



Options Report

Northland One Lane Bridges Replacement

May 2015

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1 Introduction

The purpose of this report is to provide a high level options appraisal and benefits to replace 8 of the one-lane bridges in Northland. The NZ Transport Agency already have an Options Report for the replacement of Hardies and Andersons Bridges at Matakohe.

The report will comment on necessary improvements to the network to add resilience, where appropriate, and also the need to undertake localised realignment.

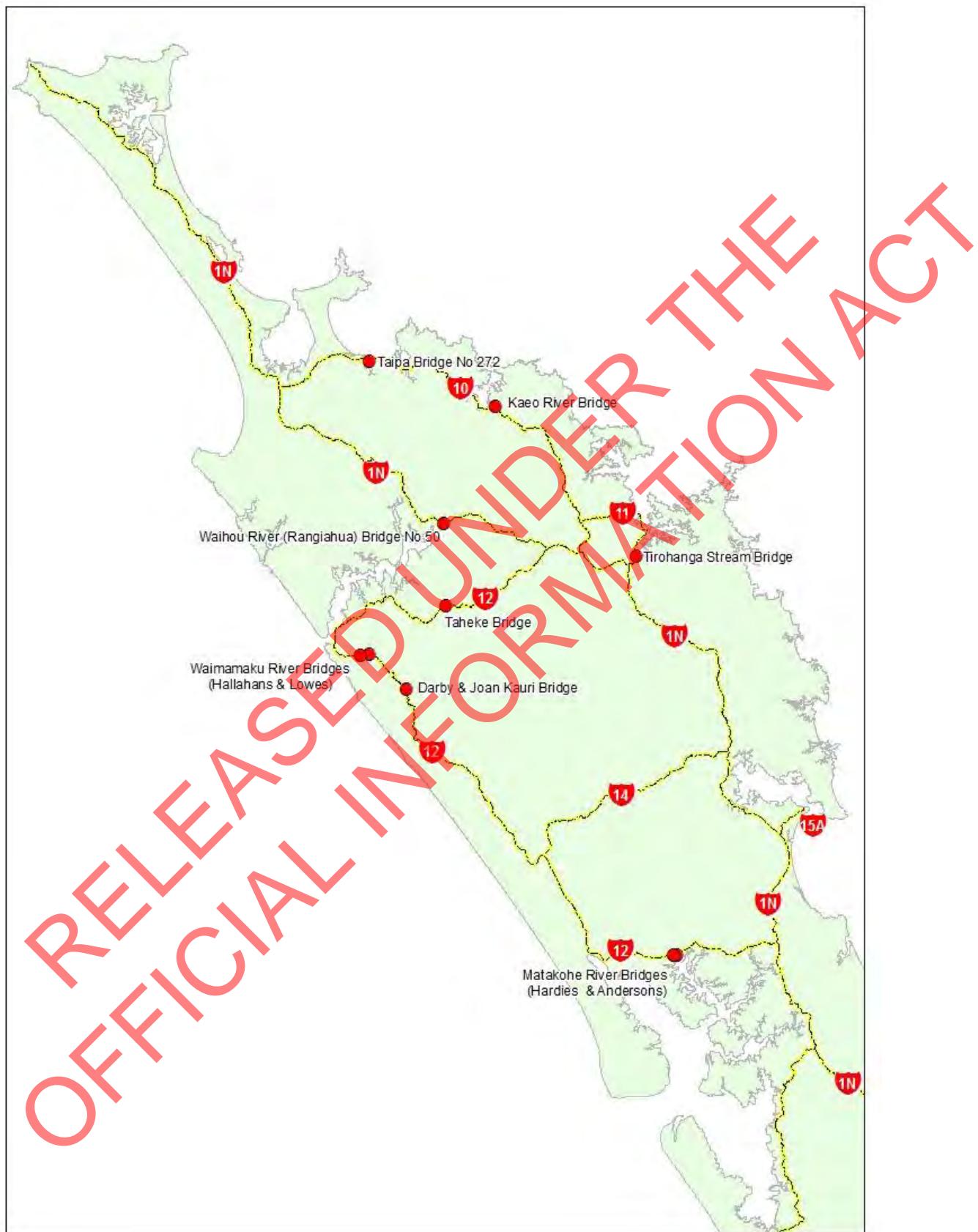
It is understood that this report shall be followed up by a more detailed business case to justify the individual replacement of bridges, as appropriate.

The bridges that are covered in this report are:

- Kaeo River Bridge No.665, SH10, RP33/11.79, BSN 448
- Taipa Bridge No.272, SH10, RP 79/3.59, BSN 826
- Tirohanga Stream Bridge, SH11, RP 0/3.09, BSN 31
- Waihou River (Rangiahua) Bridge, SH01N, RP 149/14.79, BSN 1638
- Taheke Bridge, SH12, RP 17/11.85, BSN 289
- Waimamaku River, Hallahans Bridge, SH12, RP74/3.38, BSN 774
- Waimamaku River, Lowes Bridge, SH12, RP74/1.22, BSN 752
- Darby and Joan Kauri Bridge, SH12

The financial estimates in this report have been developed to include the fees associated with design, project management and MSQA as well as an allowance for land take for any improvement options and physical works. Some assumptions have been made in these estimates considering resource consent applications and potentially protracted negotiations with land owners and stakeholders. Consequently, the estimated budgets provided are all in costs for the suggested option.

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Location Plan of Northlands One Lane Bridge Replacement Sites

2 Kaeo River Bridge, SH10: RP33/11.79

2.1 Background

This bridge is situated approximately 3km north of Kaeo. It is a 4 span bridge with an overall length of 49m and a bridge width of 3.2m. The bridge was constructed in 1933 and was structurally upgraded in 1991; as such the bridge operates generally unrestricted for HCV's, although some heavier overweight vehicles are restricted. The estimated AADT is 2752; 9% HCV, as recorded in RAMM.

There are no plans in the forward works programme for major maintenance or upgrade to this bridge. Based on the year of construction and a 100 year design life the bridge has potentially 15 to 25 years remaining life with the continuation of appropriate routine maintenance.

There are significant route security issues at this location, with SH10 immediately west of the bridge flooding several times per year. This is not directly related to the bridge; but should be addressed simultaneously, to provide route security.

Just west (heading north) of the bridge is a sensitive wetland area which relies upon these regular inundations. Ngāpuhi and Ngāti Kahu ki Whaingaroa are the representative Iwi for the area and will have an interest in any proposed work in this locality.



Aerial view of Kaeo Bridge, SH10



View looking west over Kaeo Bridge

2.2 Existing Issues

The photos below demonstrate the susceptibility of the road to flooding. These images were taken the day after the rain in July 2014. Water levels have receded in the photos. The level of flooding can be significantly affected by the state of the tide from the Whangaroa Harbour. Any upgrade of the bridge should be investigated in parallel with the raising of the road to add resilience to the network, whilst being mindful of the environmental impact.



Photograph looking east, toward the one lane bridge.



Photograph looking east toward the one lane bridge.



Photograph looking west, away from the one lane bridge



Photograph looking south, taking in SH10, the one lane bridge is to the left, just off the photo.

Kaeo Bridge is within Crash Reduction Study (CRS) site 40. There has been one minor injury accident at the bridge by the junction with Whangaroa Road. Whilst this is the only recorded data in CAS, anecdotal information suggests that vehicular accidents associated with the geometric layout of the bridge and Whangaroa Road intersection happen much more frequently.

Furthermore, the reduced bridge width is problematic for oversized vehicles and recently \$66,000 worth of damage has occurred resulting in significant guardrail replacement. Typically, repairs are required to the guardrail 3 to 5 times a year. The photos overleaf show the significant damage that was sustained recently.

Some delays at peak times, most notable at Christmas are encountered. These are satisfactorily controlled by the installation of temporary traffic lights and delays are kept to a minimum.

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As the bridge is only 3.2m wide there is no provision for pedestrians, and cyclists have no room to cross the bridge when vehicles are on it. There is no lighting on the bridge and whilst this is not uncommon, it would be desirable in the future to illuminate the bridge to improve visibility, especially for vulnerable road users.

2.3 Options

2.3.1 Do Nothing

Conceivably, working on a 100 year life and taking into consideration the structural upgrades, the bridge could, with maintenance, remain operational for a further 15 to 25 years. Traffic queuing is not an issue at this location and the bridge is capable of taking all loads other than specific types of heavy overweight vehicles.

There would be no reduction in the occurrence of accidental damage to the barriers and indeed this could be forecasted to increase with the general increasing numbers of cars and commercial vehicles operating on the network.

Similar to above, vehicular accidents particularly around the intersection with Whangaroa Road will remain. There will be a continuation of the general stakeholder unrest and disquiet over the one lane bridge remaining.

No network resilience will be achieved and in severe storm events SH10 will be closed to vehicles due to flooding.

2.3.2 Do Something

There are two options in this category:

- a. Replace the bridge on the existing alignment. This would be difficult to achieve whilst keeping the state highway operational. A temporary bridge would need to be installed and local road deviations constructed. The improvements to safety at Whangaroa Road intersection would be minimal if any and any improvements to network resilience will not be achieved.
- b. Construct a bridge widening retaining the existing bridge deck. Whilst it may be possible to keep traffic flowing on the state highway during this operation, the practicality is difficult. The existing bridge construction makes the joining of two bridge decks all but impossible. Furthermore, the existing piles would be incapable of taking the increased load and the newer part of the construction would need to be founded independently. Finally, as the existing bridge is approaching the end of its useful life, the whole practicality of having such an old structure connected to a new structure discounts this option as being practical.

2.3.3 Full Replacement and Realignment with Resilience

Replacement of the bridge on a new alignment with the raising of SH10 to the west. Continual operation of the state highway would be maintained with minimal disruption encountered. Improved safety, network resilience and reliable journey times would be achieved. Careful consultation with DOC and the Iwi will be necessary to address issues related to potential impact on the wetland. The installation of large diameter culverts along SH10 at strategic locations would mitigate the raising of the road and allow future flood water to flow unrestricted and not be dammed back, potentially exacerbating the impact of any flooding.

The construction of this option in full would have the greatest benefit to road users, ensuring full route security at this location.

2.4 Key Issues Based on Full Replacement

2.4.1 Threats and Weaknesses

The key risks or issues associated with this project are listed below:

- Flooding, resilience cannot be achieved without addressing the road flooding, see earlier photos
- Environmentally sensitive location. It is likely that the local Iwi and DOC would object to the raising of the road without good mitigation strategies to ensure that floodwater continues to inundate the wet lands, this could be achieved by the installation of regular culverts under the road
- Consultation and obtaining Resource Consents is likely to be publicly notified and time consuming, especially if the raising of the road is included in the project
- Insufficient budget to meet both bridge replacement and network resilience requirements
- Bridge piles are known to be in the region of 10m to 22m deep due to underlying poor ground conditions
- Increased use of route by HCV's leading to potential accelerated pavement damage

2.4.2 Strengths and Opportunities

- Improved resilience if road lifted (desire to make SH10 the resilient route to the Far North over SH1 which has many more compromised locations)
- Improved stakeholder satisfaction with new bridge and resilient network
- Improved and reliable journey times
- Improved alignment and accident reduction
- Opportunity to provide pedestrian and vulnerable road users facilities
- Cost saving in annual routine budgets, both for accident repairs and in bridge maintenance
- Reduction in CO₂ emissions from static vehicles and the initial acceleration from stationary
- Pavement life extended if road lifted out of the flood plain, eradication of pavement being submerged
- Improved freight efficiency with increased use of route by HCV traffic

2.5 Budgetary Considerations

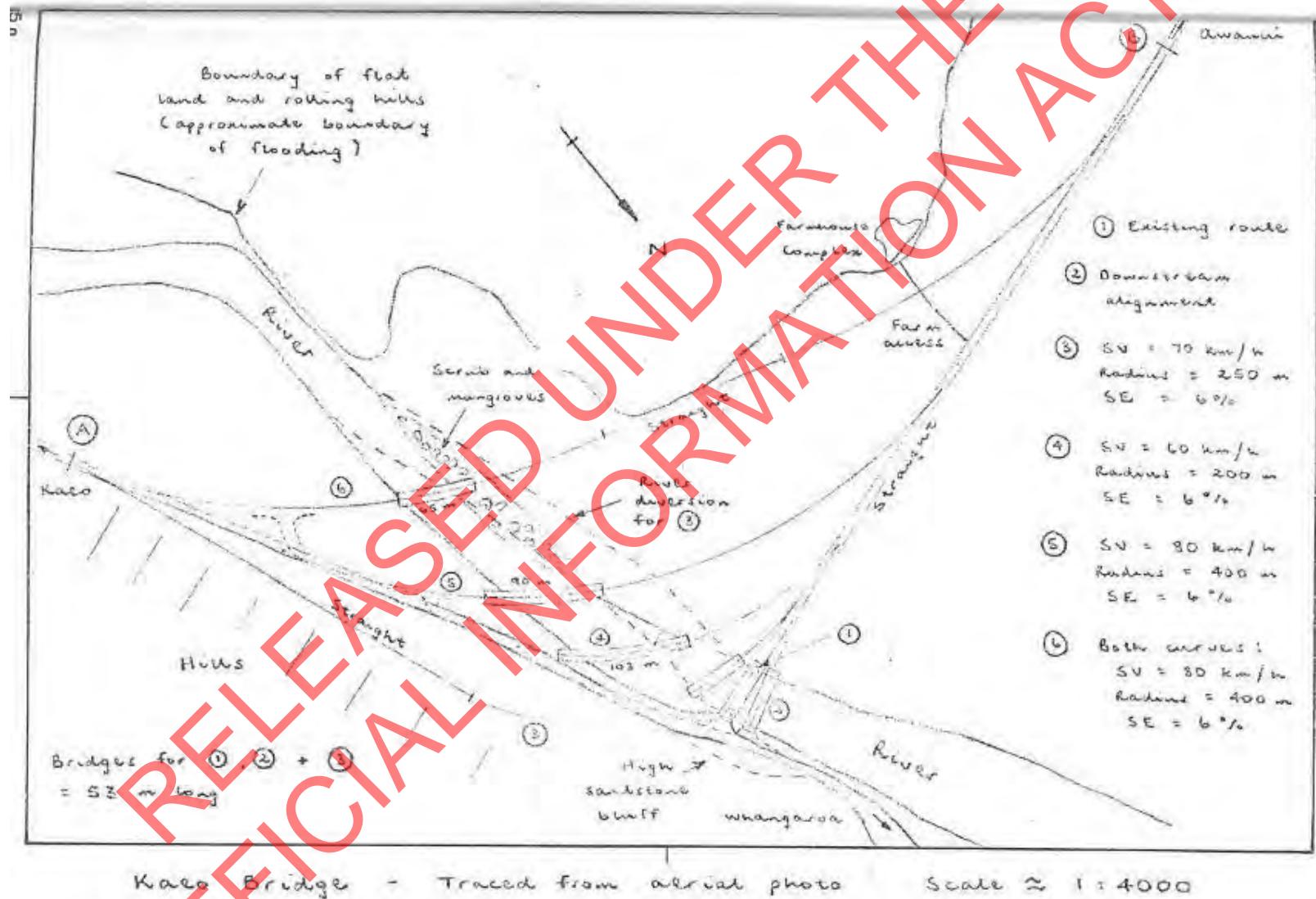
The like for like bridge replacement cost is **\$6.0M**.

However, it is not practicable or desirable to replace the bridge on the existing alignment. Opus undertook a detailed option appraisal many years ago and the base plan for this is shown on the following page. The preferred option has a sweeping radius with a skew bridge over the river. This, combined with the cost of constructing a new section of road brings the estimate up to **\$11.5M**.

Furthermore, if you wish to bring resilience into the work package a budget of **\$12.5M** is required. This allows for a notional lifting of the road to above peak recorded flood level together with the installation of 1200dia culverts at regular locations to allow the continuous free flow of flood waters, thus alleviating the damming effect of lifting the road and exacerbating the flooding. A detailed hydrological study will need to be undertaken to ratify any design. Additionally, land will be required on one or both sides to achieve the necessary shoulder gradients.

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The 90m radius bridge option was used for estimating purposes.



3 Taipa Bridge, SH10: RP 79/3.59

3.1 Background

The bridge is situated immediately south of Taipa on SH10 at RP 010-0079-3.650. The bridge is a seven span structure with a total length of 107m and a bridge width of 3.45m. The bridge was constructed in 1939. The estimated AADT 3602; 6% HCV's as recorded in RAMM.

There are no plans in the forward works programme for major maintenance or upgrade to this bridge. Based on the year of construction and a 100 year design life the bridge has potentially in excess of 25 years remaining life with the continuation of appropriate routine maintenance.

The surrounding area of Doubtless Bay, Coopers Beach, Cable Bay, Mangonui are all important tourist destinations and holiday spots situated along the Twin Coast Discovery route. Peak traffic is experienced on major holidays and often during public holidays due to the influx of visitors to the area. This results in traffic queuing at the bridge which is generally controlled by the installation of temporary traffic lights.

The bridge was originally constructed as one half of a two way bridge to allow for possible future widening to two lanes. The road alignments either end are such that a lane or separate bridge could be installed with minimal geometrical alterations.



Aerial view of Taipa Bridge, SH10



View looking north over Taipa Bridge

3.2 Existing Issues

The approach to the bridge suffers obstruction from Mangroves at the south end. A programme to hard prune the mangroves was completed in 2013; however, this does not fully address the problem and the mangroves will grow back over time and again restrict visibility.

Whilst there is a narrow pedestrian route attached to the bridge this tends to require a reasonable amount of periodic routine maintenance.

The bridge is restricted for heavier over weight vehicles **and heavier HPMV's**.

Travelling south, due to the alignment of the bridge both horizontally and vertically vehicles are unable to fully see the far end of the bridge, this does lead to conflicts in times of peak traffic.

An Opus staff member recently had a nose to tail crash on the bridge.



As this is a popular holiday destination around Christmas it is common for queues to occur on this bridge. Currently these are controlled by the installation of temporary lights; this works fairly successfully.

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3.3 Options

3.3.1 Do Nothing

Conceivably, working on a 100 year design life the bridge could, with maintenance, remain operational for in excess of another 25 years.

To leave the bridge in its current configuration is not likely to cause major issues. The control of peak holiday traffic with temporary traffic lights is sufficient to manage the local congestion. Regular maintenance of mangroves under the global consent by the maintenance contractor will ensure that forward visibility is maintained.

3.3.2 Do Something

The primary option in this category is the installation of permanent “temporarily activated” traffic lights. This would have the advantage of controlling the traffic at a pre-determined trigger. The issues concerning minor accidents would be significantly mitigated as cars meeting mid bridge or having to reverse would be removed.

3.3.3 Full Replacement

There are two options in this category, as follows:

- a. Construct a new one lane bridge to the east of the existing. This would permit two way traffic, albeit on a separate structure. This would be the most cost effective, short term solution. The Agency would however be faced with the replacement of the old, existing bridge in the next 20 to 40 years.
- b. Construct a new two lane bridge on the existing alignment, utilising the existing bridge during construction before removing and building lane two of the new structure.

3.4 Key Issues Based on Full Replacement

3.4.1 Threats and Weaknesses

- Increased vehicular speeds through Taipa with a free flowing two lane bridge
- Some land acquisition is likely and this may prove timely to acquire
- DOC and Iwi, Ngāti Kahu, should be consulted early as the bridge replacement will involve working in the tidal estuary and both organisations have an interest

3.4.2 Strengths and Opportunities

- Support for economic growth, particularly in the tourism sector
- Improved resilience in the SH10 route, by the establishment of a two lane bridge to handle a higher volume of traffic if SH1 was closed (and likely make SH10 the major freight route)
- Improved stakeholder satisfaction with reliable journey times stemming from the removal of frustrating queues
- Improved and reliable journey times
- Improved alignment and accident reduction
- Pedestrian and vulnerable road users facilities and safety improved
- Cost saving in annual routine budgets, both for accident repairs and in bridge maintenance

- Reduction in CO2 emissions from static vehicles and the initial acceleration from stationary
- Improved freight efficiency with increased use of route by HCV & HPMV traffic
- Upgrading of the route for HCV & HPMV traffic

3.5 Budgetary Considerations

- ▶ Option 1: The estimated budget for the construction of a new one lane standalone bridge at Taipa is **\$7.0M**
- ▶ Option 2: The estimated budget for the replacement of Taipa Bridge with a two way bridge on its current alignment is **\$12.0M**

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4 Tirohanga Stream Bridge, SH11: RP 0/3.09

4.1 Background

The bridge is situated approximately 2km north of the outskirts of Kawakawa at RP 011-0000-3.11. The bridge consists of 3 spans with a total length of 30m, and a bridge width of 3.7m. The exact date of bridge construction is not known, but is likely to have been in the late 1930's-early 1940's. The estimated AADT 2423, 8% HCV's.

There are no plans in the forward works programme for major maintenance or upgrade to this bridge. The bridge is structurally sound and has no restrictions for HCV's or HPMV's. Based on an estimate of the year of construction and a 100 year design life the bridge has potentially in excess of 25 years remaining life with the continuation of appropriate routine maintenance.

There was a significant improvement to the advance signage in 2013 to the bridge and approach curves to attempt to reduce speeds, warn motorists of the curves and the one lane bridge ahead.

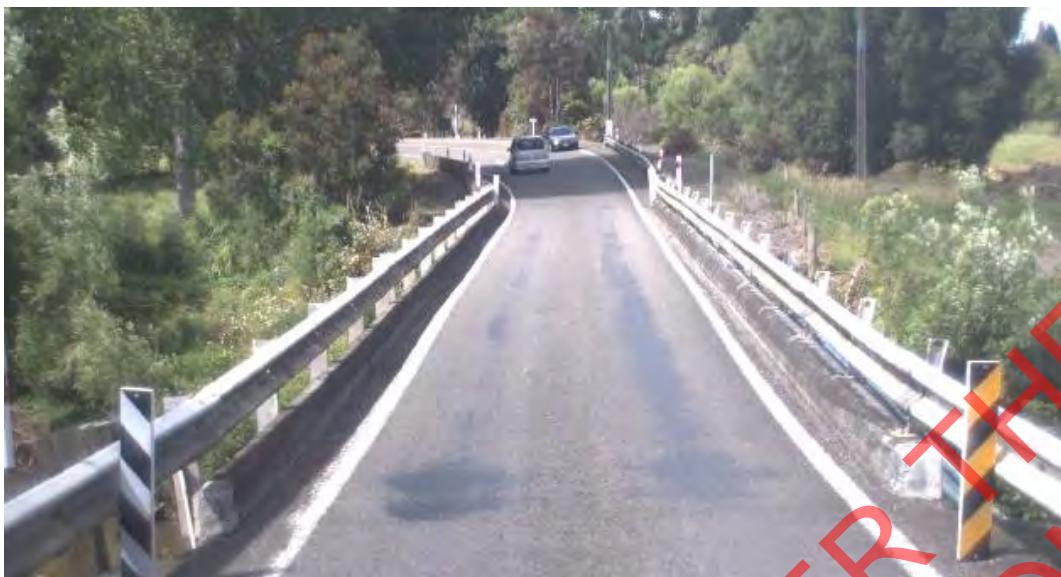
The bridge is on SH11 leading to Paihia, Waitangi and the Bay of Islands - a popular year round tourist destination. It is also the main access route to the Waikare Valley and Karetu areas east of Kawakawa. There have been 6 recorded crashes in the vicinity in the last 5 years, with 5 directly attributable to the bridge. These have been minor, such as nose to tail or reversing accidents.

There is little queuing at the bridge other than at peak holiday times. Even then, the delays are short due to the length of the bridge.

The overall resilience of SH11 to Paihia would remain compromised due to other flooding and potential land slip locations.



Aerial view of Tirohanga Stream Bridge



View travelling south toward Kawakawa.

Travelling north, there are two intersections with SH11. One of these is for a minor road. These are directly on the bridge approach resulting in very poor alignment and compromised visibility, as shown in the image below.



View travelling north to the Bay of Islands

4.2 Existing Issues

The bridge suffers from occasional damage to the guardrails but these are largely unreported. Maintenance cost are minimal. However, due to the poor alignment of bends and intersections there have been 6 reported crashes in the last 5 years. 5 are directly attributable to the bridge. It is suspected that there are many more which go unreported to the Police or the NZ Transport Agency.

The intersection layout is very unsatisfactory with two side roads connecting to SH11 right on the bridge approach, which is also a 125deg bend which limits visibility.

There is minimal queuing at the bridge, predominately due to its short length and the low traffic volumes.

There is no separate pedestrian or cycle facilities and no street lighting is present on the bridge, although there is lighting at the intersection with Waikare Road. Due to poor alignment and visibility, safety is an issue for cyclists crossing the bridge further north at the south approach to Taumarere Bridge.

Flooding of the state highway does occur, however, Tirohanga Bridge is above the flood levels. However, in 2007, the southern bridge approach was severely damaged and the bridge closed, indicating the bridge waterway area may not be sufficient for larger floods.

Resilience issues also exist further along SH11 in times of heavy rainfall. Consequently, upgrading the bridge would not provide full network security to Paihia.

4.3 Options

4.3.1 Do Nothing

Based on the design life, the bridge has in excess of 25 years useful life remaining and is fully operational to HPMV's. Traffic queuing is minor. The poor alignment in the area will remain and despite upgrading the curve and advance warning signage there remains the potential for crashes in the locality, based on historical trends. Pedestrian and cycle facilities would remain non-existent and journey times would remain variable depending upon the time of travel.

4.3.2 Do Something

There are minimal options under this category due to the geometrical layout and topography linked to the watercourse. It is not practical to widen the existing structure. The installation of temporary traffic lights might assist in peak times and should assist in the mitigation of minor crashes. However, due to the very low numbers of vehicles, the cost and practicality would outweigh the capital and revenue investment.

The widening of the existing bridge to take two way traffic is not viable due to its construction and the geometric layout of the vicinity would make alignment issues difficult.

4.3.3 Full Replacement

A full bridge replacement, off line to the west (Option 2 below) is feasible. This would improve the geometric layout of the approaches and address the substandard intersections with Waikare and Doel Road immediately north of the bridge. All the opportunities would be realised including crash reduction, pedestrian and cycle facilities, journey reliability etc.

A realignment even further west (Option 1 below) to improve the geometric layout again could be constructed but it is felt that this may not be cost effective due to the river alignment and topography of the land but should still be considered through the Indicative Business Case procedure.

There is the further option of a major realignment to the east (Option 3 below), effectively removing three bends and constructing 350m of new road together with upgrading the bridge. It is likely that this option would not be financially viable and that land acquisition would be problematic as there is a *historical* house adjacent but should still be considered through the Indicative Business Case procedure.



Ariel view showing alternate alignments

4.4 Key Issues Based on Full Replacement

4.4.1 Threats and Weaknesses

- Increased vehicular speeds through section with the potential to increase loss of control crashes immediately north at the right hand bend at Bristow Road intersection
- Land acquisition is required and this may prove timely to secure
- DOC and Iwi, Ngāti Hine, should be consulted early as the bridge replacement will involve working in the watercourse and both organisations have an interest
- A flood embankment was constructed by Downer some years ago and the new alignment would cut through this. The flood plain would need to be mapped and understood, together with the rationale behind the flood embankment so that any future scheme would deal with this
- Sufficient funding has not been allowed for to realign the road; but only to replace the bridge in its current location.

4.4.2 Strengths and Opportunities

- Improvement to the geometric layout of the locality
- Reduced likelihood of crashes in the area
- Improved intersection layout and visibility with Doel Road connecting to Waikare Road before a single intersection with SH11
- Support for economic growth, particularly in the tourism sector
- Improved stakeholder satisfaction with reliable journey times
- Improved alignment and accident reduction
- Pedestrian and vulnerable road users facilities improved
- Cost saving in annual routine budgets, both for accident repairs and in bridge maintenance
- Reduction in CO₂ emissions from static vehicles and the initial acceleration from stationary
- Improved freight efficiency with increased use of route by HCV traffic

4.5 Budgetary Considerations

- ▶ Option 1: The estimated budget for the replacement of Tirohanga Stream Bridge on a new alignment to the west, eliminating two bends is **\$5.7M**
- ▶ Option 2: The estimated budget for the replacement of Tirohanga Stream Bridge on its current alignment, modified slightly west to tie in with the existing road network is **\$4.79M**
- ▶ Option 3: The estimated budget for the replacement of Tirohanga Stream Bridge on a new alignment to the east, eliminating three bends is **\$6.2M**

5 Waihou River (Rangiahua), SH o1N: RP 149/14.79

5.1 Background

This bridge is situated on the far-reaches of the Hokianga Harbour, with Umawera to the west and Okaihau to the east. It is a 5 span bridge with an overall length of 61m and a bridge width of 3.66m. The bridge was constructed in 1935 and has not been subjected to any structural upgrades, although records show that in the mid 1980's an invasive survey was undertaken that showed that the condition of the concrete and steel were commensurate with its age. There is no posted weight restriction on the bridge. The estimated AADT is 1016; 14% HCV, as recorded in RAMM.

There are no plans in the forward works programme for major maintenance or upgrade to this bridge. Based on the year of construction and a 100-year design life the bridge has potentially 15 to 25 years remaining life with the continuation of appropriate routine maintenance.

There are significant route security issues at this location with the area flooding several times per year, along with a private access way immediately to the north of the bridge.



Aerial view of Rangiahua Bridge, SH o1N



Side elevation of the Rangiahua Bridge on SH1



View heading north over Rangiahua Bridge



View heading south over Rangiahua Bridge (note access way on right hand side)

5.2 Existing Issues

There are significant route security issues at this location with the road to the south east potentially flooding several times per year.

The photos below demonstrate the susceptibility of the road to flooding. These images were taken after the July 2014 event. Water levels would appear in places to be up to about 350mm deep.



The level of flooding can be significantly affected by the state of the tide from the Hokianga Harbour as the river is still tidal at this point. Any upgrade of the bridge should be investigated in parallel with the raising of the road to add resilience to the network.



Rangiahua Bridge is not within a 2015 Crash Reduction Study (CRS) site. There has been one reported crash within 250m of the bridge, with no injuries. Whilst this is the only recorded data in CAS, anecdotal information suggests that vehicular accidents associated with the geometric layout of the bridge approach and poor sight lines happen more frequently. Maintenance cost data shows annual repairs to the guardrail on the southern approach.

There is no provision for pedestrians, and cyclists have no room to cross the bridge when vehicles are on it. There is no lighting on the bridge and whilst this is not uncommon, it would be desirable in the future to illuminate the bridge to improve visibility, especially for vulnerable road users.

An access way to private property is immediately at the end of the north side guardrail. This is very poorly located and the sight lines are severely compromised, looking for oncoming traffic over the bridge.

The road alignment from the southern approach is less than desirable. There is a 45kph curve advisory speed limit sign. However, traffic traveling in that direction have right of way over the bridge, and are thereby taking the corner at higher speeds knowing that they have right of way and do not have to stop. This action can compromise road safety by inappropriate vehicular speed.

According to RAMM there are about 150 truck movements over the bridge each day, with a high proportion from the forestry industry. The recent forestry report suggests that there is not likely to be a significant increase in the number of truck movements on the route from the forestry sector.

There are no reported issues of significant delays encountered by customers at the bridge.

5.3 Options

5.3.1 Do Nothing

Conceivably, working on a 100-year design life with maintenance the bridge could remain operational for a further 15 to 25 years. Traffic queuing is not an issue at this location and the bridge is capable of taking all loads other than specific types of heavy overweight vehicles.

There would be no reduction in the occurrence of accidental damage to the barriers and indeed this could be forecasted to increase with the general increase in the number of cars and commercial vehicles operating on the network.

Potential vehicular accidents, related to the sight-lines and access way, will remain. Furthermore, there will be a continuation of the general stakeholders' unrest and disquiet over the one lane bridge remaining.

Network resilience will not be achieved and, in severe storm events, SH 01N will be closed to vehicles due to flooding.

5.3.2 Do Something

Due to the road and bridge alignment, together with its construction, makes it impractical to construct an extension to the bridge deck. The remaining design life would also make this option prohibitive.

Consequently, the do something option is to construct a new two lane bridge to the east of the existing and tie back the road. This is also the cheapest option to achieve two laning of the road.

5.3.3 Full Replacement and Realignment with Resilience

Replacement of the bridge on a new alignment with the raising of SH 01N to the south. Continual operation of the State Highway would be maintained with minimal disruption encountered. Improved safety, network resilience and reliable journey times would be achieved.

The design and installation of drainage culverts underneath the road would mitigate the raising of the road and allow future flood water to flow unrestricted and not be dammed back. A full hydrological survey together with liaisons with NRC would be required before this could be implemented.

The construction of this option in full would have the greatest benefit to road users, ensuring full route security at this location. It is estimated that raising the road by between 300 and 400mm over a length of about 350m would be sufficient to achieve resilience, again, subject to detailed design

5.4 Key Issues Based on Full Replacement

5.4.1 Threats and Weaknesses

The key risks or issues associated with this project are listed below:

- Flooding - resilience cannot be achieved without addressing the road flooding, see earlier photos
- Consultation and obtaining Resource Consents is likely to be publicly notified and time consuming, especially if raising of the road is included in the project
- Insufficient budget to meet both bridge replacement and network resilience requirements

5.4.2 Strengths and Opportunities

- Improved resilience if road lifted
- Improved stakeholder satisfaction with new bridge and resilient network
- Improved and reliable journey times
- Improved alignment and accident reduction
- Opportunity to provide pedestrian and vulnerable road users facilities
- Cost saving in annual routine budgets, both for accident repairs and in bridge maintenance
- Pavement life extended if road lifted out of the flood plain, eradication of pavement being submerged

5.5 Budgetary Considerations

- ▶ The estimated budget for the replacement of Rangiahua Bridge on its current alignment is **\$8.0M**
- ▶ The estimated budget for the replacement of Rangiahua Bridge on its existing alignment and to lift the road to provide network resilience from flooding is **\$9.0M**

6 Taheke Bridge, SH12: RP 17/11.85

6.1 Background

This bridge is situated approximately 17km west of Kaikohe on SH12. It is a 5 span bridge with an overall length of 64m and a bridge width of 3.66m. The bridge was constructed in 1938 and has not been subjected to any structural upgrades. There is no posted weight restriction on the bridge, although it is slightly restrictive for HPMV's. The estimated AADT is 1330; 6% HCV, as recorded in RAMM.

There are no plans in the forward works programme for major maintenance or upgrade to this bridge. Based on the year of construction and a 100-year design life the bridge has potentially 20 to 30 years remaining life with the continuation of appropriate routine maintenance.



Aerial View of Taheke Bridge, SH12



View looking along Taheke One Lane Bridge

6.2 Existing Issues

Due to the horizontal alignment there are recurring issues with vegetation growth obstructing sight lines. This requires regular pruning every few years and can been seen to the right of the above image. There are no route security issues at this location and no reported significant delays to road users at the bridge.



6.3 Options

6.3.1 Do Nothing

The bridge will remain operational and fit for purpose for another 20 to 30 years with the application of appropriate routine maintenance. The forestry truck movements that haul along SH12 are not expected to grow beyond their current levels based on the recent Forestry Study.

Do nothing would include regular maintenance and the pruning or removal of the trees that periodically obstruct sightlines.

6.3.2 Full Replacement

There are two options for a bridge replacement project at this location.

The construction of a two lane bridge immediately to the north west of the current bridge with realignment to the two approach curves.

Additionally, a new bridge and section of road further north east could be constructed. This would remove three curves from the network making the journey that much safer. Slight efficiencies would be realised by improved traffic flow by the removal of the tight bends. This alignment is shown on the plan below. Obviously detailed consultation and land take would be required for this option together with the assessment of any potential impact on the floodplain. However, this option should still be considered through the Indicative Business Case procedure.



Potential option of bridge and realignment to the northwest.

6.4 Key Issues Based on Full Replacement

6.4.1 Threats and Weaknesses

- Land take and designation will be required for both options as they both sit outside of the current designation
- The more extensive option would require greater design and hydrological assessment due to the construction of a road across a flood plain

6.4.2 Strengths and Opportunities

- Improved stakeholder satisfaction with new bridge
- Improved and reliable journey times
- Improved alignment and accident reduction if the more extensive option is selected
- Opportunity to provide pedestrian and vulnerable road users facilities
- Cost saving in annual routine budgets in bridge maintenance

6.5 Budgetary Considerations

- ▶ The estimated budget for the replacement of Taheke Bridge on its current alignment is **\$8.0M**
- ▶ The estimated budget for the replacement of Taheke Bridge on an improved alignment eliminating the three bends is **\$9.5M**

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7 Waimamaku River (Hallahans) Bridge SH12: RP74/3.38 and

Waimamaku River (Lowes) Bridge SH12: RP 74/1.22

7.1 Background

These two bridges are situated on SH12 and are 2.1km apart. Consequently they will be reported as one in this section as the issues are common to both.

- Hallahans Bridge was constructed in 1945, is a 3 span bridge 55.3m long with a bridge width of 3.66m. There are no weight restrictions to the bridge. The estimated AADT is 775; 9% HCV, as recorded in RAMM.
- Lowes Bridge was constructed in 1935, is a 3 span bridge 47.2m long with a bridge width of 3.66m and is subjected to a weight restriction for heavier overweigh vehicles. The estimated AADT is 715; 9% HCV, as recorded in RAMM.

Neither bridge has been subjected to any structural upgrades nor are there any upgrades programmed on the forward works programme for either bridge. There are no route security issues associated with these bridges or immediate network.



Aerial view Waimamaku River (Hallahans) Bridge



Waimamaku River (Hallahans) Bridge



Aerial view of Waimamaku River (Lowes) Bridge

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Waimamaku River (Lowes) Bridge



Waimamaku River (Lowes) Bridge

7.2 Existing Issues

There are no issues associated with the maintenance and operation of these bridges. No customer delays are associated with these bridges, likely due to the low vehicular movements each day. The road alignment and visibility at each location is good and there are no accidents associated with the bridges.

7.3 Options

7.3.1 Do Nothing

No real effect to the current level of service, and future traffic growth is expected to be low.

7.3.2 Do Something

There are no Do Something options to these bridges.

7.3.3 Full Replacement

Each bridge would need to be replaced off line to ensure continuation of traffic flow on the State Highway and the road geometry would need to be realigned to tie in with the new bridges.

7.4 Key Issues Based on Full Replacement

7.4.1 Threats and Weaknesses

- Little justification for the replacement of each bridge, this could be reported negatively and is a threat to the NZ Transport Agency's reputation

7.4.2 Strengths and Opportunities

- Improved stakeholder satisfaction with new two lane bridge
- Improved and reliable journey times
- Opportunity to provide pedestrian and vulnerable road users facilities
- Cost saving in annual routine budgets in bridge maintenance

7.5 Budgetary Considerations

- ▶ An estimated budget for the replacement of Hallahans Bridge is **\$7.0M**
- ▶ An estimated budget for the replacement of Lowes Bridge is **\$6.0M**

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9 Darby and Joan Kauri Bridge, SH12

9.1 Background

This bridge is situated in the heart of the Waipoua Forest. Unlike other bridges, this was constructed not to span a valley or watercourse but to span over the root system of two adjacent ancient Kauri trees in 1966. The structure is more a series of piles with a ring beam and a deck built off that, rather than a *traditional* bridge. The bridge deck is punctuated with holes to allow rain water to penetrate from the road into the ground below. The bridge is 17.3m long with a bridge width of 4.4m; the estimated AADT is 319; with 6% HCV, as recorded by RAMM.

There are no plans in the forward works programme for major maintenance or upgrade to this bridge. Based on the year of construction and a 100 year design life the bridge has in excess of 50 years remaining life with the continuation of appropriate routine maintenance.



Aerial view of the Darby and Jones Bridge, SH12



SH 12 Waipoua Forest (1994)

Photo taken in 1994 prior to the construct of the bridge and sealing of the road

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View looking north toward the bridge



View looking south toward the bridge

9.2 Existing Issues

There are few issues with the current bridge alignment. The Waipoua Forest is a major tourist location and attracts many thousands of visitors each year. Many of these are foreign drivers and are likely to be driving campervans. The speed environment within the confines of the forest is slow, the road is narrow, windy and hilly with little opportunity to comfortably get over 50kph. Consequently, this reduced speed coupled with the hilly environment regulates queue lengths at the bridge.

Furthermore the whole of the Waipoua Forest is classified as contaminated land due to kauri dieback disease (PTA). This disease can lay dormant for years within the soil, only to be transferred by human traffic to a location near Kauri. The resultant devastation is clear to see with many once mighty trees standing naked and dead. Any works within the forest will require stringent Environmental Controls, coupled with DOC and MPI approvals to methodology not to mention Te Roroa's consent and buy into the project. The costs of disposing of any excavated material are significant, the only licenced hazardous waste site is in Auckland and failing that a local dump site within the forest is possible with Te Roroa's approval but was recently costed at over \$200,000 just to acquire approvals and consents and build the bund.

9.3 Options

9.3.1 Do Nothing

To leave the bridge insitu would not cause any major journey disruption to this low volume, charismatic road. The delays due to queue lengths are negligible and only run the risk of occurrence at peak holiday times. There would be no disturbance of the natural environment and the risk of spreading kauri dieback disease would not occur.

9.4 Key Issues

9.4.1 Threats and Weaknesses

The key risks or issues associated with this project are listed below:

- Significant risk of objection and public outcry from Te Roroa, DOC, Waipoua Forest Trust, Far North District Council and others to the felling of the tree
- Increased risk of the spread of PTA due to disturbance of the land
- Obtaining resource consent and designation of the forest as highway
- Significant Public Relations risk to the NZ Transport Agency if this option is pursued
- Potential threat to the NZ Transport Agency reputation due to questions over the value for money sensibility of the project in the Waipoua forest
- Significant Environmental damage through construction activities to this ancient and historic forest

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