

Rotorua Lakes Council
1061 Haupapa Street
Rotorua 3046

Attention: Tina Harris-Ririnui

Re: Prince's Gate Arches Structural Inspection Report

Dear Tina

Introduction

At the request of the Rotorua Lakes Council (RLC) Ben Schubert and Mathew Erskine-Shaw from Blueline Consulting attended site on the 26th May 2026 to undertake a visual inspection of the existing Prince's Arches structure located in Queens Drive, Government Gardens, Rotorua. The purpose of this inspection was to visually assess the current structural condition and stability of the lattice arch structure following maintenance work that had recently been carried out by RLC contractors. We understand that a number of incidents had occurred in the past few months resulting in timber members being found beneath and around the structure. Heavy winds from Cyclone Vanuatu were experienced in on 12 April 2026, which may have contributed to timber elements becoming dislodged from the structure. Given Health and Safety concerns, RLC had engaged a contractor to remove loose framing from the structure. This was seen as a precautionary measure to mitigate hazards to the general public, given this is a highly trafficked area. Subsequent structural engineering input provides additional context for consideration in any future works of a similar nature.

Background

The Prince's Arches is a timber framed lattice box truss structure located on Queens Drive at the entrance to the Rotorua Government Gardens. It was constructed in 1901 and has a significant historic connection with the Rotorua Government Gardens. Blueline Consulting have been involved in the remediation of this structure since 2024 having provided a 'Remediation Options Assessment' in December 2024 (providing an overview of the existing structures condition and presenting methodologies for both partial and full replacement approaches, as long-term solutions). Following consultation with Heritage NZ, selecting the 'Full Replacement' option, a detailed remediation design was completed, issued for tender in October 2025 and for building consent in February 2026.

The structure of the Arches consists of two primary lattice box trusses which span at 45 degrees across Queens Drive and are supported onto four towers each side of the road. There are four smaller secondary lattice box trusses which span from the internal towers onto four external towers which are located further back from the road. The lattice box trusses consist of two vertical trusses per span which are curved with laminated top and bottom chords and vertical and diagonal compression/tension struts throughout the span. The two trusses are 1.825m apart and are linked with horizontal timber ties top and bottom between the vertical truss chords at the node points to the top chord and between the node points to the bottom chord. There are also diagonal cross braces orientated perpendicular between the two trusses. The four smaller trusses are the same structural configuration with a smaller span between the supporting towers.

The overall form of the structure, when in a complete and sound state, is theoretically and inherently stable under gravity and lateral wind and seismic loads. There is also a level of redundancy in the

structure which is demonstrated by its ability to transfer and redistribute loads where the connections and members have suffered dilapidation and can no longer function as the original designer intended. However, structures of this type can be susceptible to instability and progressive collapse if the primary lattice box truss elements are not adequately restrained from buckling.

As reported in the December 2024 'Remediation Options Assessment', the structure had previously been found to have compromised foundations, a broken top chord, and several missing members. Consequently, some of the remaining components have overtime become overstressed, posing a risk to the structural integrity, potentially leading to a failure of the structure. It is for this reason, that the structure was already known to be materially compromised, that RLC has been preparing for intervention work over the past few years to address its dilapidated state and mitigate the safety risks the structure poses to the public.

A further loss of members over recent times, has considerably reduced redundancy and lateral restraint, further compromising the structural integrity of the arches.

Site Assessment - May 2026

Irrespective of the precise sequence/cause of each missing element, the current observed state is the basis for our current assessment.

Our site inspection found that a significant number of lateral ties between the primary trusses orientated in the North-West and South-East direction are missing. The cross members which link between the two vertical trusses provide lateral restraint to the trusses under gravity loading. They also provide a load path to transfer horizontal wind and seismic loads to the supporting towers similar to a Vierendeel truss configuration. One bay of the vertical diagonal tension/compression members is missing from one side of the South-Eastern Truss. The removal of these members will increase the demands to the top and bottom chords and surrounding members as the loads redistribute to the supports. As the two orthogonal lattice box trusses rely on each other for lateral stability failure of one section of the structure may initiate collapse of the other sections.

The structure was observed to be standing under gravity loads with no wind at time of inspection, but given the quantity of members which are missing, the structure may not remain stable if members or connections (which are potentially subject to higher loads) fail due to the redistribution of forces. Due to the lack of lateral restraint and connection of the vertical truss elements in the North-West and South-East orientations, the overall lateral stability of the structure is a significant concern. When subjected to lateral wind and/or seismic loads, combined with vertical gravity loads, the lack of lateral restraint may initiate failure of the North-West and South-East arch spans which may result in a progressive failure of the remaining truss spans.

In our opinion, the loss of additional members at time of our inspection, relative to the previously assessed condition, has significantly compromised the overall stability of the structure and its ongoing stability cannot be relied upon, particular under wind, seismic action, or further loss or failure of any member/connection.

Recommendations

The programme to address the arches should be expedited as a matter of urgency. Temporary intervention measures should be carried out as soon as practicable to mitigate the risk of collapse should the structure be subjected to high winds or a seismic event. Until such time, measures to isolate the existing structure from the public shall be implemented, particularly during times of increased wind conditions. Temporary intervention measures may involve either removal of the existing arches from the towers or remediation of the existing arches in their current placement.

In concept, remediation works may involve reinstating the members which are missing using SG8 timber and screw fixings, however the cost and time to achieve adequate structural performance are considered impractical. Alternatively, removal of the arches from the supporting towers would be a pragmatic approach (noting this would require temporary bracing of the towers to maintain structural integrity).

As the truss structure is compromised and the intention is to remove it from site for repair anyway, the removal option will in essence be commencing with the deconstruction phase and removal of the lattice box trusses from the structure and placing these into storage rather than spending additional funds on rectifying the issues on site. Removal of the arches will require careful planning. As we understand multiple contractors recently tendered for the removal and replacement works, RLC already possesses established methodologies to evaluate and select the preferred contractor to execute the relocation.

Any temporary intervention measures, including repair works, removal, bracing, propping, reinstatement, or lifting, must be specifically engineered or contractor-designed and undertaken in coordination with a suitably qualified structural engineer familiar with the arch structure, who shall review and confirm the proposed methodology prior to implementation.

Pending implementation of any temporary intervention, immediate operational controls (as an interim risk management response) should be considered to manage risk to the public, including establishment of exclusion zones or physical barriers, traffic and pedestrian management measures, weather-triggered access restrictions, and ongoing site monitoring with regular inspections where the structure remains in place.

Closing

The ongoing stability of the Princes' Arches cannot be relied upon, and in the interest of public safety, requires immediate intervention.

It is advisable the RLC conduct an assessment considering the risk to the public, as it may be prudent to cordon off the structure in the short term while remediation works are undertaken or the Arches are deconstructed and eventually replaced.

For risk management, the recommended hierarchical of actions to be taken:

1. Immediate public risk controls - isolate/cordon/manage access immediately.
2. Short-term - controlled removal, based on contractor methodology and engineering review.
3. Permanent outcome - expedite development and implementation of a well-considered long-term solution.

We trust that this report addresses your concerns but please contact the undersigned if you have any queries.

Yours faithfully,



Mathew Erskine-Shaw
Senior Structural Engineer, CPEng
for and on behalf of Blueline Consulting



Ben Schubert
Director
for and on behalf of Blueline Consulting

Disclaimer

This report has been prepared solely for the purposes agreed with Rotorua Lakes Council as our Client and should not be relied upon for any other purpose.

The statements and opinions expressed in this report have been made on good faith, and on the basis that all information provided to us is true and accurate in all material aspects and not misleading by reason of omission or otherwise. Blueline Consulting will not be held liable for any loss, damage, cost or expense incurred or arising by reason of any person using or relying on the information in this report.

We reserve the right, but will be under no obligation, to review or amend this report, should any additional information, which was in existence on the date of this report, was not brought to our attention, or subsequently comes to light.

This report and its conclusions are based on a visual inspection of the structure, no testing, measurement, specific calculations or intrusive examinations of the structural elements were made.

APPENDIX A

Site Inspection Photos

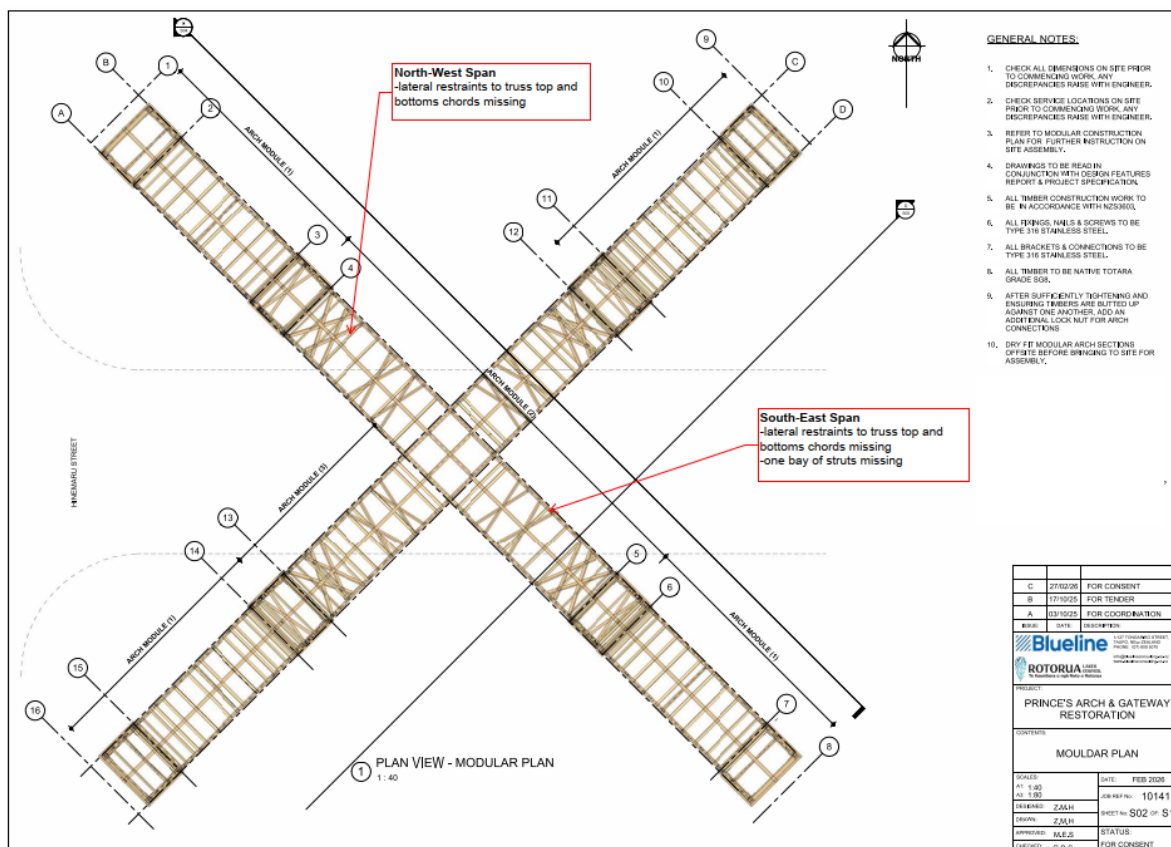


Figure 1: Prince's Arches Plan and Orientation



Figure 2: View of overall Structure (Looking to the South)

North-West Arch with
missing lateral ties
top & bottom



Figure 3: North-West Primary Arch Span showing missing members between top & bottom chords
Adjacent spans shown the original density of framing

North-West Arch with
missing lateral ties
top & bottom



Figure 4: North-West Primary Arch Span showing missing members between top and bottom chords
Adjacent spans shown the original density of framing

South -East Arch with missing
tension/compression members

South -East Arch with
missing lateral ties
top & bottom



*Figure 5: South-East Primary Arch Span showing missing members between top and bottom chords
Adjacent spans shown the original density of framing, Diagonal Bracing missing second bay from apex.*

South -East Arch
with missing
tension/compression
members

South -East Arch with
missing lateral ties
top & bottom



*Figure 6: South-East Primary Arch Span showing missing members between top & bottom chords
Adjacent spans shown the original density of framing, Diagonal Bracing missing second bay from apex*



Figure 7: North-West Secondary Arch Span showing missing members to top chord, note timber laying within arch

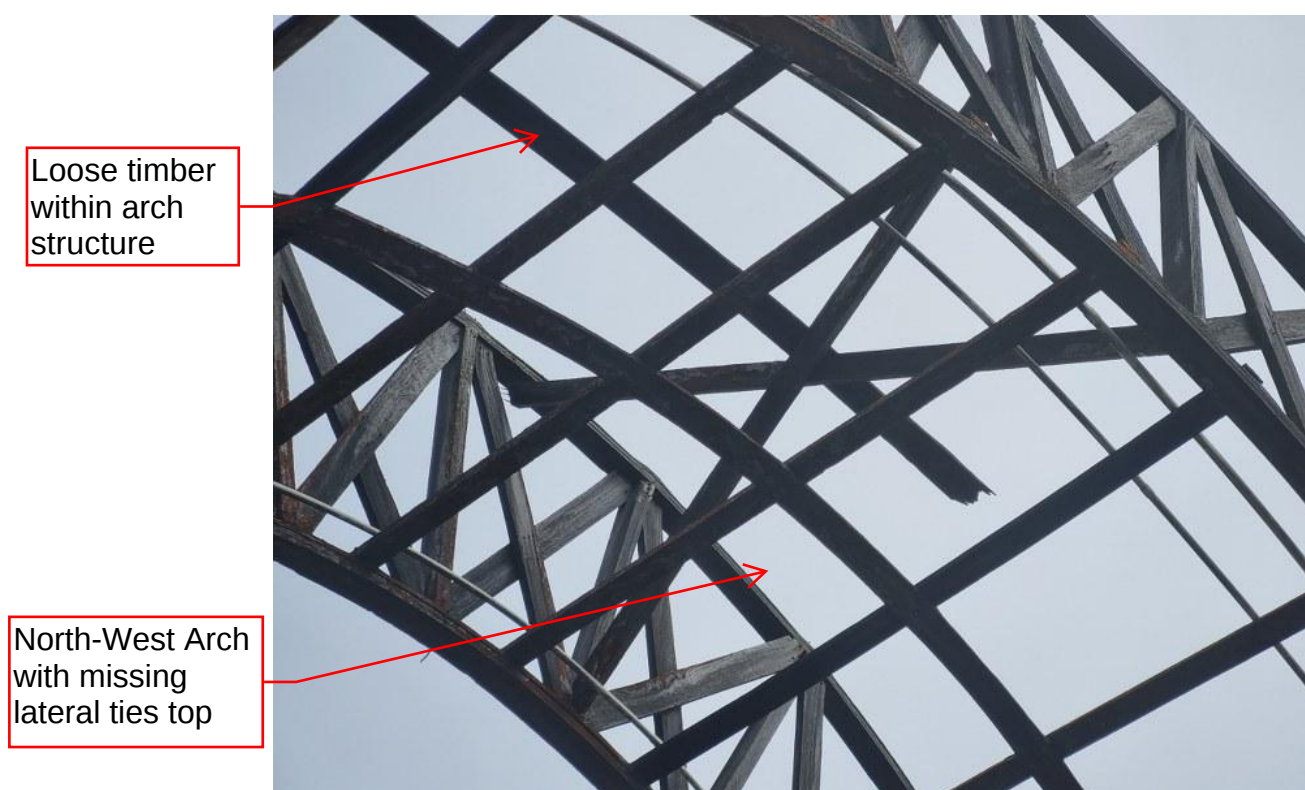


Figure 8: North-West Secondary Arch Span showing missing members to top chord, note timber laying within arch