		#2 King - Pier	- Inside	50-75%	Heavy Corrosion
			- Outside	50-75%	Heavy Corrosion

				Truss S	PAN E - F (Upstream)
Span	Side	Structural Element		Estimated %	Comments
				Original	#1 North (Hoki)
				Capacity	#2 South (Ross)
EF	US	Timber Struts			
		#1 - King Strut		50-75%	Significant weathering / cracking top surface; small PDK at base; top half of section sounds dull; large decay at top
		#1 - Queen Strut		50%	Weathered top surface with large splits down centre; PDK and split on underside
		#1 - Counter Strut		~0%	PDK top surface; minimal contact at bottom (Decay)
		#1 - Centre Strut	- Inside	75-90%	Vertical splitting full length; some horizontal splitting on sides
			- Outside	<50%	Significant vertical splitting and dacay of top surface; horizontal splitting inside face; condition likely deteriorated
		#2 - Centre Strut	- Inside	<50%	Large horizontal crack full length; significant surface decay and PDK; base decay
			- Outside	<50%	Significant splitting and PDK at base; large split at top
		#2 - Counter Strut		50-75%	PDK at thrust block; splitting at base; sounds dull
				700/	
		#2 - Queen Strut		70%	PDK at base; significant weathering and cracking top surface approx 1/4 depth
		#2 - King Strut		75-90%	Surface weathering on top surface
EF	US	Vertical Steel Tensio	n Rods		
		#1 - King Rods	- Inside	90%	Heavily corroded
			- Outside	80%	Heavily corroded
		#1 - Queen Rods	- Inside	90%	Heavily corroded
			- Outside	60%	Heavily corroded
		#1 - Centre Rods	- Inside	70%	Heavily corroded
			- Outside	>90%	New
		#2 - Queen Rods	- Inside	50%	Heavily corroded
			- Outside	60%	Heavily corroded
		#2 - King Rods	- Inside	70%	Heavily corroded
			- Outside	90%	Heavily corroded
EF	US	Timber Thrust Blocks			
		#1 - King Thrust Block 75-90%			
		#1 - Queen Thrust Blo		75-90%	
		Centre Thrust Block		50-75%	Some splitting and compression occuring
		#2 - Queen Thrust Blo	ck	75-90%	
		#2 - KingThrust Block	-	75-90%	
EF	US	Timber A-Blocks			
		#1 - Queen A-Block Centre A-Block		75-90%	Small CDK inside end
				75-90%	Small CDK inside end; small PDK at strut
		#2 - Queen A-Block		75-90%	Large CDK inside end approx. 100mm diameter

				Truss	SPAN E - F (Upstream)
EF	US	Timber Saddle Blocks #1 - King Saddle Block #1 - Queen Saddle Block			
				75-90%	Small CDK; large vertical split; treat and provice horizontal split bolts; full depth split
				75-90%	CDK approx. 80mm diameter inside end
		Centre Saddle Block		75-90%	CDK inside end; PDK on south side
		#2 - Queen Saddle Blo	ock	<50%	Large CDK extending to top chord of truss (approx. 200mm diameter), extends to vertical tie rod
		#2 - King Saddle Block	ĸ	<50%	Soft end; sounds dull; deteriorated overall
EF	US	Top Chord			
		#1 King - #1 Queen	- Inside	75-90%	Weathering
			- Middle	75-90%	······································
			- Outside	75-90%	Replaced 1940
		#1 Queen - Centre	- Inside	50-75%	Large PDK, approx. half section missing
			- Middle	50-75%	Large PDK and split through side; sounds drummy
			- Outside	75-90%	
		Centre - #2 Queen	- Inside	75-90%	Large vertical split approx. 50mm deep
	_		- Middle	75-90%	
		- Middle - Outside		75-90%	
		#2 Queen - #2 King	- Inside	50-75%	CDK at south end; large vertical spilt; one corroeded splice bolt
			- Middle	50-75%	Significant weathering; PDK inside face; blocking ineffective
			- Outside	50-75%	Large PDK inside face, approx. half section gone;
EF	US	Steel Connection Dia	te e		
EF	03	Steel Connection Plates #1 King Strut to top chord		600/	Heavily corroded; bolts gone
		÷ .		60%	Heavily corroded; bolts gone
		#2 King Strut to top ch		50%	
EF	US	Timber Braces			
		#1 - King Timber Brac	e	>90%	New
		#1 - Queen Timber Bra	ace	50-75%	PDK throughout
		Centre Timber Brace		<50%	Some end splitting and section loss
		#2 - Queen Timber Bra	ace	>90%	New
		#2 - King Timber Brack	e	<50%	Large PDK south face; large split through; PDK both sides
EF	US	Bottom chord (Steel)			
		Pier - #1 King	- Inside	50-75%	Heavy corrosion
			- Outside	30%	Heavy corrosion
		#1 King - #1 Queen	- Inside	50-75%	Heavy corrosion
			- Outside	50-75%	Heavy corrosion
		#1 Queen - Centre	- Inside	50-75%	Heavy corrosion
			- Outside	50-75%	Heavy corrosion
		Centre - #2 Queen	- Inside	50-75%	Heavy corrosion
			- Outside	50-75%	Heavy corrosion
		#2 Queen - #2 King	- Inside	<50%	Severe corrosion
			- Outside	<50%	Severe corrosion
		#2 King - Pier	- Inside	<50%	Severe corrosion
			- Outside	<50%	Severe corrosion

				Truss SP	AN E - F (Downstream)
Span	Side	Structural Element		Estimated %	Comments
				Original	#1 North (Hoki)
				Capacity	#2 South (Ross)
EF	DS	Timber Struts			
	03				Weathered top surface; decay to approximately half depth of member; water
		#1 - King Strut		50-75%	ponding at base
		#1 - Queen Strut		75-90%	Minor splitting in top surface
		#1 - Counter Strut		75-90%	
		#1 - Centre Strut	- Inside	<50%	Vertical splitting in lower half; some PDK at centre inside fall
			- Outside	75-90%	Vertical splitting in lower half
		#2 - Centre Strut	- Inside	75-90%	
			- Outside	75-90%	Splitting at bottom
		#2 - Counter Strut		75-90%	Top splitting
					Surface decay at top; dull sound in lower portion, possible CDK; section
		#2 - Queen Strut		50-75%	necking
		#2 - King Strut		75-90%	Weathered
		, , , , , , , , , , , , , , , , , , ,			
EF	DS	Vertical Steel Tensio	on Rods		
		#1 - King Rods	- Inside	85%	Heavily corroded
			- Outside	90%	Heavily corroded
		#1 - Queen Rods	- Inside	60%	Heavily corroded
		- Outside 40%		40%	Heavily corroded
		#1 - Centre Rods	- Inside	>90%	New
			- Outside	50%	Heavily corroded
		#2 - Queen Rods	- Inside	50%	Heavily corroded
			- Outside	50%	Heavily corroded
		#2 - King Rods	- Inside	50%	Heavily corroded
			- Outside	60%	Heavily corroded
EF	DS		mber Thrust Blocks		
		#1 - King Thrust Block		75-90%	
		#1 - Queen Thrust Blo	DCK	75-90%	DDK top surface and inside contact area for #2 Counter Strut
		Centre Thrust Block		75-90%	PDK top surface and inside contact area for #2 Counter Strut
		#2 - Queen Thrust Blo		75-90%	Contro anilly EDV outside food
		#2 - KingThrust Block		75-90%	Centre spilt; EDK outside face
EF	DS	Timber A-Blocks			
		#1 - Queen A-Block		75-90%	
		Centre A-Block		75-90%	
	1	#2 - Queen A-Block		75-90%	Small CDK inside end
	1				
EF	DS	Timber Saddle Block	s		
		#1 - King Saddle Bloc	k	75-90%	CDK inside end approx 50mm diameter; EDK outside end
		#1 - Queen Saddle Bl	ock	75-90%	EDK outside end
		Centre Saddle Block		75-90%	Small CDK and vertical split inside end; EDK outside end; significant top decay north face
		#2 - Queen Saddle Bl	ock	75-90%	CDK inside end; EDK outside end
		#2 - King Saddle Bloc		50-75%	CDK inside end approx. 70mm diameter; EDK outside end; PDK northern face

EF DS Top Chord Splitting inside face #1 King - #1 Queen - Inside 75-90% Splitting inside face -Outside - Outside 50-75% PDK top surface approx 300mm long; PDK on underside #1 Queen - Centre - Inside 75-90% Weathered -Outside - Outside 50-75% PDK top surface approx 300mm long; PDK on underside -Weathered - Niddle 75-90% Weathered -Outside - Outside 50-75% PDK to half section depth -Outside 75-90% Bottom decay -Outside 75-90% Bottom decay -Outside 75-90% Replaced 1933 (second hand) -Outside 75-90% PDK -F DS Steel Connection Plates #1 King Strut to t	splitting inside face
- Middle 75-90% - Outside 50-75% PDK top surface approx 300mm long; PDK on underside; #1 Queen - Centre - Inside 75-90% Weathered - Outside - Middle 75-90% Replaced 1976 - Outside 50-75% PDK to half section depth - Centre - #2 Queen - Inside 75-90% Bottom decay - Outside 75-90% Bottom decay - - Outside 75-90% Bottom decay - - Outside 75-90% Bottom decay - - Outside 75-90% Splitting - - Outside 75-90% Replaced 1933 (second hand) - - Outside 75-90% PDK - - - Middle 75-90% PDK - - - Outside 75-90% PDK - - - Outside 75-90% PDK - - - Outside 75-90% PDK - - - EF DS Steel Connection Plates - - #1 King Strut to top chord 60% <th>splitting inside face</th>	splitting inside face
Image: Solution of the section of t	splitting inside face
- Outside - PDK top surface approx 300mm long; PDK on underside. #1 Queen - Centre - Inside 75-90% Weathered - Outside 50-75% PDK top surface approx 300mm long; PDK on underside. - Outside 75-90% Replaced 1976 - Outside 50-75% PDK to half section depth - Outside 75-90% Bottom decay - Outside 75-90% Splitting - Outside 75-90% Splitting - Outside 75-90% Replaced 1933 (second hand) - Outside 75-90% PDK - Middle 75-90% PDK - Outside 75-90% PDK - F DS Steel Connection Plates - #1 King Strut to top chord 60% Heavily corroded; steel delamination at edges #2 King Strut to top chord 60% Heavily corroded; steel delamination at edges <td< td=""><td>splitting inside face</td></td<>	splitting inside face
Image: Production between inside 10 000 Image: Production between inside 10 000 Image: Production between inside 75-90% Image: Production between inside 60% Image: Production between inside 60% Image: Production between inside 75-90% Image: Production between inside 75-90%	
- Outside - Outside 50-75% PDK to half section depth Centre - #2 Queen - Inside 75-90% Bottom decay - Middle 75-90% Splitting - Outside 75-90% Replaced 1933 (second hand) #2 Queen - #2 King - Inside 75-90% - Middle 75-90% Replaced 1933 (second hand) - Middle 75-90% PDK - Outside 75-90% PDK - EF DS Steel Connection Plates	
Centre - #2 Queen - Inside 75-90% Bottom decay - Middle 75-90% Splitting - Outside 75-90% Replaced 1933 (second hand) #2 Queen - #2 King - Inside 75-90% Replaced 1933 (second hand) - Middle 75-90% PDK - - Middle 75-90% PDK - - Outside 75-90% - - EF DS Steel Connection Plates - - #1 King Strut to top chord 60% Heavily corroded; steel delamination at edges #2 King Strut to top chord 60% Heavily corroded; steel delamination at edges EF DS Timber Brace >90% New #1 - King Timber Brace >90% New - #1 - Queen Timber Brace 75-90% EDK and vertical split at top #2 - Queen Timber Brace 75-90% Split a	
- Middle 75-90% Splitting - Outside 75-90% Splitting #2 Queen - #2 King - Inside 75-90% Replaced 1933 (second hand) - Middle 75-90% PDK - Outside 75-90% PDK - Steel Connection Plates - - #1 King Strut to top chord 60% Heavily corroded; steel delamination at edges #2 King Strut to top chord 60% Heavily corroded; steel delamination at edges #2 King Strut to top chord 60% Heavily corroded; steel delamination at edges #1 - King Timber Brace >90% New #1 - Queen Timber Brace 75-90% Nut missing from bolt connecting to transom Centre Timber Brace 75-90% EDK and vertical split at top #2 - Queen Timber Brace 75-90% Split and PDK	
- Outside 75-90% #2 Queen - #2 King - Inside 75-90% - Middle 75-90% PDK - Outside 75-90% PDK - DS Steel Connection Plates - #1 King Strut to top chord 60% Heavily corroded; steel delamination at edges #2 King Strut to top chord 60% Heavily corroded; steel delamination at edges #2 King Strut to top chord 60% Heavily corroded; steel delamination at edges #1 King Strut to top chord 60% Heavily corroded; steel delamination at edges #1 - King Timber Brace >90% New #1 - Queen Timber Brace >90% New #1 - Queen Timber Brace 75-90% EDK and vertical split at top Centre Timber Brace 75-90% Split and PDK	
#2 Queen - #2 King - Inside 75-90% Replaced 1933 (second hand) - Middle 75-90% PDK - Outside 75-90% PDK - Outside 75-90% FDK EF DS Steel Connection Plates FDK #1 King Strut to top chord 60% Heavily corroded; steel delamination at edges #2 King Strut to top chord 60% Heavily corroded; steel delamination at edges #2 King Strut to top chord 60% Heavily corroded; steel delamination at edges #1 King Strut to top chord 60% Heavily corroded; steel delamination at edges #1 King Strut to top chord 60% Heavily corroded; steel delamination at edges #1 King Strut to top chord 60% Heavily corroded; steel delamination at edges #1 King Strut to top chord 60% Heavily corroded; steel delamination at edges #1 - King Timber Brace >90% New #1 - Queen Timber Brace 75-90% Nut missing from bolt connecting to transom Centre Timber Brace 75-90% EDK and vertical split at top #2 - Queen Timber Brace 75-90% Split and PDK	
- Middle 75-90% PDK - Outside 75-90% EF DS Steel Connection Plates #1 King Strut to top chord 60% Heavily corroded; steel delamination at edges #2 King Strut to top chord 60% Heavily corroded; steel delamination at edges #2 King Strut to top chord 60% Heavily corroded; steel delamination at edges #1 King Timber Braces	
Image 10 00% - Outside 75-90% EF DS Steel Connection Plates #1 King Strut to top chord 60% #2 King Strut to top chord 60% #2 King Strut to top chord 60% #4 Heavily corroded; steel delamination at edges #2 King Strut to top chord 60% #4 Heavily corroded; steel delamination at edges #4 + King Timber Brace *41 - Queen Timber Brace *5-90% New #1 - Queen Timber Brace 75-90% *2 - Queen Timber Brace 75-90%	
EF DS Steel Connection Plates Heavily corroded; steel delamination at edges #1 King Strut to top chord 60% Heavily corroded; steel delamination at edges #2 King Strut to top chord 60% Heavily corroded; steel delamination at edges #2 King Strut to top chord 60% Heavily corroded; steel delamination at edges #2 King Strut to top chord 60% Heavily corroded; steel delamination at edges #2 King Strut to top chord 60% Heavily corroded; steel delamination at edges #2 King Strut to top chord 60% Heavily corroded; steel delamination at edges #2 King Strut to top chord 60% Heavily corroded; steel delamination at edges #2 King Strut to top chord 60% Heavily corroded; steel delamination at edges #2 King Strut to top chord 60% Heavily corroded; steel delamination at edges #1 Chore Stace >90% New #1 - Queen Timber Brace 75-90% Nut missing from bolt connecting to transom Centre Timber Brace 75-90% EDK and vertical split at top #2 - Queen Timber Brace 75-90% Split and PDK	
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#2 King Strut to top chord 60% Heavily corroded; steel delamination at edges EF DS Timber Braces	
EF DS Timber Braces #1 - King Timber Brace >90% #1 - Queen Timber Brace 75-90% Centre Timber Brace 75-90% EDK and vertical split at top #2 - Queen Timber Brace 75-90%	
#1 - King Timber Brace >90% New #1 - Queen Timber Brace 75-90% Nut missing from bolt connecting to transom Centre Timber Brace 75-90% EDK and vertical split at top #2 - Queen Timber Brace 75-90% Split and PDK	
#1 - King Timber Brace >90% New #1 - Queen Timber Brace 75-90% Nut missing from bolt connecting to transom Centre Timber Brace 75-90% EDK and vertical split at top #2 - Queen Timber Brace 75-90% Split and PDK	
#1 - Queen Timber Brace 75-90% Nut missing from bolt connecting to transom Centre Timber Brace 75-90% EDK and vertical split at top #2 - Queen Timber Brace 75-90% Split and PDK	
Centre Timber Brace 75-90% EDK and vertical split at top #2 - Queen Timber Brace 75-90% Split and PDK	
#2 - Queen Timber Brace 75-90% Split and PDK	
#2 - King Timber Brace 75-90% PDK	
EF DS Bottom chord (Steel)	
Pier - #1 King - Inside 75-90% Strengthened	
- Outside 60% Heavy Corrosion	
#1 King - #1 Queen - Inside 75-90% Strengthened	
- Outside 50-75% Heavy Corrosion	
#1 Queen - Centre - Inside 50-75% Moderate corrosion	
- Outside 50-75% Moderate corrosion	
Centre - #2 Queen - Inside 50-75% Moderate corrosion	
- Outside 50-75% Moderate corrosion	
#2 Queen - #2 King - Inside 50-75% Isolated heavy corrosion	
- Outside 75-90% Strengthened	
#2 King - Pier - Inside 50-75% Heavy Corrosion	
- Outside 75-90% Strengthened	



				Tru	ss SPAN F - G (Upstream)		
Span	Side	Structural Element		Estimated %	Comments		
				Original	#1 North (Hoki)		
				Capacity	#2 South (Ross)		
FG	US	Timber Struts					
					Significant surface weathering and PDK in top surface; top 1/4 section no longer		
		#1 - King Strut		70%	contributing to strength		
	-	#1 - Queen Strut		50-75%	Advanced surface decay top surface; splitting in top surface approx. 100mm deep		
					Significant splitting on top surface and inside face, full length; PDK top surface; top 1/3		
		#1 - Counter Strut		60%	section no longer contributing to strength		
		#1 - Centre Strut	- Inside	75-90%	Splitting in top surface; PDK near top		
			- Outside	50-75%	Splitting in top surface; PDK top surface and outside face		
		#2 - Centre Strut	- Inside	50-75%	PDK at base; weathering of top surface; bottom and top decay at base		
			- Outside	75-90%	Weathering of top surface		
		#2 - Counter Strut		75-90%	Weathering and splitting of top surface; PDK top surface; some splitting in side at top		
		#2 - Queen Strut		75-90%	PDK throughout		
					Replaced 1928; advance surface decay on top surface; PDK on sides, top and bottom		
		#2 - King Strut		50-75%	surface; horizontal split bolts at top; advancing decay		
FG	US	Vertical Steel Tension					
		#1 - King Rods	- Inside	60%	Heavily corroded		
			- Outside	80%	Heavily corroded		
		#1 - Queen Rods	- Inside	60%	Heavily corroded		
			- Outside	60%	Heavily corroded		
	_	#1 - Centre Rods - Inside 90-100% - Outside 90-100%		90-100%	New		
	_				New		
		#2 - Queen Rods	- Inside	50%	Heavily corroded		
		#0 King Dada	- Outside	50%	Heavily corroded		
	_	#2 - King Rods	- Inside - Outside	90%	Pitting Heavily corroded		
			- Outside	60%			
FG	US	Timber Thrust Block	(S				
		#1 - King Thrust Bloc	<	75-90%	Split in centre		
		#1 - Queen Thrust Blo	ock	<50%	Significant splitting and decay		
		Centre Thrust Block		75-90%			
		#2 - Queen Thrust Blo	ock	75-90%			
		#2 - KingThrust Block <50%		<50%	Significant decay across top in line of tension rods.		
FG	US	Timber A-Blocks					
10	00	#1 - Queen A-Blocks		75-90%	Small CDK inside end		
		Centre A-Block		75-90%	Small CDK inside end		
		#2 - Queen A-Block		75-90%			
				75-5078			
FG	US	Timber Saddle Bloc	ks				
			-	50.750/	Significant EDK (approx 1/3 of end approaching 1/2) extending to top surfce; dull		
		#1 - King Saddle Bloc		50-75%	sound at top		
		#1 - Queen Saddle Bl	ock	75-90%	Replaced 1967; small CDK inside end; soft		
				50-75%			
		Centre Saddle Block			CDK inside end approx. 80mm diameter extending to base of saddle block		
		#2 - Queen Saddle Bl		50-75%	CDK inside end extending up to top surface		
		#2 - King Saddle Bloc	К	50-75%	EDK inside end (approx. 1/3 of end approaching 1/2); dull sound on northern face		

				Tru	iss SPAN F - G (Upstream)
FG	US	Top Chord			
		#1 King - #1 Queen	- Inside	75-90%	Inside face splits
			- Middle	75-90%	Weathered
			- Outside	75-90%	Weathered
		#1 Queen - Centre	- Inside	75-90%	Inside face splits
			- Middle	75-90%	Weathered; moss growing
			- Outside	75-90%	Weathered; moss growing
		Centre - #2 Queen	- Inside	75-90%	Horizontal splitting inside face
			- Middle	75-90%	Isolated PDK
			- Outside	50-75%	PDK inside face, approx. 50% loss of section
		#2 Queen - #2 King	- Inside	75-90%	Weathered
			- Middle	75-90%	
			- Outside	75-90%	Weathered; PDK
FG	US	Steel Connection Pla			
		#1 King Strut to top ch		30%	Heavily corroded; bolts gone
		#2 King Strut to top chord		70%	Heavily corroded; bolts gone
FG	US	Timber Braces			
		#1 - King Timber Brac	e	75-90%	Splitting and surface decay at base; nut missing from bolt connecting to saddle
				75-90%	Large split through centre; PDK outside edge near base; nut missing from bolt
		#1 - Queen Timber Br	ace		connecting to saddle; bolt missing at base
		Centre Timber Brace		<50%	Top end completed decayed; organic matter growing
		#2 - Queen Timber Br		75-90%	Nut missing at bottom; replace bottom bolt
		#2 - King Timber Brac	e	75-90%	PDK at bottom around bolts
_					
FG	US	Bottom chord (Steel			
		Pier - #1 King	- Inside	50-75%	Heavy corrosion
			- Outside	<50%	Approaching severe corrosion
		#1 King - #1 Queen	- Inside	50-75%	Heavy corrosion
			- Outside	50-75%	Heavy corrosion
		#1 Queen - Centre	- Inside	50-75%	Moderate corrosion
			- Outside	50-75%	Moderate corrosion
		Centre - #2 Queen	- Inside	50-75%	Moderate corrosion
			- Outside	50-75%	Moderate corrosion
		#2 Queen - #2 King	- Inside	50-75%	Heavy corrosion
			- Outside	<50%	Severe corrosion
		#2 King - Pier	- Inside	50-75%	Heavy corrosion
			- Outside	<50%	Severe corrosion



				Truss	SPAN F - G (Downstream)		
Span	Side	e Structural Element Estimated % C			Comments		
				Original	#1 North (Hoki)		
				Capacity	#2 South (Ross)		
FG	DS	Timbor Struto					
10	03	Timber Struts		75.000/	Replaced 1977		
		#1 - King Strut		75-90%			
		#1 - Queen Strut #1 - Counter Strut		75-90%	Replaced 1965; splitting top surface		
			lasida	75-90%	Curface weethering: aplitting		
		#1 - Centre Strut	- Inside	75-90%	Surface weathering; splitting Surface weathering		
		#0 Combro Obrut	- Outside	75-90%	Surface weathering; splitting top surface		
		#2 - Centre Strut	- Inside	75-90%	Surface weathering; bottom face splitting at top		
			- Outside	75-90%			
		#2 - Counter Strut		75-90%	Weathering and splitting		
		#2 - Queen Strut		50-75%	Some hollowing in bottom end; PDK top surface; weathered throughout		
		#2 - King Strut		75-90%			
FG	DS	Vertical Steel Tensio	n Rods				
	1	#1 - King Rods	- Inside	50%	Heavily corroded		
		U	- Outside	80%	Heavily corroded		
		#1 - Queen Rods	- Inside	60%	Heavily corroded		
		+1 - Centre Rods - Inside		60%	Heavily corroded		
				60%	Heavily corroded		
			- Outside	80%	Heavily corroded		
		#2 - Queen Rods	- Inside	85%	Light corrosion		
			- Outside	70%	Heavily corroded		
		#2 - King Rods	- Inside	70%	Heavily corroded		
			- Outside	60%	Heavily corroded		
FG	DS	Timber Thrust Block		75.000/			
		#1 - King Thrust Block		75-90%	Concil explicit minima from the subside of subside the red		
		#1 - Queen Thrust Blo	OCK	75-90%	Small section missing from top outside of outside tie rod		
		Centre Thrust Block	.l.	75-90%	Centre split		
		#2 - Queen Thrust Blo	OCK	75-90%			
		#2 - King Thrust Block	(75-90%	CDK started on outside face; small section missing from top outside of outside tie rod		
50	De	Timber A-Blocks					
FG	DS			75-90%			
	+	#1 - Queen A-Block Centre A-Block		75-90%	CDK inside end approx. 100mm+ diameter		
	-	#2 - Queen A-Block		75-90%			
				10 00 /0			
FG	DS	Timber Saddle Block	s				
		#1 - King Saddle Bloc		75-90%	EDK at windbrace connection		
		#1 - Queen Saddle Bl	ock	75-90%	Vertical split through inside face		
				<50%	PDK; outside tension rod loose due to saddle block crushing; 30% section gone by		
		Centre Saddle Block	[.		crushing		
		#2 - Queen Saddle Blo		75-90%	EDK at windbrace connection; CDK inside approx 70mm diameter		
		#2 - King Saddle Bloc	ĸ	75-90%	Significant EDK at outside end; up to 20% CDK inside end		

				Trus	s SPAN F - G (Downstream)
FG	DS	Top Chord			
		#1 King - #1 Queen	- Inside	75-90%	Splitting and PDK top surface; EDK and southern end
			- Middle	75-90%	
			- Outside	75-90%	
		#1 Queen - Centre	- Inside	<50%	Splitting in top surface; heavy bottom decay
			- Middle	75-90%	
			- Outside	75-90%	PDK
		Centre - #2 Queen	- Inside	75-90%	Weathered
			- Middle	75-90%	Weathering
			- Outside	75-90%	Weathering
		#2 Queen - #2 King	- Inside	75-90%	
			- Middle	75-90%	
			- Outside	75-90%	
FG	DS	Steel Connection Pl			
		#1 King Strut to top cl		70%	Heavily corroded, bolts gone
		#2 King Strut to top cl	hord	60%	Heavily corroded, bolts gone
50	-				
FG	DS	Timber Braces			
		#1 - King Timber Brace		75-90% 75-90%	
			Queen Timber Brace		Split through centre at top end
		Centre Timber Brace		>90%	New
		#2 - Queen Timber Brace #2 - King Timber Brace		>90%	New
				75-90%	
FG	DS	Bottom chord (Steel)		
		Pier - #1 King	- Inside	50-75%	Heavy corrosion
	-		- Outside	<50%	Severe corrosion
		#1 King - #1 Queen	- Inside	<50%	Severe corrosion
			- Outside	<00 % 50-75%	Heavy corrosion
		#1 Queen - Centre	- Inside	50-75%	Moderate corrosion
			- Outside	50-75%	Moderate corrosion
		Centre - #2 Queen	- Inside	50-75%	Moderate corrosion
			- Outside	50-75%	Moderate corrosion
		#2 Queen - #2 King	- Inside	<50%	Severe corrosion
		<u>_</u>	- Outside	<50%	Isolated severe corrosion
		#2 King - Pier	- Inside	<50%	Severe corrosion
			- Outside	50-75%	Heavy corrosion

				Truss SPAN	G - H (Upstream)	
Span	Side	Structural Element		Estimated %	Comments	
				Original	#1 North (Hoki)	
				Capacity	#2 South (Ross)	
GH	US	Timber Struts				
on	03	#1 - King Strut		70%	Extensive surface weathering and splitting	
		#1 - Queen Strut		_		
		#1 - Queen Strut #1 - Counter Strut		75-90% 75-90%		
		#1 - Counter Strut	- Inside	<50%	Large PDK inside face; splitting	
			- Inside - Outside	_	Splitting and associated PDK; ropey top surface	
			- Outside	<50%	Vertical splitting top surface; small PDK at base	
		#2 - Centre Strut	_	75-90% 75-90%	Vertical splitting top surface	
			- Outside	75-90%	PDK both ends; some horizontal splitting; weathering and surface	
		#2 Counter Strut		75-90%	decay on top surface	
		#2 - Counter Strut		75.000/	Repaced 1960; Splitting and PDK top surface	
		#2 - Queen Strut		75-90%		
		#2 - King Strut		70%	Vertical splitting and PDK top surface up to 60mm deep	
GH	US	Vertical Steel Tensi	on Rods			
		#1 - King Rods	- Inside	85%	Surface corrosion	
ļ	1		- Outside	60%	Heavily corroded	
		#1 - Queen Rods	- Inside	80%	Heavily corroded	
			- Outside	60%	Heavily corroded	
		#1 - Centre Rods	- Inside	80%	Heavily corroded	
			- Outside	50%	Heavily corroded	
		#2 - Queen Rods	- Inside	70%	Heavily corroded	
			- Outside	95%	Light surface corrosion	
		#2 - King Rods	- Inside	80%	Heavily corroded	
			- Outside	90%	Heavily corroded	
GH	US	Timber Thrust Blocks				
		#1 - King Thrust Block		75-90%		
				75-90%	Second hand (replaced); PDK top surface; small PDK inside of	
		#1 - Queen Thrust Bl	ock	75-90%	inside rod	
		Centre Thrust Block		75-90%		
		#2 - Queen Thrust Bl	ock	75-90%		
				75-90%	Second hand (replaced); Some decay along top through centre;	
		#2 - King Thrust Bloc	k	75-5078	cement repair outside north corner	
GH	US	Timber A-Blocks				
		#1 - Queen A-Block		75-90%	Split with some decay south edge	
		Centre A-Block		75-90%	Small CDK inside end; small PDK behind strut	
		#2 - Queen A-Block		75-90%	Small CDK and some splitting through end	
CЦ		Timbor Coddle DI	ko			
GH	US	Timber Saddle Bloc	rs		I area antitingida and from tan ta contra: Cignificant EDV autoida	
		#1 - King Saddle Bloo	ck	50-75%	Large split inside end from top to centre; Significant EDK outside end; sounds hollow; ply over inside end	
					, , , p.,	
		#1 - Queen Saddle B	lock	50-75%	Large EDK extending full depth; souds hollow underneath bolts	
		Centre Saddle Block		<50%	Large CDK inside end full depth of saddle; ply covered inside end	
		#2 - Queen Saddle B	lock	75-90%	CDK starting at inside end with vertical crack	
		#2 - King Saddle Bloo	ck	75-90%	Large CDK inside end through centre extending to top surface; outside end similar; sounds very hollow; cement patched	

Truss SPAN G - H (Upstream)	Truss	SPAN	G - H	(Upstream)
-----------------------------	-------	------	-------	------------

	1				
GH	US	Top Chord			
		#1 King - #1 Queen	- Inside	75-90%	Replaced 1960; some splitting and PDK inside face
			- Middle	75-90%	
			- Outside	75-90%	Significant weathering and PDK inside face
		#1 Queen - Centre	- Inside	75-90%	Large PDK inside face
			- Middle	75-90%	
			- Outside	75-90%	Small PDK on top; splitting on inside face; significantly weathered
		Centre - #2 Queen	- Inside	75-90%	Replaced 1960; Large split on inside face
			- Middle	75-90%	Replaced 1960
			- Outside	75-90%	Significantly weathered
		#2 Queen - #2 King	- Inside	75-90%	Replaced 1960; PDK and splitting inside face
			- Middle	75-90%	Replaced 1960
			- Outside	75-90%	Weathered top surface
		Steel Connection Plates			
H	US			30%	Heavily corroded; bolts gone
		#1 King Strut to top chord #2 King Strut to top chord		40%	Heavily corroded; bolts gone
			IUIU	40%	
GH	US	Timber Braces			
		#1 - King Timber Brac	e	>90%	New
		#1 - Queen Timber Bi	race	>90%	New
		Centre Timber Brace		>90%	New
		#2 - Queen Timber Bi	race	>90%	New; dark staining south face
		#2 - King Timber Brac	e	>90%	New
			-		
H	US	Bottom chord			
		Pier - #1 King	- Inside	50-75%	Moderate corrosion
			- Outside	<50%	Severe corrosion
		#1 King - #1 Queen	- Inside	50-75%	Heavy corrosion
			- Outside	50-75%	Heavy corrosion
		#1 Queen - Centre	- Inside	50-75%	Moderate corrosion
			- Outside	50-75%	Heavy corrosion
		Centre - #2 Queen	- Inside	50-75%	Heavy corrosion
			- Outside	50-75%	Heavy corrosion
		#2 Queen - #2 King	- Inside	50-75%	Heavy corrosion
			- Outside	75-90%	Strengthened
		#2 King - Pier	- Inside	50-75%	Heavy corrosion
			- Outside	75-90%	Strengthened

				Truss SPAN G	- H (Downstream)
Span	Side	Structural Element		Estimated % Original Capacity	Comments #1 North (Hoki) #2 South (Ross)
GH	DS	Timber Struts			
		#1 - King Strut		75-90%	Weathering; PDK on top face
		#1 - Queen Strut		75-90%	Significant surface cracking top surface and inside face
		#1 - Counter Strut		75-90%	Weathering; splitting on top
		#1 - Centre Strut	- Inside	75-90%	Some cracking and isolated PDK
			- Outside	75-90%	Some cracking and isolated PDK
		#2 - Centre Strut	- Inside	75-90%	Split at top; splits and PDK throughout
			- Outside	75-90%	Split with PDK at top
		#2 - Counter Strut		<50%	Significant loss of section at bottom end through decay
		#2 - Queen Strut		75-90%	Top surface weathering
		#2 - King Strut		75-90%	Replaced 1933 (second hand); surface decay inside face
GH	DS	Vertical Steel Tens	ion Rods		
		#1 - King Rods	- Inside	85%	Corrosion
			- Outside	70%	Corrosion
		#1 - Queen Rods	- Inside	50%	Heavily corroded
			- Outside	50%	Heavily corroded
		#1 - Centre Rods	- Inside	95%	Light surface corrosion only
			- Outside	>90%	New
		#2 - Queen Rods	- Inside	60%	Heavily corroded
			- Outside	60%	Heavily corroded
		#2 - King Rods	- Inside	90%	Corrosion
			- Outside	80%	Corrosion
GH	DS	Timber Thrust Blog	ks		
		#1 - King Thrust Blo		50-75%	Top section loss
		#1 - Queen Thrust E		75-90%	
		Centre Thrust Block		75-90%	Centre split
		#2 - Queen Thrust B	lock	75-90%	
		#2 - King Thrust Blo		75-90%	Weathering
011	D 0			_	
GH	DS	Timber A-Blocks			 CDK: PDK and splitting on counter strut side: signs of compression
		#1 - Queen A-Block		<50%	CDK; PDK and splitting on counter strut side; signs of compression; replace within 5yrs
		Centre A-Block		75-90%	Small PDK around strut
	+	#2 - Queen A-Block		75-90%	

			-	Truss SPAN G	G - H (Downstream)
GH	I DS Timber Saddle Blo		nber Saddle Blocks		
		#1 - King Saddle Block #1 - Queen Saddle Block		50-75%	CDK; PDK top at top; ply covered
				<50%	Large CDK inside end; replace within 5 years
		Centre Saddle Block		75-90%	EDK outside end and inside end
		#2 - Queen Saddle Bl	ock	75-90%	Some surface decay and weathering
		#2 - King Saddle Bloc	k	75-90%	EDK; all round vegetation growing
				•	
GH	DS	Top Chord			
		#1 King - #1 Queen	- Inside	75-90%	Splice plate over A-block
			- Middle	75-90%	
			- Outside	75-90%	Large PDK around bolts; completely gone near #1 Queen A-block
		#1 Queen - Centre	- Inside	<50%	PDK around splice; plate strengthened
			- Middle	75-90%	
			- Outside	75-90%	Plate strengthened
		Centre - #2 Queen	- Inside	75-90%	
			- Middle	75-90%	
		1	- Outside	75-90%	PDK around bolts
		#2 Queen - #2 King	- Inside	75-90%	Weathered
		ľ	- Middle	75-90%	Replaced 1974 (second hand)
			- Outside	75-90%	Moss growth
GH	DS	Steel Connection Plates			
		#1 King Strut to top cl		50%	Heavily corroded; bolts gone
		#2 King Strut to top cl	nord	70%	Heavily corroded, bolts gone
GH	DS	Timber Braces			
		#1 - King Timber Brac	<u>се</u>	>90%	New; splintered at top
		#1 - Queen Timber Bi		>90%	New
		Centre Timber Brace		>90%	New
		#2 - Queen Timber Br		50-75%	Spilt through lower half of brace
		#2 - King Timber Brad		>90%	New
				0070	
GH	DS	Bottom chord			
		Pier - #1 King	- Inside	<50%	Severe corrosion
			- Outside	<50%	Severe corrosion
		#1 King - #1 Queen	- Inside	<50%	Severe corrosion
			- Outside	<50%	Severe corrosion
		#1 Queen - Centre	- Inside	50-75%	Heavy corrosion
			- Outside	50-75%	Heavy corrosion
		Centre - #2 Queen	- Inside	50-75%	Heavy corrosion
			- Outside	50-75%	Heavy corrosion
		#2 Queen - #2 King	- Inside	50-75%	Heavy corrosion
			- Outside	50-75%	Heavy corrosion
		#2 King - Pier	- Inside	50-75%	Heavy corrosion
			- Outside	50-75%	Heavy corrosion

Span				TRANSOMS (per span)
- P	Side	Structural Element	Estimated %	
			Original	#1 North (Hoki)
			Capacity	#2 South (Ross)
CD	US	#1 King Transom	75-90%	Bolts heavily corroded; horizontal split US; EDK DS
	DS	#1 King Transom	75-90%	Replaced 1960
	US	#1 Queen Transom	75-90%	Condition of bolts is mixed; EDK upstream
	DS	#1 Queen Transom	<50%	Replaced 1944; PDK downstream end; EDK severe
<u> </u>	US DS	Centre Transom Centre Transom	75-90% 75-90%	Weathered; EDK; cement reapir; bolts corroded and missing Replaced 1977 (second hand); PDK top surface between road beams; bolts corroded and missing; horizontal split DS
	US	#2 Queen Transom	75-90%	Replaced 1977 (second namp), PDR top surface between road beams, boils confided and missing, nonzontal spin DS
	DS	#2 Queen Transom	75-90%	Replaced 1960; weathered; horizontel crack and EDK both ends
	US	#2 King Transom	75-90%	Replaced 1977; small surface defect top surface between RH truss and RH road beam
	DS	#2 King Transom	75-90%	Replaced 1967 (second hand); organic growth; horizontal splitting
	-	, , , , , , , , , , , , , , , , , , , 		
DE	US	#1 King Transom	<50%	large CDK; Sounds hollow under road beams; EDK and splititng both ends
	DS	#1 King Transom	<50%	Significant EDK upstream end; sounds hollow under truss; EDK downstream and fixings corroded
	US	#1 Queen Transom	50-75%	Sounds hollow under US road beam; top decay and weathering, splitting, CDK, EDK
	† ·			Honey combing and surface decay downstream end; large split between DS road beam and DS truss; small CDK upstream end;
	DS	#1 Queen Transom	75-90%	plate repair DS end with cement
	US	Centre Transom	50-75%	Sounds hollow under US road beam; weathering; splitting; EDK US
	DS	Centre Transom	75-90%	Isolated PDK south face; surface weathering and decay; weathering; splitting, EDK DS
				Replaced 1960; large CDK downstream end extending back to thrust block; EDK upstream end; large PDK northern face between
	US	#2 Queen Transom	50-75%	DS road beam and DS truss; bolts/fixings corroded
	DS	#2 Queen Transom	50-75%	Replaced 1960; EDK upstream end; condition of bolts is mixed - Splitting DS end
<u> </u>	US	#2 King Transom	75-90%	Condition of bolts is mixed; EDK upstream and downstream
	DS	#2 King Transom	75-90%	PDK
	1110			
EF	US	#1 King Transom	75-90%	Replaced 1975; weathered EDK DS; US end split
	DS	#1 King Transom	75-90%	Some horizontal splitting downstream end; condition of bolts is mixed; nuts misisng
	US DS	#1 Queen Transom	75-90%	Replaced 1977; splitting DS end Split through top at upstream end
	US	#1 Queen Transom Centre Transom	75-90% 75-90%	Replaced 1944; weathered; splitting at ends
	DS	Centre Transom	75-90%	Split through top at upstream end; EDK; PDK throughout
	US	#2 Queen Transom	75-90%	Replaced 1960; splitting DS end
			10 00/0	Significant EDK upstream end extending up to 1.5m from end; extensive surface decay on top surface; member collapsing inward;
	DS	#2 Queen Transom	50-75%	(likely replacement required); EDK DS; end plate strengthend
	US	#2 King Transom	75-90%	Condition of bolts is mixed; 5 splice bolts between transoms are missing; EDK both ends, PDK; Replaced 1933
	DS	#2 King Transom	75-90%	Horizontal split DS end
FG	US	#1 King Transom	75-90%	PDK top surface; EDK upstream end; condition of bolts mixed
	DS	#1 King Transom	75-90%	End splitting upstream end; CDK DS end 200m diameter
	US	#1 Queen Transom	75-90%	Replaced 1944; condition of bolts is mixed; splits at both ends
	DS	#1 Queen Transom	75-90%	
	US	Centre Transom	75-90%	large horizontal split through side at upstream end - install vertical split bolts
	DS	Centre Transom	75-90%	large CDK / EDK upstream end; surface decay / weathering on top surface; EDK DS
	US	#2 Queen Transom	75-90%	Weathered; EDK US
	DS	#2 Queen Transom	75-90%	Splitting downstream end; install vertical split bolts CDK downstream end; large PDK south face; PDK upstream face; hollow sound from LH truss to end; cement repair south face and
1	US	#2 King Transom	50 75%	CDK downstream end, large PDK south face, PDK upstream face, nollow sound from LH truss to end, cement repair south face and plate repair US
	DS	#2 King Transom #2 King Transom	50-75% 75-90%	Weathered; splitting on north and south face with associated decay
	00		10-00/0	
GH	US	#1 King Transom	50-75%	Small EDK upstream end; splitting; sounds drummy
<u></u>	DS	#1 King Transom	75-90%	EDK US
	US	#1 Queen Transom	75-90%	Large CDK downstream end; significant weathering; PDK
	DS	#1 Queen Transom	75-90%	large CDK downstream end; significant reactioning, i DK
	US	Centre Transom	50-75%	Significant weathering; large PDK upstream end; sounds drummy
	DS	Centre Transom	75-90%	Horizontal split through centre at downstream end; install vertical split bolts; replaced 1961
	US	#2 Queen Transom	75-90%	Replaced 1977; PDK
	1			Significant EDK upstream end in horizontal plane, extending back under truss; large PDK south face; significant weathering; soft;
	DS	#2 Queen Transom	50-75%	plate repair effectiveness questionable due to significant DS end decay
	US	#2 King Transom	75-90%	Surface weathering EDK and splitting US
	03			

					PIERS (Ab	utment A - Abutment J)		
Pier	Structural Assessment /				, i			
			Recommendation			Comments		
		Sound /			% of			
		Treatment	Investigate		Original	#1 North (Hoki)		
		only	Further	Replace	Capacity	#2 South (Ross)		
Abut. A	Piles							
Abut. A	Upstream Pile	•				PDK at top where previously drilled; general splitting and weathering		
Abut. A	Centre Pile	•				Surface soft but sound underneath; general weathering		
A	Downstream Pile					Surface splitting; EDK at top where previously drilled; excavation around pile showed pile sound belov ground (2010?)		
Abut. A		•						
Abut. A	Pile Cap	•				CDK both ends; significant weathering and splitting; appears sound over piles		
Abul. A								
	Abutment Wells Timber							
	Abutment Walls - Timber facing					Top part collapsing; ends gone; otherwise appears ok		
	Abutment Walls - Vertical							
Abut. A	Railway Irons	•			60%	Extensive corrosion		
Pier B	Piles							
						Surface splitting and weathering; PDK under pile cap, at top of pile, and several small isolated PDK		
Pier B	Upstream Pile	•				along pile		
		1				Small outer section missing top and US end; vertical splitting and weathering; small loss of outer		
Pier B	Centre Pile	•				section at ground level; excavation around pile showed pile sound below ground		
Pier B	Downstream Pile	•				Large vertical splits in top 1/3 pile; hollow sound at top likely due to splitting; large PDK at top;		
Pier B	Upstream Cut Water Pile	•				EDK and splitting at top; vegetation growth all around		
Pier B	Downstream Cut Water Pile	•				Not inspected due to vegetation		
Pier B	Raker Studs							
Pier B	Upstream Raker Stud					Significant decay at bottom; significant weathering; top surface has honeycomb effect and worm holes		
	Downstream Raker Stud	-	•			Not inspected to due vegetation		
			-					
Pier B	Diagonal Bracing							
Pier B	Cross bracing	•			70%	Steel railway iron; varying amounts of corrosion		
-								
Pier B	Whaling's							
Pier B	Whaling's	•			50%	Steel railway irons; heavily corroded		
Pier B	Pile Cap	•				Replaced 1975; surface decay North Face		
	Piles							
	Pile #1	•				Vertical splitting above whalers		
	Pile #2	•				Vertical splitting above whalers		
	Pile #3	•				Deep splits / pockets on north face from spikes >1/2 depth over 2m length		
	Pile #4	•				Vertical splitting above whalers; surface loss US stream		
	Pile #5	•				Replaced 1961		
Pier C	Pile #6	•				Splitting; weathering; block bolted to outside face at top to support pile cap		
Diar O	Dilo #7					Large CDK just above whaler; sound at ground and cap		
Pier C	Pile #7		•			- Consider splicing in section of pile or redundant; h ollow sounding		
Diar O	Pile #8					Large CDK just above whaler; sound at ground and cap - Consider splicing in section of pile or redundant		
	Upstream cut-water pile		•			- Consider splicing in section of pile or redundant Has sunk approx 600mm; significant splitting and decay at top		
Pier C Pier C	Downstream cut-water pile	•	-			Splitting and small EDK at top		
		- `						
Pier C	Raker Studs							
						Has come free of fixing at top due to sinking cut-water pile; large split and EDK at top; large split		
Pier C	Upstream Raker Stud			•		upstream face; weathered		
	_				1	Splitting, surface weathering and significant decay downstream face; large CDK / EDK at base		
Pier C	Downstream Raker Stud			•		- Probable replacement		
					ļ			
	Diagonal Bracing							
Pier C	Cross Bracing	•			70%	Railway iron cross bracing; varying amounts of corrosion		
D' O	M/h = lin = li	l						
	Whaling's					All presents individual appropriate of each scholar and environments		
Pier C	Whaling's	•				All present; individual assessment of each whaler not carried out		
						All whalings significantly deteriorated		

					PIERS (Ab	utment A - Abutment J)
Pier Number	Structural Element	Re	tural Assessn commendati		Estimated	Comments
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	#1 North (Hoki) #2 South (Ross)
Pier C	Pile Caps	,				
Pier C	Pile Cap #1	•				Replaced 1975; EDK downstream end; PDK upstream
Pier C	Pile Cap #2	•				Splitting and associated CDK downstream end; EDK and splitting upstream end
Pier C	Pile Cap #3	•				Splitting and EDK starting downstream end; EDK upstream end; PDK centre
						Large end section gone downstream end; large PDK along length and extensive decay upstream end
Pier C	Pile Cap #4			•		and ineffective - Replace or consider redundant
D i 0	O ante a la				-	
Pier C	Corbels LH Truss Corbel - Inside					Replaced 1975 second hand; vertical split north end
Pier C Pier C	- Outside	•				PDK outside face: weathered
Pier C Pier C	RH Truss Corbel - Inside	•				Replaced 1975 second hand; minor end splitting
Pier C	- Outside	•				EDK and splitting both ends
Pier C	Packers Between Pile Cap and Beam Corbel					
Pier C	Perpendicular to corbel	•				4 no. total; weathered
						Weathered but generally sound except for packer under LH corbel which has significant decay; all deteriorated
Pier C	Parallel to corbel	•	•			- Consider packing or replacement
Pier D	Piles					
Pier D	Pile #1	Ì	•			Extensive CDK at top; vertical splitting above whalers at spike locations
Pier D	Pile #2		•			Major splitting and decay on outside face and other areas; sound at base and top
Pier D	Pile #3	•				Vertical splitting above whalers
Pier D	Pile #4	•				Advanced EDK at top; vertical splitting above whalers
Pier D	Pile #5		•			Splitting and associated decay on outside face due to spikes; sounds drummy above whaler; possible CDK
Pier D	Pile #6		•			Splitting and associated decay on outside face going into centre due to spikes; possible CDK; deep split >1/2 depth
Pier D	Pile #7		•			Splitting and associated decay outside face but appears sounds; sounds drummy at top - Investigate top further
Pier D	Pile #8	•				EDK at top; splitting and associated decay due to spike holes
Pier D	Upstream cut-water pile		•			Significant CDK / EDK
Pier D	Downstream cut-water pile	•				
Pier D	Raker Studs					Packer missing at top; significant splitting and decay on north face; large split and CDK at base
Pier D	Upstream Raker Stud		•			- Possible replacement
Pier D	Downstream Raker Stud	•				Weathering and splitting on sides and downstream face
Pier D	Diagonal Bracing					
Pier D	Cross bracing	•			50%	Heavily corroded railway irons
	Whaling's					
Pier D	Whaling's					All present; individual assessment of each whaler not carried out; US North end missing between pile
Pier D	Whaling's	•				1 and raker stud
Pier D	Pile Caps					
Pier D	Pile Cap #1	•				Typically split and EDK
Pier D	Pile Cap #2	•				Typically split and EDK
Pier D	Pile Cap #3	•				Replaced 1960; typically split and EDK Replaced 1967 second hand; typically split and EDK
Pier D	Pile Cap #4	•				replaceu 1907 second nand, typically Split and EDK
Pier D	Corbels					
Pier D	US Truss Corbel - Inside	•			I	
Pier D	- Outside	•			I	End Splitting
Pier D	DS Truss Corbel - Inside	•				Splitting at south end
Pier D	- Outside	•				EDK both ends
Pier D	Packers Between Pile Cap and Beam Corbel					
Pier D	US Beam	•				Weathered and deteriorated
-	DS Beam	•				Weathered and deteriorated
Pier D	DS Dealli					

					PIERS (Abu	utment A - Abutment J)
Pier Number	Structural Element	Re	ural Assessn commendatio		Estimated	Comments
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	#1 North (Hoki) #2 South (Ross)
Pier E	Piles					
						EDK at top; typical splitting and decay on outside face; deep split
Pier E	Pile #1		•			- worst pile of group therefore recommend investigating
Pier E	Pile #2	•				Typical splitting and decay on outside face
Pier E	Pile #3	•				Typical splitting and decay on outside face
						Large split and associated decay on outside face due to spike holes; CDK; excavation around pile
Pier E	Pile #4			•		showed pile sound below ground; only shell remaining above whaler - Investigate or may be redundant
						EDK at top; deep splitting and associated decay all around pile; numerous drill holes from previous
Pier E	Pile #5		•			investigations
Pier E	Pile #6	•				Minor splitting and associated decay
D' E	Dila #7					Tuning politing and decay on outside force execution around alls should alls accordingly ground
Pier E Pier E	Pile #7 Pile #8	•				Typical splitting and decay on outside face; excavation around pile showed pile sound below ground EDK at top; evidence of insect attack; significant splitting and associated decay
Pier E	Upstream cut-water pile	•				Splitting and EDK at top
Pier E	Downstream cut-water pile	•				Significant EDK at top, full of soil
				1		
Pier E	Raker Studs					
Pier E	Upstream Raker Stud	•				Splitting and EDK at top; some debris
Pier E	Downstream Raker Stud		•			Significant weathering / splitting and associated decay; EDK at base; possible CDK at connection to cut-water pile
Pier E	Diagonal Bracing					
Pier E	Brace #1	•			50%	Heavily corroded railway irons
Pier E	Brace #2	•			50%	Heavily corroded railway irons
Pier E	Whaling's					
	\A/l= =1: =1-					Whalers all there; soil + vegetation on top of whalers; individual assessment of each whaler not carried
Pier E	Whaling's	•				out; weathered; deteriation around fixings
Pier E	Pile Caps					
Pier E	Pile Cap #1	•				Replaced 1977; typical splitting and EDK
Pier E	Pile Cap #2	•				Typical splitting and EDK
Pier E	Pile Cap #3 Pile Cap #4	•				Replaced 1977; minor splitting downstream end only; typical splitting and EDK Typical splitting and EDK
Pier E	File Cap #4	•				
Pier E	Corbels					
Pier E	US Truss Corbel - Inside	•				
Pier E	- Outside	•				
Pier E	DS Truss Corbel - Inside	•				
Pier E	- Outside	•				Small EDK and splitting south end
	Deskars Detween Dile Ore					
Pier E	Packers Between Pile Cap and Beam Corbel					
Pier E	US Beam	•				Typical sound; packer directly under and parallel to corbel is sound but packer on outside is not
						Small amount of decay on downstream packer // to corbel - not supporting corbel; otherwise typically
Pier E	DS Beam	•				sound
Dian	Dilas					
Pier F	Piles					
Pier F	Pile #1	•				Vertical split at top; timber on outside covering spike lines; isolated honeycombing
Pier F	Pile #2					EDK at top; typical splitting outside face; multiple drill holes; small amount of decay at each seating; excavation around pile showed pile sound below ground; deep pockets
Pier F Pier F	Pile #2 Pile #3	•				Decay below whater at seating on inside of pile; 2023 debris below whater
Pier F	Pile #4	•				Typical splitting outside face
Pier F	Pile #5	•		1	1	Significant EDK at top; vertical splitting on outside face; minor splitting elsewhere
Pier F	Pile #6	•				Minor honeycombing through midsection; minor splitting
Pier F	Pile #7	•				Minor splitting and decay; excavation around pile showed pile sound below ground
Dia 5	Dilo #9					Minor splitting on outside face; excavation around pile showed pile sound below ground; splits and
Pier F	Pile #8 Upstream cut-water pile	•				surface decay
Pier F Pier F	Downstream cut-water pile	•				EDK at top; appears sound at attachment to raking stud
	Bownou can out-water pile	<u>├</u>				בבית מרוסף, מטיטיים של מונגמוווזיפות נס זמתווא שלומי
		I				

					PIERS (Ab	utment A - Abutment J)
Pier		Struct	ural Assessr	nent /		
Number	Structural Element		commendati	on	Estimated	Comments
		Sound /			% of	
		Treatment only	Investigate Further	Replace	Original Capacity	#1 North (Hoki) #2 South (Ross)
D' E	Raker Studs	onny		Replace	Capacity	
Pier F	Raker Studs					Minor splitting along lines of spikes
Pier F	Upstream Raker Stud	•				Fenders in good condition, SH61 (inside), SH77 (outside / upstream)
						Significant CDK; decay on downstream face to 1/2 depth; vegetation
Pier F	Downstream Raker Stud			•	30%	- Replace or consider redundant
Pier F	Diagonal Bracing					
Pier F	Cross bracing	•			50%	Steel railway irons; varying amounts of corrosion
Pier F	Whaling's				-	
Pier F	Whaling's	•				All present; vegetation on top; weathered and deteriorated
Diar E	Pile Caps					
Pier F Pier F	Pile Cap #1	•				Replaced 1944; end splitting typical
Pier F	Pile Cap #2	•				Replaced 1977; end splitting typical
Pier F	Pile Cap #3	•				Replaced 1977; end splitting typical
Pier F	Pile Cap #4	•				End splitting typical
		1			1	1 U VE **
Pier F	Corbels					
Pier F	US Truss Corbel - Inside	•	1		1	
Pier F	- Outside	•				Replaced 1967; EDK both ends
Pier F	DS Truss Corbel - Inside		•			Vertical split north end; large CDK south end
Pier F	- Outside	•				Replaced 1960; vertical split north end; EDK South
Diar E	Packers Between Pile Cap and Beam Corbel					
Pier F						Typically 2 no. parallel to corbel and 4 no. perpendicular; packer #1 perpendicular to corbel dozy;
Pier F	US Beam	•				others typically sound; perpendicular ones generally deteriorated
Pier F	DS Beam	•				Generally deteriorated
-						
Pier G	Piles					
Pier G	Pile #1	•				Isolated weathering and honeycombing; timber covering spike holes
						Typical splitting on outside face from spikes up to 100mm deep; surface decay and weathering; packer
	D" "0					missing at top to cap
Pier G	Pile #2	•				 Reinstate packer at top to pile cap Typical splitting on outside face from spikes; lower 2/3 of pile has advanced surface decay and
						splitting; advanced decay at top below cap
Pier G	Pile #3	•				- Further assess decay at top when treating
Pier G	Pile #4	•				Minor splitting at top; typical splitting and decay
					700/	Split running approx. 1m down pile from backside of seating at top; typical splitting due to spikes
Pier G	Pile #5	•			70%	- Replace split bolt at top
						Vertical split extending down from cap seat; split bolt corroded; typical vertical splitting on outside face
						extending into core
Pier G	Pile #6	•				- Replace split bolt at top
						Large split and EDK at top; outside face covered in timber; large vertical split extends down approx.
	Dilo #7					600mm from cap seating; split bolt corroded
Pier G	Pile #7	•				- Replace split bolt at top
Disco	Dile #9					Large split and EDK at top; vertical split and PDK behind brace connection at top; typical splitting on
Pier G	Pile #8	•				outside face Debris build up against
Pier G	Upstream cut-water pile Downstream cut-water pile	•				Debris build up against Minor splitting and weathering; some EDK
Pier G		•				ואווזיטי שאונווא מווע שכמווכוווא, שוווכ בטוע
Pier G	Raker Studs		-			
Pier G Pier G	Upstream Raker Stud	•			+	EDK / CDK at base; weathering and splitting on sides and upstream face; vegetated
		<u> </u>				Splitting in side due to spikes; weathering, splitting and decay on downstream face; packer at top faller
Pier G	Downstream Raker Stud	•				out
Pier G	Diagonal Bracing					
Pier G	Cross bracing	•			50%	Timber; PDK behind pile connections

Pier Structural Element Structural Assessment / Recommendation Estimated Original Further Comments Pier G Whaling's Immediation % of Original Further #1 North (Hoki) #2 South (Ross) Pier G Whaling's Immediation All present; sound condition; not fully inspected Pier G Pier Cap #1 Immediation Replaced Pier Cap #1 Pier G Pier Cap #2 Immediation Replaced 1933 second hand; end splitting and EDK Pier G Pier Cap #2 Immediation Replaced 1975; end splitting and EDK Pier G Pier G Controls Replaced 1975; end splitting and EDK Pier G Corbels Immediation Replaced 1967 second hand; minor end splitting Pier G Outside Immediation Replaced 1967 second hand; minor end splitting Pier G Outside Immediation Immediation Pier G	
Number Structural Element Recommendation Estimated Further Comments Pier G Whaling's - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -	
Sound / Treatment only Notestigate Further % of Original Replace % of Original Replace # 1 North (Hoki) # 2 South (Ross) Pier G Whaling's • All present; sound condition; not fully inspected Pier G Pile Caps • All present; sound condition; not fully inspected Pier G Pile Cap #1 • • • Pier G Pile Cap #2 • Replaced 1933 second hand; end splitting and EDK Pier G Pile Cap #2 • Replaced 1975; end splitting and EDK Pier G Pile Cap #3 • Replaced 1975; end splitting and EDK Pier G Diaz pitz • Replaced 1975; end splitting and EDK Pier G Outside • Replaced 1967 second hand; minor end splitting Pier G Outside • Replaced 1967 second hand; minor end splitting Pier G Outside • Vertical split at south end Pier G Outside • Vertical split at south end Pier G Outside • Outside Pier G Dis #1 • Outside <td></td>	
Treatment Investigate only Original Further #1 North (Hoki) (Capacity #2 South (Ross) Pier G Whaling's - - Pier G Whaling's - - Pier G Pie Cap - - Pier G Pie Cap #1 - - Pier G Pie Cap #2 - - Pier G Pie Cap #3 - - Pier G Pie Cap #3 - - Pier G Pie Cap #4 - - Pier G Dia Cap #4 - - Pier G Dia Cap #4 - - Pier G Dia Za #4 - - Pier G Corbels - - Pier G Corbels - - Pier G DS Truss Corbel - Inside - - Pier G - - - Pier G DS Truss Corbel - Inside	
Pier G Whaling's All present; sound condition; not fully inspected Pier G Pile Caps Piler G Pier G Pile Cap #1 Piler G Pier G Pile Cap #1 Piler G Pier G Pile Cap #1 Piler G Pier G Pile Cap #3 Piler G Pier G Pile Cap #3 Piler Gap #3 Pier G Pile Cap #3 Piler Gap #3 Pier G Pile Cap #3 Piler Gap #3 Pier G Pile Cap #4 Piler Gap #3 Pier G Pile Cap #3 Piler Gap #3 Pier G Pile Cap #4 Piler Gap #3 Pier G Outside Piler Gap #3 Pier G - Outside Piler Gap #3 Pier H Piles Pile #3 Pier H <t< td=""><td></td></t<>	
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Pier G Whaling's • All present; sound condition; not fully inspected Pier G Pile Caps • • Pier G Pile Cap #1 • • Pier G Pile Cap #2 • Replaced 1933 second hand; end splitting and EDK Pier G Pile Cap #3 • Replaced 1975; end splitting and EDK Pier G Pile Cap #4 • Replaced 1975; end splitting and EDK Pier G Die Cap #4 • Replaced 1967 second hand; minor end splitting Pier G US Truss Corbel - Inside • Replaced 1967 second hand; minor end splitting Pier G DS Truss Corbel - Inside • Replaced 1967 second hand; minor end splitting Pier G DS Truss Corbel - Inside • • Vertical split at south end Pier G Outside • Vertical split at south end • Pier G and Beam Corbel • • • Pier H Piles • • • • Pier H Pile #1 • 70% Typical vertical splitting on outside face • Pier H Pile #2 • <td></td>	
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Pier H Pile #5 • 70% deep Pier H Pile #6 • 70% Full length splits on backside approx. 70mm deep; large vertic centre; excavation around pile showed pile sound below groun Pier H Pile #7 • 70% Minor splitting only Image: Split in the split of the split in the split of	l splitting on backside approx 30mm
Pier H Pile #6 • 70% Full length splits on backside approx. 70mm deep; large vertic centre; excavation around pile showed pile sound below grour Pier H Pile #7 • 70% Minor splitting only 50% Top filled with pitch; vertical splitting on outside face through n	a spirtung on backside approx. Somm
Pile #6 • 70% centre; excavation around pile showed pile sound below ground pile showed pile sound below ground pile #7 Pier H Pile #7 • 70% Minor splitting only Solution 50% Top filled with pitch; vertical splitting on outside face through not solution for the solution outside face through not solution for the solution outside face through not solution for the solution outside face through not solution outside face through	al splits on outside extending into pile
Pier H Pile #7 • 70% Minor splitting only 50% Top filled with pitch; vertical splitting on outside face through n	
Top mild with pitch, voltoer opitating of outside laborational and an object of the second seco	
Top mild with pitch, voltoer opitating of outside laborational and an object of the second seco	
Top mild with pitch, voltoer opitating of outside laborational and an object of the second seco	aid section through to CDK
	ind Section through to OBIC
Splitting and hollow at top; heavily decayed	
Pier H Upstream cut-water pile	
Splitting and hollow at top; heavily decayed	
Pier H Downstream cut-water pile	
Pier H Raker Studs	
Splitting along lines of spikes; decayed over lower section whe	ere previously buried in vegetation;
Pier H Upstream Raker Stud vegetation growth	
Pier H Downstream Raker Stud	ere previously buried in vegetation
Pier H Diagonal Bracing	
Pier H Cross bracing	
Pier H Whaling's	
Pier H Whaling's Buried in soil - not assessed, may be redundant	
Pier H Pile Caps	
	ak to Di Jaman a shekatatata
Pier H Pile Cap #1 • Advanced EDK upstream end; extensive PDK and splitting ba	
Pier H Pile Cap #2 • Splitting at upstream end; general weathering and splitting and	
Pier H Pile Cap #3 • Splitting at upstream end; general weathering and splitting and	TEUK at downstream end
Pier H Pile Cap #4 Replaced 1978; EDK downstream end	

					PIERS (Ab	utment A - Abutment J)
Pier		Struct	ural Assessn	nent /		
Number	Structural Element		commendati	on	Estimated	Comments
		Sound /			% of	
		Treatment	Investigate Further	L .	Original	#1 North (Hoki) #2 South (Ross)
		only		Replace	Capacity	#2 South (Ross)
	Corbels					
Pier H	US Truss Corbel - Inside	•				Vertical splits at both ends; decay top surface
Pier H	- Outside	•				Replaced 1967 second hand
Discult	DC Truco Corbol Incido					Large CDK / EDK north end; significant decay all way along; EDK Severe
Pier H	DS Truss Corbel - Inside			•		- Investigate further, likely replace
Pier H	- Outside			•		Replaced 1967 second hand; EDK severe
	Packers Between Pile Cap					
Pier H	and Beam Corbel					
						#1 packer rotten at downstream end in under corbel; all packers likely decayed due to moisture
Pier H	Perpendicular to corbel	•				- Rotten packer likely redundant
	Devellet to control					Sound under beams; downstream packer completely rotten
Pier H	Parallel to corbel	•		ļ		- Rotten packer likely redundant due to moisture
	B ¹¹					
Pier I	Piles					
Pier I	Upstream Pile	•				Splitting and EDK at top; vertical splitting and associated decay further down; sounds drummy
D' 1	Contro Dilo					Significant splitting full length; sounds drummy but likely due to splitting; small EDK at top; excavation
Pier I	Centre Pile Downstream Pile	•				around pile showed pile sound below ground Minor splitting and decay; small EDK at top
Pier I	Upstream Cut Water Pile	•				Iminor spiruing and decay, small EDK at top
Pier I	Opstream Cut water Pile					Large CDK / EDK at top; significant weathering, splitting and decay; appears reasonably sound at
Pier I	Downstream Cut Water Pile	•				connection to raking stud; not inspected due to vegetation
		-				
Pier I	Raker Studs					
Pier I	Upstream Raker Stud			•		Splitting and decay at top; highly decayed at base; decay throughout
Pier I	Downstream Raker Stud	•				Large vertical split and decay at top; significant weathering and decay on sides and downstream face
Pier I	Diagonal Bracing					
Pier I	Cross bracing	•			80%	Light to moderate corrosion; railway iron braces
Pier I	Whaling's					
						Timber splitting and decayed through centre; south side buried under soil; effectively not doing
						anything
Pier I	Whaling's			•		- Replace or may be redundant as pier is on river bank not subject to any water flow
	Dile Con					I loo ilu dooruoti mistilikelu internellu too
Pier I	Pile Cap			•		Heavily decayed; moist likely internally too
Abort 1	Dilea					
Abut. J	Piles					Colload at ground lovel 1060: online politiet top for af aplice costion seconds hallow EDV at the of
Abut. J	Upstream Pile	•				Spliced at ground level 1966; splice split at top; top of splice section sounds hollow; EDK at top of original pile; original pile - pile surface soft and wet below ground level, otherwise sound
Abut. J	Centre Pile	•				Replaced 1966; some splitting
Abut. J	Downstream Pile	•				Splitting down to ground level; excavation around pile showed pile sound below ground
		<u> </u>				
Abut. J	Pile Cap	•				Replaced 1944; splitting and EDK both ends; typical weathering
Abul. J		├ ・		<u> </u>		איז
	Abutment Walls - Timber					
Abut. J	facing			•		Various states of decay; collapsing at upstream end
	Abutment Walls - Vertical					
Abut. J	Railway Irons	•		•		4 no. railway irons; various states of decay / corrosion

Read Beams US1 • mean pile B: segation growing on tip D Read Beams US2 • Segretation growing on tip D Read Beams US3 • • Segretation growing on tip D Read Beams US3 • • • • Read Beams US4 • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • •			1		RO	AD BEAMS,	CORBELS & BRACING
Interferent ny Interferent project Cargedia Partice Cargedia Capacity Note beams Chip inspecticit from tomoath Read Beams US1 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -	Structural Element		Re				Comments
Read Beams US1 • man pre B: suggetting growing on top Read Beams US2 • Significant watering and spling. PDN trade and outside face all northem end; PDK top surface and both sides, significant horizontal spliling through sides on top 12:2.2.3 weekin edges Read Beams US3 • PDN horizontal spliting top surface and both sides, significant horizontal spliting through sides on top 12:2.2.3 weekin edges Read Beams US5 • PDN to the other end, down, would at pict 2.2.3 weekin edges Read Beams US5 • PDN to the other end, down, would at pict 2.2.3 weekin edges Read Beams US6 • PDN to the other end, down, would at pict 2.2.3 weekin edges Read Beams US6 • PDN to the other end, down, would at pict 2.2.3 weekin edges Read Beams US7 • Large PDX at noth end schedule in the other end schedule in the other end to the other end tothe other end tother end to the other end tother end to the other			Treatment		Replace	Original	Road beams Only inspected from beneath
Supficient watering ind spilling. PDK incide and outside face at northern end. PDK top factors. - Incide matching and spilling. PDK incide and outside face at northern end. PDK top factors. - Incide matching and spilling in the additional point point in the additional point in the additionad point in the additional point additional point point additional	Pood Booms	1161					Significant weathering and splitting; large PDK outside face; PDK top surface and outside face
Paced Beams US3 • Numerous PDN top unfee and oblis des ignificant hotizontal spitting through sides or top 1/2 to 23 section days Read Beams US4 • Numerous PDN top unfees Numerous PDN top unfees Read Beams US5 • PDN top unfees and oblis des ignificant hotizontal cracking in sides, numerous PDN top unfees Read Beams US5 • PDN at nonfinement, during under deschip form top to white STIT and A table (20 accilin grach). Read Beams US5 • PDN at nonfinement, during under deschip form top to white STIT and A tables of basins, STIN and A table (20 accilin grach). Read Beams US7 • end of 10 Queen Thannos stipp. At Oncol desci (Usen of 11 uncells). Read Beams US8 • end of a desci (Usen of 11 uncells). end of a desci (Usen of 11 uncells). End (Usen 11 uncells). Read Beams US8 • end and top fair dir basin of contracking indicating of top and the basin of top thread tables. End (Usen 11 uncells).				•			Significant weathering and splitting; PDK inside and outside face at northern end; PDK top surface;
Road Beams US4 • Weathering and splitting top surface, minor horizontial cracking in sides, numerous PDK top surface Road Beams US5 • PDK at nothing and splitting on side and PDK top and splitting PDK at nothing splitting and splitting on side and PDK top and splitting PDK in top and splitting po split in table with associated pDK in top and splitting po				•			Numerous PDK top surface and both sides; significant horizontal splitting through sides over
Read Beams USS • PDK at northem end; dummy sound at pier D end Read Beams USS • BDK at northem end; dummy sound at pier D end Read Beams USS • BDK at northem end; dummy sound at pier D end Read Beams USS • BDK at northem end; dummy sound at pier D end Read Beams USS • BDK at northem end; dummy sound at pier D end Read Beams USS • BDK at northem end; dummy sound at pier D end Read Beams USS • BDK at northem end; dummy sound at pier D end Read Beams USS • BDK at northem end; dummy sound at pier D end Read Beams USS • BDK at northem end; dummy sound at pier D end Read Beams USS • BDK at northem end; dummy sound at pier D end Read Beams USS • BDK at northem end; dummy sound at pier D end USS • Replaced 1980; inge PDK inside face at south end; isolated PDK northem end; dummy sound at pier D end Read Beams USS • Replaced 1983; isocon hand; the sufficient weathering and spititing; nounouse weatherend of insect atatach; horizontat apititin			•				Weathering and splitting top surface; minor horizontal cracking in sides; numerous PDK top
Rad Barns US6 • adjitional watering and splitting numerous PDK on top surface. Israye PDK on top surface and a splitting numerous PDK on top surface and a splitting numerous PDK on top surface and and splitting numerous PDK on top surface and and splitting numerous PDK on top surface and on sides. PDK is and between center-#2 Queen Road Barns US7 • Significant watering splitting inform topiling both sides, numerous PDK on top surface and on sides. PDK is not between center-#2 Queen Road Barns US8 • -estimate top half of beam on cantribuing structuraly Road Barns US9 • Significant watering and surface decay all faces, whether of insect attack, large PDK on top PDK under regain US Road Barns US9 • Replaced 1990; times PDK inside faces, whether of insect attack, large PDK on top and uside face. Needed 1990; times PDK inside face, wetrical splitting on top: evidence of insect attack; horizontal splitting top Sites and underside, evidence of ement regain top; PDK inside face, significant vertical splitting and uside face. Needed 1990; times PDK inside face, wetrical splitting on top: evidence of insect attack; horizontal splitting top Sites and the decay all faces, vertical splitting south end; splitting and uside face. Needed 1990; times PDK inside face. Needed 1990; times PDK inside face. Needed 1990; times PDK inside face. Needed 1990; times attack wetering and significant vertical splitting and uside PDK top surface. Splitting and uside face. Needed 1990; times attack interper NDK inside face. Needed 1990; times attack interper NDK in sufface attack interper NDK in sufface attack interper NDK in su	Road Beams	US5	•				Replaced 1974; diagonal splitting on side and PDK both sides of beam at #2 Queen corbel ; PDK at northern end; drummy sound at pier D end
Read Beams US7 • and on sides; PDK US and between Center-2 Queen Read Beams US8 • Significant splitting both sides; PDK Inside and outcome faces, eviden of insect attack; holdwork significant horizontal splitting PDK US between (Fig Per Read Beams US8 •	Road Beams	US6		•			Large PDK at north end extending from top to within 150mm of base (2/3 section gone); significant weathering and splitting; numerous PDK top surface; large PDK between #1 King and #1 Queen transoms approx. 40mm deep; dull sound at southern end; horizontal splitting
Road Beams US8 • Significant weathering: significant splitting bidse: PDK inside and outside faces: eviden of significant hards: holdw sound at north end; significant horizontal splitting PDK US between	Road Beams	US7	•				Weathering , splitting and surface decay on top and both sides; numerous PDK on top surface and on sides; PDK US end between Center-#2 Queen
Road Beams US9 Image: Significant weathering and surface decay all faces; widened of insect attack; targe PDK tog surface at anoth end; PDK sides and underside; evidence of cement repair tog; PDK Under repair US Road Beams US10 Image: Replaced 1960; targe PDK inside face at south end; isolated PDK tog and outside face; weathering and splitting US Road Beams US10 Image: Replaced 1933 (second hand); tog surface weathering and splitting; targe PDK inside face at south end; significant weathering and splitting; targe PDK inside face is significant weathering and splitting; targe PDK inside face is significant weathering and splitting; targe PDK inside face is significant weathering and splitting; targe PDK inside face is significant weathering and splitting; targe PDK inside face is significant weathering and splitting; targe PDK inside face is significant weathering and splitting; targe PDK inside face is significant weathering and splitting; targe PDK inside face is significant weathering and splitting; targe PDK inside face is significant weathering and splitting; targe britzental splitting to sides; top 14 depth sounds drummy to end of corbel at south end; significant weathering and splitting; targe britzental splitting to sides; top 14 depth sounds drummy to end of corbel at south end; significant weathering and sound at targe britzental splitting to sides; splitting and isolated PDK top surface; significant weathering and splitting; and PDK top surface; significant weathering and surface decay, outdoes and targe split in side with associated decay at south end; - Investigate south and; - Investi							Significant weathering; significant splitting both sides; PDK inside and outside faces; evidence of insect attack; hollow sound at north end; significant horizontal splitting PDK US between #2
Road Beams US9 • repair US Road Beams US10 • Replaced 1900; large PDK inside face at south end; isolated PDK top and outside face; werdening and splitting on outside face; werdening and splitting on outside face; werdening and splitting; large PDK inside face; isolated PDK inside face; werdening and splitting; large PDK inside face; isolated PDK inside face; werdening PDK south end; significant werdening inside at south end; significant werdening and splitting; large PDK north end DS Road Beams US12 • Typical surface weathering and splitting; isolated PDK top surface; evidence of insect attack; increasing and splitting; isolated PDK top surface; evidence of insect attack Road Beams US13 • Typical surface weathering; PDK south end US; PDK north end DS Road Beams US14 • Typical surface weathering; and PDK top surface; evidence of insect attack Road Beams US14 • Replaced 1960; weathering; and PDK top surface; and sides; forizontal splitting to ides; top 14 addition; sounds drummy at ends Assume top 14 section does not contake; langt britter at the surface; addition; additin; addition; additin;	Road Beams	US8		•			Significant weathering and surface decay all faces; evidence of insect attack; large PDK top
Road Beams US10 • horizontal splitting DS Road Beams US11 • Replaced 1933 (second hand): top surface weathering and splitting: large PDK inside face 4 is significant venticel splitting at outhen d; significant veathering south end; cement repair at - investigate south end; Road Beams US12 • Typical surface weathering: PDK south end US; PDK north end DS Road Beams US13 • PDK bottom north end DS Road Beams US13 • PDK bottom north end DS Road Beams US14 • PDK bottom north end DS Road Beams US14 • north end Replaced 1966; weathering, splitting and isolated PDK top surface; significant weathering a surface decay, outside face; PDK both end; sounds drummy at ends	Road Beams	US9			•		repair US Replaced 1960; large PDK inside face at south end; isolated PDK top and outside face;
Road Beams US11 • significant vertical splitting at south end; significant weathering south end; cement repair at i - Investigate south end Road Beams US12 • Typical surface weathering and splitting; isolated PDK top surface; widence of insect attact PDK bottom north end Road Beams US13 • PDK bottom north end Road Beams US14 • PDK bottom north end Road Beams US15 • PDK bottom north end Road Beams US15 • PDK bottom north end Road Beams US15 • POK bottom north end Road Beams US16 • POK bottom does not contribute structurally Road Beams US16 • • POK bottom end; sourds downmy at ends; ends explitt in side with associated decay at north end; hollow sound at north end; investigate south end; Road Beams US17 • • • Road Beams US18 • Replaced 1966; EDK Replaced 1966; EDK	Road Beams	US10		•			
Road Beams US13 • Typical surface weathering and splitting; isolated PDK top surface; evidence of insect attact PDK bottom north end Road Beams US14 • Weathering and isolated PDK to top surface and sides; horizontal splitting to sides; top 1/4 depth sounds drummy to end of corbel at south end; targe horizontal splitting of octed at north end. Road Beams US15 • Replaced 1966; weathering, splitting and isolated PDK top surface; significant weathering a surface decay, outside face; PDK both ends; sounds drummy at ends Road Beams US15 • - Assume top 1/4 section does not contribute structurally Road Beams US16 • - Assume top 1/4 section does not contribute structurally Road Beams US16 • - Investigate south end; Road Beams US17 • - Investigate south end; Road Beams US17 • - Investigate further (likely replacement) Road Beams US18 • Replaced 1966; EDK Road Beams US19 • • Road Beams US19 • • Road Beams US19 • • Road Beams US19 • • • Road Beams US19 <td>Road Beams</td> <td>US11</td> <td></td> <td>•</td> <td></td> <td></td> <td>Replaced 1933 (second hand); top surface weathering and splitting; large PDK inside face and significant vertical splitting at south end; significant weathering south end; cement repair at pier - Investigate south end</td>	Road Beams	US11		•			Replaced 1933 (second hand); top surface weathering and splitting; large PDK inside face and significant vertical splitting at south end; significant weathering south end; cement repair at pier - Investigate south end
Road Beams US13 • PDK bottom north end Road Beams US14 • Weathering and isolated PDK to top surface and sides; horizontal splitt to end of corbel at south end; large horizontal split to end of corbel at north end Road Beams US15 • Replaced 1960; weathering, splitting and isolated PDK top surface; significant weathering as surface decay, outside face; PDK both ends; sounds drummy at ends Road Beams US15 • Replaced 1960; weathering, splitting and isolated PDK, and large split in side with associated decay at south end; Road Beams US16 • - Weathering and south end; Road Beams US16 • - Investigate south end; Road Beams US17 • • Vertical and horizontal cracking with associated decay at north end; hollow sound at north en unmerrous PDK top surface; splitting and PDK to sufface; soft sound at so end Road Beams US18 • Replaced 1966; EDK Road Beams US18 • Replaced 1900; advanced surface and inside face; horizontal split and CI at pier (Bkag) Road Beams CN1 • Significant weathering and splitting; PDK on downstream face; isolated PI upstream face; probable end decay at pier 1	Road Beams	US12	•				
Road Beams US14 • depth sounds drummy to end of corbel at south end; large horizontal split to end of corbel at north end north end Road Beams US15 • Replaced 1966; weathering, splitting and isolated PDK top surface; significant weathering a surface decay, outside face; PDK both ends; sounds drummy at ends Road Beams US15 • - Assume top 1/4 section does not contribute structurally Road Beams US16 • - Assume top 1/4 section does not contribute structurally Road Beams US16 • - Investigate south end; Road Beams US17 • - Investigate south end; Road Beams US18 • Replaced 1966; EDK Road Beams US19 • Significant weathering and splitting; PDK on downstream face at cross member; vegetation growing on top; hollow sound at pier B end Road Beams CN1 • Significant weathering, and splitting; PDK top surface; horizontal split at north end Road Beams CN2 • • Significant weathering, and splitting; pD	Road Beams	US13	•				PDK bottom north end
Road Beams US15 • surface decay, outside face, PDK both ends; sounds drummy at ends - Assume top 1/4 section does not contribute structurally Road Beams US16 • - Assume top 1/4 section does not contribute structurally Road Beams US16 • - Investigate south end; Investigate south end - Investigate south end; - Investigate south end; Road Beams US17 • - Investigate south end; Road Beams US18 • Replaced 1966; EDK Road Beams US19 • Replaced 1966; EDK Road Beams CN1 • Significant weathering and splitting; PDK on downstream face at cross member; vegetation growing on top; hollow sound at pier B end Road Beams CN2 • Significant weathering and splitting; PDK top surface and inside face; horizontal split an CI at pier C Road Beams CN2 • Significant weathering and splitting; DDK top surface and inside face; horizontal split an CI at pier C Road Beams CN2 • • Significant weathering and splitting; DNK top surface and inside face; horizontal split an CI at pier C Road Beams CN2 • • Significant weathering and splitting; and associated decay top and downstream face; isolated PI upstrea	Road Beams	US14		•			depth sounds drummy to end of corbel at south end; large horizontal split to end of corbel at
Road Beams US16 Weathering and PDK, top surface; split and associated PDK, and large split in side with associated decay at south end; Road Beams US16 - Investigate south end Road Beams US17 • Road Beams US17 • Road Beams US17 • Road Beams US18 • Road Beams US18 • Road Beams US19 • Road Beams US19 • Road Beams CN1 • Road Beams CN1 • Road Beams CN2 • Road Beams CN2 • Road Beams CN1 • Road Beams CN1 • Road Beams CN2 • Road	Road Beams	US15					
Road Beams US17 • Vertical and horizontal cracking with associated decay at north end; hollow sound at pier f Road Beams CN2 • • Significant weathering; splitting and associated decay top and downstream face; isolated PI upstream face; probable end decay a							Weathering and PDK, top surface; split and associated PDK, and large split in side with
Road Beams US17 • - Investigate further (likely replacement) Road Beams US18 • Replaced 1966; EDK Road Beams US19 • Replaced 1940; advanced surface decay and weathering on top and sides; soft sound at so end Road Beams US19 • Replaced 1940; advanced surface decay and weathering on top and sides; soft sound at so end Road Beams CN1 • Significant weathering and splitting; PDK on downstream face at cross member; vegetation growing on top; hollow sound at pier B end Road Beams CN2 • Significant weathering and splitting; PDK top surface and inside face; horizontal split and CI at pier C Road Beams CN2 • Significant weathering, splitting and associated decay top and downstream face; isolated PI upstream face; probable end decay at pier 1 Road Beams CN3 • - Investigation end south end and PDK at mid span (upstream face) Road Beams DS1 • - Significant weathering; general decay; PDK on sides; horizontal split at north end - Likely redundant • - Significant weathering and splitting; splitting and associated PDK on inside face; Road Beams DS1 • - Significant weathering and vertical splitting top surface; minor horizontal splitting and weathering to sid R	Road Beams	US16		•			Vertical and horizontal cracking with associated decay at north end; hollow sound at north end;
Road Beams US19 • Replaced 1940; advanced surface decay and weathering on top and sides; soft sound at so end Road Beams CN1 • Significant weathering and splitting; PDK on downstream face at cross member; vegetation growing on top; hollow sound at pier B end Road Beams CN2 • Significant weathering and splitting; PDK top surface and inside face; horizontal split and CI at pier C Road Beams CN2 • Significant weathering, splitting and associated decay top and downstream face; isolated PI upstream face; robable end decay at pier I Road Beams CN3 • - Road Beams CN4 • Surface weathering; general decay; PDK on sides; horizontal split at north end - Likely redundant Road Beams DS1 • Significant weathering and splitting; splitting and associated PDK on inside face; - bottom half of beam appears sound Road Beams DS2 • Significant weathering and vertical splitting top surface; minor horizontal splitting and weathering to sid replaced 1941; splitting and decay US; spliting US south end	Road Beams	US17		•			
Road Beams CN1 • Significant weathering and splitting; PDK on downstream face at cross member; vegetation growing on top; hollow sound at pier B end Road Beams CN2 • Significant weathering and splitting; PDK top surface and inside face; horizontal split and CI at pier C Road Beams CN3 • Significant weathering, splitting and associated decay top and downstream face; isolated PI upstream face; probable end decay at pier I Road Beams CN4 • - Investigation end south end and PDK at mid span (upstream face) Surface weathering; general decay; PDK on sides; horizontal split at north end - Likely redundant Road Beams DS1 • Significant weathering and splitting top surface; minor horizontal splitting and weathering to sid Road Beams DS2 • Weathering and vertical splitting top surface; minor horizontal splitting and weathering to sid	Road Beams		•				Replaced 1966; EDK Replaced 1940; advanced surface decay and weathering on top and sides; soft sound at south
Road Beams CN1 • growing on top; hollow sound at pier B end Road Beams CN2 • Significant weathering and splitting; PDK top surface and inside face; horizontal split and CI at pier C Road Beams CN3 • Significant weathering, splitting and associated decay top and downstream face; isolated PI upstream face; probable end decay at pier I Road Beams CN3 • - Investigation end south end and PDK at mid span (upstream face) Road Beams CN4 • - Likely redundant Road Beams DS1 • Significant weathering and splitting top surface; minor horizontal splitting and weathering to sid Road Beams DS2 • Weathering and vertical splitting top surface; minor horizontal splitting and weathering to sid	Road Beams	US19		•			end Significant weathering and splitting; PDK on downstream face at cross member; vegetation
Road Beams CN3 • Significant weathering, splitting and associated decay top and downstream face; isolated PI upstream face; probable end decay at pier I Road Beams CN4 • - Investigation end south end and PDK at mid span (upstream face) Road Beams CN4 • - Likely redundant Road Beams DS1 • Significant weathering and splitting; splitting and associated PDK on inside face; - bottom half of beam appears sound Road Beams DS2 • Weathering and vertical splitting top surface; minor horizontal splitting and weathering to sid replaced 1941; splitting and decay US; spliting US south end				•			growing on top; hollow sound at pier B end Significant weathering and splitting; PDK top surface and inside face; horizontal split and CDK
Road Beams CN3 • - Investigation end south end and PDK at mid span (upstream face) Road Beams CN4 • Surface weathering; general decay; PDK on sides; horizontal split at north end - Likely redundant Road Beams DS1 • Significant weathering and splitting; splitting and associated PDK on inside face; - bottom half of beam appears sound Road Beams DS2 • Weathering and vertical splitting top surface; minor horizontal splitting and weathering to sid replaced 1941; splitting and decay US; spliting US south end	Road Beams	CN2	•				Significant weathering, splitting and associated decay top and downstream face; isolated PDK
Road Beams DS1 • Significant weathering and splitting; splitting and associated PDK on inside face; - bottom half of beam appears sound Road Beams DS2 • Weathering and vertical splitting top surface; minor horizontal splitting and weathering to sid replaced 1941; splitting and decay US; spliting US south end	Road Beams	CN3		•			- Investigation end south end and PDK at mid span (upstream face)
Road Beams DS1 • - bottom half of beam appears sound Road Beams DS2 • Weathering and vertical splitting top surface; minor horizontal splitting and weathering to sid replaced 1941; splitting and decay US; spliting US south end	Road Beams	CN4		•			
				•			 bottom half of beam appears sound Weathering and vertical splitting top surface; minor horizontal splitting and weathering to sides;
Road Beams IDS3 • Weathered north end: minor splitting	Road Beams	DS2 DS3					replaced 1941; splitting and decay US; splitting US south end Weathered north end; minor splitting

				RO	AD BEAMS,	CORBELS & BRACING
Structural Element		Re	tural Assessi commendat		Estimated	Comments
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	Road beams Only inspected from beneath
Road Beams	DS4	•				Weathering and splitting top surface; minor horizontal cracking in sides; numerous PDK top surface
Road Beams	DS5		•			Significant splitting and associated PDK in top and both sides; evidence of insect attack; large PDK / EDK at both ends
Road Beams	DS6		•			Advanced surface decay and weathering; numerous PDK top surface; horizontal splitting through top half of section; estimate top 1/4 of section not contributing structurally; soft surface and dull sound at south end; PDK DS end
Road Beams	DS7	•				Replaced 1965, PDK north end splitting throughout
Road Beams	DS8	•				Replaced (est. 1950 - 1965, barrier post covering date); isolated PDK top surface; weathering and horizontal splitting on sides
Road Beams	DS9	•				Replaced 1950; numerous small PDK top surface; weathering and PDK outside face; large PDK approx. 600 long x 40 deep and approx. 1/3 section depth on outside face
Road Beams	DS10	•				Horizontal splitting US face
Road Beams	DS11		•			Weathering and decay both sides; large split and PDK at south end extending full width of section; horizontal split inside face at north end
Road Beams	DS12					Several large PDK along member; ply repair work both sides - Parts of beam may be reused elsewhere
Road Beams	DS13					Weathering and splitting; large PDK on outside face at north end extending to end of corbel; large vertical split from north end to first bolt; sounds hollow at north end; horizontal splitting US side
Road Beams	DS14		•			Significant weathering and splitting and associated PDK on top and both sides; large horizontal split at south end with PDK; large vertical split at north end; PDK over #2 King corbel (both sides of beam); sounds drummy both ends
Road Beams	DS15		•			Weathering and associated decay to top surface; PDK south end and sounds hollow; top half sounds drummy at north end; dull sound inside face between #1 King and #1 Queen transoms; horizontal splitting US face - Assume top 1/4 of member does not contribute structurally
Road Beams	DS16	•				Weathering and associated PDK top surface; weathered sides; splitting resulting in loose segments at top corners of beam; PDK DS side
Road Beams	DS17	•				Replaced 1963; splitting US face
Road Beams	DS18	•				Replaced 1940; extensive weathering and decay on outside face; weathering and PDK top surface; worm holes outside face
Road Beams	DS19		•			Significant weathering and splitting and associated PDK on top surface; large PDK to half width of member over #1 King transom; significant splitting at south end, sounds drummy out to end of corbel
Road Beams	DS20	•				Splitting and decay on top surface and sides; PDK and horizontal split outside face at south end.
Road Beams	DS21	•				Replaced 1968; minor weathering
Road Beams	DS22		•			Large PDK / EDK at both ends; Large PDK top surface at #2 King transom; significant weathering outside face; horizontal splitting north end
Road Beams	DS23	•				EDK south end; weathering, splitting and associated decay to top surface; large horizontal split at north end (approx. 600 long, near centre); hollow sound at north end
Road Beams	DS24	•				General weathering only

		-		RC	AD BEAMS,	CORBELS & BRACING
Structural Element		R	tural Assessi ecommendati		Estimated	Comments
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	Road beams Only inspected from beneath
Corbels						
Pier B	US Corbel	•				Surface decay
	Centre Corbel	•				
	DS Corbel		•			CDK southern end; large PDK outside face
Pier C	US Corbel	•				Cracking at end and small CDK starting; surface weathering and cracking on outside face
	Centre Corbel		•			EDK southern end; PDK both sides; honeycombing of upstream and downstream sides; evidence of possible insect attack
	DS Corbel	•				Splitting at ends; CDK southern end
#1 King	US Corbel	•				PDK at sides; surface decay
	DS Corbel			•	40%	PDK inside and outside extending in under beams; EDK - Replace within 5yrs
#1 Queen	US Corbel	-	•			PDK at sides of corbel extending in under beams
	DS Corbel	•				CDK starting at southern end
Centre	US Corbel	•				PDK at fixing to transom
	DS Corbel	•				PDK at fixing to transom
	US Corbel	•				Replaced 1966
	DS Corbel	•				PDK at sides; bolt corroded
#2 King	US Corbel	•				Replaced 1977 (second Hand); large vertical split at northern end - Replace corroded splitter nuts
	DS Corbel	•				Splitting at ends; PDK at fixings to transom
Dian D	US Corbel					CDK southern end; significant splitting and PDK outside face
Pier D	DS Corbel	•				Replaced 1944
#1 King	US Corbel	•				Replaced 1966
-	DS Corbel					Replaced 1965
#1 Queen	US Corbel	•				PDK inside face near centre
	DS Corbel	•			1	PDK top surface and inside and outside faces
	US Corbel	•				PDK both sides
	DS Corbel	•				PDK inside vertical face; surface decay and soft on sides
#2 Queen	US Corbel	•				PDK outside face at base
	DS Corbel	•				PDK outside face; large area of decay on inside top and side; PDK around bolts
1017	US Corbel					PDK both side above transom; PDK top surface inside face
#2 King	US Corbel	•				Weathering and splitting; PDK both sides above transom; corbel is bowed
	DS COIDEI	•				The among and splitting, FUR both sides above transoff, corber is bowed

				RC	DAD BEAMS,	CORBELS & BRACING
Structural Element		R	tural Assessi ecommendat		Estimated	Comments
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	Road beams Only inspected from beneath
Corbels						
Pier E	US Corbel	•				Replaced 1960; split at north end near centre; weathering and softening on outside surface; horizontal split inside face; end split south
	DS Corbel		•			Replaced 1977 (second hand); weathered; end split south
#1 King	US Corbel	•				PDK outside face overtop of transoms; decay at base of corbel over US transom extending approx. 150mm over transom (20mm deep); split along inside top edge; large PDK inside face
	DS Corbel		•			Significant weathering and decay inside face; large diagonal crack and associated decay extending from top surface down under beam - Investigate further when beam is replaced
#1 Queen	US Corbel	•				Small EDK north end; PDK both sides overtop of transoms
	DS Corbel	•				Weathering on outside face; PDK inside and outside faces
Centre	US Corbel	•				PDK inside and outside face; weathering and softening to outside surface
	DS Corbel	•				Typical weathering; PDK outside face; split and PDK linking spike holes on inside face
#2 Queen	US Corbel	•				Typical weathering and splitting; PDK over US transom
	DS Corbel	•				Split on inside face; weathered outside face
#2 King	US Corbel	•				Vertical Split
	DS Corbel	•				Typical weathering and splitting
Pier F	US Corbel	•				CDK / EDK at south end; weathered outside face; horizontal split and associated PDK outside face; significant splitting and decay to inside face; splitting at north end
	DS Corbel	•				CDK both ends; significant weathering and splitting both sides
#1 King	US Corbel		•			Surface decay to top surface extending in under beams (both sides); vertical split through centre at north end; - Install horizontal split bolt at north end
#114119	DS Corbel	•				PDK
#1 0	LIC Carbol					Continent enough of decay at the outending is upday been (both side: $-ft - 0$
#1 Queen	US Corbel DS Corbel	•	•			Significant amount of decay at top extending in under beam (both sides of corbel) Surface decay at top (inside face)
Contro	US Corbel		•			Docay at too surface extending in under beam (both sides of earbel): extensive PDK beth sides
	DS Corbel		•			Decay at top surface extending in under beam (both sides of corbel); extensive PDK both sides Decay at top surface extending in under beam (both sides of corbel); - Likely replace
						Advanced decay at top on outside
#2 Queen	US Corbel		•			- Likely replace
	DS Corbel	•				PDK
	US Corbel	•				
	DS Corbel	•				Decay to contract surface with transoms on inside face

				RC	DAD BEAMS,	CORBELS & BRACING
Structural Element		R	tural Assessi ecommendat		Estimated	Comments
Corbels		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	Road beams Only inspected from beneath
		-	1	i		
Pier G	US Corbel	•				Decay along bottom edge in contact with packers (inside face)
	DS Corbel	•				Weathered
#1 1/ing	US Corbel	•				Weathering; isolated PDK
#1 King	DS Corbel	-				Weathering; splitting and PDK on outside
	DS Colbei	•				
#1 Queen	US Corbel			•		Large CDK at both ends (full depth); large crack and associated decay under beam
						PDK inside face around spikes; splitting and PDK outside face;
	DS Corbel	•				- Vegetation in the way on inside at transom
Centre	US Corbel	•				Top surface decay on outside; some isolated PDK
	DS Corbel	•				Top surface cracking and associated decay; some isolated PDK
						Tan Januara antida autor Jina un das basara anna DDV
#2 Queen	US Corbel DS Corbel	•				Top decay on outside extending under beam; some PDK
	DS Corbei	•				Replaced 1960; weathered
#2 King	US Corbel	•				End splitting and weathering; split bolts both ends
	DS Corbel					Large vertical split separating two halves with split bolt at north end; sounds drummy but likely due to split - Install split bolt at south end
						Manmade vertical cut on south side near outside edge of pier, still approx. 600mm seating for
Pier H	US Corbel		•			beam; decay
	Centre Corbel	•				Replaced 1967 (second hand); surface decay upstream face Isolated PDK inside face; large horizontal split and PDK under beam DS22
	DS Corbel		•			- Investigate PDK under beam (otherwise sound)
Pier I	US Corbel		•			Splitting and EDK both ends; numerous PDK on sides; end splitting; weathering and decay
	Centre Corbel	•				Surface decay and splitting both ends; end splitting; weathering and decay
	DS Corbel		•			CDK / PDK and splitting both ends; end splitting; weathering and decay

				RC	DAD BEAMS, C	ORBELS & BRACING		
	Structural Assessment /			ment /				
Structural Element		Recommendation		Estimated	Comments			
			Sound /		W (Q · · ·)			
		Treatment only	Investigate Further	Replace	% of Original Capacity	Road beams Only inspected from beneath		
Cross Bracing, Sol	lid Blocking and	,		Replace	oupuony			
erece Bracing, ee								
						4 no. at 1/3 points; various states of decay; blocks falling out		
Span AB	Solid Blocking			•		- Replace / reinstate		
						Rods generally ok; some nuts missing		
	Tie Rods	•				- Replace nuts		
						A no ot 1/2 pointer untitue states of decour blocks folling out		
Span BC	Solid Blocking			•		4 no. at 1/3 points; various states of decay; blocks falling out - Replace / reinstate		
Span BC	Cond Diocking					Rods generally ok; some nuts missing		
	Tie Rods	•				- Replace nuts		
Span CD	Cross Bracing							
Pier C to #1K					20%			
	DS				75-90%	Sound		
#1K to #1Q					20%			
	DS				30%			
#1Q to Centre	DS DS				70%	Sound		
Centre to #2Q					60%			
Centre to #2Q	DS				70% 80%			
#2Q to #2K	-				0%	Broken detached at 2K end		
#2Q 10 #2N	DS				0%	Broken		
#2K to Pier D					5%	Pitch point at pier end		
121110110110	DS				30%	Heavily corroded at pier end; otherwise sound		
Span DE	Cross Bracing							
Pier D to #1K					40%	Heavy corrosion at pier end		
	DS				30%	40% at pier end; 70% under US beam; otherwise sound		
#1K to #1Q					0%	25% at both ends, broken centre rod		
	DS				10%	Ineffective at K1 end		
#1Q to Centre					40%			
0 1 1 100	DS				50%	Bent		
Centre to #2Q	DS				50% 0%	Broken at 2Q end		
#00 1- #01/					5%			
#2Q to #2K	DS				5%	Rail iron heavily corroded along lenth Rail iron heavily corroded along lenth		
#2K to Pier E					40%			
#ZIX IO FIEL	DS				0%	Broken at piers end		
Span EF	Cross Bracing							
	L J							
Pier E to #1K	US				0%	gone at King Transom; 30% at pier end; gone at 1K		
	DS				70%			
#1K to #1Q					0%	Broken/gone		
	DS				20%			
#1Q to Centre					40%			
	DS				0%	0% at centre transom end; 50% along rod; sound at #1Q transom; nut missing 1Q end		
Centre to #2Q					50%	Sound at ends		
	DS				50%	50% at coupler under US beam; 60% under DS beam; otherwise sound		
#2Q to #2K					70%			
	DS				50%	Railway iron replacement; heavily corroded along full length		
#2K to Pier F					0%	0% and 0% at ends; 70% along rod		
	DS				30%	30% at #2K end; 80% along rod		

				R	OAD BEAMS, C	ORBELS & BRACING	
	Structural Ass		tural Assessi	ment /			
Structural Element		Recommendation			Estimated	Comments	
		Sound /					
		Treatment only	Investigate Further		% of Original Capacity	Road beams Only inspected from beneath	
Our of Duration Cal		. ,	Fululei	Replace	Сараску		
Cross Bracing, Sol		Tie Rods					
Span FG	Cross Bracing				-		
					90%		
Pier F to #1K	US				50 /8	Sound	
					0%		
	DS					Completely gone at #1K end; 80% along rod; broken at 1K	
#1K to #1Q					70%		
	DS				0%	0% both ends; 40% along rod	
					0%		
#1Q to Centre						60% at coupler under US beam; 80% under DS beam; otherwise sound; broken at coupler	
	DS				30%	60% under beams; otherwise sound	
Centre to #2Q					0%	Sound at ends; broken at coupler	
	DS				50%	60% under beams; otherwise sound	
#2Q to #2K	US				0%	0% at #2K transom; 30% at coupler under US beam; otherwise sound	
	DO				0%	gone at #2K end; otherwise sound	
"0(c) D: 0	DS				100/	- Replace from centre to #2K end	
#2K to Pier G					40%	Pier G end	
	DS				30%	Pier G end	
	A B ·						
Span GH	Cross Bracing						
Pier G to #1K					0%	Broken at #1K transom; remaining rod >60%	
	DS				60%	Pier G end	
#1K to #1Q					10%	10% and 30% at ends; 60% along rod	
	DS				20%	20% at #1Q end; remaining rod >80%	
#1Q to Centre					80%	Railway iron replacement; corroded significantly	
	DS				70%		
Centre to #2Q					0%	Rod completely gone at centre transom end; 50% along rod; sound at #2Q end	
	DS				40%	sound at eyes	
#2Q to #2K					60%		
	DS				30%	30% under DS beam; 50% under US beam; sound at ends	
#2K to Pier H					20%	20% at pier end; 70% under US beam	
	DS				40%	Pier H end	
						4 no. at 1/3 points; various states of decay; blocks falling out; one block missing	
Span HI	Solid Blocking	•				- Replace / reinstate	
	Tio Pode					Rods generally ok; some nuts missing	
	Tie Rods	•				- Replace nuts	
						A no. at 1/2 points: various states of deepy: blocks falling out	
Spon II	Solid Blocking					4 no. at 1/3 points; various states of decay; blocks falling out - Replace / reinstate	
Span IJ	Soliu Biocking	•				Rods generally ok; some nuts missing	
	Tie Rods					- Replace nuts	

Appendix D Typical Defect Photos



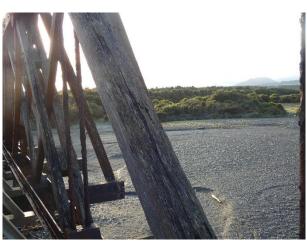
Moderate to Heavy Bottom Chord Corrosion.



Critical Bottom Chord Corrosion.



Typical Timber Splitting – Top Chord Shown.



Typical Timber Splitting – King Strut Shown.



Typical Weathered Timber and Ponding Moisture.



Typical Weathered Timber.



Typical Corroded (Pack Rusting) Hanger Rods – Heavy to Critical Corrosion Shown.



Typical Decay and Loss of Timber Section at Connections – Top of Wind Brace Shown.



Typical Decay of Top Blocks.



Timber Decay – Heavy to Critical Decay Shown.



Typical Decay and Loss of Timber Section at Connections – Bottom of Wind Brace Shown.



Typical Splitting and Section Loss of Thrust Blocks.



Typical Moderate Decay of 'A' Block.



Corrosion of Truss Connection Plates.



Typical Loose Fixings. Corroded Steel Components.



Typical Heavy to Critical Decay of 'A' Block.



Corrosion and Loss of Fixing Components. Missing Nut and Necked Bolt Shown.



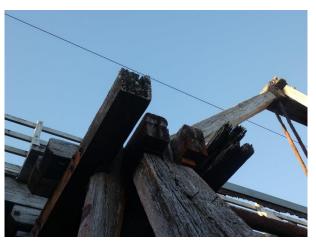
Widespread Loss of Deck Bracing Due to Corrosion.



Missing Pier Waling Timbers



Typical Decay of Pier Piles



Typical Decay of Pier Cap Timbers



Typical Splitting and Decay of Pier Piles



Vegetation Growth From Timber Decay Pockets



Debris Caught on Piers Causing Local Scour.



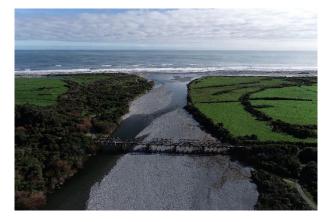
Approach Spans Shrouded in Dense Vegetation. Northern Approach.



Approach Spans Shrouded in Dense Vegetation. Southern Approach.



Moisture in Timber Components. Reduced Air Flow for Drying due to Vegetation.



Observation – Flow Favours True Left of River as this is the Outside of the Curved Alignment. Significant Gravel Deposition.



Dislodged and Missing Timber Bracing Blocks Typical.



Pier G and Underside of Span G-H not inspected due to Channel Location. Main Channel is Deep. Pile Embedment Depth Unknown.

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REPORT

Totara River Bridge Structural Condition Assessment - Preliminary

Prepared for Westland District Council AUGUST 2010



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Rev No	Date	Description	Prepared By	Reviewed By	Approved By
1	Dec 09	Draft for Client Comment	JD	JS	J Strange
2	Aug 10	Final	JD	JS	J Strange



WESTLAND DISTRICT COUNCIL

Totara River Bridge Structural Condition Assessment – Preliminary

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	5.2	Inspection Results	.8			
6	Recomm	endations	.8			

Appendix A:

- Indicative Plan of Totara River Bridge
- Pier Pile Plan
- Truss Elevation
- (3 pages total)

Appendix B:

• Typical Construction Drawing – 80ft Howe Truss

(1 page)

- Appendix C: Inspection Results Trusses (10 pages)
- Appendix D: Inspection Results Transoms (2 pages)
- Appendix E: Inspection Results Road Beams, Corbels and Deck Bracing (9 pages)
- Appendix F: Piers (8 pages)



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1 Executive Summary

This report was prepared for the Westland District Council to assess the structural condition of the Totara River Bridge.

The on-site visual condition assessment showed that there are considerable variations in the condition of the various structural members. A large portion of the structural members are in sound condition and require only treatment to treat decay and weathering that has occurred and to prolong the life of the members. A small portion of the members have undergone significant decay and corrosion and now require replacement. The remaining members require further investigation to determine if treatment or replacement is required.

Intrusive investigations and detailed structural analysis were not carried out as part of this assessment.

We recommend the following processes be carried out to determine the extent and cost of renewal and maintenance works on the bridge:

- 1. Carry out a structural assessment
- 2. Carry out intrusive investigation
- 3. Prepare recommendations for remedial and maintenance works to the bridge
- 4. Prepare rough order cost estimates for the renewal and maintenance works

2 Introduction

As requested by Westland District Council, MWH New Zealand Ltd carried out a visual baseline inspection of the Totara River Bridge.

The Totara River Bridge formed part of the Hokitika to Ross Railway Line which was closed in 1980. Westland District Council are proposing to use this bridge as a pedestrian / cycle bridge as part of a proposed cycle way between Hokitika and Ross.

3 Inspection

A visual baseline inspection was carried out over eight days on 19, 20, 21, 23, and 27 October and 03, 25, and 26 November. The inspection was carried out by John Strange and Jason Davidson. Assistance for inspection was provided by the following:

- Dean Arthur (Due West Ltd) assistance with safety ropes and lines for all work at heights.
- Dave Hawes (Department of Conservation) assisted with the inspection on 19 October to provide input into inspection and recording techniques, based on his previous experience with similar structures whilst working for NZ Rail and the Department of Conservation.

4 Bridge Description

The Totara River Bridge is the southernmost rail bridge on the old Hokitika to Ross Railway. The Railway was opened on 01 April 1909 following completion of the Totara River Bridge and closed 71 years later in November 1980¹. Some time following the closure of the railway from Hokitika to Ross, the railway lines and decking on the Totara River Bridge were removed.

^{1.} Mahinapua Creek Railway Bridge - Conservation Plan prepared by Chris Cochran, 30 July 1999



Following removal of the decking (sleepers) only the main longitudinal beams were left remaining. The bridge currently has a timber barrier / balustrade fixed to the downstream beam (refer Figure 4-4). We understand that the Westland District Council had this installed to enable walking access to be maintained across the bridge as the bridge is regularly used by a local farmer to access his land and livestock on the northern side of the Totara River.

The Totara River Bridge is a nine span timber bridge constructed predominantly of what we understand to be Australian Hardwood timbers, and "steel" bracing and tension members. There was a transition from the use of black iron to steel during the period from 1880 to 1910 and during this period it was common for both materials to be used in construction.

The bridge is made up of nine spans with the first two spans constructed using simply supported timber beams and the central five spans, being much longer are Howe Trusses. Figure 4-1 on the following page shows a typical Howe Truss and Table 4-1 below shows the construction of each span.

Span Number	Structure Description
Span #1	Simply supported timber beams
Span #2	Simply supported timber beams
Span #3	Howe Truss (Standard Railway 80ft truss)
Span #4	Howe Truss (Standard Railway 80ft truss)
Span #5	Howe Truss (Standard Railway 80ft truss)
Span #6	Howe Truss (Standard Railway 80ft truss)
Span #7	Howe Truss (Standard Railway 80ft truss)
Span #8	Simply supported timber beams
Span #9	Simply supported timber beams

Table 4-1 : Bridge Spans

The bridge superstructure is supported on timber piers. The timber piers supporting the longer Howe truss spans (river spans) consist of ten piles and the piers supporting the shorter simply supported spans (land spans) and forming the abutment walls consist of five and three piles respectively. Figures 4-2 and 4-3 on the following pages show typical piers supporting both river and land spans.

The hardwood piles forming the piers appear to have been driven and all piles generally have markings to enable the depth of pile below ground level to be determined.

A plan of the bridge which outlines the numbering system for the piers and spans etc is included in Appendix A of this report and Appendix B includes a typical drawing of an 80ft span Howe Truss.



Figure 4-1 : Typical Howe Truss Span (Span 6 – Downstream)



Figure 4-2 : Typical End Span (Spans 8 and 9 – Southern End)

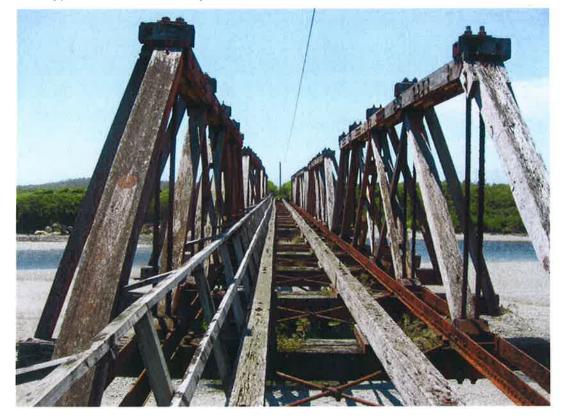






Figure 4-3 : Typical River Pier (Pier No. 7)

Figure 4-4 : Typical View North Along Bridge





5 Bridge Inspection

5.1 Inspection Methodology

The structural inspection of the bridge involved visually inspecting all members / elements. In addition to the visual inspections, timber members were "hammer tested" to check for signs of internal decay. This involved striking the timber members with a hammer and listening to the pitch of the sound which alters with changes in timber density. Intrusive investigations were not carried out as part of these inspections.

In addition to this, excavations were carried out by Westroads Ltd with an excavator down alongside a number of piles to check the condition of these piles at and below existing ground level.

This inspection methodology was used to classify members into the following three categories:

- 1. *Member sound, treatment only required*: Members in this category are typically sound and may or may not exhibit one or more of the following signs of decay:
 - No, or limited, signs of centre decay
 - No, or limited, sign of end decay
 - Minor isolated pocket decays
 - Minor surface weathering / decay
 - Minor splitting and associated decay
 - Corrosion of steel members

In some instances, an assumption has been made during the inspection as to the required member capacity for the intended future use of the structure. Taking this into account some members with greater decay / corrosion have been classed as "sound – treatment only" if they appear to have a sufficient amount of redundancy. For example a steel member with corrosion that has reduced the cross section considerably but which is likely to have sufficient redundancy for the intended future use of the structure.

- 2. *Further investigation required*: Members in this category are suspect and exhibit one or more of the following signs of decay:
 - Signs of centre decay where the extent of the decay is unknown (i.e. dull sound)
 - Significant end decay extending into / along member where the extent is unknown
 - Significant pocket decays where the depth / extent is unknown
 - Significant splitting and / or decay where the depth / extent is unknown
 - Heavy corrosion of steel members

Further investigation is likely to involve core drilling of timbers to assess the extent of any decay and in a number of cases will also include a structural load assessment to determine the required size of members.

- 3. *Member requires replacement*: Members in this category are typically heavily decayed or corroded. The following criteria has been used to classify members into this category and further investigation (i.e. structural calculations) may be required to confirm assumptions that have been made:
 - Steel members with >50% loss of cross section
 - Timber members that are decayed to an extent where treatment is no longer an option, i.e. large centre decays reducing cross section

The above classifications do take into account the intended future use of the structure, being a pedestrian / cycle bridge. These classifications therefore take account of the significant redundancies in some members and some assumptions have been made on site as to the required capacity / size of some members for the intended future use of this structure.



Figures 5-1 to 5-4 below and on the following pages show the classification of some structural members.

Figure 5-1 : Top Chord of Timber Trusses – Minor Weathering / Splitting Only, "Sound"

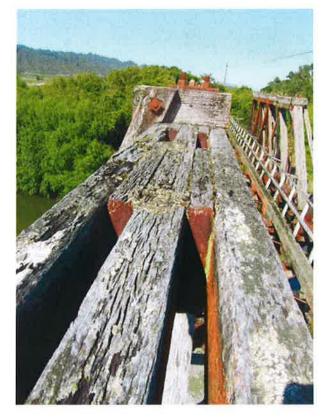


Figure 5-2 : Saddle Block – Large Centre Decay Back Beyond Tension Rod, "Requires Replacement"; A-Block (Top Thrust Block), "Sound"

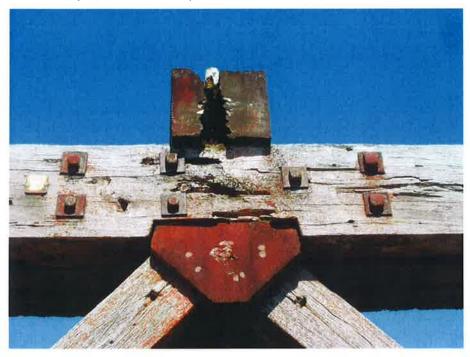




Figure 5-3 : Lateral Braces – Members Completely Decayed at Ends, "Requires Replacement"



Figure 5-4 : King Strut – Significant Surface Decay, Pocket Decay and Splitting, "Investigate Further"





The structural inspections were carried out by John Strange (Senior Engineer) and Jason Davidson (Structural Engineer). Dave Hawes (Department of Conservation) also spent one day (19 October 2009) on site assisting with the structural inspections.

5.2 Inspection Results

The structural inspection of the bridge showed that there is considerable variation in the condition of the various structural elements. When this structure was in service it was subject to regular checks and maintenance by Railways. When timber members were replaced by Railways, the date was chiselled into the surface of the new timber to indicate its age. There are a large number of timber members that have been replaced with dates ranging from 1928 for the earliest replacements to 1978 for the last members replaced before closure of the railway line. A number of those members replaced have been replaced with second hand members, denoted by an "SH" chiselled into the face of the member with the date of replacement. Many of these timber members that have been replaced, and particularly those replaced toward the end of the bridges service period, are in noticeably better condition than those older timber members.

As a result of the exposed location of the bridge in close proximity to the sea, some elements have undergone significant weathering, particularly where they face the prevailing westerly winds. Steel elements including cross bracing, tension rods, bottom truss chord and bolts are typically heavily corroded. Timber members show various signs of decay including surface decay and weathering (particularly on faces exposed to the prevailing weather), small isolated pocket decays typically where there are penetrations in the wood surface allowing moisture into the timber, end decays where the ends of the timber members are exposed to the weather and centre decays where the softer centre of the hardwood timber members have started to decay.

Detailed inspection results are included in Appendices C, D, E and F of this report.

6 Recommendations

We recommend that to more accurately quantify the extent and cost of remedial and maintenance works required to bring this structure up to a standard suitable for a pedestrian / cycle bridge, the following works be carried out:

1. Structural Assessment:

Carry out a desktop structural assessment to determine required sizes of members (steel and timber) for the future intended purpose of the structure.

This would include modelling the bridge to assess loads through individual members and connections and enable treatment or replacement of members to be more accurately quantified.

2. Intrusive Investigation:

Following determination of member and connection requirements by structural assessment, those members currently classified as "investigate further" could be investigated by intrusive methods to confirm whether or not they meet structural requirements. If so they would be reclassified as "treatment required" and if not would be reclassified as "require replacement".

Investigation would involve carrying out core drilling of timber members.

3. Recommendations for Renewal / Maintenance Works

Prepare recommendations for renewal and maintenance works. These recommendations would be classified as immediate, short term and long term

4. Rough Order Cost Estimates

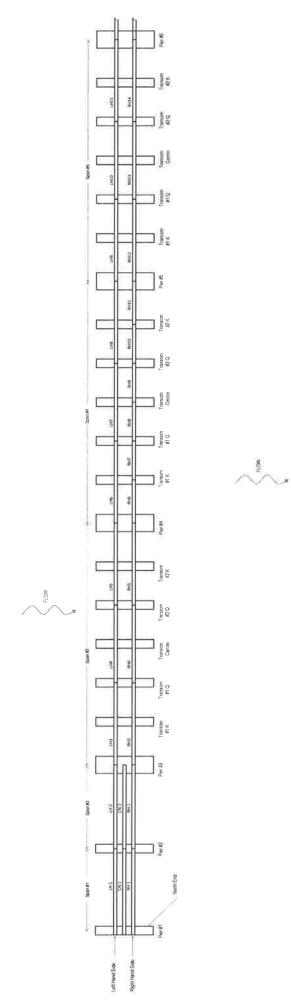
Prepare rough order cost estimates for renewal and maintenance works.

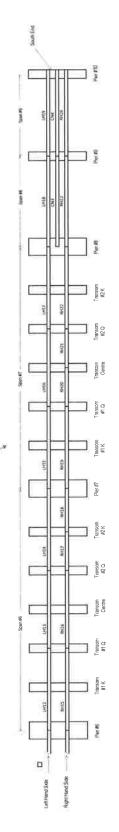


Appendix A:

- Indicative Plan of Totara River Bridge
- Pier Pile Plan
- Truss Elevation
 - (3 pages total)





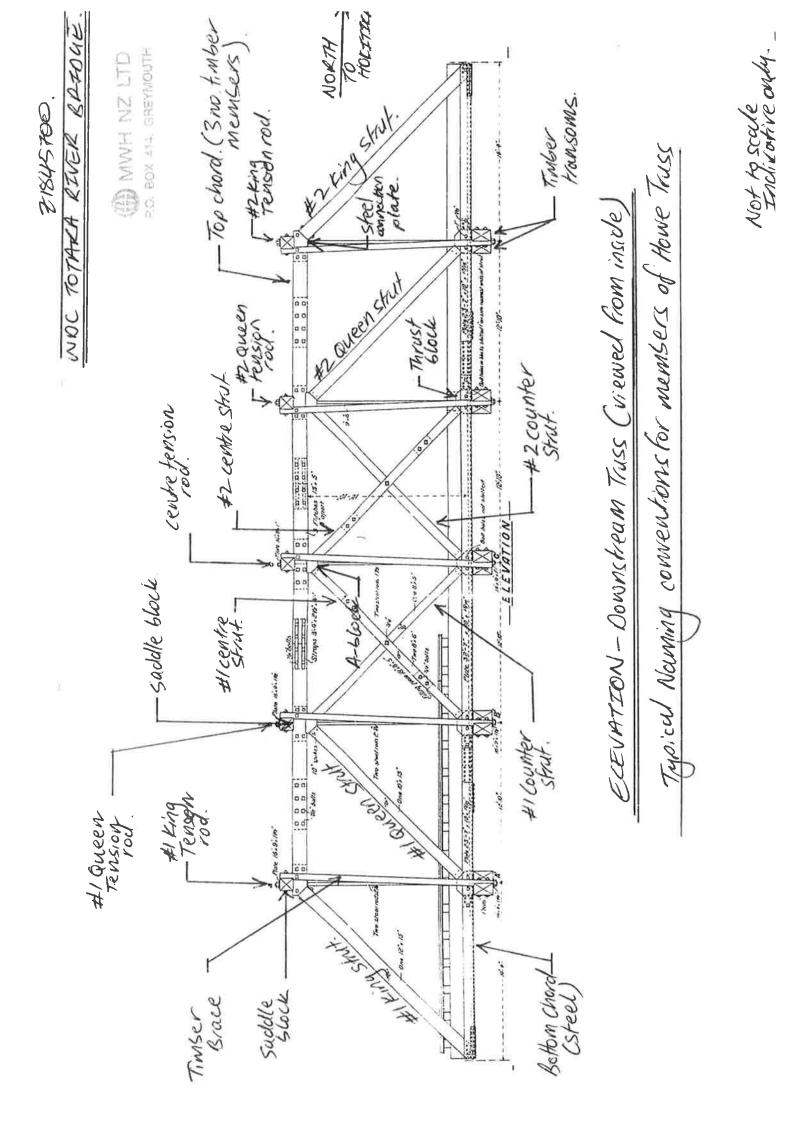


PLAN - TOTARA RIVER BRIDGE

August 2010 ambis A. Plan doox

Our rel: 218487

(∰ MWH		IC TO HURA PLAN -	KIVER BUDE	PROJECT NO.	ENU	184570 MSCRA	Convention
	PREPARED BY	JKD.		DA	TE	\cup	
BUILDING A BETTER WORLD	CHECKED BY				TE	4	
	REF/DWGS			SH	IEET/	OF	/
	LUPSTREAM PIE#S #6 #7 #8 DOWNSTREAM		×1 #2 1 0 0 0 0 0	Lugheam cut-water pile.	DIAN-TYOTTAN ATIED OTED		

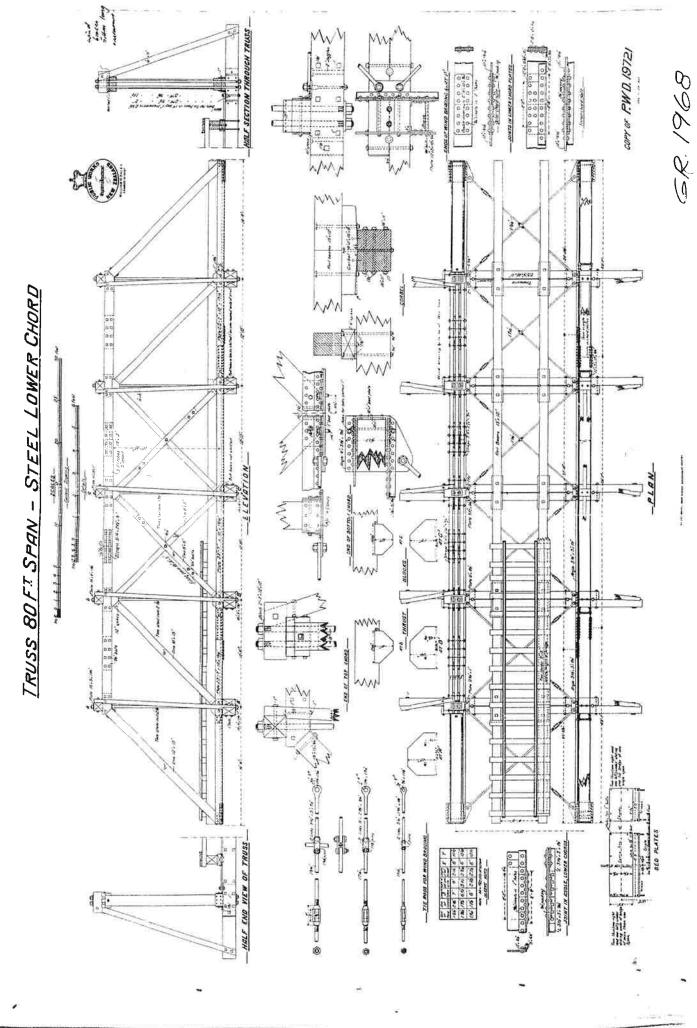




Appendix B:

 Typical Construction Drawing – 80ft Howe Truss

(1 page)



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Appendix C: Inspection Results – Trusses (10 pages)

Definition of terminology used

- "PDK" Pocket Decay
- "EDK" End Decay
- "CDK" Centre Decay

pan	Side	Structural Element		tural Assessm commendation		Estimated	Comments
			Sound /			% of	
			Treatment	Investigate		Original	
			only	Further	Replace	Capacity	
	-						
3	LH	Timber Struts					
-		#1 - King Strut				50%	Significant weathering and deep cracking top surface; bottom half section sound; large PDK at base
-	-	#1 - Queen Strut				50%	Heavy weathering and deep cracking top surface; bottom half section sound;
_	-	#1 - Counter Strut				0070	Large split through centre; large PDK at base
	<u> </u>						Bottom sounds drummy; PDK inside face; splitting
_		#1 - Centre Strut - Inside				-	Large PDK at base; top surface weathering and splitting
_	<u> </u>	- Outside	-	•		-	
		#2 - Centre Strut - Inside		•			Sounds drummy,
		- Outside		•			PDK inside face; sounds drummy at top
		#2 - Counter Strut		•			Vertical splitting at top; sounds drummy
		#2 - Queen Strut				50%	PDK top face; weathering and splitting top face
_		#2 - King Strut	•			50%	Large horizontal split inside lace; significant weathering / splitting on top surface
	-	Vertical Steel Tension Rods					
_	-	#1 - King Rods - Inside				80%	Heavily corroded
_	-	- Outside				70%	Heavily corroded
_	-					-	Heavily conceed
_		#1 - Queen Rods - Inside	· ·			70%	
_		- Outside	•			70%	Heavily corroded
		#1 - Centre Rods - Inside	•			50%	Heavily corroded
		- Outside				50%	Heavily corroded
		#2 - Queen Rods - Inside	•			80%	Heavily corroded
		- Outside	•			60%	Heavily corroded
		#2 - King Rods - Inside				90%	Heavily corroded
		- Outside				70%	Heavily corroded
-	-				-		
-		Timber Thrust Blocks					
_							
_	<u> </u>	#1 - King Timber Thrust Block	· ·	12	-		Large PDK at outside rod
	_	#1 - Queen Timber Thrust Block		•			Laige PDK at outside rou
_		Centre Timber Thrust Block	•				
_		#2 - Queen Timber Thrust Block	•				
		#2 - King Timber Thrust Block	•				
_							
		Timber A-Blocks					
		#1 - Queen A-Block	•				
-	-	Centre A-Block	•				
-	-	#2 - Queen A-Block					
-		WZ GOOTA DIOGR			<u> </u>		
_	_	Timber Saddle Blocks			-		Lassa CDK asynda hallaw
		#1 - King Saddle Block			•		Large CDK; sounds hollow
		#1 - Queen Saddle Block					Weathered with large splits on top; sounds drummy
		Centre Saddle Block		•			Large CDK inside end
		#2 - Queen Saddle Block		•			CDK inside end; otherwise appears sound
		#2 - King Saddle Block	•				Typical EDK and weathering; otherwise sound
-		Top Chord					
-		#1 King - #1 Queen - Inside			•		Large PDK; significant weathering
_							
_		- Middle					
_		- Outside	-	•		-	
_		#1 Queen - Centre - Inside	•				Plasiforstworthering
	-	- Middle	•				Significant weathering
		- Outside	•				Significant weathering
		Centre - #2 Queen - Inside	•				Surface weathering
		- Middle	•				
		- Outside		•			Sounds drummy
		#2 Queen - #2 King - Inside	•				
-		- Middle		•			EDK at king strut, large PDK near #2 queen
	-	- Outside	1				Sounds Drummy
	-	- 0/010100		<u> </u>			
-		Rottom Chard					
_		Bottom Chord				0.00/	Heavy corrosion, King strul seatings at piers sound
1		Steel Bottom Chord	•			80%	noury concerning the occurring out proto counter
	-	Steel Connection Plates					
		#1 King Strut to top chord	•			70%	Heavily corroded; bolts gone
		#2 King Strut to top chord	•			80%	Heavily corroded; bolts gone
		Timber Braces					
-		#1 - King Timber Brace			•		EDK top end
-	-			-			EDK top end
		#1 - Queen Timber Brace		-	-		EDK top end; connection to saddle block OK, bolt / nuts corroded
		Centre Timber Brace	•				
		#2 - Queen Timber Brace					EDK top end
		#2 - King Timber Brace		1		1	EDK top end

Span	Side	Structural Element	Re	tural Assessn commendati		Estimated	Comments
			Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
-	-				Replace	Gupueny	
1	RH	Timber Struts					
-		#1 - King Strut					Sounds Drummy
_		#1 - Queen Strut	-	•	-		Replaced 1966; Sounds drummy lower portion
_	-	#1 - Counter Strut		100			Vertical splitting through top surface full length
_		#1 - Centre Strut - Inside		•		-	PDK at thrust block; Splitting and Pad top surface
_		- Outside			-		PDK outside face around bolts
-		#2 - Centre Strut - Inside	-	•			
	-	- Outside					
-	-	#2 - Counter Strut				-	PDK outside face; vertical splitting
		#2 - Queen Strut		•	-		Surface weathering; dull sound at base
		#2 - King Strut		•			Surface weathering; insect holes noted near top
		HE Ming Out					
-		Vertical Steel Tension Rods				-	
-		#1 - King Rods - Inside				70%	
		- Outside				70%	
-	-	#1 - Queen Rods - Inside				80%	
-	-	- Outside		-		90%	
-		#1 - Centre Rods - Inside	•			80%	
_		- Outside				80%	
-		#2 - Queen Rods - Inside				70%	
	-	- Outside				70%	
		#2 - King Rods - Inside				30%	
		- Outside	-			30%	
	-	000000				1	
		Timber Thrust Blocks				1	
-		#1 - King Timber Thrust Block			•		Significant decay top surface; large PDK between rods and on outside of rods
-		#1 - Queen Timber Thrust Block					
	-	Centre Timber Thrust Block					
		#2 - Queen Timber Thrust Block	•				
-		#2 - King Timber Thrust Block	•		-		
	-					÷	
-	-	Timber A-Blocks					
		#1 - Queen A-Block					
-		Centre A-Block				1	
		#2 - Queen A-Block	•	-			
	-				-	1	
		Timber Saddle Blocks	-		-	1	
1		#1 - King Saddle Block		(Large CDK inside end
1		#1 - Queen Saddle Block	•				Typical EDK and weathering
-		Centre Saddle Block	•				CDK inside end; significant decay / weathering on top surface
		#2 - Queen Saddle Block				1	
		#2 - King Saddle Block		•		1	Small CDK inside end; several PDK's on northern face
-						1	
		Top Chord				1	
		#1 King - #1 Queen - Inside		•		1	Remove vegetation at end and investigate further
		- Middle	1	•			Replaced 1950; remove vegetation at end and investigate further
		- Outside	1	•			Remove vegetation at end and investigate further
1		#1 Queen - Centre - Inside	•				Significant surface decay top surface
		- Middle					
		- Outside	•				
		Centre - #2 Queen - Inside		1	-		Surface decay inside face
		- Middle	•				Weathered
		- Outside	•				Weathered
	-	#2 Queen - #2 King - Inside		•			Replaced 1933 (second hand); large PDK inside face at bolt group
	-	- Middle	•				Weathered
		- Outside					Weathered
	-	Bottom Chord					
		Steel Bottom Chord	•			60 - 80%	Heavy corrosion, King strut sealings at piers sound
	_						
-		Steel Connection Plates	-				
		#1 King Strut to top chord				60%	Heavy corrosion; bolts gone
		#2 King Strut to top chord				90%	Heavy corrosion; bolls gone
	-					1	
	-	Timber Braces	-				
	_	#1 - King Timber Brace		-		1	EDK top end
	-						EDK top end
		#1 - Queen Timber Brace					EDK top end; large PDK (approx, half section gone)
		#1 - Queen Timber Brace Centre Timber Brace #2 - Queen Timber Brace			•		EDK top end; large PDK (approx. half section gone) EDK top end; extensive splitting throughout

Span	\$ide	Structural Element		lural Assessn commendatio		Estimated	Comments
			Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
4	LH	Timber Struts					
		#1 - King Strut	•			50%	Significant weathering / cracking top surface; small PDK at base; top half of section sounds dull
		#1 - Queen Strut	•			50%	Significant weathering / cracking top surface; small PDK at base; top half of section sounds dull
		#1 - Counter Strut					Small PDK inside face at base; splitting in top surface
		#1 - Centre Strut - Inside	•				Some splitting along inside face
-	-	- Outside	•		-		Some surface splitting
_		#2 - Centre Strut - Inside					PDK on top surface
-	-	- Outside					Some splitting top surface
-	-	#2 - Counter Strut					Split in top surface full length of member
	-	#2 - Queen Strut	100			1	Deep splitting / weathering in top surface
		#2 - King Strut	•				Replaced 1944
_	-	#2 • King Stut	<u> </u>				
		Vertical Steel Tension Rods			-		
-	-				-	0.00/	Heavy corroded
-		#1 - King Rods - Inside	· ·			80%	Heavy corroded
_	-	- Outside				80%	Heavy conduct
		#1 - Queen Rods - Inside	•		-	60%	Heavy corroded
_	-	- Outside	•			80%	
		#1 - Centre Rods - Inside	· ·			90%	Heavy corroded Heavy corroded
		- Outside	•			60%	
		#2 - Queen Rods - Inside	•			70%	Heavy corroded
		- Outside	•			70%	Heavy corroded
		#2 - King Rods - Inside	•			60%	Heavy corroded
		- Outside	•			60%	Heavy corroded
		Timber Thrust Blocks					
		#1 - King Timber Thrust Block	•				
		#1 - Queen Timber Thrust Block					
_		Centre Timber Thrust Block	•				
		#2 - Queen Timber Thrust Block	•				
	-	#2 - King Timber Thrust Block					
-					<u> </u>		
-	-	Timber A-Blocks		1			
-	-	#1 - Queen A-Block					Small CDK
-		Centre A-Block	•				
-	-	#2 - Queen A-Block		•			CDK approx. 120mm diameter
-	-	WZ - QUEEN A-DIOCK			-		
-	-	Timber Saddle Blocks				-	
-	-	#1 - King Saddle Block	· ·			-	CDK inside end approx. 50mm diameter
-	-		1			+	Surface decay on lop extending down into saddle block
-		#1 - Queen Saddle Block					CDK inside end approx. 40mm diameter
-	_	Centre Saddle Block				-	
-	-	#2 - Queen Saddle Block	1				CDK inside end approx. 20mm diameter; Pad at drill holes on northern face.
-	_	#2 - King Saddle Block	<u> </u>				
_		Tan Chard				-	
_		Top Chord	-				Weathered
_	-	#1 King - #1 Queen - Inside	•		-		Replaced 1933 (second hand); weathered
_		- Middle	· ·	-			Weathered
		- Outside	•				Weathered
							Weathered
		#1 Queen - Centre - Inside	1.00				I Meanielen
		- Middle	•			-	Large DDK of and or Bitch (approx, balf another missing)
		- Middle - Outside		•			Large PDK at end or flitch (approx_half section missing)
		- Middle - Outside Centre - #2 Queen - Inside	•	•			
		- Middle - Outside Centre - #2 Queen - Inside - Middle	·	•			PDK top surface and inside face; weathered
		- Middle - Outside Centre - #2 Queen - Inside - Middle - Outside	•	•			PDK top surface and inside face; weathered PDK top surface; weathered
		- Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside	·	•			PDK top surface and inside face; weathered PDK top surface; weathered Weathered
		- Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle	•				PDK top surface and inside face; weathered PDK top surface; weathered Weathered Significant weathering and Isolated PDK
		- Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside	•	•			PDK top surface and inside face; weathered PDK top surface; weathered Weathered
		- Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle	•				PDK top surface and inside face; weathered PDK top surface; weathered Weathered Significant weathering and Isolated PDK
		- Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord	•				PDK top surface and inside face; weathered PDK top surface; weathered Weathered Significant weathering and Isolated PDK Significant weathering and Isolated PDK; dozy near #2 king Timber brace connection.
		- Middle - Outside Centre - #2 Queen - Inside - Middle #2 Queen - #2 King - Inside - Middle - Outside	•			80%	PDK top surface and inside face; weathered PDK top surface; weathered Weathered Significant weathering and Isolated PDK
		- Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord	•			80%	PDK top surface and inside face; weathered PDK top surface; weathered Weathered Significant weathering and Isolated PDK Significant weathering and Isolated PDK; dozy near #2 king Timber brace connection.
		- Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord	•			80%	PDK top surface and inside face; weathered PDK top surface; weathered Weathered Significant weathering and Isolated PDK Significant weathering and Isolated PDK; dozy near #2 king Timber brace connection.
		- Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord Steel Bottom Chord	•			80%	PDK top surface and inside face; weathered PDK top surface; weathered Weathered Significant weathering and Isolated PDK Significant weathering and Isolated PDK; dozy near #2 king Timber brace connection. Typically heavily corroded, King strut seatings at piers sound Heavily corroded; bolts gone
		- Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord Steel Bottom Chord Steel Connection Plates #1 King Strut to top chord	•				PDK top surface and inside face; weathered PDK top surface; weathered Weathered Significant weathering and Isolated PDK Significant weathering and Isolated PDK; dozy near #2 king Timber brace connection. Typically heavily corroded, King strut seatings at piers sound
		- Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord Steel Bottom Chord Steel Connection Plates	• • • • • • • • • •			90%	PDK top surface and inside face; weathered PDK top surface; weathered Weathered Significant weathering and Isolated PDK Significant weathering and Isolated PDK; dozy near #2 king Timber brace connection. Typically heavily corroded, King strut seatings at piers sound Heavily corroded; bolts gone
		- Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord Steel Bottom Chord Steel Bottom Chord Steel Connection Plates #1 King Strut to top chord #2 King Strut to top chord	• • • • • • • • • •			90%	PDK top surface and inside face; weathered PDK top surface; weathered Weathered Significant weathering and Isolated PDK Significant weathering and Isolated PDK; dozy near #2 king Timber brace connection. Typically heavily corroded, King strut seatings at piers sound Heavily corroded; bolts gone
		- Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord Steel Bottom Chord Steel Bottom Chord Steel Connection Plates #1 King Strut to top chord #2 King Strut to top chord Timber Braces	•			90%	PDK top surface and inside face; weathered PDK top surface; weathered Weathered Significant weathering and Isolated PDK Significant weathering and Isolated PDK; dozy near #2 king Timber brace connection. Typically heavily corroded, King strut seatings at piers sound Heavily corroded; bolts gone
	· · · · · ·	Middle Outside Centre - #2 Queen Inside Outside Steel Bottom Chord Steel Bottom Chord Steel Connection Plates #1 King Strut to top chord #2 King Strut to top chord Timber Braces #1 - King Timber Brace	• • • •			90%	PDK top surface and inside face; weathered PDK top surface; weathered Weathered Significant weathering and Isolated PDK Significant weathering and Isolated PDK; dozy near #2 king Timber brace connection. Typically heavily corroded, King strut seatings at piers sound Heavily corroded; bolts gone Heavily corroded; bolts gone
	· · · · · ·	Middle Outside Centre - #2 Queen Inside Outside Outsi	• • • • •			90%	PDK top surface and inside face; weathered PDK top surface; weathered Weathered Significant weathering and Isolated PDK Significant weathering and Isolated PDK; dozy near #2 king Timber brace connection. Typically heavily corroded, King strut seatings at piers sound Heavily corroded; bolts gone
	· · · · · ·	Middle Outside Centre - #2 Queen Inside Outside Steel Bottom Chord Steel Bottom Chord Steel Connection Plates #1 King Strut to top chord #2 King Strut to top chord Timber Braces #1 - King Timber Brace	• • • •			90%	PDK top surface and inside face; weathered PDK top surface; weathered Weathered Significant weathering and Isolated PDK Significant weathering and Isolated PDK; dozy near #2 king Timber brace connection. Typically heavily corroded, King strut seatings at piers sound Heavily corroded; bolts gone Heavily corroded; bolts gone

Span	Side	Structural Element		tural Assessm commendation		Estimated	Comments
			Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
					Ttopiado	2.4 .	
4	RH	Timber Struts					
-		#1 - King Strut					Significant surface weathering top surface; several PDK top surface
		#1 - Queen Strut	•			-	Weathered top surface
		#1 - Counter Strut		•			Split and PDK top surface
_		#1 - Centre Strut - Inside	•				Some vertical cracking noted
_		- Outside					Some vertical cracking noted
_		#2 - Centre Strut - Inside		•			Some surface decay and splitting at base
		- Outside		•			Large vertical split full length; surface decay
_		#2 - Counter Strut	•				Splitting in top surface full length
		#2 - Queen Strut					Cracking in top surface; sounds hollow from 1m below A-block
[#2 - King Strut	•				Weathered top surface; isolated PDK inside surface
_	-					-	
	-	Vertical Steel Tension Rods					
		#1 - King Rods - Inside	•			50%	Heavily corroded
		- Outside	•			40%	Heavily corroded
-		#1 - Queen Rods - Inside	•	1		30%	Heavily corroded
		- Outside		1		30%	Heavily corroded
	-	#1 - Centre Rods - Inside	•			40%	Heavily corroded
		- Outside	•			40%	Heavily corroded
		#2 - Queen Rods - Inside	•			70%	Heavily corroded
_		- Outside				70%	Heavily corroded
		#2 - King Rods - Inside	•			70%	Heavily corroded
		- Outside			-	70%	Heavily corroded
		Timber Thrust Blocks					
	-	#1 - King Timber Thrust Block	•				
		#1 - Queen Timber Thrust Block	•				
	-	Centre Timber Thrust Block	•				
		#2 - Queen Timber Thrust Block					
-		#2 - King Timber Thrust Block					
				1		1	
		Timber A-Blocks					
-	-	#1 - Queen A-Block					
	-	Centre A-Block	•			1	
_		#2 - Queen A-Block					Small CDK inside end
-	-		<u> </u>				
		Timber Saddle Blocks					
-		#1 - King Saddle Block					Small CDK and splitting inside end; significant EDK outside end to beyond brace connection
_		#1 - Queen Saddle Block					EDK outside end
	-	Centre Saddle Block					Advanced CDK
_		#2 - Queen Saddle Block		•			Small CDK inside end; significant EDK outside end to beyond Timber brace connection; sounds hollow
		#2 - King Saddle Block	ļ	•			Large CDK inside end up to 150mm diameter; surface decay; sounds hollow; investigate and treat / replace
		Top Chord			<u> </u>		
_	-	#1 King - #1 Queen - Inside		•			Weathered; sounds hollow
		- Middle					Large PDK inside face approx. 50mm deep; weathered
	-	- Outside				-	Large PDK, approx half cross section missing
		#1 Queen - Centre - Inside	•				
-		- Middle		-			
-		- Outside					EDK at splice connection
		Centre - #2 Queen - Inside					Weathered
_	_	- Middle					Weathered
	-	- Midule - Outside				1	Weathered; small PDK top surface
		#2 Queen - #2 King - Inside		•			Weathered; split; PDK inside flitch below saddle; sounds hollow
_	_	- Middle	•			1	Weathered; split
	-	- Middle - Outside					Weathered; split
	-	Cutolut		1			
		Bottom Chord					
		Steel Bottom Chord				70%	Moderate to heavy corrosion, King strut seatings at piers sound
_		Pteel Connection Dist.					
	-	Steel Connection Plates					
		#1 King Strul to top chord				70%	Heavily corroded
		#2 King Strut to top chord	·			/0%	
		Timber Braces				-	
-		#1 - King Timber Brace					PDK at base; weathered and splitting
		#1 - Queen Timber Brace					Large split from top end through bolted connection; install split bolt
		Centre Timber Brace					
		#2 - Queen Timber Brace		•			Significant cracking; hollow sound
							Split in end; large PDK at connection to transom

Span	Side	Structural Element	Re	tural Assessn ecommendati		Estimated	Comments
			Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
	LH	Timber Struts	-				
9	-	#1 - King Strut					Significant weathering / cracking lop surface; small PDK at base; top half of section sounds dull
-		#1 - Queen Strut	•			50%	Weathered top surface with large splits down centre; PDK and split on underside
-		#1 - Counter Strut	-			0010	PDK top surface
-	_	#1 - Centre Strut - Inside	•		<u> </u>		Vertical splitting full length; some horizontal splitting on sides
-		- Outside			-		Significant vertical splitting and decay of top surface; horizontal splitting inside face
-		#2 - Centre Strut - Inside			•		Large horizontal crack full length; significant surface decay and PDK
_		- Outside					Significant splitting and PDK at base; large split at top
		#2 - Counter Strut		•			PDK at thrust block; splitting at base; sounds dull
-		#2 - Queen Strut	-			70%	PDK at base; significant weathering and cracking top surface approx 1/4 depth
	1	#2 - King Strut	•				Surface weathering on top surface
		Vertical Steel Tension Rods					
		#1 - King Rods - Inside	•			90%	Heavily corroded
		- Outside	•	-		90%	Heavily corroded
		#1 - Queen Rods - Inside				90%	Heavily corroded
	_	- Outside	•			70%	Heavily corroded
_		#1 - Centre Rods - Inside	•			80%	Heavily corroded Heavily corroded
_	_	- Outside	•			60%	Heavily corroded
		#2 - Queen Rods - Inside	·			60% 60%	Heavily corroded
-		- Outside #2 - King Rods - Inside	*	+		80%	Heavily corroded
		#2 - King Rods - Inside - Outside				90%	Heavily conoced
_		- Quiside	+			50 %	
		Timber Thrust Blocks	1	1			
_		#1 - King Timber Thrust Block	•				
-		#1 - Queen Timber Thrust Block		1			
		Centre Timber Thrust Block		(•);			Some splitting and compression occurring
		#2 - Queen Timber Thrust Block					
-		#2 - King Timber Thrust Block	•				
		Timber A-Blocks					
-		#1 - Queen A-Block	•				Small CDK inside end
		Centre A-Block	•				Small CDK inside end; small PDK at strut
		#2 - Queen A-Block	•				Large CDK inside end approx. 100mm diameter
	<u> </u>	Timber Saddle Blocks					
		#1 - King Saddle Block	•				Small CDK; large vertical split; treat and provide horizontal split bolts
_		#1 - Queen Saddle Block	•		-		CDK approx. 80mm diameter inside end
_		Centre Saddle Block	•				CDK inside end; PDK on south side Large CDK extending to top chord of truss (approx. 150mm diameter), extends to vertical tie rod
_		#2 - Queen Saddle Block			•		Soft end: sounds dull
-	_	#2 - King Saddle Block					
-	_	Top Chord			-		
-		#1 King - #1 Queen - Inside	•		<u> </u>		
		- Middle			<u> </u>		
-		- Outside	1 .				Replaced 1940
	-	#1 Queen - Centre - Inside		•			Large PDK, approx, half section missing
		- Middle		•			Large PDK and split through side; sounds drummy
		- Outside	•				
		Centre - #2 Queen - Inside	•				Large vertical split approx. 50mm deep
		- Middle	•				
		- Outside	•				
		#2 Queen - #2 King - Inside		•			CDK at south end; large vertical spilt
		- Middle					Significant weathering; PDK inside face
		- Outside		(•)			Large PDK inside face, approx. half section gone;
					_		
		Bottom Chord					Hanvily approduct King attrit eachings at sing anund
		Steel Bottom Chord	•			70%	Heavily corroded, King strut seatings at piers sound
_						-	
_	_	Steel Connection Plates				-	Heavily corrected balls gaps
_		#1 King Strut to top chord	· ·			60%	Heavily corroded; bolts gone Heavily corroded; bolts gone
		#2 King Strut to top chord	· ·	-		50%	n loanit contrad, pollo gone
_		Timber Press					
_		Timber Braces					EDK to beyond fixing bolt to saddle block
		#1 - King Timber Brace			-		Period on the second se
_		#1 - Queen Timber Brace					Some end splitting
		Contro Timber Broom					
		Centre Timber Brace #2 - Queen Timber Brace	•	•			CDX approx. 60mm diameter at top

Span	Side	Structural Element	Re	tural Assessn commendatio		Estimated	Comments
			Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
1							
5	RH	Timber Struts					
		#1 - King Strut		•			Weathered top surface; decay to approximately half depth of member
1		#1 - Queen Strut	•				Minor splitting in top surface
		#1 - Counter Strut	•				
-	-	#1 - Centre Strut - Inside				1	Vertical splitting in lower half
	-	- Outside					Vertical splitting in lower half
-	-	#2 - Centre Strut - Inside	•		<u> </u>		
-		- Outside					
-	-						
_	_	#2 - Counter Strut					Surface decay at top; dull sound in lower portion, possible CDK
	_	#2 - Queen Strut					danace decay at top, dan sound in tower portion, possible optic
_		#2 - King Strut	·				
(1				-	
		Vertical Steel Tension Rods					
l		#1 - King Rods - Inside	•			90%	Heavily corroded
		- Outside	•			90%	Heavily corroded
		#1 - Queen Rods - Inside	•			70%	Heavily corroded
		- Outside	•			70%	Heavily corroded
		#1 - Centre Rods - Inside	•			70%	Heavily corroded
		- Outside	•			70%	Heavily corroded
		#2 - Queen Rods - Inside	•			50%	Heavily corroded
		- Outside	•			70%	Heavily corroded
		#2 - King Rods - Inside	•			60%	Heavily corroded
-	-	- Outside				60%	Heavily corroded
	-	000000				1	
-		Timber Thrust Blocks	-				
		#1 - King Timber Thrust Block					
	-	#1 - Queen Timber Thrust Block			-	-	
_	-						PDK top surface and inside contact area for #2 Counter Strut
	-	Centre Timber Thrust Block	⊢ •		<u> </u>		
		#2 - Queen Timber Thrust Block	· ·	-			
		#2 - King Timber Thrust Block	•				
_						_	
		Timber A-Blocks					
		#1 - Queen A-Block	•				
		Centre A-Block	•				
	1	#2 - Queen A-Block	•				Small CDK inside end
		Timber Saddle Blocks	1				
-		#1 - King Saddle Block	•				CDK inside end approx 50mm diameter; EDK outside end
		#1 - Queen Saddle Block	•				EDK oulside end
-		Centre Saddle Block		-		-	Small CDK and vertical split inside end; EDK outside end
-		#2 - Queen Saddle Block	•		1		CDK inside end; EDK outside end
-	-	#2 - King Saddle Block					CDK inside end approx. 70mm diameter; EDK outside end; PDK northern face
	-	The range of the second					
-	-	Top Chord	-	-	-		
			•				
_	-					1	
_		- Middle	+ ·			-	PDK top surface approx 300mm long; PDK on underside
_		- Outside		•			I on top serious upprox openimicity i on en endererae
-	-	#1 Queen - Centre - Inside	•				Replaced 1976
	-	- Middle	•	Case 1			
		- Outside		•	-	-	PDK to half section depth
		Centre - #2 Queen - Inside	•				
		- Middle	•			_	
		- Outside	•				
		#2 Queen - #2 King - Inside	•				Replaced 1933 (second hand)
		- Middle	•				
		- Outside	•				
			-				
-		Bottom Chord					
		Steel Bottom Chord	•			60-80%	Heavily corroded, King strut seatings at piers sound
-	-						
	-	Steel Connection Plates			-		
-		#1 King Strut to top chord	•			60%	Heavily corroded; steel delaminating at edges
-	-			1		60%	Heavily corroded, steel delaminating at edges
	-	#2 King Strut to top chord	+ · ·			00%	
	-						
	-	Timber Braces		-	-	-	PDV at the second first and mission from balled percentions with a single and the
		#1 - King Timber Brace	•				EDK at top connection; nut missing from bolled connection; extensive splitting
		#1 - Queen Timber Brace				_	Nut missing from bolt connecting to transom
		Centre Timber Brace	•				EDK and vertical split at top
	1	#2 - Queen Timber Brace	•				
				1	1		

Span	Side	Structural Element	Re	tural Assessn commendation		Estimated	Comments
			Sound /	Lange Parata		% of	
			Treatment only	Investigate Further	Replace	Original Capacity	
-	<u> </u>		- Child	artiful	Neplace	Copacity	
6	LH	Timber Struts					
-							
		#1 - King Strut	•			70%	Significant surface weathering and PDK in lop surface; top 1/4 section no longer contributing to strength
		#1 - Queen Strut		•			Advanced surface decay top surface; splitting in top surface approx. 100mm deep
	<u> </u>						Significant splitting on top surface and inside face, full length; PDK top surface; top 1/3 section no longer
	1	#1 - Counter Strut	•			60%	contributing to strength
		#1 - Centre Strut - Inside	•		·		Splitting in top surface; PDK near top
		- Oulside	_				Splitting in top surface; PDK top surface and outside face
		#2 - Centre Strut - Inside			-		PDK at base; weathering of top surface
_		- Oulside	•				Weathering of top surface
		#2 - Counter Strut	•				Weathering and splitting of top surface; PDK top surface; some splitting in side at top PDK and thrust block; weathered top surface
	-	#2 - Queen Strut	•				PDK and birdst block, weathered top surface
		40 King Obut					Replaced 1928; advance surface decay on top surface; PDK on sides and top surface; horizontal split bolls at
-	-	#2 - King Strut					
-		Vertical Steel Tension Rods		-			
-		#1 - King Rods - Inside	· ·			70%	Heavily corroded
_	-	- Outside				80%	Heavily corroded
		#1 - Queen Rods - Inside				60%	Heavily corroded
_		- Outside	•			60%	Heavily corroded
		#1 - Centre Rods - Inside				70%	Heavily corroded
		- Outside	•			50%	Heavily corroded
		#2 - Queen Rods - Inside	•			70%	Heavily corroded
		- Outside	•			70%	Heavily corroded
		#2 - King Rods - Inside	•			95%	Light surface corrosion only
		- Outside	•			60%	Heavily corroded
_							
		Timber Thrust Blocks					
		#1 - King Timber Thrust Block	•				Significant splitting and decay
		#1 - Queen Timber Thrust Block		•			Signincant spirung and decay
	-	Centre Timber Thrust Block	•				
_	-	#2 - Queen Timber Thrust Block #2 - King Timber Thrust Block	<u> ·</u>	•			Significant decay across top in line of tension rods.
		#2 * King Hillber Hildst block	<u> </u>				
_		Timber A-Blocks					
_	-	#1 - Queen A-Block	•		-		Small CDK inside end
	-	Centre A-Block					Small CDK inside end
-		#2 - Queen A-Block	•				
-							
		Timber Saddle Blocks				1	
		#1 - King Saddle Block		•			Significant EDK (approx 1/3 of end) extending to top surface; dull sound at top
		#1 - Queen Saddle Block	•		· · · · · · · · · · · · · · · · · · ·		Replaced 1967; small CDK inside end; soft
		Centre Saddle Block					CDK inside end approx. 80mm diameter extending to base of saddle block
		#2 - Queen Saddle Block					COK inside end extending up to top surface
_		#2 - King Saddle Block					EDK inside end (approx. 1/3 of end); dull sound on northern face
	-	T. Obard				-	
_		Top Chord			-		
-		#1 King - #1 Queen - Inside	•				Weathered
-		- Middle - Outside	+:				Weathered
-	-	#1 Queen - Centre - Inside			-	-	
-		# I Queen - Centre - Inside - Middle					Weathered
	-	- Middle - Outside					Weathered
							Horizontal splitting inside face
_	-		t :				
		Centre - #2 Queen - Inside - Middle					Isolated PDK
		Centre - #2 Queen - Inside	•				Isolated PDK PDK inside face, approx. 50% loss of section
		Centre - #2 Queen - Inside - Middle	•	•			
		Centre - #2 Queen - Inside - Middle - Outside	•				PDK inside face, approx: 50% loss of section Weathered
		Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside	•				PDK inside face, approx. 50% loss of section
		Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle	•				PDK inside face, approx: 50% loss of section Weathered
		Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord	•				PDK inside face, approx: 50% loss of section Weathered Weathered; PDK
		Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside	•			70%	PDK inside face, approx: 50% loss of section Weathered
		Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord Steel Bottom Chord	•			70%	PDK inside face, approx: 50% loss of section Weathered Weathered; PDK
		Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord Steel Bottom Chord Steel Connection Plates	•				PDK inside face, approx. 50% loss of section Weathered Weathered; PDK Heavily corroded, King strut seatings at piers sound
		Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord Steel Bottom Chord Steel Connection Plates #1 King Strut to top chord	•			70%	PDK inside face, approx. 50% ioss of section Weathered Weathered; PDK Heavily corroded, King strut seatings at piers sound Heavily corroded; bolts gone
		Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord Steel Bottom Chord Steel Connection Plates	•				PDK inside face, approx. 50% loss of section Weathered Weathered; PDK Heavily corroded, King strut seatings at piers sound
		Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord Steel Bottom Chord Steel Connection Plates #1 King Strut to top chord #2 King Strut to top chord	•	•		70%	PDK inside face, approx. 50% ioss of section Weathered Weathered; PDK Heavily corroded, King strut seatings at piers sound Heavily corroded; bolts gone
		Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Middle - Outside Bottom Chord Steel Bottom Chord Steel Bottom Chord #1 King Strut to top chord #2 King Strut to top chord #2 King Strut to top chord	• • • • • •	•		70%	PDK inside face, approx: 50% loss of section Weathered Weathered; PDK Heavily corroded, King strut seatings at piers sound Heavily corroded; boilts gone Heavily corroded; boilts gone
		Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord Steel Bottom Chord Steel Bottom Chord #1 King Strut to top chord #2 King Strut to top chord #1 King Strut to top chord #1 King Strut to top chord #1 King Strut to top chord	• • • • • • •	•		70%	PDK inside face, approx. 50% ioss of section Weathered Weathered; PDK Heavily corroded, King strut seatings at piers sound Heavily corroded; bolts gone Heavily corroded; bolts gone Splitting and surface decay at base; nut missing from bolt connecting to saddle
		Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord Steel Bottom Chord Steel Bottom Chord #1 King Strut to top chord #2 King Strut to top chord Timber Braces #1 - King Timber Brace	• • • • • •			70%	PDK inside face, approx. 50% ioss of section Weathered Weathered; PDK Heavily corroded, King strut seatings at piers sound Heavily corroded; bolts gone Heavily corroded; bolts gone Splitting and surface decay at base; nut missing from bolt connecting to saddle Large split through centre; PDK outside edge near base; nut missing from bolt connecting to saddle
		Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord Steel Bottom Chord Steel Bottom Chord #1 King Strut to top chord #2 King Strut to top chord #1 King Strut to top chord #1 King Strut to top chord #1 King Strut to top chord	• • • • • • •			70%	PDK inside face, approx. 50% ioss of section Weathered Weathered; PDK Heavily corroded, King strut seatings at piers sound Heavily corroded; bolts gone Heavily corroded; bolts gone Splitting and surface decay at base; nut missing from bolt connecting to saddle

Span	Side	Structural Element	Re	tural Assessn ecommendation		Estimated	Comments
			Sound / Treatment only	Investigate Further	Donlass	% of Original Capacity	
_			Giny		Replace	Capacity	
6	RH	Timber Struts					
-		#1 - King Strut	•				Replaced 1977
		#1 - Queen Strut	•				Replaced 1965
	-	#1 - Counter Strut					
		#1 - Centre Strut - Inside	•				Surface weathering
	-	- Outside	•			1	Surface weathering
		#2 - Centre Strul - Inside	•				Surface weathering
		- Outside					Surface weathering
-		#2 - Counter Strut	•				
		#2 - Queen Strut					Some hollowing in bottom end; PDK top surface
		#2 - King Strut	•		ĨC.,		
. 1		Vertical Steel Tension Rods					
		#1 - King Rods - Inside	•			60%	Heavily corroded
		- Outside				80%	Heavily corroded
		#1 - Queen Rods - Inside	•			70%	Heavily corroded
		- Outside	•			70%	Heavily corroded
		#1 - Centre Rods - Inside	¥			80%	Heavily corroded
		- Outside				80%	Heavily corroded
		#2 - Queen Rods - Inside	•			95%	Very light surface corrosion
		- Outside	•		_	80%	Heavily corroded
		#2 - King Rods - Inside	•			90%	Light corrosion only
		- Outside	•			70%	Heavily corroded
-		Timber Thrust Blocks		-			
		#1 - King Timber Thrust Block	•				Constitute minimum form lan autoide of avaida for red
		#1 - Queen Timber Thrust Block	•				Small section missing from top outside of outside tie rod
_		Centre Timber Thrust Block	•				
_		#2 - Queen Timber Thrust Block	•				CDK started on outside face
		#2 - King Timber Thrust Block					CDR staned on outside race
	_						
_	_	Timber A-Blocks					
_		#1 - Queen A-Block	•				CDK inside end approx. 80mm diameter
_		Centre A-Block	•				
_		#2 - Queen A-Block	•	-			
						-	
-		Timber Saddle Blocks					EDK at Timber brace connection
		#1 - King Saddle Block	•				Vertical split through inside face
-		#1 - Queen Saddle Block Centre Saddle Block	- ·				PDK; outside tension rod loose due to saddle block crushing
		#2 - Queen Saddle Block			<u> </u>		EDK at Timber brace connection
	-	#2 - King Saddle Block	•				Significant EDK at outside end; up to 20% CDK inside end
	-	Hz - King Saddle block					
-		Top Chord				-	
		#1 King - #1 Queen - Inside	•				Splitting and PDK top surface; EDK and southern end
		- Middle	· ·				
-		- Outside					
		#1 Queen - Centre - Inside	•				Splitting in top surface
		- Middle	•				
		- Outside	•	1			PDK
		Centre - #2 Queen - Inside	•				
	1	- Middle	•				
		- Outside					
		#2 Queen - #2 King - Inside	•				
		- Middle	•				
		- Outside	•				
		Bottom Chord					
		Steel Bottom Chord	•		1	80-90%	Light to moderate corrosion, King strut seatings at piers sound
		Steel Connection Plates					
		#1 King Strut to top chord	•			70%	Heavily corroded; bolts gone
		#2 King Strut to top chord	•			70%	Heavily corroded; bolts gone
		Timber Braces				_	
		#1 - King Timber Brace	•				Significant splitting and PDK
		#1 - Queen Timber Brace	•			-	Split through centre at top end
		Centre Timber Brace	-		•		EDK top end
		#2 - Queen Timber Brace			•		EDK top end; large split through centre
		#2 - King Timber Brace	•				

oan S	Side	Structural Element	Re	tural Assessn ecommendation		Estimated	Comments
			Sound /			% of	
			Treatment	Investigate		Original	
			only	Further	Replace	Capacity	
7 L	H.	Timber Struts					
		#1 - King Strut	•			70%	Extensive surface weathering and splitting
		#1 - Queen Strul	•				
		#1 - Counter Strut	•				
-		#1 - Centre Strut - Inside			•		Large PDK inside face; splitting
-		- Outside	•				Splitting and associated PDK; ropey top surface
-+		#2 - Centre Strut - Inside	•				Vertical splitting top surface; small PDK at base
-	-						Vertical splitting top surface
-	_	- Outside	-				PDK both ends; some horizontal splitting; weathering and surface decay on top surface
_		#2 - Counter Strut	•				Replaced 1960; Splitting and PDK top surface
_	_	#2 - Queen Strut	•				
		#2 - King Strut	•			70%	Vertical splitting and PDK top surface up to 60mm deep
		Vertical Steel Tension Rods					
		#1 - King Rods - Inside	•			95%	Light surface corrosion
		- Outside	•			60%	Heavily corroded
-	-	#1 - Queen Rods - Inside	•			20%	Heavily corroded
-	_	- Outside	•			40%	Heavily corroded
+		#1 - Centre Rods - Inside	•			20%	Heavily corroded
+		- Outside	•			40%	Heavily corroded
+				-		70%	Heavily corroded
-	_	#2 - Queen Rods - Inside					Light surface corrosion
-		- Outside	•			95%	
		#2 - King Rods - Inside	•			80%	Heavily corroded
		- Outside	•			90%	Heavily corroded
1		Timber Thrust Blocks					
	1	#1 - King Timber Thrust Block	•				
		#1 - Queen Timber Thrust Block					Second hand (replaced); PDK top surface; small PDK inside of inside rod
-		Centre Timber Thrust Block	•				
-	_	#2 - Queen Timber Thrust Block	· ·				
-							Second hand (replaced); Some decay along top through centre
-+-	_	#2 - King Timber Thrust Block	· ·				
_	_						
_	_	Timber A-Blocks					a month i stati
		#1 - Queen A-Block	•				Split with some decay south edge
		Centre A-Block	•		1		Small CDK inside end; small PDK behind strut
		#2 - Queen A-Block	•		0		Small CDK and some splitting through end
-		Timber Saddle Blocks					
	-	#1 - King Saddle Block		•			Large split inside end from top to centre; Significant EDK outside end; sounds hollow
-		#1 - Queen Saddle Block					Large EDK extending full depth; sounds hollow underneath bolts
-		Centre Saddle Block	-				Large CDK inside end full depth of saddle
	_	#2 - Queen Saddle Block	•	-			CDK starting at inside end with vertical crack
	_		· · ·		-	-	Large CDK inside end through centre extending to top surface; outside end similar, sounds very hollow
_	_	#2 - King Saddle Block			•		and a set and an another entered and an and a set a
	_	Top Chord					
		#1 King - #1 Queen - Inside	•				Replaced 1960; some splitting and PDK inside face
T		- Middle	•				
		- Outside	٠				Significant weathering and PDK inside face
		#1 Queen - Centre - Inside		1	1		Large PDK inside face
1		- Middle	•				
+		- Outside					Small PDK on top; splitting on inside face
+		Centre - #2 Queen - Inside			-	-	Replaced 1960; Large splil on inside face
-	-	- Middle					Replaced 1960
			•				
-		- Outside	•	-	-		Performed 1060: PDK and califing inside face
		#2 Queen - #2 King - Inside	•				Replaced 1960; PDK and splitting inside face
		- Middle					Replaced 1960
		- Outside	•				Weathered top surface
T							
		Bottom Chord					
		Steel Bottom Chord	•			70-80%	Heavily corroded; Up to 50% loss in section between #2 King Rods and pier, King strut seatings at piers sol
					1		
+	-	Steel Connection Plates	1				
	_	#1 King Strut to top chord	•			70%	Heavily corroded; bolls gone
+							Heavily corroded; boils gone
-	_	#2 King Strul to top chord	•		-	60%	i louril solloud, colo gollo
_							
		Timber Braces					
		#1 - King Timber Brace					Large cracks; Large PDK below saddle block
		#1 - Queen Timber Brace	•				Large CDK at lop (splice in short section at top?)
T		Centre Timber Brace	1		•		EDK at top to beyond fixing bolt to saddle block
	_	#2 - Queen Timber Brace			•		EDK at top to beyond fixing bolt to saddle block
			-			-	Large PDK at base and mid height

Span	Side	Structural Element		tural Assessn commendation		Estimated	Comments
			Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
	-						
7	RH	Timber Struts					
	_	#1 - King Strut	•				No. 10 standard realized for surface
_	_	#1 - Queen Strut	•				Significant surface cracking top surface
	_	#1 - Counter Strut					Demonstrate and factored DDV
	_	#1 - Centre Strut - Inside				<u> </u>	Some cracking and isolated PDK Some cracking and isolated PDK
	-	- Outside	(•)				
_	_	#2 - Centre Strul - Inside	2(•C				Split at top
	_	- Outside	•			<u> </u>	Split with PDK at top
		#2 - Counter Strut			•		Significant loss of section at bottom end through decay otherwise sound; splice in a short length?
_		#2 - Queen Strut					Replaced 1933 (second hand); surface decay inside face
_		#2 - King Strul	•				Replaced 1955 (Second nalid), sonace decay inside lace
	_	Vertical Steel Tension Rods					
	_	#1 - King Rods - Inside				95%	Light surface corrosion only
		- Outside	•			95%	Light surface corrosion only
	-	#1 - Queen Rods - Inside				50%	Heavily corroded
	-	- Outside	•			50%	Heavily corroded
	-	#1 - Centre Rods - Inside	•			95%	Light surface corrosion only
	-	- Outside			<u> </u>	50%	Heavily corroded
		#2 - Queen Rods - Inside	1.0			40%	Heavily corroded
		- Outside				40%	Heavily corroded
		#2 - King Rods - Inside	•			90%	Light corrosion only
		- Outside	•			90%	Light corrosion only
		Timber Thrust Blocks					
		#1 - King Timber Thrust Block	. se				
		#1 - Queen Timber Thrust Block	(•)				
		Centre Timber Thrust Block	((#)			_	
		#2 - Queen Timber Thrust Block					
		#2 - King Timber Thrust Block					
		Timber A-Blocks					
		#1 - Queen A-Block			•		CDK; PDK and splitting on counter strut side; signs of compression; replace within 5yrs
		Centre A-Block	()•)				Small PDK around strut
		#2 - Queen A-Block	1.066				
		Timber Saddle Blocks					
		#1 - King Saddle Block			•		CDK; PDK top at top
		#1 - Queen Saddle Block			•		Large CDK inside end; replace within 5 years
		Centre Saddle Block	•				EDK outside end
		#2 - Queen Saddle Block	3.00) 				Some surface decay and weathering
		#2 - King Saddle Block	•				EDK outside end
and the second s		Top Chord					
		Top Chord #1 King - #1 Queen - Inside			•		PDK inside and outside faces at #1 Queen A-block
					•		
		#1 King - #1 Queen - Inside			•		Large PDK around bolts; completely gone near #1 Queen A-block
		#1 King - #1 Queen - Inside - Middle	•				
		#1 King - #1 Queen - Inside - Middle - Outside			•		Large PDK around bolts; completely gone near #1 Queen A-block PDK inside and outside faces at #1 Queen A-block
		#1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside			•		Large PDK around bolts; completely gone near #1 Queen A-block
		#1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside - Middle			•		Large PDK around bolts; completely gone near #1 Queen A-block PDK inside and outside faces at #1 Queen A-block
		#1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside - Middle - Outside	•		•		Large PDK around bolts; completely gone near #1 Queen A-block PDK inside and outside faces at #1 Queen A-block Large PDK around bolts; completely gone near #1 Queen A-block
		#1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside - Middle - Outside Centre - #2 Queen - Inside	•		•		Large PDK around bolts; completely gone near #1 Queen A-block PDK inside and outside faces at #1 Queen A-block
		#1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside - Middle Centre - #2 Queen - Inside - Middle	•		•		Large PDK around bolts; completely gone near #1 Queen A-block PDK inside and outside faces at #1 Queen A-block Large PDK around bolts; completely gone near #1 Queen A-block PDK around bolts
		#1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside - Middle - Outside Centre - #2 Queen - Inside - Middle - Outside	•		•		Large PDK around bolts; completely gone near #1 Queen A-block PDK inside and outside faces at #1 Queen A-block Large PDK around bolts; completely gone near #1 Queen A-block
		#1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside - Middle Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside	•		•		Large PDK around bolts; completely gone near #1 Queen A-block PDK inside and outside faces at #1 Queen A-block Large PDK around bolts; completely gone near #1 Queen A-block PDK around bolts
		#1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside - Middle Centre - #2 Queen - Inside - Outside - Outside - Middle - Outside #2 Queen - #2 King - Inside - Middle	•		•		Large PDK around bolts; completely gone near #1 Queen A-block PDK inside and outside faces at #1 Queen A-block Large PDK around bolts; completely gone near #1 Queen A-block PDK around bolts
		#1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside - Middle Centre - #2 Queen - Inside - Outside - Outside - Middle - Outside #2 Queen - #2 King - Inside - Middle	•		•		Large PDK around bolls; completely gone near #1 Queen A-block PDK inside and outside faces at #1 Queen A-block Large PDK around bolts; completely gone near #1 Queen A-block PDK around bolts PDK around bolts Replaced 1974 (second hand)
		#1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside - Middle - Outside Centre - #2 Queen - Inside - Middle #2 Queen - #2 King - Inside - Middle - Outside	•		•	60%	Large PDK around bolts; completely gone near #1 Queen A-block PDK inside and outside faces at #1 Queen A-block Large PDK around bolts; completely gone near #1 Queen A-block PDK around bolts
		#1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside - Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord	•			60%	Large PDK around bolls; completely gone near #1 Queen A-block PDK inside and outside faces at #1 Queen A-block Large PDK around bolts; completely gone near #1 Queen A-block PDK around bolts PDK around bolts Replaced 1974 (second hand)
		#1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside - Middle - Outside Centre - #2 Queen - Inside - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord Steel Bottom Chord	•			60%	Large PDK around bolls; completely gone near #1 Queen A-block PDK inside and outside faces at #1 Queen A-block Large PDK around bolts; completely gone near #1 Queen A-block PDK around bolts PDK around bolts Replaced 1974 (second hand)
		#1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside - Middle - Outside Centre - #2 Queen - Inside - Inside - Outside #2 Queen - #2 King - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord Steel Bottom Chord	•			60%	Large PDK around bolls; completely gone near #1 Queen A-block PDK inside and outside faces at #1 Queen A-block Large PDK around bolts; completely gone near #1 Queen A-block PDK around bolts PDK around bolts Replaced 1974 (second hand)
		#1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside - Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside #2 Queen - #2 King - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Battom Chord Steel Bottom Chord Steel Connection Plates #1 King Strut to top chord					Large PDK around bolts; completely gone near #1 Queen A-block PDK inside and outside faces at #1 Queen A-block Large PDK around bolts; completely gone near #1 Queen A-block PDK around bolts PDK around bolts Replaced 1974 (second hand) Heavily corroded, King strut seatings at piers sound
		#1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside - Middle - Outside Centre - #2 Queen - Inside - Inside - Outside #2 Queen - #2 King - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord Steel Bottom Chord	•			70%	Large PDK around bolts; completely gone near #1 Queen A-block PDK inside and outside faces at #1 Queen A-block Large PDK around bolts; completely gone near #1 Queen A-block PDK around bolts PDK around bolts Replaced 1974 (second hand) Heavily corroded, King strut seatings at piers sound Heavily corroded; bolts gone
		#1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside - Middle Centre - #2 Queen - Inside - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside - Steel Bottom Chord Steel Bottom Chord Steel Bottom Chord - Steel Connection Plates #1 King Strut to top chord #2 King Strut to top chord				70%	Large PDK around bolts; completely gone near #1 Queen A-block PDK inside and outside faces at #1 Queen A-block Large PDK around bolts; completely gone near #1 Queen A-block PDK around bolts PDK around bolts Replaced 1974 (second hand) Heavily corroded, King strut seatings at piers sound Heavily corroded; bolts gone
		#1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside - Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Middle			•	70%	Large PDK around bolts; completely gone near #1 Queen A-block PDK inside and outside faces at #1 Queen A-block Large PDK around bolts; completely gone near #1 Queen A-block PDK around bolts PDK around bolts Replaced 1974 (second hand) Heavily corroded; King strut seatings at piers sound Heavily corroded; bolts gone Heavily corroded; bolts gone
		#1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside - Middle - Outside Centre - #2 Queen - Inside - Inside - Outside #2 Queen - #2 King - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Battom Chord Steel Bottom Chord Steel Bottom Chord Steel Connection Plates #1 King Strut to top chord #2 King Strut to top chord #1 King Strut to top chord #1 King Strut to top chord	· · · · · · · · · · · · · · · · · · ·			70%	Large PDK around bolts; completely gone near #1 Queen A-block PDK inside and outside faces at #1 Queen A-block Large PDK around bolts; completely gone near #1 Queen A-block PDK around bolts PDK around bolts Replaced 1974 (second hand) Heavily corroded, King strut seatings at piers sound Heavily corroded; bolts gone
		#1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside - Middle - Outside Centre - #2 Queen - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Bottom Chord Steel Bottom Chord Steel Bottom Chord Steel Bottom Plates #1 King Strut to top chord #2 King Strut to top chord #1 King Strut to top chord			•	70%	Large PDK around bolts; completely gone near #1 Queen A-block PDK inside and outside faces at #1 Queen A-block Large PDK around bolts; completely gone near #1 Queen A-block PDK around bolts PDK around bolts Replaced 1974 (second hand) Heavily corroded, King strut seatings at piers sound Heavily corroded; bolts gone Heavily corroded; bolts gone Large PDK at end Large PDK at end
		#1 King - #1 Queen - Inside - Middle - Outside #1 Queen - Centre - Inside - Middle - Outside Centre - #2 Queen - Inside - Inside - Outside #2 Queen - #2 King - Inside - Middle - Outside #2 Queen - #2 King - Inside - Middle - Outside Battom Chord Steel Bottom Chord Steel Bottom Chord Steel Connection Plates #1 King Strut to top chord #2 King Strut to top chord #1 King Strut to top chord #1 King Strut to top chord	· · · · · · · · · · · · · · · · · · ·		•	70%	Large PDK around bolts; completely gone near #1 Queen A-block PDK inside and outside faces at #1 Queen A-block Large PDK around bolts; completely gone near #1 Queen A-block PDK around bolts PDK around bolts Replaced 1974 (second hand) Heavily corroded; King strut seatings at piers sound Heavily corroded; bolts gone Heavily corroded; bolts gone



Appendix D: Inspection Results – Transoms (2 pages)

Definition of terminology used

- "PDK" Pocket Decay
- "EDK" End Decay
- "CDK" Centre Decay

TOTARA RIVER BRIDGE - TRANSOMS

200						
		Sound / Treatment only	Further Investigation	Replace	Original Capacity	
3 LH	#1 King Transom	•				Bolts heavily corroded
RH	#1 King Transom	•				Replaced 1960
H	#1 Queen Transom	•				Condition of bolts is mixed
RH	#1 Queen Transom	•				Replaced 1944; PDK downstream end
H	Centre Transom	•				Weathered
RH	Centre Transom	•				Replaced 1977 (second hand); PDK top surface between road beams
3	#2 Queen Transom	•				Replaced 1977
RH	#2 Queen Transom	•				Replaced 1960
H	#2 King Transom	•				Replaced 1977; small surface defect top surface between RH truss and RH road beam
RH	#2 King Transom	•				Replaced 1967 (second hand)
4 LH	#1 King Transom		•			large CDK; Sounds hollow under road beams
RH	#1 King Transom		•			Significant EDK upstream end; sounds hollow under truss
5	#1 Queen Transom		•			Sounds hollow under LH road beam
RH	#1 Queen Transom	•				Honey combing and surface decay downstream end; large split between RH road beam and RH truss; small CDK upstream end
E	Centre Transom		•			Sounds hollow under LH road beam
표	Centre Transom	•				Isolated PDK south face; surface weathering and decay
3	#2 Queen Transom		•			Replaced 1960; large CDK downstream end extending back to thrust block; EDK upstream end; large PDK northern face between RH road beam and RH truss
RH	#2 Queen Transom		•			Replaced 1960; EDK upstream end; condition of bolts is mixed
В	#2 King Transom	•				Condition of bolts is mixed
RH	#2 King Transom	•				
5 LH	#1 King Transom	•				Replaced 1975
표	#1 King Transom	•				Some horizontal splitting downstream end; condition of bolts is mixed
H	#1 Queen Transom	•				Replaced 1977
F	#1 Queen Transom	•				Split through top at upstream end
3	Centre Transom	•				Replaced 1944
RH	Centre Transom	•				Split through top at upstream end
E	#2 Queen Transom					
표	#2 Olieen Transom		•			Significant EDK upstream end extending up to 1.5m from end; extensive surface decay on top surface; member collapsing inward; (likely replacement required)
3	#2 King Transom	•				Condition of bolts is mixed; 5 splice bolts between transoms are missing
표						

TOTARA RIVER BRIDGE - TRANSOMS

B H #1 King Transom Sound / Further Original RH #1 King Transom • Purther Criginal RH #1 King Transom • Purther Criginal RH #1 King Transom • Purther Criginal RH #1 Uueen Transom • Purther Criginal RH #1 Oueen Transom • Purther Criginal RH #1 Oueen Transom • Purther Criginal RH #1 Oueen Transom • Purther Criginal RH #2 Oueen Transom • • Purther Criginal RH #2 Oueen Transom • • Purther Purther RH #2 Cueen Transom • • Purther Purther RH #2 Cueen Transom • • Purther Purther RH #1 King Transom • • Purther Purther RH #1 King Transom • • Purther Purther RH #1 Conten Transom	Snan Side	Structural Flement	Structural Asses	sement / Recon		Estimated % Comments	amments
Sound / Treatment only Further Orginal #1 King Transom • • • #1 Queen Transom • • • #2 Centre Transom • • • #2 Cueen Transom • • • #2 King Transom • • • #2 King Transom • • • #1 King Transom • •<					Т		
#1 King Transom Treatment only Investigation Replace Capacity #1 King Transom • • • • • #1 King Transom • • • • • • #1 King Transom • • • • • • • #1 Queen Transom • • • • • • • #1 Queen Transom • • • • • • • #2 Cutre Transom • • • • • • • #2 King Transom • • • • • • • #1 King Transom • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • •				Further		Original	
#1 King Transom • • • • #1 King Transom • • • • #1 King Transom • • • • #1 Gueen Transom • • • • #1 Queen Transom • • • • #2 King Transom • • • • #2 King Transom • • • • #2 King Transom • • • • #1 King Transom • • • • #1 King Transom • • • • #1 King Transom • • • • • #1 Queen Transom • • • • • • #1 Queen Transom • • • • • • • • • • </td <td></td> <td></td> <td></td> <td></td> <td>Replace</td> <td>Capacity</td> <td></td>					Replace	Capacity	
#1 King Transom • • • #1 King Transom • • • #1 Queen Transom • • • #2 Centre Transom • • • #2 Queen Transom • • • #2 King Transom • • • #1 King Transom • • • #1 Gueen Transom • • • #1 Gueen Transom • • #1 Queen Transom • • • #1 Queen Transom • • • #1 Queen Transom • • • #2 King Transom • • • #2 Queen							
#1 King Transom • • • • #1 Queen Transom • • • • #1 Queen Transom • • • • #1 Queen Transom • • • • Centre Transom • • • • Dentre Transom • • • • #2 Queen Transom • • • • #2 King Transom • • • • #2 King Transom • • • • #2 King Transom • • • • #1 Queen Transom • • • • • #1 Queen Transom • • • • • • #1 Queen Transom • • • • • • • • • • <td>6 LH</td> <td>#1 King Transom</td> <td>•</td> <td></td> <td></td> <td></td> <td>PDK top surface; EDK upstream end; condition of bolts mixed</td>	6 LH	#1 King Transom	•				PDK top surface; EDK upstream end; condition of bolts mixed
#1 Queen Transom • • • • #1 Queen Transom • • • • Centre Transom • • • • Centre Transom • • • • Centre Transom • • • • #2 King Transom • • • • #1 King Transom • • • • #1 King Transom • • • • #1 Queen Transom • • • • #1 Queen Transom • • • • #1 Queen Transom • • • • • #1 Queen Transom • • • • • • #1 Queen Transom • • • • • • • • • •	RH	#1 King Transom	•				rd splitting upstream end
#1 Queen Transom • • • • Centre Transom • • • • Centre Transom • • • • #2 Uueen Transom • • • • #2 King Transom • • • • #1 King Transom • • • • #1 King Transom • • • • #1 Queen Transom • • • • #1 Queen Transom • • • • #1 Queen Transom • • • • #2 Queen Transom • • • • • #2 King Transom • • • • • • #2 King Transom • • • • • • • • • •	Н	#1 Queen Transom	•				splaced 1944; condition of bolts is mixed
Centre Transom • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • •	RH	#1 Queen Transom	•				
Centre Transom • • • #2 Queen Transom • • • #2 King Transom • • • #2 King Transom • • • #1 Queen Transom • • • #2 Queen Transom • • • • #2 Queen Transom • • • • #2 Ming Transom • • • • • #2 Ming Transom • • • • • <	Н	Centre Transom	•				large CDK / EDK upstream end; surface decay / weathering on top surface
#2 Queen Transom • • • • #2 Queen Transom • • • • #2 King Transom • • • • #2 King Transom • • • • #1 King Transom • • • • #1 King Transom • • • • #1 Ucuen Transom • • • • #1 Queen Transom • • • • #1 Queen Transom • • • • #2 Queen Transom • • • • #2 Queen Transom • • • • #2 King Transom • • • • #2 King Transom • • • • #2 King Transom • • • • • #2 King Transom • • • • • • #2 King Transom • • • • • • #2 King Transom • <td>RH</td> <td>Centre Transom</td> <td>•</td> <td></td> <td></td> <td></td> <td>Weathered; large horizontal split through side at upstream end - install vertical split bolts</td>	RH	Centre Transom	•				Weathered; large horizontal split through side at upstream end - install vertical split bolts
#2 Queen Transom • • • • #2 King Transom • • • • #2 King Transom • • • • #2 King Transom • • • • • #1 King Transom • • • • • • #1 King Transom • • • • • • #1 King Transom • • • • • • #1 Queen Transom • • • • • • • #1 Queen Transom • • • • • • • #1 Queen Transom • • • • • • • • #1 Queen Transom • • • • • • • • • • • • • • • • • • • • • • • • • • • • • •	Н	#2 Queen Transom	•				Splitting downstream end; significant horizontal splitting upstream end - install vertical split bolts
#2 King Transom • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • •	RH	#2 Queen Transom	•				eathered
#2 King Transom • • • • #1 King Transom • • • • #1 King Transom • • • • #1 King Transom • • • • • #1 Queen Transom • • • • • • #1 Queen Transom • • • • • • • #1 Queen Transom • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • <t< td=""><td>H</td><td>#2 King Transom</td><td></td><td>•</td><td></td><td></td><td>CDK downstream end; large PDK south face; PDK upstream face; hollow sound from LH truss to end</td></t<>	H	#2 King Transom		•			CDK downstream end; large PDK south face; PDK upstream face; hollow sound from LH truss to end
#1 King Transom • • • #1 Queen Transom • • • #1 Queen Transom • • • #1 Queen Transom • • • #2 King Transom • • • #2 King Transom • • •	RH	#2 King Transom	•				Weathered; splitting on north and south face with associated decay
#1 King Transom • • • • #1 King Transom • • • • #1 Queen Transom • • • • #1 Queen Transom • • • • • #1 Queen Transom • • • • • • #1 Queen Transom • • • • • • #1 Queen Transom • • • • • • • #2 Queen Transom • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • •							
#1 King Transom • • • • #1 Queen Transom • • • • #1 Queen Transom • • • • #1 Queen Transom • • • • • #1 Queen Transom • • • • • Centre Transom • • • • • #2 Queen Transom • • • • • #2 Queen Transom • • • • • • #2 King Transom • • • • • • • #2 King Transom • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • <td< td=""><td>7 LH</td><td>#1 King Transom</td><td></td><td>•</td><td></td><td></td><td>nall EDK upstream end; splitting; sounds drummy</td></td<>	7 LH	#1 King Transom		•			nall EDK upstream end; splitting; sounds drummy
#1 Queen Transom • • • #1 Queen Transom • • • #1 Queen Transom • • • Centre Transom • • • Centre Transom • • • #2 Queen Transom • • • #2 Queen Transom • • • #2 King Transom • • • #2 King Transom • • •	RH	#1 King Transom	•				
#1 Queen Transom • • • Centre Transom • • • Centre Transom • • • K2 Queen Transom • • • #2 Queen Transom • • • #2 King Transom • • •	[CH	#1 Queen Transom	•				arge CDK downstream end; significant weathering; PDK
Centre Transom • • • Centre Transom • • • • #2 Queen Transom • • • • #2 Queen Transom • • • • #2 Queen Transom • • • • #2 King Transom • • • • #2 King Transom • • • •	RH	#1 Queen Transom	•				large CDK upstream end; splitting both ends; horizontal split and downstream end requires vertical split botts
Centre Transom • • • #2 Queen Transom • • • #2 Queen Transom • • • #2 King Transom • • • #2 King Transom • • •	H	Centre Transom		•			Significant weathering; large PDK upstream end; sounds drummy
#2 Queen Transom • • #2 Queen Transom • • #2 King Transom • •	RH	Centre Transom	•				Horizontal split through centre at downstream end; install vertical split bolts
#2 Queen Transom • • • • • • • • • • • • • • • • • • •	H	#2 Queen Transom	•				eplaced 1977
#2 King Transom • • • • • • • • • • • • • • • • • • •	RH	#2 Queen Transom		•			Significant EDK upstream end in horizontal plane, extending back under truss; large PDK south face; significant weathering; soft
#9 Kina Transom	E	#2 King Transom	•				urface weathering
	RH	#2 King Transom	•				PDK upstream end; significant weathering



Appendix E: Inspection Results – Road Beams, Corbels and Deck Bracing (9 pages)

Definition of terminology used

- "PDK" Pocket Decay
- "EDK" End Decay
- "CDK" Centre Decay

Structural Eleme	opt		ural Assessm commendation		Estimated % of Original Capacity	Comments
Structural Eleme	ent	Sound /	Investigate	Replace		
Road Beams	LH1		•			Significant weathering and splitting; large PDK outside face; PDK top surface and outside face near pier #2; vegetation growing on top
	LH2		•			Significant weathering and splitting; PDK inside and outside face a northern end; PDK top surface; - bottom half of section appears sound
	LH3	•				Numerous PDK top surface and both sides; significant horizontal splitting through sides over top 1/2 to 2/3 section depth
	LH4	•				Weathering and splitting top surface; minor horizontal cracking in sides; numerous PDK top surface
	LH5	•				Replaced 1974; diagonal splitting on side and PDK both sides of beam at #2 Queen corbel ; PDK at northern end; drummy sound a pier #4 end
	LH6		•			Large PDK at north end extending from top to within 150mm of base (2/3 section gone); significant weathering and splitting; numerous PDK top surface; large PDK between #1 King and #1 Queen transoms approx. 40mm deep; dull sound at southern end
	LH7					Weathering , splitting and surface decay on top and both sides; numerous PDK on top surface and on sides
	LH8					Significant weathering; significant splitting both sides; PDK inside and outside faces; evidence of insect attack; hollow sound at north end - estimate top half of beam not contributing structurally
	LH9			•		Significant weathering and surface decay all faces; evidence of insect attack; large PDK top surface at north end; PDK sides and underside
	LH10					Replaced 1960; large PDK inside face at south end; isolated PDK top and outside face; weathering and splitting on outside face; vertical splitting on top; evidence of insect attack;
	LH11		•			Replaced 1933 (second hand); top surface weathering and splitting; large PDK inside face and significant vertical splitting at south end; significant weathering south end - <i>Investigate south end</i>
	LH12	•				Typical surface weathering
	LH13	•				Typical surface weathering and splitting; isolated PDK top surface evidence of insect attack
	LH14		•			Weathering and isolated PDK to top surface and sides; horizontal splitting to sides; top 1/4 depth sounds drummy to end of corbel a south end; large horizontal split to end of corbel at north end
	LH15	·				Replaced 1966; weathering, splitting and isolated PDK top surface significant weathering and surface decay, outside face; PDK both ends; sounds drummy at ends - Assume top 1/4 section does not contribute structurally
	LH16		•			Weathering and PDK, top surface; split and associated PDK, and large split in side with associated decay at south end; - Investigate south end

Structural Element		ural Assessn commendatio		Estimated	Comments
	Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
LH17 LH18		•			Vertical and horizontal cracking with associated decay at north end hollow sound at north end; numerous PDK top surface; splitting and PDK to sides - Investigate further (likely replacement) Replaced 1966
LH19					Replaced 1940; advanced surface decay and weathering on top and sides; soft sound at south end
CN1		•			Significant weathering and splitting; PDK on downstream face at cross member; vegetation growing on top; hollow sound at pier #2 end
CN2	•				Significant weathering and splitting; PDK top surface and inside face; horizontal split and CDK at pier #3
CN3		•			Significant weathering, splitting and associated decay top and downstream face; isolated PDK upstream face; probable end decay at pier #9 - Investigation end south end and PDK at mid span (upstream face)
CN4		•			Surface weathering; general decay; PDK on sides; horizontal spli at north end - Likely redundant
RH1		•			Significant weathering and splitting; splitting and associated PDK on inside face; - bottom half of beam appears sound
RH2	•				Weathering and vertical splitting top surface; minor horizontal splitting and weathering to sides
RH3 RH4	•				Weathering and splitting top surface; minor horizontal cracking in sides; numerous PDK top surface
RH5		•			Significant splitting and associated PDK in top and both sides; evidence of insect attack; large PDK / EDK at pier #4 end
RH6		•			Advanced surface decay and weathering; numerous PDK top surface; horizontal splitting through top half of section; estimate t 1/4 of section not contributing structurally; soft surface and dull sound at south end;
RH7	•		_		
RH8	•				Replaced (est. 1950 - 1965, barrier post covering date); isolated PDK top surface; weathering and horizontal splitting on sides
RH9	•				Replaced 1950; numerous small PDK top surface; weathering ar PDK outside face; large PDK approx. 600 long x 40 deep and approx. 1/3 section depth on outside face
RH10	•				
RH11		•			Weathering and decay both sides; large split and PDK at south e extending full width of section; horizontal split inside face at north end
RH12			•		Several large PDK along member - Parts of beam may be reused elsewhere
RH13					Weathering and splitting; large PDK on outside face at north end extending to end of corbel; large vertical split from north end to fin bolt; sounds hollow at north end.

Structural Eleme	ent		ural Assessn commendatio		Estimated	Comments
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
	RH14		•			Significant weathering and splitting and associated PDK on top and both sides; large horizontal split at south end with PDK; large vertical split at north end; PDK over #2 King corbel (both sides of beam); sounds drummy both ends
	RH15		•			Weathering and associated decay to top surface; PDK south end and sounds hollow; top half sounds drummy at north end; dull sound inside face between #1 King and #1 Queen transoms - Assume top 1/4 of member does not contribute structurally
	RH16					Weathering and associated PDK top surface; weathered sides; splitting resulting in loose segments at top corners of beam.
	RH17	•				Replaced 1963
	RH18	•				Replaced 1940; extensive weathering and decay on outside face; weathering and PDK top surface; worm holes outside face
	RH19		•			Significant weathering and splitting and associated PDK on top surface; large PDK to half width of member over #1 King transom; significant splitting at south end, sounds drummy out to end of corbel
	RH20					Splitting and decay on top surface and sides; PDK and horizontal split outside face at south end.
	RH21	•				Replaced 1968; minor weathering
	RH22		•			Large PDK / EDK at both ends; Large PDK top surface at #2 King transom; significant weathering outside face; horizontal splitting north end
	RH23	•				EDK south end; weathering, splitting and associated decay to top surface; large horizontal split at north end (approx. 600 long, near centre); hollow sound at north end
	RH24	•				General weathering only

Structural Eleme	nt		tural Assessn commendati		Estimated	Comments
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
Corbels						
Pier # 2	LH Corbel	•				
	Centre Corbel	•				
	RH Corbel		•			CDK southern end; large PDK outside face
Pier # 3	LH Corbel					Cracking at end and small CDK starting; surface weathering and cracking on outside face
	Centre Corbel		•			EDK southern end; PDK both sides; honeycombing of upstream and downstream sides; evidence of possible insect attack
	RH Corbel	•				Splitting at ends; CDK southern end
#1 King	LH Corbel	•				PDK at sides; surface decay
	RH Corbel			•		PDK inside and outside extending in under beams; EDK - Replace within 5yrs
						DDV at sides of earlyst extending in under booms
#1 Queen	LH Corbel		•			PDK at sides of corbel extending in under beams
	RH Corbel	•				CDK starting at southern end
Centre	LH Corbel	•				PDK at fixing to transom
	RH Corbel	•				PDK at fixing to transom
						Destand 4000
#2 Queen	LH Corbel	•				Replaced 1966
	RH Corbel	•				PDK at sides
#2 King	LH Corbel					Replaced 1977 (second Hand); large vertical split at northern end - Replace corroded splitter bolts
#2 Mily	RH Corbel					Splitting at ends; PDK at fixings to transom
	KH COIDEI					
		-				
Pier #4	LH Corbel					CDK southern end; significant splitting and PDK outside face
	RH Corbel	·				Replaced 1944
		-	-		-	
#1 Kind	LH Corbel	•			1	Replaced 1966
	RH Corbel					Replaced 1965
#1 Queen	LH Corbel	•				PDK inside face near centre
	RH Corbel	•				PDK top surface and inside and outside faces
Centre	LH Corbel	•				PDK both sides
	RH Corbel	•				PDK inside vertical face; surface decay and soft on sides
#2 Queen	LH Corbei	•				PDK outside face at base
	RH Corbel	•				PDK outside face; large area of decay on inside top and side.
#2 King	LH Corbel	•				PDK both side above transom; PDK top surface inside face
	RH Corbel	•				Weathering and splitting; PDK both sides above transom

Structural Elemer	nt		tural Assessm commendation		Estimated	Comments
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
Pier #5	LH Corbel					Replaced 1960; split at north end near centre; weathering and softening on outside surface; horizontal split inside face
	RH Corbel		•			Replaced 1977 (second hand); weathered
#1 King	LH Corbel	•				PDK outside face overtop of transoms; decay at base of corbel over LH transom extending approx. 150mm over transom (20mm deep); split along inside top edge; large PDK inside face
	RH Corbel		•			Significant weathering and decay inside face; large diagonal crack and associated decay extending from top surface down under beam - Investigate further when beam is replaced
#1 Queen	LH Corbel RH Corbel	•				Small EDK north end; PDK both sides overtop of transoms Weathering on outside face; PDK inside and outside faces
Centre	LH Corbel			1		PDK inside and outside face; weathering and softening to outside surface
	RH Corbel	•				Typical weathering; PDK outside face; split and PDK linking spike holes on inside face
#2 Queen	LH Corbel	•				Typical weathering and splitting; PDK over LH transom
	RH Corbel	•				Split on inside face; weathered outside face
#2 King	LH Corbel RH Corbel	•				Typical weathering and splitting
	LH Corbel					CDK / EDK at south end; weathered outside face; horizontal split and associated PDK outside face; significant splitting and decay to inside face; splitting at north end
	RH Corbel					CDK both ends; significant weathering and splitting both sides
#1 King	LH Corbel		•			Surface decay to top surface extending in under beams (both sides); vertical split through centre at north end; - Install horizontal split bolt at north end
	RH Corbel	•				
#1 Queen	LH Corbel		•			Significant amount of decay at top extending in under beam (both sides of corbel) Surface decay at top (inside face)
	RH Corbel	•				
Centre	LH Corbel		•			Decay at top surface extending in under beam (both sides of corbel); extensive PDK both sides
	RH Corbel		•			Decay at top surface extending in under beam (both sides of corbel); - Likely replace

Structural Elemer	nt		ural Assessn commendation		Estimated	Comments
			Investigate Further	Replace	% of Original Capacity	
#2 Queen	LH Corbel		•			Advanced decay at top on outside - Likely replace
	RH Corbel	•				
#2 Kina	LH Corbel	•				
#2 King	RH Corbel	•				Decay to contract surface with transoms on inside face
Pier #7	LH Corbel					Decay along bottom edge in contact with packers (inside face)
	RH Corbel	•				Weathered
#1 King	LH Carbol					Weathering; isolated PDK
#1 \\ing	LH Corbel RH Corbel	•				Weathering; splitting and PDK on outside
#1 Queen	LH Corbel			•		Large CDK at both ends (full depth); large crack and associated decay under beam
	RH Corbel	•				PDK inside face around spikes; splitting and PDK outside face; - Vegetation in the way on inside at transom
Centre	LH Corbel	•		1		Top surface decay on outside; some isolated PDK
	RH Corbel	•				Top surface cracking and associated decay; some isolated PDK
#2 Queen	LH Corbel	•				Top decay on outside extending under beam; some PDK
#2 King	RH Corbel	•				Replaced 1960; weathered
	LH Corbel	•				End splitting and weathering; split bolts both ends
	RH Corbel					Large vertical split separating two halves with split bolt at north end; sounds drummy but likely due to split - Install split bolt at south end
Pier #8	LH Corbel		•			Manmade vertical cut on south side near outside edge of pier, still approx. 600mm seating for beam; decay
						Replaced 1967 (second hand); surface decay upstream face
	Centre Corbel	•				Isolated PDK inside face; large horizontal split and PDK under beam RH22
	RH Corbel		•			- Investigate PDK under beam (otherwise sound)
Pier #9	LH Corbel	_	•			Splitting and EDK both ends; numerous PDK on sides
	Centre Corbel	•				Surface decay and splitting both ends
	RH Corbel		•			CDK / PDK and splitting both ends

Structural Element			ural Assessn commendati		Estimated	Comments
		Sound / Treatment Investigate only Further		Replace	% of Original Capacity	
Cross Presing	Solid Blocking ar	d Tio Podo				
cross bracing, a	Solid Blocking at					
Span #1	Solid Blocking			•		4 no. at 1/3 points; various states of decay; blocks falling out - Replace / reinstate
	Tie Rods	•				Rods generally ok; some nuts missing - <i>Replace nuts</i>
Span #2	Solid Blocking			•		4 no. at 1/3 points; various states of decay; blocks falling out - Replace / reinstate
	Tie Rods	•				Rods generally ok; some nuts missing - <i>Replace nuts</i>
Span #3	Cross Bracing					
Pier #3 to #1K	ĹĦ			•	30%	
	RH	•				Sound
#1K to #1Q	LH	•				Sound
	RH	•			50%	
#1Q to Centre		•				Sound
	RH			•		1/2 rod missing from centre to #1Q transom
Centre to #2Q		•			80%	
#00 to #01/	RH	•			80%	Sound through centre
#2Q to #2K	RH	•				Ends sound
#2K to Pier #4				•		Sound through centre
	RH			•	40%	Heavily corroded at pier end; otherwise sound

TOTARA RIVER BRIDGE - ROAD BEAMS, CORBELS and DECK BRACING

Structural Eleme	nt		ural Assessn commendation		Estimated	Comments		
	17	Sound / Treatment only	Investigate Further	Replace	% of Original Capacity			
Span #4	Cross Bracing							
Pier #4 to #1K	1 LL			•	40%			
FIEI #4 10 # IN	RH					40% at pier end; 70% under LH beam; otherwise sound		
#1K to #1Q				•		25% under LH beam; otherwise sound		
#11/10#102					2070			
	RH			•		10% at #1K transom; 50% under RH beam; otherwise sound		
#1Q to Centre	LH	•			70%			
	RH	•			70%			
Centre to #2Q	LH	•			50%			
	RH	•			70%			
#2Q to #2K	LH	•			50%			
	RH	•			50%			
#2K to Pier #5	LH	•			60%			
	RH			•	5%	5% and 25% at ends, otherwise sound		
Span #5	Cross Bracing			·				
Pier #5 to #1K	LH			•	0%	Almost gone at King Transom; 30% at pier end		
	RH	•			70%			
#1K to #1Q	LH			•	0%	Eyes at end sound; rest of rod completely gone		
	RH	•			50%			
#1Q to Centre	LH	•			60%			
	RH			•		10% at centre transom end; 50% along rod; sound at #1Q transom		
Centre to #2Q	LH	•			60%	Sound at ends		
	RH				50%	50% at coupler under LH beam; 60% under RH beam; otherwise sound		
#2Q to #2K		•			70%			
	RH	•				Railway iron replacement; heavily corroded along full length		
#2K to Pier #6	LH			•		20% and 40% at ends; 70% along rod		
	RH			•	40%	40% at #2K end; 80% along rod		

TOTARA RIVER BRIDGE - ROAD BEAMS, CORBELS and DECK BRACING

Structural Elemer	nt		ural Assessn commendation		Estimated	Comments			
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity				
Span #6	Cross Bracing								
Pier #6 to #1K		•				Sound			
	RH			•		Completely gone at #1K end; 80% along rod			
#1K to #1Q		•			70%				
	RH			•	20%	20% both ends; 40% along rod			
#1Q to Centre	LH					60% at coupler under LH beam; 80% under RH beam; otherwise sound			
	RH	•			60%	60% under beams; otherwise sound			
Centre to #2Q	LH	•			70%	Sound at ends			
	RH	•			60%	60% under beams; otherwise sound			
#2Q to #2K	LH			•	<10%	<10% at #2K transom; 30% at coupler under LH beam; otherwise sound			
	RH			•		Almost completely gone at #2K end; otherwise sound - Replace from centre to #2K end			
#2K to Pier #7	LH	•			60%				
	RH	•			50%				
Span #7	Cross Bracing								
Pier #7 to #1K	14			•	<10%	<10% at #1K transom; remaining rod >60%			
	RH	•			80%				
#1K to #1Q				•		30% and 40% at ends; 60% along rod			
	RH			•	30%	30% at #1Q end; remaining rod >80%			
#1Q to Centre		•			80%	Railway iron replacement			
	RH	•			70%				
Centre to #2Q	LH				0%	Rod completely gone at centre transom end; 50% along rod; sound at #2Q end			
	RH			•	40%	sound at eyes			
#2Q to #2K		•			60%				
	RH			•		30% under RH beam; 50% under LH beam; sound at ends			
#2K to Pier #8	LH			•	30%	30% at pier end; 70% under LH beam			
	RH	•				Sound			
						4 no. at 1/3 points; various states of decay; blocks falling out; one block missing			
Span #8	Solid Blocking	•				- Replace / reinstate			
	Tie Rods	•				Rods generally ok; some nuts missing - <i>Replace nuts</i>			
Span #9	Solid Blocking	•				4 no. at 1/3 points; various states of decay; blocks falling out - Replace / reinstate			
	Tie Rods	•				Rods generally ok; some nuts missing - <i>Replace nu</i> ts			



Appendix F: Inspection Results – Piers (8 pages)

Definition of terminology used

- "PDK" Pocket Decay
- "EDK" End Decay
- "CDK" Centre Decay

Pier Number	Structural Element		ural Assessn commendati		Estimated	Comments			
		Sound / Treatment only	tment Investigate		% of Original Capacity				
1	Piles								
	Upstream Pile	•				PDK at top where previously drilled; general splitting and weathering			
	Centre Pile	•			1	Surface soft but sound underneath; general weathering			
	Downstream Pile	•				Surface splitting; EDK at top where previously drilled; excavation around pile showed pile sound below ground			
	Pile Cap	•				CDK both ends; significant weathering and splitting; appears sound over piles			
	Abutment Walls - Timber facing			•		Top part collapsing; ends gone; otherwise appears ok; top part needs replacing			
	Abutment Walls - Vertical Railway Irons	•			60%	Extensive corrosion			
2	Piles	-							
	Upstream Pile	•				Surface splitting and weathering; PDK under pile cap, at top of pile, and several small isolated PDK along pile			
	Centre Pile					Vertical splitting and weathering; small loss of outer section at ground level; excavation around pile showed pile sound below ground			
	Downstream Pile					Large vertical splits in top 1/3 pile; hollow sound at top likely due to splitting; large PDK at top; excavation around pile showed pile sound below ground			
	Upstream Cut Water Pile	•				EDK and splitting at top			
	Downstream Cut Water Pile					Large CDK / EDK at top			
	Raker Studs								
	Upstream Raker Stud	•				Significant weathering; top surface has honeycomb effect and worm hole			
	Downstream Raker Stud		•		-	Surface decay and weathering to downstream face; PDK / EDK at base			
	Diagonal Bracing								
	Cross bracing				70%	Steel railway iron; varying amounts of corrosion			
	Whaling's								
	Whaling's	•			50%	Steel railway irons; heavily corroded			
	Pile Cap					Replaced 1975			

Pier Number	Structural Element		ural Assessn commendatio		Estimated	Comments				
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity					
3	Piles									
	Pile #1	•				Vertical splitting above whalers				
	Pile #2	•				Vertical splitting above whalers				
	Pile #3	•				Deep splits / pockets on north face from spikes				
	Pile #4					Vertical splitting above whalers				
	Pile #5	•				Replaced 1961				
						Splitting; weathering; block bolted to outside face at top to support pile				
	Pile #6	•				cap				
	Pile #7		•			Large CDK just above whaler; sound at ground and cap - Consider splicing in section of pile or redundant				
	Pile #8		•			Large CDK just above whaler; sound at ground and cap - Consider splicing in section of pile or redundant				
	Upstream cut-water pile		•			Has sunk approx 600mm; significant splitting and decay at top				
	Downstream cut-water pile	•				Splitting and small EDK at top				
	Raker Studs									
	Upstream Raker Stud				1	Has come free of fixing at top due to sinking cut-water pile; large split an EDK at top; large split upstream face; weathered				
	Downstream Raker Stud			•		Splitting, surface weathering and significant decay downstream face; large CDK / EDK at base - <i>Probable replacement</i>				
	Discovel Preside									
	Diagonal Bracing Cross Bracing	•			70%	Railway iron cross bracing; varying amounts of corrosion				
	Whaling's									
	Whaling's	•				All present; individual assessment of each whaler not carried out				
	Pile Caps									
	Pile Cap #1	•				Replaced 1975; EDK downstream end				
	Pile Cap #2					Splitting and associated CDK downstream end; EDK and splitting upstream end				
	Pile Cap #3	•				Splitting and EDK starting downstream end; EDK upstream end				
	Pile Cap #4			•		Large end section gone downstream end; large PDK along length and extensive decay upstream end - Replace or consider redundant				
	0 - the la									
	Corbels					Depleced 1975 accord hand: vertical calit path and				
	LH Truss Corbel - Inside - Outside	•		-		Replaced 1975 second hand; vertical split north end PDK outside face; weathered				
	RH Truss Corbel - Inside	•				Replaced 1975 second hand; minor end splitting				
	- Outside					EDK and splitting both ends				
	Packers Between Pile Cap and Beam Corbel									
	Perpendicular to corbel	•				4 no. total; weathered				
	Parallel to corbel	•	•			Weathered but generally sound except for packer under LH corbel which has significant decay - Consider packing or replacement				

2

Pier Number	Structural Element		tural Assessn commendati		Estimated	Comments			
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity				
4	Piles								
	Pile #1		•			Extensive CDK at top; vertical splitting above whalers at spike locations			
	Pile #2					Major splitting and decay on outside face and other areas; sound at base and top			
	Pile #3	•				Vertical splitting above whalers			
	Pile #4	•				Advanced EDK at top; vertical splitting above whalers			
	Pile #5		•			Splitting and associated decay on outside face due to spikes; sounds drummy above whaler; possible CDK			
	Pile #6		•			Splitting and associated decay on outside face going into centre due to spikes; possible CDK			
	Pile #7					Splitting and associated decay outside face but appears sounds; sounds drummy at top - Investigate top further			
	Pile #8	•			-	EDK at top; splitting and associated decay due to spike holes			
	Upstream cut-water pile		•			Significant CDK / EDK			
	Downstream cut-water pile	•							
	Raker Studs								
	Upstream Raker Stud					Packer missing at top; significant splitting and decay on north face; large split and CDK at base - Possible replacement			
	Downstream Raker Stud		<u> </u>			Weathering and splitting on sides and downstream face			
	Diagonal Bracing								
	Cross bracing	•			50%	Heavily corroded railway irons			
	Whaling's					All access to dividual accessment of each wholes not period out			
-	Whaling's	•				All present; individual assessment of each whaler not carried out			
	Pile Caps								
	Pile Cap #1	•				Small EDK downstream end			
	Pile Cap #2	•				Small EDK downstream end			
	Pile Cap #3	•				Replaced 1960			
	Pile Cap #4	•				Replaced 1967 second hand			
	Corbels								
	LH Truss Corbel - Inside								
	- Outside								
	RH Truss Corbel - Inside					Splitting at south end			
	- Outside	•				EDK both ends			
	Packers Between Pile Cap								
	and Beam Corbel	1			1				
	LH Beam	•							

Pier Number	Structural Element		ural Assessn commendati		Estimated	Comments
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
	Piles					
5	Pile #1		•			EDK at top; typical splitting and decay on outside face - worst pile of group therefore recommend investigating
	Pile #2	•				Typical splitting and decay on outside face
	Pile #3	•				Typical splitting and decay on outside face
	Pile #4		•			Large split and associated decay on outside face due to spike holes; CDK; excavation around pile showed pile sound below ground - Investigate or may be redundant
	Pile #5		•			EDK at top; deep splitting and associated decay all around pile; numerou drill holes from previous investigations
	Pile #6	•				Minor splitting and associated decay
	Pile #7	•				Typical splitting and decay on outside face; excavation around pile showed pile sound below ground
	Pile #8					EDK at top; evidence of insect attack; significant splitting and associated decay
	Upstream cut-water pile	•				Splitting and EDK at top
	Downstream cut-water pile	•				Significant EDK at top, full of soil
	Raker Studs Upstream Raker Stud					Califica and EDK at top
	Upstream Raker Stud	•				Splitting and EDK at top Significant weathering / splitting and associated decay; EDK at base;
	Downstream Raker Stud		•			possible CDK at connection to cut-water pile
	Diagonal Bracing					
	Brace #1	•			50%	Heavily corroded railway irons
	Brace #2	•		-	50%	Heavily corroded railway irons
	Whaling's					
	Whaling's	•				Whalers all there; soil + vegetation on top of whalers; individual assessment of each whaler not carried out
	Pile Caps					
	Pile Cap #1	•				Replaced 1977; minor splitting downstream end only
	Pile Cap #2	•				
	Pile Cap #3	•				Replaced 1977; minor splitting downstream end only
	Pile Cap #4	•		· · · · · · · · · · · · · · · · · · ·		EDK downstream end
	Corbels					
	LH Truss Corbel - Inside - Outside	•				
	RH Truss Corbel - Inside	•				
	- Outside	•				Small EDK and splitting south end
	Packers Between Pile Cap and Beam Corbel					
	LH Beam	•				Typical sound; packer directly under and parallel to corbel is sound but packer on outside is not
	RH Beam					Small amount of decay on downstream packer // to corbel - not supporti corbel; otherwise typically sound

Pier Number	Structural Element		ural Assessm commendatio		Estimated	Comments			
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity				
	Piles								
0	r lles					Vertical split at top; timber on outside covering spike lines; isolated			
	Pile #1	•				honeycombing			
	Pile #2					EDK at top; typical splitting outside face; multiple drill holes; small amour of decay at each seating; excavation around pile showed pile sound below ground			
_	Pile #3	•			4	Decay below whaler at seating on inside of pile			
_	Pile #4	•				Typical splitting outside face			
	Pile #5	•				Significant EDK at top; vertical splitting on outside face; minor splitting elsewhere			
	Pile #6					Minor honeycombing through midsection; minor splitting			
	Pile #7	•				Minor splitting and decay; excavation around pile showed pile sound below ground			
	Pile #8	•				Minor splitting on outside face; excavation around pile showed pile sound below ground			
	Upstream cut-water pile								
	Downstream cut-water pile	•				EDK at top; appears sound at attachment to raking stud			
	Raker Studs								
	Upstream Raker Stud					Minor splitting along lines of spikes Fenders in good condition, SH61 (inside), SH77 (outside / upstream)			
	Downstream Raker Stud			•	30%	Significant CDK; decay on downstream face to 1/2 depth - Replace or consider redundant			
	Diagonal Bracing								
	Cross bracing	•			50%	Steel railway irons; varying amounts of corrosion			
	croco bracing			-	5078				
	Whaling's			-	r				
	Whaling's	•				All present; vegetation on top; generally appear sound			
	Pile Caps								
	Pile Cap #1	•				Replaced 1944			
	Pile Cap #2	•				Replaced 1977			
_	Pile Cap #3	•			1	Replaced 1977			
	Pile Cap #4	•							
	Corbels								
_	LH Truss Corbel - Inside	•			-	EDK both ends			
	- Outside	•				Replaced 1967			
	RH Truss Corbel - Inside - Outside	•	•			Vertical split north end; large CDK south end Replaced 1960; vertical split north end			
	Packers Between Pile Cap and Beam Corbel								
	LH Beam					Typically 2 no. parallel to corbel and 4 no. perpendicular; packer #1 perpendicular to corbel dozy; others typically sound			
	RH Beam	•							

Pier Number	Structural Element		ural Assessm commendatio		Estimated	Comments			
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity				
					1				
7	Piles								
	Pile #1	•				Isolated weathering and honeycombing; timber covering spike holes			
	Pile #2					Typical splitting on outside face from spikes up to 100mm deep; surface decay and weathering; packer missing at top to cap - Reinstate packer at top to pile cap			
	Pile #3					Typical splitting on outside face from spikes; lower 2/3 of pile has advanced surface decay and splitting; advanced decay at top below cap - Further assess decay at top when treating			
	Pile #4	•				Minor splitting at top; typical splitting and decay			
	Pile #5				70%	Split running approx. 1m down pile from backside of seating at top; typica splitting due to spikes - Replace split bolt at top			
	Pile #6					Vertical split extending down from cap seat; split bolt corroded; typical vertical splitting on outside face extending into core - Replace split bolt at top			
	Pile #7	•				Large split and EDK at top; outside face covered in timber; large vertical split extends down approx. 600mm from cap seating; split bolt corroded - Replace split bolt at top			
	Pile #8	•				Large split and EDK at top; vertical split and Pad behind brace connection at top; typical splitting on outside face			
	Upstream cut-water pile	•							
	Downstream cut-water pile	•				Minor splitting and weathering; some EDK			
-	Raker Studs								
	Upstream Raker Stud	•				EDK / CDK at base; weathering and splitting on sides and upstream fac			
	Downstream Raker Stud	•				Splitting in side due to spikes; weathering, splitting and decay on downstream face; packer at top about to fall out			
	Diagonal Bracing								
	Cross bracing	•			50%	Timber; PDK behind pile connections			
	Whaling's								
	Whaling's	•				All present; sound condition			
	Pile Caps								
	Pile Cap #1	•							
	Pile Cap #2					Replaced 1933 second hand			
	Pile Cap #3	•				Replaced 1975			
	Pile Cap #4	•				Replaced 1975			
	Corbels								
	LH Truss Corbel - Inside	•				Replaced 1967 second hand; minor end splitting			
	- Outside	•				Replaced 1967 second hand; minor end splitting			
	RH Truss Corbel - Inside	•							
	- Outside	•				Vertical split at south end			
	Packers Between Pile Cap and Beam Corbel								
	LH Beam	•				General weathering only			
	RH Beam	•							

Pier Number	Structural Element		ural Assessm commendation		Estimated	Comments				
annodi		Sound / Treatment	Investigate		% of Original					
		only	Further	Replace	Capacity					
8	Piles					The local sector balling and sold from				
	Pile #1	•			1	Typical vertical splitting on outside face				
	Pile #2	· ·			70%	Typical vertical splitting on outside face				
	Pile #3	•			70%	Typical vertical splitting on outside face, significant split on downstream face starting above whaler				
	Pile #4	•			50%	Top filled with pitch; vertical splitting on outside face through mid section through to CDK - Estimate only 50% of pile contributing due to splitting				
	Pile #5	•			70%	EDK at top; splitting through mid section due to spikes; vertical splitting on backside approx, 30mm deep				
	Pile #6				70%	Full length splits on backside approx. 70mm deep; large vertical splits or outside extending into pile centre; excavation around pile showed pile sound below ground				
	Pile #7					Minor splitting only				
	Pile #8					Top filled with pitch; vertical splitting on outside face through mid section through to CDK - Estimate only 50% of pile contributing due to splitting				
	Upstream cut-water pile					Splitting and hollow at top; heavily decayed - Replace or consider redundant				
	Downstream cut-water pile			•		Splitting and hollow at top; heavily decayed - Replace or consider redundant				
	Raker Studs									
	Upstream Raker Stud	•				Splitting along lines of spikes; decayed over lower section where previously buried in vegetation				
	Downstream Raker Stud	•				Splitting along lines of spikes; decayed over lower section where previously buried in vegetation				
	Diagonal Bracing									
	Cross bracing	•			70%	Varying amounts of corrosion; railway iron braces				
	Whaling's				-					
	Whaling's		•			Buried in soil - not assessed, may be redundant				
	Dila Casa									
	Pile Caps Pile Cap #1					Advanced EDK upstream end; extensive PDK and splitting back to RH truss corbel at downstream end				
_	Pile Cap #2	•				Splitting at upstream end; general weathering and splitting and EDK at downstream end				
	Pile Cap #3	•				Splitting at upstream end; general weathering and splitting and EDK at downstream end				
_	Pile Cap #4	•				Replaced 1978; EDK downstream end				
	Corbels									
	LH Truss Corbel - Inside	•				Vertical splits at both ends				
	- Outside					Replaced 1967 second hand				
	0010/00					Large CDK / EDK north end; significant decay all way along				
	RH Truss Corbel - Inside - Outside		•			- Investigate further, likely replace Replaced 1967 second hand				
	- Outside	•								
	Packers Between Pile Cap and Beam Corbel									
	Perpendicular to corbel	•				#1 packer rotten at downstream end in under corbel - Rotten packer likely redundant				
	Parallel to corbel					Sound under beams; downstream packer completely rotten - Rotten packer likely redundant				

7

Pier Number	Structural Element		ural Assessn commendati		Estimated	Comments		
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity			
0	Piles							
3	Upstream Pile					Splitting and EDK at top; vertical splitting and associated decay further down; sounds drummy		
	Centre Pile					Significant splitting full length; sounds drummy but likely due to splitting; small EDK at top; excavation around pile showed pile sound below ground		
	Downstream Pile	•				Minor splitting and decay; small EDK at top		
	Upstream Cut Water Pile							
	Downstream Cut Water Pile					Large CDK / EDK at top; significant weathering, splitting and decay; appears reasonably sound at connection to raking stud		
	Raker Studs			-				
	Upstream Raker Stud			•		Splitting and decay at top; highly decayed at base		
	Downstream Raker Stud					Large vertical split and decay at top; significant weathering and decay or sides and downstream face		
	Diagonal Bracing					in the second		
	Cross bracing	•			80%	Light to moderate corrosion; railway iron braces		
	Whaling's							
	Whaling's			•		Timber splitting and decayed through centre; south side buried under so effectively not doing anything - Replace or may be redundant as pier is on river bank not subject to an water flow		
	Pile Cap			•		Heavily decayed		
	Piles Upstream Pile					Spliced at ground level 1966; splice split at top; top of splice section sounds hollow; EDK at top of original pile; original pile - pile surface sol and wet below ground level, otherwise sound		
	Centre Pile					Replaced 1966; some splitting		
	Downstream Pile	•				Splitting down to ground level; excavation around pile showed pile soun below ground		
	Pile Cap	•				Replaced 1944; splitting and EDK both ends; typical weathering		
	Abutment Walls - Timber facing			•		Various states of decay; collapsing at upstream end		
	Abutment Walls - Vertical Railway Irons			•		4 no. railway irons; various states of decay / corrosion		

8

	Span 3 - LH	-	гот	AR		ROS	R B S	Key: Pipe - interal Pocket PDK - Powder Decay HDK - Heart Decay WS - White Spot/Yellow Spot Spilt - Major Spilts in Timber Other - Corroision, Missing bolts, Damaged, loose RED - From WSP Report		
Side LH	Structural Element Timber Struts	PIPE	PDK	HDK	ws	Split	Other	Replace	Repair	Comments-
	#1-King Strut (Dia 330x300x5.3m)	x		х		х		х		Bottom -100x90 Middle- Sound Top-120x70.
	#1-Queen Strut (Dia 250x300x5.3)	X	х	X		X		X		50x70 Pipe - 90x120 PDK-Sound.
	#1 Counter Strut					х				Sound
	#1- Centre Strut-Inside					Х				Sound
	Outside	Х								Bottom 40x70 Remainder sound
	#2- Centre Strut- Inside	Х				Х				Bottom 35x70 remainder sound
	Outside #2-Counter Strut					х		x		Sound
	#2-Queen Strut	х		х	х	^		X		40x30 HDK-110x150 Pipe &WS-135x80 Pipe&WS
	#2-King Strut	~		~	^	х		~		
	Vertical Steel Tension Rods					1				
	#1-King Rods -Inside									
	Outside									
<u> </u>	#1-Queen Rods -Inside					<u> </u>				
┣—	Outside					<u> </u>				
	#1-Centre Rods- Inside Outside									
	#2-Queen Rods -Inside									
-	Outside							х		
	#2- King Rods -Inside									
	Outside									
	Timber Thrust Blocks									
	#1 King Timber Thrust Block									
	#1 Queen Timber Thrust Block Centre Timber Thrust Blocks	х						х		100x55 pipe
	#2 Queen Timber Thrust Blocks									
	#2 King Timber Thrust Blocks									
	Timber A-Blocks									
	#1-Queen A-Blocks									
	Centre A-Block									
	#2-Queen A-Blocks									
	Timber Saddle Blocks #1 King saddle Block					-		х		AS Per WSP Report
	#1 Queen saddle block	х						^	х	30x90 pipe has open pipe both ends Grout Repair
	Centre Saddle Block	X				х		х	X	45x130 Pipe Has major spilting bothends
	#2- Queen Saddle Block	Х						Х		90x135 Pipe
	Top Chord									
┣—	#1-King-#1Queen -Inside							х	<u> </u>	As per WSP report
┣──	Middle Outside									Sound Sound
├──	#1 Queen- Centre Inside					-				Gound
	Middle	1	1	1	1	1	1			
	Outside					L				
	Centre- #2 Queen Inside									
L	Middle	L	L	L		<u> </u>	L			
 	Outside									Cound
┣──	#2 Queen # 2 King Inside Middle							x		Sound
┣	Outside	<u> </u>	<u> </u>	<u> </u>	<u> </u>		<u> </u>	X		Minor Pipe- 40x90 Pipe-60x120 Pipe
<u> </u>	Steel Plate Connections					1				
	#1-King Strut to Top Cord							х	х	Bolt replacement/Plate Replacement
	#2-King Strut to Top Cord							Х	Х	
<u> </u>										
┣—	Timber Braces	<u> </u>								
┣	#1-King Timber Brace #1-Queen Timber Brace	<u> </u>	<u> </u>	<u> </u>	<u> </u>		<u> </u>			
	Centre Timber Brace							х		
	#2-Queen Timber Brace	1	1	1	1	1				
L	#2-King Timber Brace									

	Span 3 - RH	1	гот	'AR		IVE ROS	r bi S	Key: Pipe - interal Pocket PDK - Powder Decay HDK - Heart Decay WS - White Spot/Yellow Spot Spilt - Major Spilts in Timber Other - Corroision, Missing bolts, Damaged, loose RED - From WSP Report			
Side	Structural Element	Pipe	PDK	HDK	ws	Split	Other	Replace	Repair	Comments-	
RH	Timber Struts										
	#1-King Strut (Dia 330x300x5.3m)	Х		Х		Х		Х		Bottom -Sound Middle- Sound Top-85x135 Pipe	
	#1-Queen Strut (Dia 250x300x5.3)										
	#1 Counter Strut										
	#1- Centre Strut-Inside					Х				Sound	
	Outside					_				Bottom 40x70 Remainder sound	
	#2- Centre Strut- Inside							Х		Sound	
	Outside									• •	
	#2-Counter Strut	<u> </u>				Х			 	Sound	
	#2-Queen Strut					х				Sound	
	#2-King Strut					^				Sound	
	Vertical Steel Tension Rods										
	#1-King Rods -Inside	<u> </u>	1	1		+	1		<u> </u>		
	Outside			1		1		1	ł		
	#1-Queen Rods -Inside		1	1	1	1		1	1		
	Outside										
	#1-Centre Rods- Inside										
	Outside										
	#2-Queen Rods -Inside										
	Outside										
	# 2 King Rods -Inside						Х	Х			
	-Outside						Х	Х			
	Timber Thrust Blocks					_					
	#1 King Timber Thrust Block							Х			
	#2 Queen Timber Thrust block Centre Timber Thrust Blocks					-					
	#2 Queen Timber Thrust Blocks										
	#2 King Timber Thrust Blocks			-				x			
	Timber Saddle Blocks							~			
	#1 King saddle Block							х			
	#2 Queen saddle block										
	Centre Saddle Block										
	#2 Queen Saddle Block										
	#2 King saddle block	Х						Х			
	Top Chord										
	#1-King-#1Queen -Inside										
	Middle	ļ	ļ	 				ļ	<u> </u>		
	Outside	<u> </u>	<u> </u>	<u> </u>	<u> </u>						
	#1 Queen-Centre - Inside					-					
	Middle		<u> </u>	<u> </u>							
	Outside					+					
	Centre-#2 Queen- Inside Middle		-				-				
	Outside	<u> </u>	+			+	+		ł		
	#2 Queen-#2 King - Inside					1		х		Replace High amount of Surface Decay	
	#2 Queen #2 King Middle	-		<u> </u>		-		X	1	Replace High amount of Surface Decay	
	Outside	1		1	1	1		X		Replace High amount of Surface Decay	
			1	1	1	1	1	İ			
	Steel Connection Plate										
	#1-King Strut to Top Cord								х	Bolt Replacement	
	#2-King Strut to Top Cord								Х	Bolt Replacement	
	Timber Braces										
	#1-King Timber Brace										
	#1-Queen Timber Brace			<u> </u>		-		ļ	ļ		
	Centre Timber Brace	<u> </u>	<u> </u>	<u> </u>	<u> </u>						
	#2-Queen Timber Brace	1				1	1	1	1		

	Span 4 - LH	т	ΟΤ/	ARA		os	5	RIDG		Key: Pipe - interal Pocket PDK - Powder Decay HDK - Heart Decay WS - White Spot/Yellow Spot Spilt - Major Spilts in Timber Other - Corroision, Missing bolts, Damaged, loose RED - From WSP Report
_	Structural Element	Pipe	PDK	HDK	WS	Split	Other	Replace	Repair	Comments-
	Timber Struts							X		N
	#1-King Strut (Dia 330x300x5.3m) #1-Queen Strut (Dia 250x300x5.3)							X X		Need to re visit Need to re visit
	#1 Counter Strut							^		Need to re visit
	#1- Centre Strut-Inside									
	Outside									
	#2- Centre Strut- Inside									
	Outside									
	#2-Counter Strut									
	#2-Queen Strut	Х						Х		95x60-120x70-Top Sound
<u> </u>	#2-King Strut	<u> </u>			<u> </u>	<u> </u>	<u> </u>		L	
<u> </u>						<u> </u>				
<u> </u>	Vertical Steel Tension Rods				<u> </u>	<u> </u>	<u> </u>		<u> </u>	
<u> </u>	# 1 King Rods -Inside -Outside							×		
	#1 Queen Rods -Inside							^ Y		
<u> </u>	-Outside							^		
	#1-Centre Rods -Inside									
	-Outside							Х		
	#2 Queen Rods-Inside									
	Outside									
	#2 King Rods -Inside							Х		
	Outside							Х		
	Timber A-Blocks									
	#1- Queen A-Blocks									Open Pipe at End-Grout Repair
	Centre Saddle Block								N/	
	#2-Queen A- Block								Х	Grout Repair Hole in middle of block Bores minor Decay
	Timber Thrust Blocks									
	#1 King Timber Thrust Block									
	#2 Queen Timber Thrust block									
	Centre Timber Thrust Blocks									
	#2 Queen Timber Thrust Blocks									
	#2 King Timber Thrust Blocks									
	Timber Saddle Blocks									
 	#1 King saddle Block									
 	#1-Queen saddle block									
┣──	Center Saddle Block #2- Queen Saddle Block									
<u> </u>	#2- Queen Saddle Block #2-King Saddle Block									
—	Top Chord					<u> </u>				
<u> </u>	#1-King-#1Queen - Inside	1				<u> </u>				
	Middle	1						İ		
L	Outside									
	#1-Queen -Centre Inside									
	Middle									
L	Outside	Х						Х		70x90-60x120-Sound
┣	#2 Queen-#2 King - Inside					 				
<u> </u>	Middle	v			<u> </u>		<u> </u>	v	<u> </u>	0
<u> </u>	Outside	Х			<u> </u>		<u> </u>	Х	<u> </u>	Sound-60x100-75x125
—	Steel Connection Plate									
<u> </u>	#1-King Strut To Top Chord								Х	Replace bolts
	#2 King Strut To Top Chord								Replace bolts	
	Timber Braces	1	l	l	İ	1	İ		İ	
	#1-King Timber Brace							1		
L	#1-Queen Timber Brace					L				
	Centre Timber Brace									
	#2-Queen Timber Brace									
	#2-King Timber Brace	Х						Х		Sound-80x135.Bad surface Decay

	Span 4 - RH	Т			R	os	6	RIDG		Key: Pipe - interal Pocket PDK - Powder Decay HDK - Heart Decay WS - White Spot/Yellow Spot Spilt - Major Spilts in Timber Other - Corroision, Missing bolts, Damaged, loose RED - From WSP Report
	Structural Element Timber Struts	Pipe	PDK	HDK	ws	Split	Other	Replace	Repair	Comments-
RH	#1-King Strut (Dia 330x300x5.3m)									
-	#1-Queen Strut (Dia 250x300x5.3)									
-	#1 Counter Strut									Sound
	#1- Centre Strut-Inside									Sound
	Outside	Х						Х		70x80-Sound
	#2- Centre Strut- Inside Outside	х						х		Sound 70x80- large full length spilt and surface decay
	#2-Counter Strut	~						X		
	#2-Queen Strut	х			х			Х		50x40-60x120-65x75 Pipe/WS
	#2-King Strut									
┣—	Vertical Steel Territor Dada									
<u> </u>	Vertical Steel Tension Rods # 1 King Rods -Inside		-	-	<u> </u>	+				
<u> </u>	-Outside							Х		
L	#1 Queen Rods -Inside				L	L		X		
	-Outside							Х		
	#1-Centre Rods -Inside									
	-Outside #2 Queen Rods-Inside									
	#2 Queen Rods-Inside Outside									
	#2 King Rods -Inside									
	Outside									
	Timber A-Blocks									
	#1- Queen A-Blocks									
	Centre A-Blocks #2-Queen A-Blocks									
	Timber Thrust Blocks									
	#1 King Timber Thrust Block									
	#1-Queen Timber Thrust Block									
	Centre Timber thrust Block									
	#2- Queen Timber Thrust Block #2-King Timber Thrust Block									
-	Timber Saddle Blocks									
	#1 King saddle Block									
	#2 Queen saddle block									
	Centre Saddle Block									
	#2 Queen saddle Block #2 King saddle Block	X X						Х	х	80x100 50x40 Grout Repair open pipe ends
	Top Chord	^							^	
	#1-King-#1Queen - Inside	х	1	1	1	1	1	Х	1	45x50-50-40-Sound. High amount of decay inside face
	Middle									Sound
	Outside	x								60x40-Sound
<u> </u>	#1-Queen-Centre- Inside Middle									Sound
<u> </u>	Outside				-					
 	Centre-#2Queen - Inside	1	1	1			<u> </u>			
	Middle									
	Outside									
┣—	#2 Queen-#2 King -Inside					-	<u> </u>		<u> </u>	Minor decay otherwise sound
<u> </u>	Middle Outside									
	Outside					-				
	Steel Connection Plate									
	#1 King Strut To Top Cord									
<u> </u>	#2 King Strut To Top Cord				<u> </u>		<u> </u>		<u> </u>	
┣──	Timber Braces #1-King Timber Brace								<u> </u>	
┣──	#1 Queen Timber Brace					-				
L	Centre Timber Brace	1.	1	1	L		L		L	
	#2 Queen Timber Brace							Х		
	#2 King Timber Brace							Х		

Span 5 - LH	т	ΌΤ	E -		Key: Pipe - interal Pocket PDK - Powder Decay HDK - Heart Decay WS - White Spot/Yellow Spot Spilt - Major Spilts in Timber Other - Corroision, Missing bolts, Damaged, loose RED - From WSP Report					
Side Structural Element	Pipe	PDK	HDK	WS	Split	Other	Replace	Repair	Comn	nents-
LH Timber Struts	X							V	10.05	00-00 Discovit theory of the Only shows a solution to solution
#1-King Strut (Dia 330x300x5.3m) #1-Queen Strut (Dia 250x300x5.3)	Х						X	Х	40x25	-30x80. Big split through top. Split clamp or split bolt repair
#1 Counter Strut							X		Bores	sound. Split at bottom. Split clamp or split bolt repair
#1- Centre Strut-Inside										
Outside							X		Sound	1
#2- Centre Strut- Inside Outside							X			
#2-Counter Strut							^		Sound	1
#2-Queen Strut										
#2-King Strut										
Vertical Steel Tension Dade										
# 1 King Rods -Inside										
-Outside	1	t	t	1	1				1	
#1 Queen Rods -Inside										
-Outside							Х			
#1-Centre Rods -Inside -Outside										
#2 Queen Rods-Inside							x			
Outside										
#2 King Rods -Inside										
Outside										
Timber A-Blocks #1- Queen A-Blocks										
Centre A-Blocks										
#2-Queen A-Blocks										
Timber Thrust Blocks										
#1 King Timber Thrust Block #1-Queen Timber Thrust Block										
Centre Timber thrust Block	х						х		100x1	30
#2- Queen Timber Thrust Block										-
#2-King Timber Thrust Block									Sound	1
Timber Saddle Blocks										
#1 King saddle Block #2 Queen saddle block										
Centre Saddle Block										
#2 Queen saddle Block							Х			
#2 King saddle Block							х			
Top Chord #1-King-#1Queen -Inside										
#1-King-#1Queen -Inside Middle										
Outside										
#1 King- #1 Queen Inside										
Middle Outside	-	<u> </u>	<u> </u>		<u> </u>					
#1-Queen To Centre Inside	-									
Middle							Х		End S	ound however centre has major decay unable to drill
Outside									Sound	1
Centre-#2 Queen Inside		 	 		 					
Middle Outside	х	<u> </u>	<u> </u>	├──	<u> </u>				├──	
#2 Queen-#2 King - Inside	~		х				х		Sound	I-Soft to drill through out
Middle										I-Sound-60x65
Outside									Sound	
Steel Connection Plate		<u> </u>	<u> </u>		├					
#1 King Strut To Top Cord							х			
#2 King Strut To Top Cord	1				1		X			
Timber Braces										
#1-King Timber Brace	-	<u> </u>	<u> </u>	ļ	<u> </u>				ļ	
#1 Queen Timber Brace Centre Timber Brace	-						X			
#2 Queen Timber Brace	+				<u> </u>		~		Has b	een replace
#2 King Timber Brace							Х			decay to soft to drill

	Span 5 - RH	т	ΟΤ	٩RA		VEF OS:		RIDG	E -	Key: Pipe - interal Pocket PDK - Powder Decay HDK - Heart Decay WS - White Spot/Yellow Spot Spilt - Major Spilts in Timber Other - Corroision, Missing bolts, Damaged, loose RED - From WSP Report
	Structural Element	Pipe	PDK	HDK	WS	Split	Other	Replace	Repair	Comments-
RH	Timber Struts									Minor decay and Pipe through out 150mm deep split Weathered
	#1-King Strut (Dia 330x300x5.3m)	Х		Х				X	х	at top grout repair top
	#1-Queen Strut (Dia 250x300x5.3) #1 Counter Strut									
	#1- Centre Strut-Inside									
	Outside									
	#2- Centre Strut- Inside									
	Outside #2-Counter Strut		-				-	-		
	#2-Queen Strut									Sound
	#2-King Strut									
<u> </u>	Vertical Steel Tension Rods									
<u> </u>	# 1 King Rods -Inside	-	<u> </u>	-	-	-	<u> </u>			
	-Outside									
	#1 Queen Rods -Inside									
	-Outside #1-Centre Rods -Inside							Х		
	-Outside							X		
	#2 Queen Rods- Inside							X		
	Outside							Х		
	#2 King Rods -Inside Outside							X		
-	Timber A-Blocks							^		
	#1- Queen A-Blocks									
	Centre A-Blocks									
	#2-Queen A-Blocks Timber Thrust Blocks									
	#1 King Timber Thrust Block									
	#1-Queen Timber Thrust Block									
	Centre Timber Thrust Block									
	#2- Queen Timber Thrust Block #2-King Timber Thrust Block									
-	#2-King Timber Thrust Block Timber Saddle Blocks									
	#1 King saddle Block	х							Х	
	#2 Queen saddle block									
	Centre Saddle Block									
	#2 Queen saddle Block #2 King saddle Block	х							х	60x90. Open Pipe at ends grout repair
	Top Chord	~							X	
	#1-King-#1Queen - Inside									
	Middle		<u> </u>				<u> </u>			0 sund
┣──	Outside #1-Queen-Centre -Inside	+	<u> </u>	+	+	+	<u> </u>			Sound
	Middle		1				1			
	Outside									Sound
	Centre-#2 Queen - Inside									
┣──	Middle Outside							<u> </u>		
 	#2 Queen-#2 King - Inside									
	Middle									
	Outside									
<u> </u>	Stool Connection Plate									
┣──	Steel Connection Plate #1 King Strut To Top Cord							Х		
E	#2 King Strut To Top Cord		L				L	X		
	Timber Braces									
	#1-King Timber Brace		<u> </u>				<u> </u>			
┣—	#1 Queen Timber Brace Centre Timber Brace						<u> </u>			
⊢	#2 Queen Timber Brace		<u> </u>				<u> </u>			
L	#2 King Timber Brace									

	Span 6 - LH	т	ΌΤ	AR/		VEI		RIDG	E -	Key: Pipe - interal Pocket PDK - Powder Decay HDK - Heart Decay WS - White Spot/Yellow Spot Spilt - Major Spilts in Timber Other - Corroision, Missing bolts, Damaged, Joose RED - From WSP Report
	Structural Element	Pipe	PDK	HDK	ws	Split	Other	Replace	Repair	Comments-
LH	Timber Struts #1-King Strut (Dia 330x300x5.3m)									
	#1-Queen Strut (Dia 250x300x5.3)	х				х		х		170x 120 Through split-60x60-Sound. Major surface decay top face
	#1 Counter Strut									
	#1- Centre Strut-Inside									
	Outside #2- Centre Strut- Inside									Sound Sound
	Outside									
	#2-Counter Strut									
	#2-Queen Strut									
	#2-King Strut						х	X	Х	Top of strut has top face decay grout repair
	Vertical Steel Tension Rods		1							
	# 1 King Rods -Inside							х		
	-Outside									
<u> </u>	#1 Queen Rods -Inside -Outside	<u> </u>				-		X		
	#1-Centre Rods -Inside							^		
	-Outside									
	#2 Queen Rods- Inside							Х		
	Outside							Х		
	#2 King Rods -Inside Outside									
-	Timber A-Blocks									
	#1- Queen A-Blocks									
	Centre A-Blocks									
	#2-Queen A-Blocks Timber Thrust Blocks									
	#1 King Timber Thrust Block							1		
	#1-Queen Timber Thrust Block					Х		Х		Major splits and decay
	Centre Timber Thrust Block									
	#2- Queen Timber Thrust Block #2-King Timber Thrust Block							×		Sound
	Timber Saddle Blocks							^		Sound
	#1 King saddle Block	х								90x65
	#2 Queen saddle block									Sound
	Centre Saddle Block	Х			Х			Х		120 x110
-	#2 Queen saddle Block #2 King saddle Block	х				-		х		115x90
	Top Chord	ľ.		1	1			-	1	
	#1-King-#1Queen - Inside									
 	Middle			 						
┣—	Outside #1-Queen-Centre -Inside	<u> </u>				+		<u> </u>		
	Middle			1						
	Outside	х								60x70
	Centre-#2 Queen - Inside	<u> </u>		<u> </u>				<u> </u>		
	Middle Outside							X		
<u> </u>	#2 Queen-#2 King -Inside	<u> </u>		1		1	1	^		
	Middle									
	Outside									
	Stool Connection Blate									
	Steel Connection Plate #1 King Strut To Top Cord			+				x		
-	#2 King Strut To Top Cord			<u> </u>	1				х	Replace Bolts
	Timber Braces									
	#1-King Timber Brace									
<u> </u>	#1 Queen Timber Brace	<u> </u>				-		х		As par WSP Papart
	Centre Timber Brace #2 Queen Timber Brace							^		As per WSP Report
	#2 King Timber Brace			1				<u> </u>		

	Span 6 - RH	т	ΌΤ	AR A		VEF OS		RIDG	Key: Pipe - interal Pocket PDK - Powder Decay HDK - Heart Decay WS - White Spot/Yellow Spot Spilt - Major Spilts in Timber Other - Corroision, Missing bolts, Damaged, loose RED - From WSP Report	
Side	Structural Element	Pipe	PDK	HDK	WS	Split	Other	Replace	Repair	Comments-
RH	Timber Struts									
	#1-King Strut (Dia 330x300x5.3m)									
	#1-Queen Strut (Dia 250x300x5.3)									Sound
	#1 Counter Strut									
	#1- Centre Strut-Inside									
	Outside #2- Centre Strut- Inside									
	#2- Centre Strut- Inside Outside									
	#2-Counter Strut									
	#2-Queen Strut									
<u>├</u>	#2-Gueen Strut				<u> </u>					
	Vertical Steel Tension Rods				1					
	# 1 King Rods -Inside				İ —			x		
	-Outside	1	İ		İ					
	#1 Queen Rods -Inside							X		
	-Outside							Х		
	#1-Centre Rods -Inside							X		
	-Outside									
	#2 Queen Rods- Inside									
	Outside									
	#2 King Rods -Inside									
┣	Outside Timber A-Blocks							X		
	#1- Queen A-Blocks									
	Centre A-Blocks									
	#2-Queen A-Blocks									
	Timber Thrust Blocks									
	#1 King Timber Thrust Block									
	#1-Queen Timber Thrust Block									
	Centre Timber Thrust Block									
	#2- Queen Timber Thrust Block									
	#2-King Timber Thrust Block									
	Timber Saddle Blocks									
	#1 King saddle Block									
	#2 Queen saddle block									
┣──	Centre Saddle Block		<u> </u>	<u> </u>	<u> </u>	<u> </u>		х		As Per WSP Report
┣—	#2 Queen saddle Block #2 King saddle Block		<u> </u>	<u> </u>	<u> </u>	<u> </u>				
┣	#2 King saddle Block Top Chord									
	#1-King-#1Queen - Inside									
<u> </u>	Middle			<u> </u>	<u> </u>	<u> </u>				
<u>├</u>	Outside									
	#1-Queen-Centre -Inside							х		Not bore. However signs of failure
	Middle				İ —			1		
	Outside	1								
	Centre-#2 Queen - Inside	1								
	Middle									
	Outside									
	#2 Queen-#2 King -Inside									
	Middle									
┣	Outside									
<u> </u>	Steel Connection Plate		<u> </u>		<u> </u>					
┣	#1 King Strut To Top Cord			<u> </u>		<u> </u>		v		
┣	#2 King Strut To Top Cord Timber Braces							Х		
<u> </u>	#1-King Timber Brace									
\vdash	#1 Queen Timber Brace			<u> </u>		<u> </u>				
	Centre Timber Brace							х		As per WSP Report
	#2 Queen Timber Brace							x		As per WSP Report
	#2 King Timber Brace	1							1	

	Span 7 - LH	т	ΟΤ	4RA		OS	S	RIDG		Key: Pipe - interal Pocket PDK - Powder Decay HDK - Heart Decay WS - White Spot/Yellow Spot Spilt - Major Spilts in Timber Other - Corroision, Missing bolts, Damaged, loose RED - From WSP Report
	Structural Element	Pipe	PDK	HDK	WS	Split	Other	Replace	Repair	Comments-
LH	Timber Struts									
	#1-King Strut (Dia 330x300x5.3m)									
	#1-Queen Strut (Dia 250x300x5.3)									
	#1 Counter Strut							v		AC Des MCD second
	#1- Centre Strut-Inside Outside							X X		AS Per WSP report
	#2- Centre Strut- Inside							^		
	Outside									
	#2-Counter Strut									
	#2-Queen Strut	1	1	1		1	1	1	<u> </u>	
	#2-King Strut									
	Vertical Steel Tension Rods									
L	# 1 King Rods -Inside	<u> </u>		<u> </u>	<u> </u>	<u> </u>	<u> </u>		L	
<u> </u>	-Outside				<u> </u>	<u> </u>		Х	<u> </u>	
	#1 Queen Rods -Inside -Outside	-	-	-						
	-Outside #1-Centre Rods -Inside				<u> </u>		+			
	-Outside							x		
	#2 Queen Rods- Inside							^		
	Outside									
	#2 King Rods -Inside									
	Outside									
	Timber A-Blocks									
	#1- Queen A-Blocks									
	Centre A-Blocks									
	#2-Queen A-Blocks									
	Timber Thrust Blocks									
	#1 King Timber Thrust Block #1-Queen Timber Thrust Block									
-	Centre Timber Thrust Block									
	#2- Queen Timber Thrust Block									
	#2-King Timber Thrust Block									
	Timber Saddle Blocks									
	#1 King saddle Block					1		х		Sound
	#2 Queen saddle block							Х		Sound
	Centre Saddle Block							х		As Per WSP
	#2 Queen saddle Block									
<u> </u>	#2 King saddle Block	 	 	 	<u> </u>	<u> </u>	<u> </u>	х		As Per WSP
<u> </u>	Top Chord									
	#1-King-#1Queen - Inside				<u> </u>		+			
<u> </u>	Middle Outside				<u> </u>	<u> </u>			<u> </u>	
	#1-Queen-Centre -Inside						+			
	Middle						+	1		
	Outside				<u> </u>	1	1		<u> </u>	
	Centre-#2 Queen - Inside					1		1	<u> </u>	
	Middle	İ.	l.	İ.	L	L	L	L		
	Outside									
	#2 Queen-#2 King - Inside									
	Middle									
L	Outside									
Ļ	Steel Connection Plate				<u> </u>	<u> </u>		v	<u> </u>	
	#1 King Strut To Top Cord				<u> </u>		+	X		
	#2 King Strut To Top Cord Timber Braces							^		
	#1-King Timber Brace	+	+	+	<u> </u>		+	Х	<u> </u>	As Per WSP report
	#1 Queen Timber Brace				<u> </u>		<u> </u>	<u> </u>		
 	Centre Timber Brace				<u> </u>	1	1	х	<u> </u>	AS Per WSP Report
	#2 Queen Timber Brace	1	1	1		1	1	X	1	AS Per WSP Report
	#2 King Timber Brace	1	1	1		1		х	1	AS Per WSP Report

	Span 7 - RH				R	os	5	RIDG		Key: Pipe - interal Pocket PDK - Powder Decay HDK - Heart Decay WS - White Spot/Yellow Spot Spilt - Major Spilts in Timber Other - Corroision, Missing bolts, Damaged, loose RED - From WSP Report		
	Structural Element	Pipe	PDK	HDK	ws	Split	Other	Replace	Repair	Comments-		
	Timber Struts											
	#1-King Strut (Dia 330x300x5.3m)											
	#1-Queen Strut (Dia 250x300x5.3)											
	#1 Counter Strut											
	#1- Centre Strut- Inside Outside											
	#2- Centre Strut- Inside											
	Outside											
	#2-Counter Strut							х		As per WSP report		
	#2-Queen Strut											
	#2-King Strut											
	Vertical Steel Tension Rods											
	# 1 King Rods - Inside											
	- Outside											
	#1 Queen Rods -Inside							X				
	-Outside							X				
┣	#1-Centre Rods -Inside		<u> </u>	<u> </u>	<u> </u>	ļ						
	-Outside											
	#2 Queen Rods- Inside							X				
	Outside							Х				
	#2 King Rods - Inside Outside											
	Timber A-Blocks											
	#1- Queen A-Blocks							х		As per WSP report		
	Centre A-Blocks							~				
	#2-Queen A-Blocks											
	Timber Thrust Blocks											
	#1 King Timber Thrust Block											
	#1-Queen Timber Thrust Block											
	Centre Timber Thrust Block											
	#2- Queen Timber Thrust Block											
	#2-King Timber Thrust Block											
	Timber Saddle Blocks											
	#1 King saddle Block							X				
	#2 Queen saddle block							х				
├ ──	Centre Saddle Block #2 Queen saddle Block			<u> </u>								
\vdash	#2 King saddle Block											
F	Top Chord											
	#1-King-#1Queen - Inside					1		х				
l –	Middle			1		1		1	1			
	Outside		İ		İ	1		х				
	#1-Queen-Centre -Inside											
	Middle											
	Outside							Х				
	Centre-#2 Queen -Inside											
	Middle											
┣	Outside			 								
┣—	#2 Queen-#2 King - Inside		<u> </u>		<u> </u>							
	Middle Outside											
┣──	Outside											
	Steel Connection Plate											
<u> </u>	#1 King Strut To Top Cord							X				
	#2 King Strut To Top Cord		1	1	1	1			x	Bolts gone		
	Timber Braces					1				ž		
	#1-King Timber Brace		1	1	1			Х				
	#1 Queen Timber Brace											
	Centre Timber Brace											
	#2 Queen Timber Brace											
	#2 King Timber Brace											

		Transoms	Т	ΌΤ	4R <i>A</i>		VEF OS		RIDG	E -	Key: Pipe - interal Pocket PDK - Powder Decay HDK - Heart Decay WS - White Spot/Yellow Spot Spilt - Major Spilts in Timber Other - Corroision, Missing bolts, Damaged, loose RED - From WSP Report
	Side	Structural Element	Pipe	PDK	HDK	WS	Split	Other	Replace	Repair	Comments-
3											All from upstream to downstream
-	LH RH	#1-King Transom #1-King Transom									
		#1 Queen Transom									
	RH	#1-Queen Transm							х		
	LH	Centre Transom									
	RH	Centre Transom									
	LH	#2 Queen Transom									
	RH	#2 Queen Transom	_								
		#2 King Transom									
\vdash	RH	#2-King Transom	-								
4	LH	#1-King Transom	Х							Х	Sound from upstream to downstream end 85x85 Open pipe grout Repair
		#1-King Transom	X	1	1	1				X	Sound from upstream to downstream end 130x200 Open pipe grout Repair bothends
	LH	#1 Queen Transom	х							х	100x80 Pipe Upstream end remainder sound
	RH	#1-Queen Transm									
	LH	Centre Transom									Sound
	RH	Centre Transom									
		#2 Queen Transom	X							X X	Upstream 150x140. Remainder sound. Grout repair Sound -120x150-80x125-Sound-Repair steel PFC bothsides
	RH LH	#2 Queen Transom #2 King Transom	X							X	Sound -120x150-80x125-Sound-Repair steel PFC bothsides
		#2 King Transom									
5	LH	#1-King Transom		Ĺ			Ĺ				
	RH	#1-King Transom									
	LH	#1 Queen Transom									
	RH	#1 Queen Transom		-							
		Centre Transom	_								
	RH LH	Centre Transom #2 Queen Transom									
	RH	#2 Queen Transom					х		x		Sound. Split Downstream side
	LH	#2 King Transom					~		~		
	RH	#2 King Transom								х	Grout repair
		#1-King Transom									
		#1-King Transom	_								
		#1 Queen Transom #1 Queen Transom									
-		#1 Queen Transom Centre Transom	+				+				
	RH	Centre Transom	+				1				
	LH	#2 Queen Transom		1	1	1					Sound
		#2 Queen Transom									
		#2 King Transom									
	RH	#2 King Transom									
┝─┤										<u> </u>	
		#1-King Transom	_		<u> </u>	<u> </u>				 	
	RH LH	#1-King Transom #1 Queen Transom	_								
	LH RH	#1 Queen Transom #1 Queen Transom	-								
		Centre Transom		+	<u> </u>	<u> </u>				<u> </u>	
		Centre Transom		<u> </u>	<u> </u>	<u> </u>				1	
	LH	#2 Queen Transom		1			1		1		
	RH	#2 Queen Transom									
	LH	#2 King Transom									
	RH	#2 King Transom									

Road Beams	тс	ΟΤΑ	AR A		RIVE ROS		BRID	GE -	Key: Pipe - interal Pocket PDK - Powder Decay HDK - Heart Decay WS - White Spot/Yellow Spot Spilt - Major Spilts in Timber Other - Corroision, Missing bolts, Damaged, loose RED - From WSP Report				
Structural Element	Pipe	PDK	HDK	WS	Split	Other	Repair	Comments-					
	Pipe PDK HDK WS Split Other Replace Repa								Bores are from Hoki to Ross				
LH1					Х			Х	Split clamp repair Grout repair to Face Decay				
LH2	Х								80x125- sound				
LH3													
LH4													
LH5													
LH6	Х				Х		Х		125x195-130x195-60x110-sound. Steel PFC repair				
LH7			<u> </u>			<u> </u>							
LH8					Х		Х		Sound.Major Surface decay and spliting				
LH9							х		As per WSP report				
LH10													
LH11					Х				Sound				
LH12													
LH13									Sound				
LH14					Х								
LH15													
LH16					Х				Sound				
LH17													
LH18													
LH19													
014					V				Occurred .				
CN1 CN2					Х				Sound				
CN2 CN3													
CN3 CN4													
CIN4									Sound				
RH1									Sound				
RH2													
RH3													
RH4													
RH5	х				х		х		Sound-110x75-100x140-150x150				
RH6	X				X				Sound-80x90-Sound -Sound				
RH7	<u> </u>							1					
RH8	1												
RH9			<u> </u>					1					
RH10	1							1					
RH11	х				х			1	Sound-85x80-Sound-Sound				
RH12	1						х		As per WSP report				
RH13	1	-	1		х	1			Sound				
RH14	Х				X		1	1	Bores sound however major surface decay and spliting				
RH15					X				Sound				
RH16									Sound				
RH17	1						1	1					
RH18	1						1	1					
RH19	1	-	1		х				Sound				
RH20	1	-	1										
RH21													
RH22					х				Sound				
RH23									Sound				
RH24													

	С	orbels	т	ΌΤ	ARA		VEF		RIDGI	E -	Key: Pipe - interal Pocket PDK - Powder Decay HDK - Heart Decay WS - White Spot/Yellow Spot Spilt - Major Spilts in Timber Other - Corroision, Missing bolts, Damaged, loose RED - From WSP Report
Pier	Side		Pipe	PDK	HDK	WS	Split	Other	Replace	Repair	Comments-
		Corbels									
2		LH Corbel									
		Centre Corbel RH Corbel	х								120x90
			~								120,50
3		LH Corbel									
		Centre Corbel RH Corbel									Sound
	1#King	LH Corbel									
	1#Queen	RH Corbel LH Corbel							Х		AS Per WSP Report Sound
	1#Queen	RH Corbel									Sound
	Centre	LH Corbel									
	#2Queen	RH Corbel LH Corbel									
	2440011	RH Corbel									
L	#2King	LH Corbel									
<u> </u>		RH Corbel									
4		LH Corbel									
<u> </u>		Centre Corbel RH Corbel]
L	1#King	LH Corbel	L	L	L	L	L	L		L	<u> </u>
		RH Corbel									
	1#Queen	LH Corbel RH Corbel									
	Centre	LH Corbel									
	#00	RH Corbel									
	#2Queen	LH Corbel RH Corbel									
	#2King	LH Corbel									
		RH Corbel									
5		LH Corbel									
		Centre Corbel									
	1#King	RH Corbel LH Corbel					х		Х		Sound, Dia spilts. Replace when beam is replaced
	ig	RH Corbel	х						х		200x200
	1#Queen	LH Corbel									
	Centre	RH Corbel LH Corbel									
		RH Corbel									
	#2Queen	LH Corbel RH Corbel									
	#2King	LH Corbel									
		RH Corbel									
6		LH Corbel									
		Centre Corbel									
	1#King	RH Corbel								~	Cound Calit clamp
	1#King	LH Corbel RH Corbel								^	Sound, Split clamp
	1#Queen	LH Corbel									Sound
<u> </u>	Centre	RH Corbel LH Corbel	х						х		250x250
		RH Corbel									Sound
<u> </u>	#2Queen	LH Corbel RH Corbel	Х						Х		150x230
⊢	#2King	RH Corbel LH Corbel									
		RH Corbel									
7		LH Corbel							x		As per WSP report
Ľ		Centre Corbel	L	L	L	L	L	L		L	
—	4.002	RH Corbel									
<u> </u>	1#King	LH Corbel RH Corbel									
	1#Queen	LH Corbel									
<u> </u>	Contro	RH Corbel									
	Centre	LH Corbel RH Corbel									
<u> </u>	#2Queen	LH Corbel									
<u> </u>	#2King	RH Corbel LH Corbel									
L		RH Corbel				L					
Γ.			v						v		
8		LH Corbel Centre Corbel	х						х		sound-140x140-105x120
		RH Corbel	х								90x130-Sound
<u> </u>											
9		LH Corbel	х	L	L	L	х	L			70x140
L		Centre Corbel									Or word
L	l	RH Corbel	1	1	1			1			Sound

		ss Bracing, Solid king & Tie Rods	т	от	٩RA		VEF OS		RIDG	E -	Key: Pipe - interal Pocket PDK - Powder Decay HDK - Heart Decay WS - White Spot/Yellow Spot Spilt - Major Spilts in Timber Other - Corrosision, Missing bolts, Damaged, loose RED - From WSP Report	
Pier/Span	Side	Structural Element	PIPE	PDK	HDK	WS	Split	Other	Replace	Repair	Comments-	
		Cross Bracing,Soild Blocking & Tie Rods										
Span # 1		Soild Blocking Tie Rods							Х	×	As per WSP report Nuts missing, WSP Report	
		The Rous								^		
Span #2		Soild Blocking Tie Rods							Х	х	As Per WSP report Nuts missing, WSP Report	
Span #3		Cross Bracing										
Pier #3 To #1K									Х			
#1K to #1Q	RH LH											
#1Q to Centre	RH LH											
	RH								х			
#2Q to#2K	LH RH								x			
#2K to Pier #4	LH								X			
Span # 4	RH								Х			
									v			
Pier #4 To #1K	RH								X			
#1K to #1Q	LH RH								X			
#1Q to Centre	LH								^			
#2Q to#2K	RH LH											
	RH											
#2K to Pier #5	LH RH								x			
									~			
Span #5												
Pier #5 To #1K									Х			
#1K to #1Q	RH LH								х			
#10 to Contro	RH											
#1Q to Centre	LH RH								х			
#2Q to#2K	LH RH											
#2K to Pier #6	LH								Х			
	RH								Х			
Span #6												
Pier #6 To #1K	LH											
	RH								Х			
#1K to #1Q	LH RH								х			
#1Q to Centre	LH RH											
#2Q to#2K	LH								х			
#2K to Pier #7	RH LH								Х			
	RH											
Span #7												
Pier #7 To #1K	LH								х			
	RH								x			
#1K to #1Q	LH RH								X X			
#1Q to Centre	LH RH											
centre to #2Q	LH								х			
#2Q to#2K	RH LH								х			
	RH								х			
#2K to Pier #8	LH RH								х			
									~			
Span #8	Soild Blocking Tie Rods								х	х	As per WSP report Nuts missing	
											-	
Span #9	Soild Blocking								х		As per WSP report	
	Tie Rods									х	Nuts Missing	
	1	l										

Piles			Т	ΌΤ	AR A		VEF OS		RIDG	Key: Pipe - interal Pocket PDK - Powder Decay HDK - Heart Decay WS - White Spot/Yellow Spot Spilt - Major Spilts in Timber Other - Corroision, Missing bolts, Damaged, loose RED - From WSP Report	
Pier	Side	Structural Element	Pipe	PDK	HDK	WS	Split	Other	Replace	Repair	Comments-
3		Piles									Bores = Bottom to top
		Pile #1									
		Pile #2									
		Pile #3 Pile #4									
		Pile #4 Pile #5									
		Pile #6									
┠──┤		Pile #7	х		<u> </u>		х	<u> </u>	х	1	Sound- 105x140-Sound
┢──┤		Pile #8	X			1	X		X	1	Sound 130x140-Sound
		Upstream cut water pile	X	1	1	1	X	1	X		Sound-265x155-Sound
		Downstream cut water pile	L	1	L	L	1	L			
		· · ·									
		Raker Studs									
		Upstream raker Stud					Х		Х		Major decay and splits
┝─┘		Downstream Raker Stud					Х		Х		Major decay and splits
		Diagonal Bracing									
		Cross Bracing									
		14/1 Ilin									
		Whalings									
		Whalings									
		Pile Cap									
		Cap #1									
		Cap #2									
		Cap #3									
		Cap #4							Х		Poor condition
4		Piles									
		Pile #1	Х				Х				95x70-remainder sound
		Pile #2	Х				Х		Х		Sound-105x40-sound.Major spilting
		Pile #3									
┡──┤		Pile #4			ļ		<u> </u>	ļ		<u> </u>	
		Pile #5	Х				V		X		145x155-90x85-Sound
┠──┤		Pile #6	х				Х		Х		130x125-210x165-sound-sound
┢──┤		Pile #7 Pile #8			<u> </u>			<u> </u>			Sound
┠──┤		Upstream cut water pile	-		<u> </u>	-		<u> </u>			Sound
		Downstream cut water pile									oound
		Raker Studs	1	1	1	1	1	1			
		Upstream raker Stud	Х				Х		х	1	Major Decay
		Downstream Raker Stud					1			1	
		Diagonal Bracing									
		Cross Bracing									
		Whalings					<u> </u>			ļ	
		Whalings					<u> </u>			ļ	
┡──┤		Pile Cap									
		Cap #1									
		Cap #2 Cap #3			<u> </u>			<u> </u>			
		0ap #3			1		1	1		1	

	т	στ	AR/		VEF OS		RIDGI	Key: Pipe - interal Pocket PDK - Powder Decay HDK - Heart Decay WS - White Spot/Yellow Spot Spilt - Major Spilts in Timber Other - Corroision, Missing bolts, Damaged, loose RED - From WSP Report		
Pier Si	de Structural Element	Pipe	PDK	HDK	WS	Split	Other	Replace	Repair	Comments-
5	Piles									
5	Pile #1	х				х		х		50x110-80x90-120x200
	Pile #2									
	Pile #3									
	Pile #4 Pile #5	x X				X X		х		Sound-Sound-150x90 Sound-260x235-200x190-230x195
	Pile #6	^				^		^		30010-2008233-2008190-2308195
	Pile #7									
	Pile #8									
	Upstream cut water pile Downstream cut water pile									
	Downstream cut water pile									
	Raker Studs									
	Upstream raker Stud									
\vdash	Downstream Raker Stud	х				х		х		Major Decay
	Diagonal Bracing	1								
	Cross Bracing									
┝─┼╴	Whalings	<u> </u>								
	Whalings	-								
	Pile Cap									
	Cap #1									
	Cap #2									
	Cap #3 Cap #4									
	oup # 1	1								
6	Piles									
	Pile #1									
	Pile #2 Pile #3									
	Pile #4	1								
	Pile #5									
	Pile #6									
	Pile #7 Pile #8									
	Upstream cut water pile									
	Downstream cut water pile									
	Raker Studs Upstream raker Stud									
	Downstream Raker Stud	1						х		
	Diagonal Bracing									
	Cross Bracing									
	Whalings									
	Whalings									
	Dila Car									
\vdash	Pile Cap Cap #1									+
	Cap #2	L	L	L	L	L	L			
	Cap #3									
\vdash	Cap #4	<u> </u>								
7	Piles									
	Pile #1	1								
	Pile #2									
\vdash	Pile #3	<u> </u>	<u> </u>	<u> </u>	<u> </u>					
\vdash	Pile #4 Pile #5									
	Pile #6	1								
	Pile #7									
$\mid \downarrow \downarrow$	Pile #8									
\vdash	Upstream cut water pile									
\vdash	Downstream cut water pile		 	 	 					
	Raker Studs	L	L	L		L	L			
	Upstream raker Stud									
\vdash	Downstream Raker Stud	<u> </u>								
\vdash	Diagonal Bracing	+								
	Cross Bracing	1								
\vdash	Whalings	<u> </u>								
\vdash	Whalings									
	Pile Cap	L	L	L	L	L	L			
	Cap #1									
$\mid \downarrow \downarrow$	Cap #2									
\vdash	Cap #3 Cap #4									
	Jap #4		1	l	L	I	1			ł