Capital Heritage Limited
Archaeology and Heritage Consultancy

Beechwood Lane
Howe Truss Bridge, Te Marua, Upper Hutt

Heritage Report

Prepared For Upper Hutt City Council

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1 Introduction

1.1 Background to Report

This report had been prepared on behalf of the Upper Hutt City Council in relation to an historic wooden truss bridge located on Beechwood Lane, Te Marua, Upper Hutt (grid reference East 2688748, North 6010306). The bridge is currently used by cyclists and pedestrians and is part of the Remutaka Rail Trail cycle way and it had been assessed as being structurally unsound for purpose. The council is has considered a number of options to either strengthen or replace the bridge and it appears that the most practical option will be to remove historic timbers and place a new, purpose built span over the historic abutments.

The date of construction for the bridge appears to be 1902-1904 so the demolition and consruction work does not require an archaeological authority as per the *Heritage New Zealand Pouhere Taonga Act* (2014). However, the Upper Hutt City Council has requested that the bridge be documented prior to its demolition, for the public record. This report presents details about the construction and history of the bridge as well as detailed structural drawings.

The regional location of Te Marua, Upper Hutt can be seen in Illustration 1 and the local location can be seen in Illustration 2. Illustration 3 shows the aerial view of the bridge location.

Illustration 1: Regional location of Te Marua, Upper Hutt (from Quickmap)

Illustration 2: Location of Beechwood Lane Bridge indicated in purple (from Quickmap)

Illustration 3: Aerial view of SH2 and Plateau Road junction (from Upper Hutt City Council Xplorer). Bridge location indicated in red.

2 History of the Mangaroa River Bridges

Adkin and Best (Adkin, 1959:5) identify the voyager Kupe as traditionally the earliest traveller to reach this country. Kupe's visit was followed some time later by the arrival of Ngai-Tara, who occupied the area on a more permanent basis (Adkin, 1959:6). Best also identifies Ngati-Mamoe and Ngati Ira as early inhabitants of the greater Wellington area. Ngati Ira were defeated by Tamiti Waka Nene of Ngapuhi and Te Rauparaha of Ngati Toa at Whakataka Pa across the bank from what is now Te Marua on the northern side of the junction of the Hutt and Mangaroa Rivers. There were kumara cultivations associated with Wkakataka Pa on the river terraces off the end of Gillespies Road, Birchville (Kelleher, 1991:163-164). Ngati Mutunga and Te Ati Awa came to the region from Taranaki during the early part of the 19th Century and established villages at Te Hau-Karetu (Maoribank) and Whirinaki (Silverstream) (Adkin, 1959:8-9, Hutt City).

Colonial settlement of the area began during the 1850s with various settlers taking up rural sections by Crown Grant. The Beechwood Lane bridge is situated in what was originally Section 110, Hutt District (see for instance Illustration 6 and Illustration 7). This part of Section 110 was awarded to J. Taine by Crown Grant although by 1909 it had been acquired by Henry Pearson of Nottingham, England (WN190/102).

It seems that a succession of road bridges were constructed over the Mangaroa (Mungaroa) River (Stream) between the 1840s and the early 20th Century in two principal locations: close to the present position of the Beechwood Lane bridge (15-20m east) and a little to the east of the current SH2 Mangaroa River bridge some 80m west of the Beechwood Lane bridge. To confuse matters, there are also numerous reports regarding repairs to and replacement of the Mungaroa rail bridge that was part of the Wellington-Wairarapa railway line installed during the 1870s. There is sometimes no distinction made between the rail bridge and the road bridge in contemporary documents.

2.0.1 First Mangaroa River Bridge early 1840s-late 1860s

The first bridge over the Mangaroa River was probably constructed very early in Wellington's colonial settlement, during the early 1840s. Two drawings by different artists labelled “Mungaroa Bridge, Upper Hutt” dating to ca 1840 and 1848 probably show this first structure (see Illustration 4 and Illustration 5). This bridge appears to have been located some 80m west of the present Beechwood Lane bridge. In 1848 it was described as “still a cranky construction, being a little lop-sided which makes it look foolish in a tradesman's eye.” (*Wellington Independent,* 24th June, 1848:3). The main highway running through Section 110 was surveyed out as early as the 1850s and what was probably this first bridge over the Mangaroa River is shown on a plan dating to ca 1852 fairly close to the location of the current SH2 Mangaroa River bridge (see Illustration 6).

Illustration 4: Mungaroa Bridge, Upper Hut [Hutt], Robert Westmacott ca 1840 (National Library of Australia 163#T706 NK762/35).

Illustration 5: Mungaroa Bridge, Upper Hutt, William Swainson, January 1849 (Hocken Pictorial Collections .

Illustration 6: Detail of SO 10509, ca 1852 (from Quickmap). Approximate location of Beechwood Lane Bridge circled in red. First bridge over Mangaroa River circled in blue.

2.0.2 Second Mangaroa River Bridge Late 1860s-1904

There are various references to the “Mungaroa Bridge” in newspapers during the 1860s and 1870s. It was noted in 1866 that timbers had rotted in the north-eastern abutment (*Wellington Independent* 5th June 1866:6). The bridge was deemed unfit to carry heavy vehicles during the late 1860s, and in 1867 the road was moved from the alignment on the northern side of Mangaroa River as shown in Illustration 6 to that on the southern side of the river as shown in Illustration 7.

Land was swapped for this purpose by Edward Benge, local farmer (see Illustration 9). In 1868 a replacement bridge was constructed at a cost of some £600 and it seems from later newspaper reports that this was located slightly to the east of the current Beechwood Lane bridge on the alignment of the surveyed newly surveyed roadway as shown in Illustration 7, dating to the early 1870s (see *Wellington Independent* 16th May, 1867:5, 21st April 1868:5 and *Evening Post* 13th May 1902:6).

The location of the second bridge was in an area that was subsequently subdivided out into residential sections following closure of the road during the early 20th C (see Illustration 8).

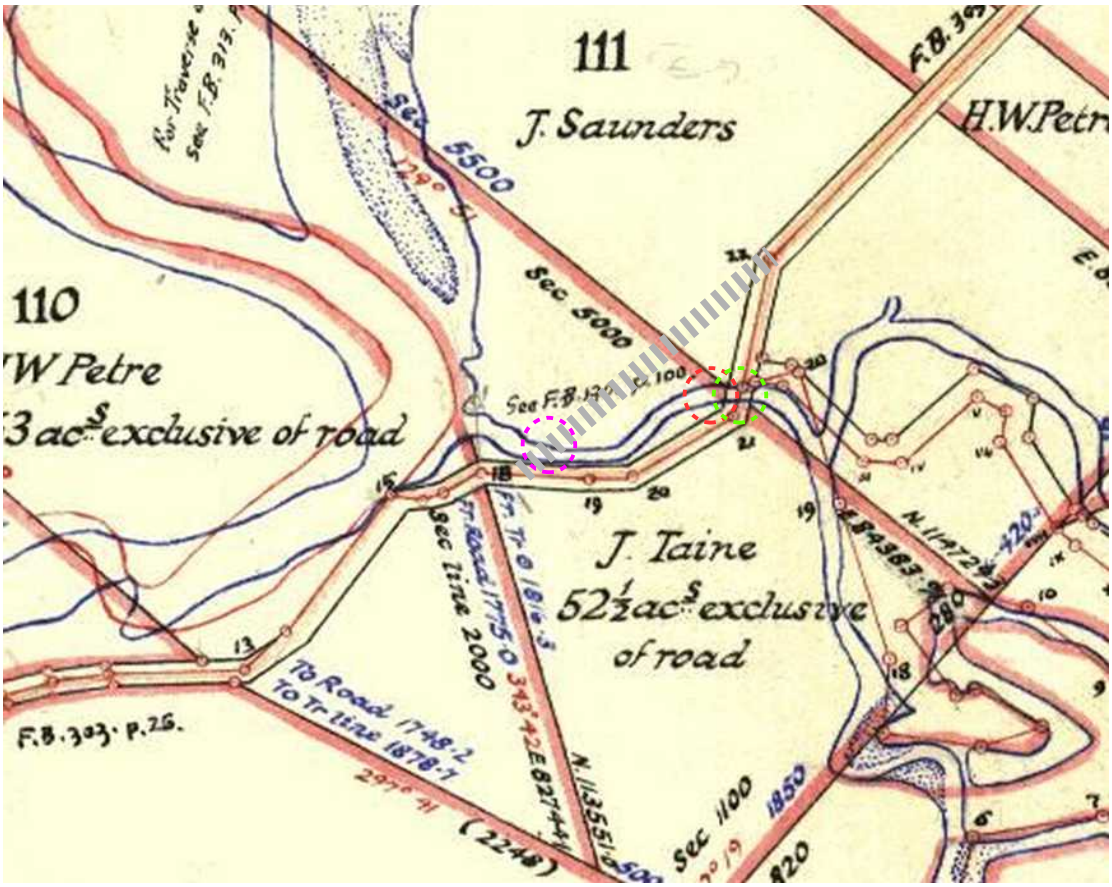

Illustration 7: Detail of Crown Grants plan SO 10985, ca 1871 (from Quickmap). Approximate location of Beechwood Lane Bridge circled in red. Approximate location of first bridge circled in pink over original SH2 alignment (in grey), probable location of second Mangaroa Bridge circled in green.

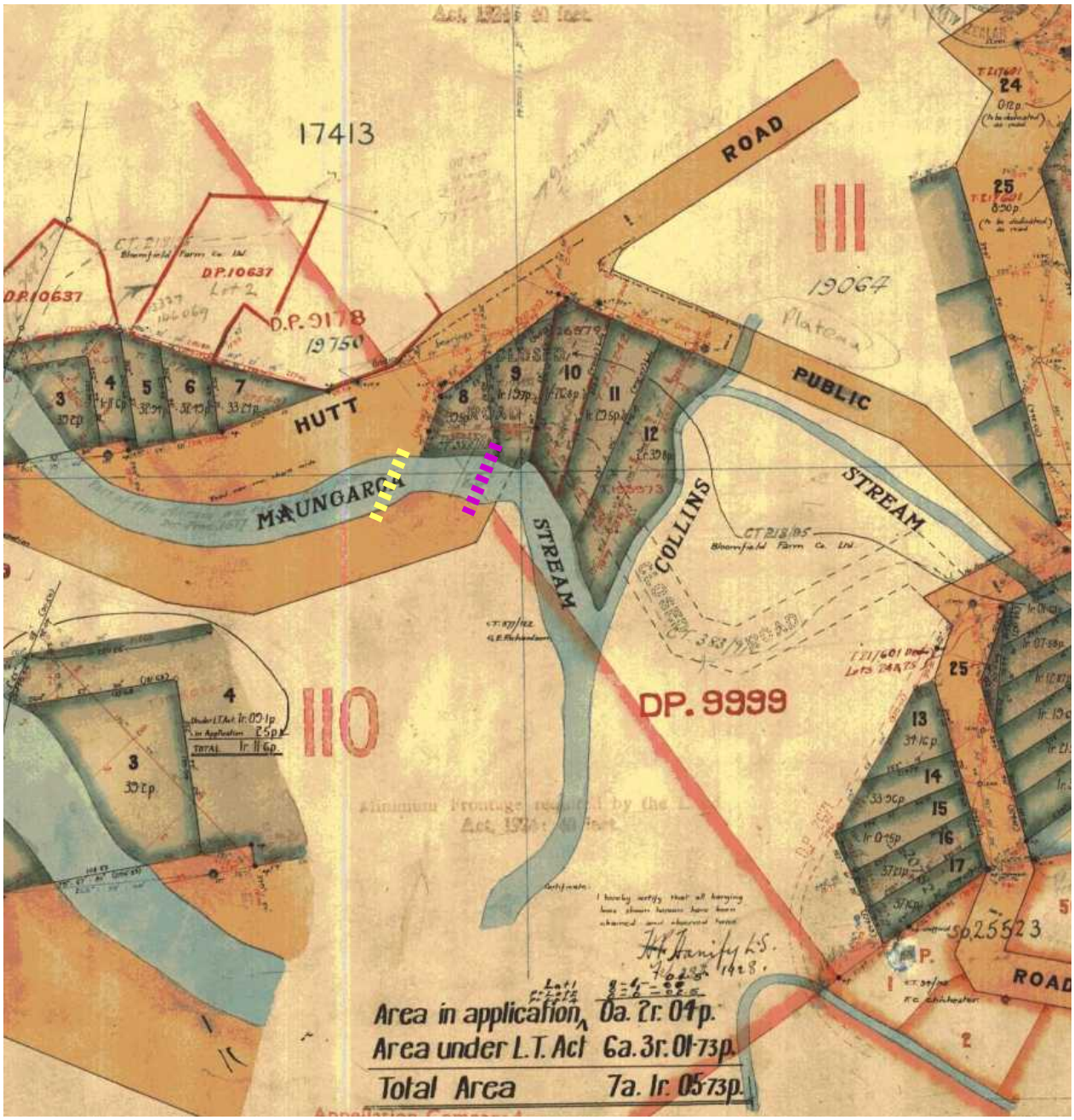

Illustration 8: Detail of DP8821, 1927 showing area of former road surveyed out into residential sections (Lots 8 & 9). Approximate location of Beechwood Lane Bridge indicated in yellow. Approximate location of 1867-1904 bridge indicated in pink.

This second bridge appears to have required repairs in the later 1870s with strengthening on the underside by means of struts and replacement of decking slats (*New Zealand Times*, 4th April 1877:3). There is no mention of the Mungaroa Bridge during the 1880s although there is a note that it was closed to heavy traffic in 1898 (*New Zealand Times*, 23rd November 1898:3).

In order to cause as little inconvenience as possible, to the travelling public, the Hutt County Engineer proposes to build the new Mungaroa Bridge about two chains lower down the river than the present one, on a site where a bridge stood until 1867. It is as good as the present site, having rock on both sides, and the span being the same. The old approaches are still there, and only require a little clearing out. When the road was altered in 1867, Mr. J. Benge's father gave the present site in exchange for the old one. The Engineer, in reporting these facts to the Council, to-day, pointed out that as they would not be able to close the present road on the northern side of the river, Mr. J. Benge wanted £25 compensation for the old site and a V-shaped piece of severed ground between the two roads. The Engineer's recommendation that these terms be agreed to was adopted. All the timber for the bridge is now on the ground, and everything is ready for the work to be proceeded with.

Illustration 9: New Mungaroa Bridge- (Evening Post, 13th May 1902:6)

2.0.3 Third Mangaroa River Bridge 1902-2020

By 1902 there were firm plans for the construction of a replacement bridge (see for instance Illustration 9). The abutments for the new bridge appear to have been cast as early as 1902, as this date is carved into the concrete on the southern end, as evidenced by subsequent clearance of encroaching vegetation (see Illustration 28).

Somewhat confusingly, contemporary newspaper reporting indicates that this 1902 bridge was to be built on the site of the first, 1840s Mungaroa Bridge, using the original approaches (see Illustration 9. This is very unlikely to have been the case, however, as the 1852 plan shows the first bridge to be considerably further to the west (see Illustration 6). It is possible the original location was obscured during the 45 or so years since the second bridge had been opened or that there was some other (possibly farm-related) structure spanning the river at this location at some point. There is no reference to this elsewhere in the literature, however, and it is not clear why an historic approach was recognised there.

The new bridge was opened in September 1904 in the present location. A celebration was held at the Upper Hutt Town Hall to mark the occasion and the Minister for Public Works was present (*Evening Post* 17th September, 1904:5). This site was noted as being "about 2 chains (40m) lower down the river from the previous bridge. A survey plan dating to 1909

shows the new road and reserve alignments in the area, incorporating the area swapped by Mr. Benge (coloured red in Illustration 10).

Sadly no construction plans for the Beechwood Lane bridge have been located in National Archives New Zealand, although many of the surviving historic Ministry of Works (previously the Public Works Department) files are held there. It can, however, be seen in two historic photographs dating to the 1920s in Illustration 13 and Illustration 14. The Beechwood Lane highway deviation as acquired from the Benge family during the 1860s was resurveyed out several times during the early 20th Century. There were various road closures and alterations to the layout and the Beechwood Lane bridge is located some 10-15m west of the legal road as originally surveyed out (see Illustration 11 and Illustration 12). It was not until 1927 that a fresh survey of the Mangaroa River SH 2 road deviation showing the actual location of the present Beechwood Lane bridge was drawn up (see Illustration 15).

There was further newspaper reporting to indicate that a new Mungaroa River bridge was to be erected mid 1911 (*Evening Post* 13th June, 1911:8). This is most likely to refer to a railway bridge rather than one for the current road, location. Reports of the completion of this particular Mungaroa River bridge were given in 1912 (*Dominion*, 15th May 1912:4).

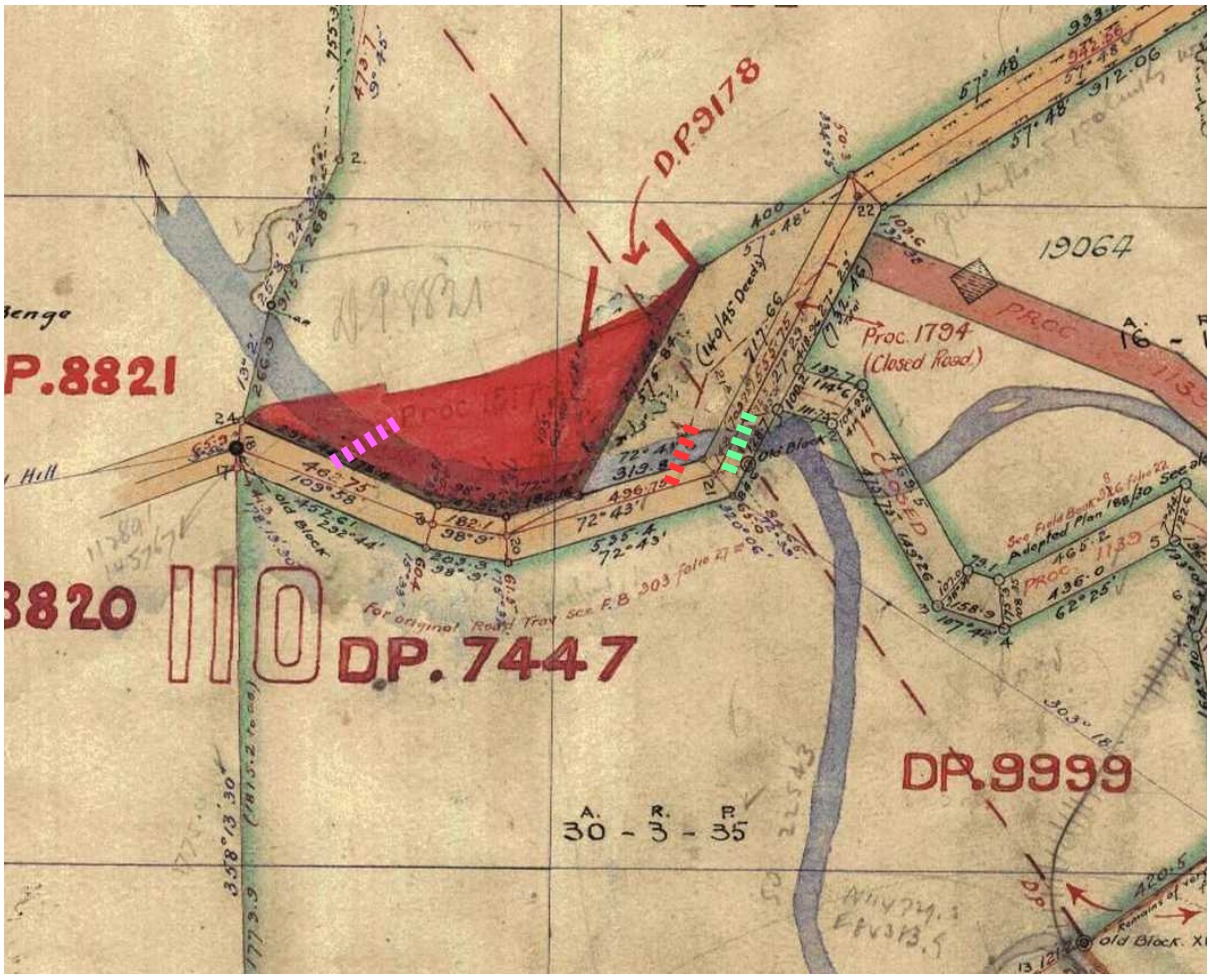

Illustration 10: Detail of B278, Part Sections 110, 111 & Sec 297 Hutt District, 1909 (From Quickmap). Approximate location of Beechwood Lane Bridge indicated in red. Probable alignment of second bridge indicated in green, probable alignment of first aridge indicated in pink.

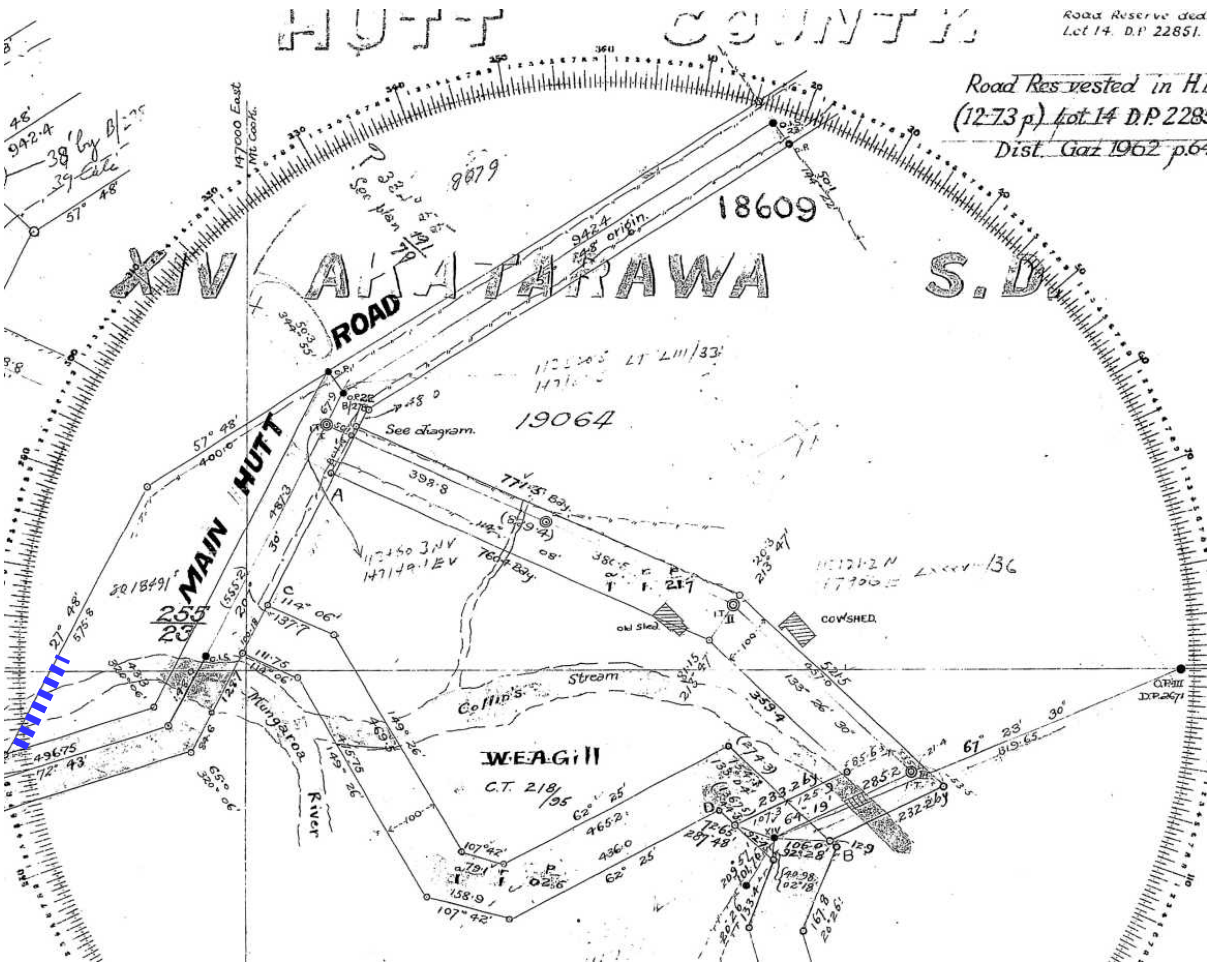

Illustration 11: Detail of SO 17225, 1917 (From Quickmap). Approximate location of Beechwood Lane Bridge indicated in blue.

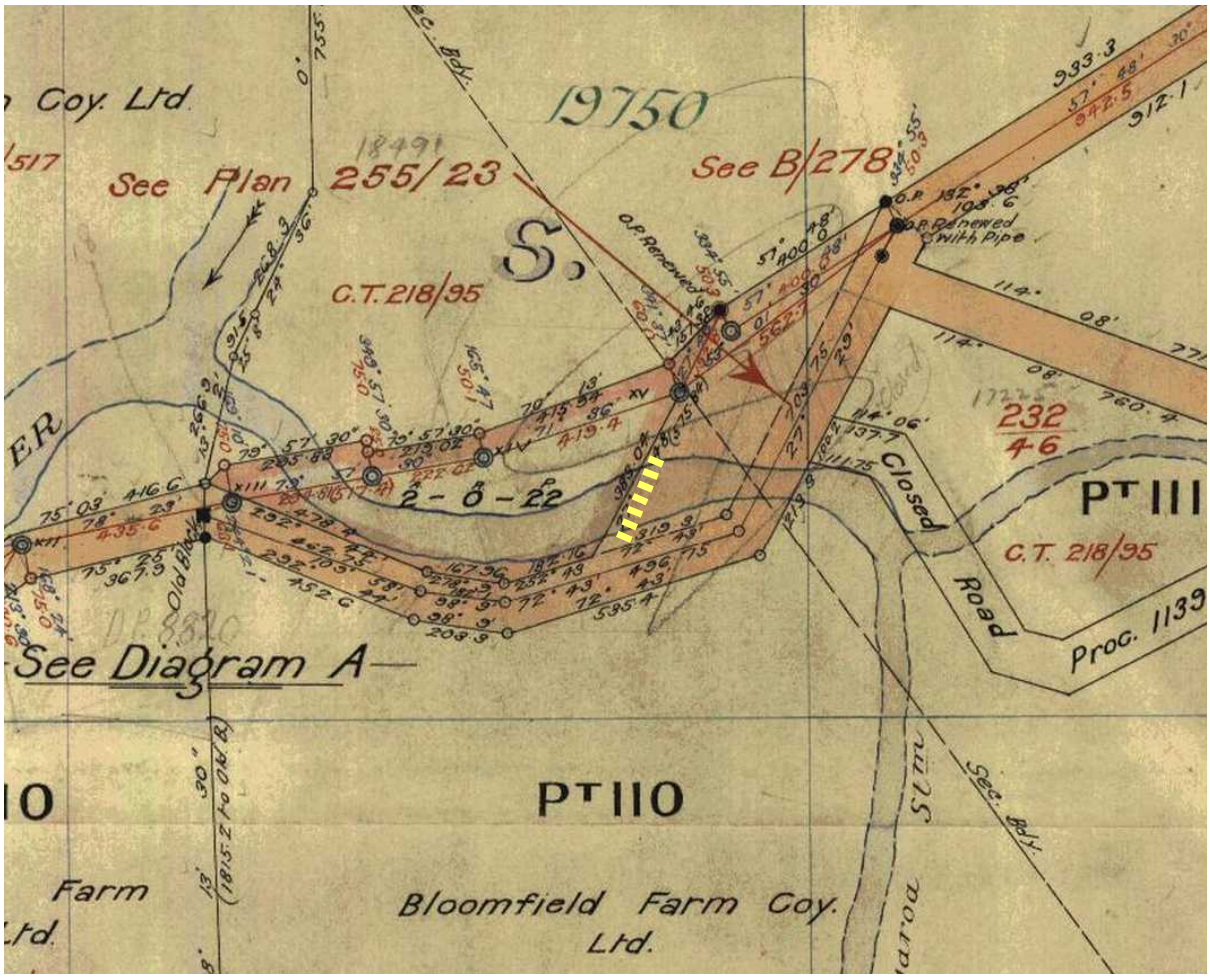

Illustration 12: Detail of SO18079, Re-survey of Deviation of Road Akatarewa Junction, 1924 (From Quickmap). Approximate location of Beechwood Lane Bridge indicated in yellow.

Illustration 13: Detail of traffic bridge over the Mangaroa River, Upper Hutt, photographed by Albert Percy Godber. 1924 (ATL PA1-q-102)

Illustration 14: Mangaroa River Bridge, Te Marua, ca 1927 (Upper Hutt City Library Heritage Collections P-38-529).

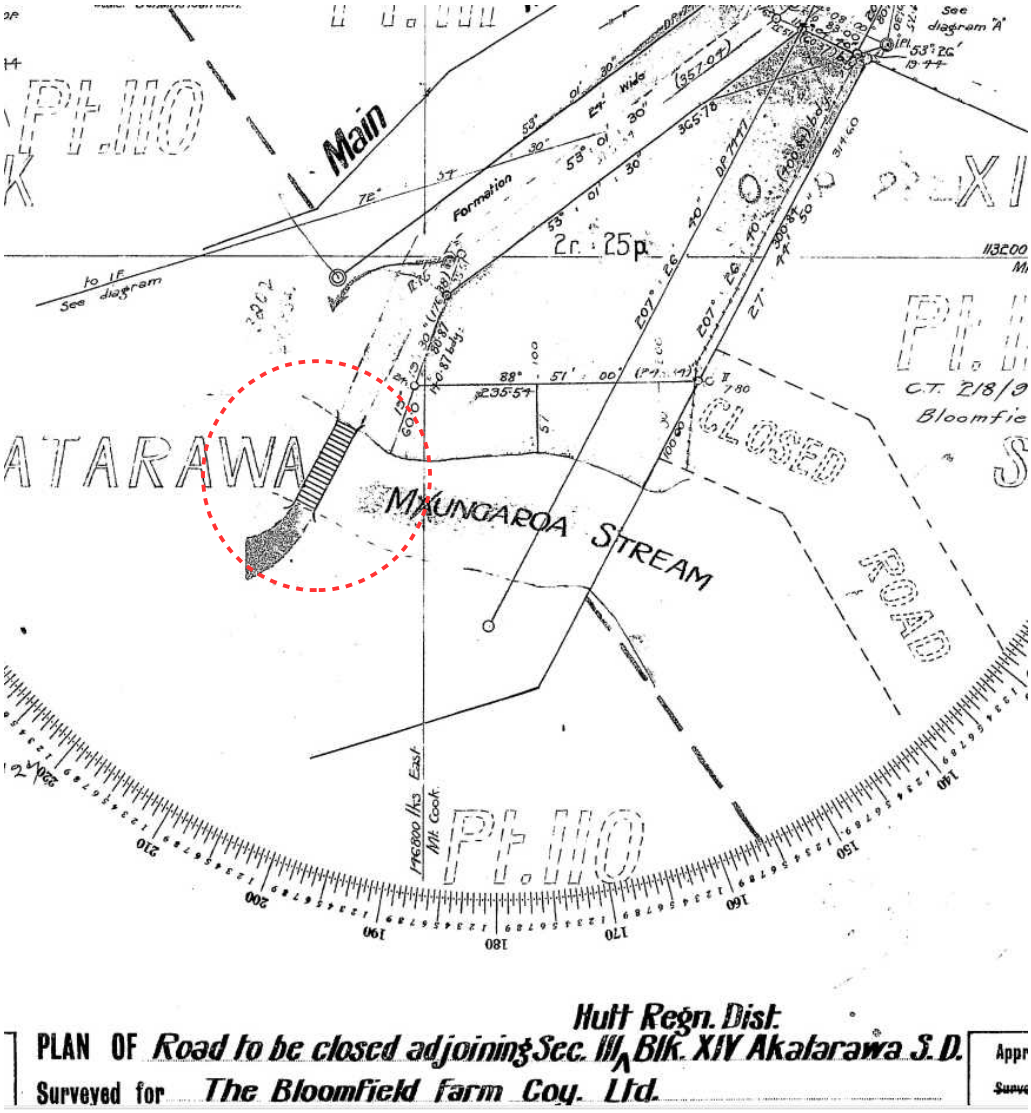

Illustration 15: Detail of SO 18491, Plan of Road to Be Closed Adjoining Sec 111, Hutt Regn. Dist. For Bloomfield Farm Co. Ltd. 1927 (From Quickmap). 1911 Beechwood Lane bridge circled n red.

2.0.4 Fourth Mangaroa River Bridge over SH2 1928

The Beechwood Lane bridge was used until a more substantial, concrete girder replacement was constructed to plans approved by the Public Works Department in 1927 (see Illustration 17). This was located some 100m west of the Beechwood Road bridge on what is now SH2 (see Illustration 16). The Beechwood Lane bridge was briefly reopened to vehicular traffic in 1939 when the 1928 concrete replacement was damaged by flooding. The late 1920s concrete girder bridge has subsequently been replaced with a new, wider bridge, date unknown.

Illustration 16: Mangaroa River bridge 2, J. W. Chapman-Taylor (after 1929) (Upper Hutt City Library Heritage Collections P-49-3-2-20).

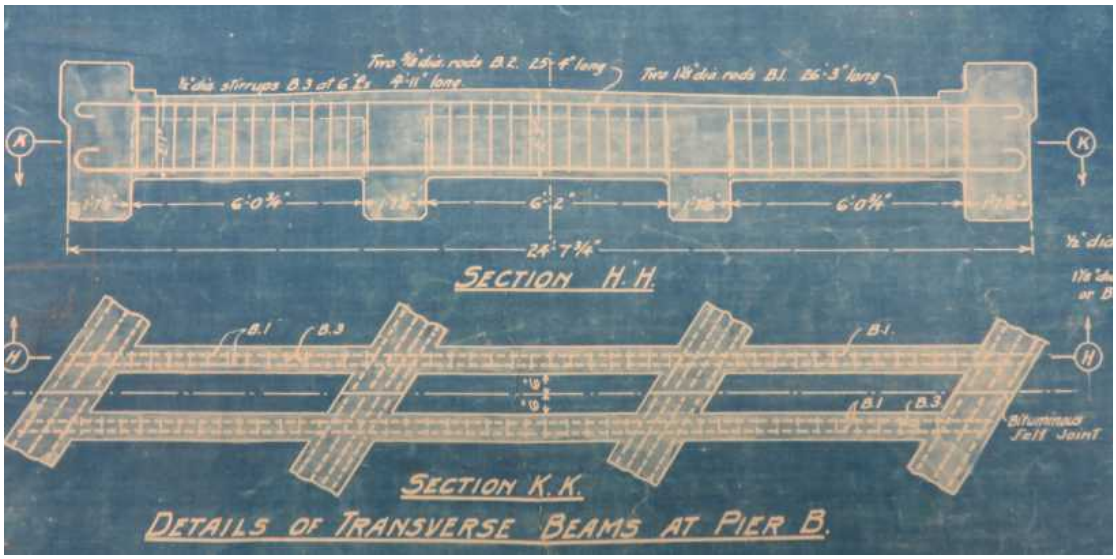

Illustration 17: Detail -Mungaroa Stream Bridge (National Archives AAOB W3138 6006)

2.1 Mangaroa River Bridges: Construction Sequence Summary

A summary of the likely sequence and locations of bridges constructed over the Mangaroa River between ca 1840 and 1928 in relation to the current road layout is given below (see also Illustration 18).

1. **Bridge 1**1840-1867: This was the initial wooden bridge as shown in Illustration 4 to Illustration 6. Its location was most likely roughly in the position of a modern conduit that bridges the river some 80-100m west of the Beechwood Lane Bridge

2. **Bridge 2** 1867-1904: Replacement wooden bridge on old main road alignment (see also Illustration 10). This area has since been subdivided off and sold as residential sections following closure of the road.

3. **Bridge 3** 1902/4-2020: Early 20th C wooden truss bridge located in present Beechwood Lane [subject of this report].

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4. **Bridge 4** 1928-?- SH2 Bridge: Concrete girder bridge located on modern SH2 alignment, has been subsequently replaced with new, wider bridge in current SH2 alignment.

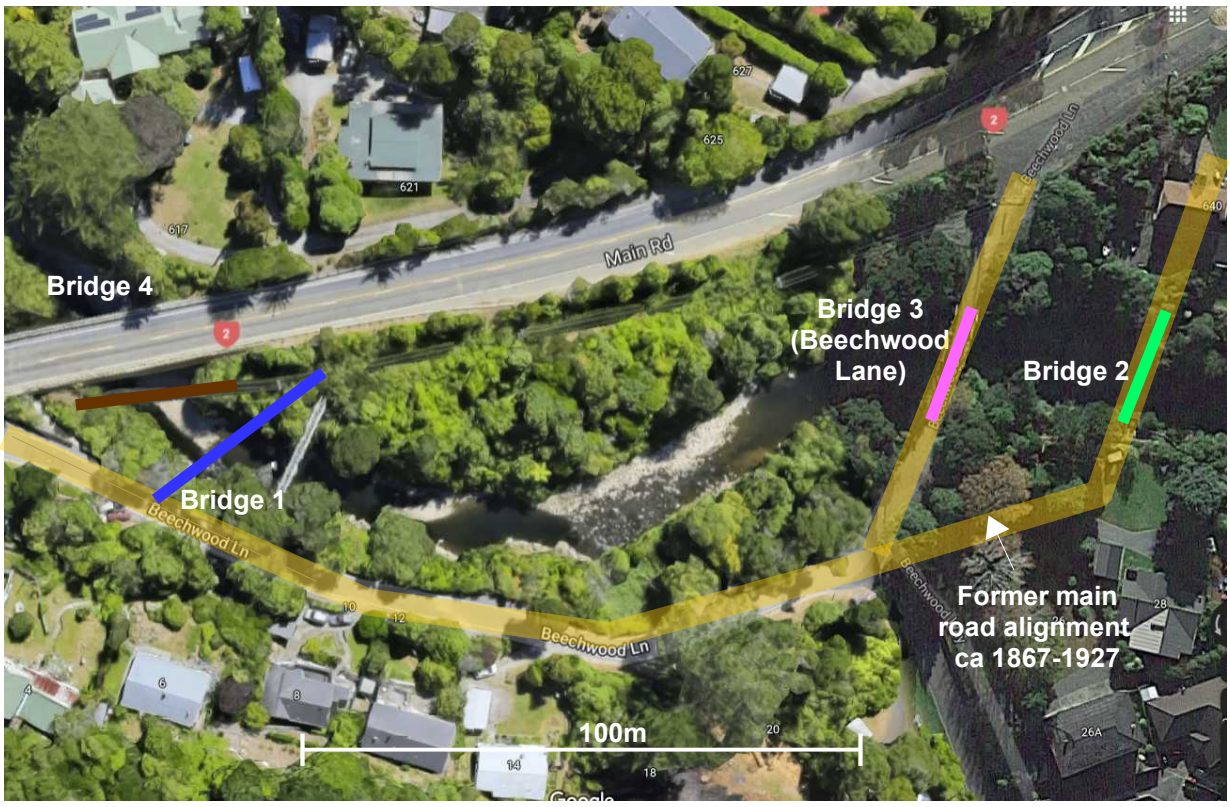

Illustration 18: Mangaroa River bridge sequence

2.2 Third Mangaroa River Bridge Beechwood Lane

The Beechwood Lane bridge is a typical wooden Howe type truss bridge with braced wooden timbers over concrete abutments tensioned by vertical iron rods topped by adjustable turnbuckles.

2.3 Howe Truss Bridges: History and Characteristics

Wood and metal truss style bridges have been used in New Zealand in a wide variety of locations and time periods (see Thornton, 2001:86-127). One particular truss system was patented by William Howe in 1840. This involved inserting vertical iron rods to take the tension of the timber top and bottom chords and diagonal compression members. He also used “turnbuckles” on joints that could be tightened when they became loosened with use over time (Thornton, 2001:87). Truss bridges were capable of supporting much greater weights than other contemporary conventional stone and timber types of bridge. This property became very advantageous with the advent of railways and motorised vehicles.

Advantages of the truss bridge were that fact that it could be laid between two abutments over a significant span and still be self-supporting, and the fact that it could easily be adjusted over time using the turnbuckles to raise and lower the deck as the timbers seasoned and shrank. The Beechwood Lane Bridge is a primarily wooden Howe type truss bridge with characteristic wooden bottom and top chords and wooden diagonal bracing, tensioned by vertical iron rods.

Truss bridges were constructed in a number regional Wellington locations including a footbridge over the Hutt River at Petone (1847). Various truss bridges were also constructed in the Wairarapa area during the 1850s-1870s. A wooden railway truss bridge with iron bottom chord was constructed over the Hutt River at Silverstream in 1875 as part of the Wellington-Wairarapa line.

Several Howe type wooden truss bridges were constructed along the Wellington-Wairarapa Railway during the 1870s. This line was decommissioned in the 1950s and it is now included in the Pakuratahi Forest as part of the Remutaka Incline Rail Trail, several kilometres east of the Beechwood Lane Bridge. Surviving Howe type truss bridges along the Remutaka Incline Track include one over the Pakuratahi River, one at Ladle Bend.

A substantial Howe truss bridge (the Pipe Bridge) was constructed over the Hutt River in 1909 to carry a water main from Wainuiomata to Wellington (See Thornton 2001:113). This used the same principles as the wooden bridges, but with metal pipes instead.

Very similar Howe truss bridges to that at Beechwood Lane were constructed by the Public Works Department on the Akatarawa Valley Road within 4km of each other between 1920 and 1921 (see Thornton 2001:119). These had spans ranging from 19.4 m to 24.4 m with a width of 4.1 m and all were still extant in 2001.

Thornton documented the Beechwood lane truss bridge in his comprehensive book on New Zealand Bridges and had this to say about it in 2001 (118).

> *Another bridge that was probably built in the 1920's was a single-span structure over the Mangaroa Stream, a tributary of the Hutt River, at Te Marua. Originally on the main highway, that portion of the road is now Beechwood Lane. The bridge is now restricted to foot traffic and has a span of 15.2m with a road*

width of 3.8m. The main chord members of this Howe truss are 330 x 250 mm, and it rests on solid concrete abutments. It was superseded in 1928-29 by a concrete girder bridge on a new alignment.

2.4 Beechwood Lane Howe Truss Bridge - Description

The following detailed photographs and drawings show the bridge in different aspects (see Illustration 20 to Illustration 44). There have been various modifications made to it over time, most recently the installation of tanalised pine balustrades and safety grating over and along the timber deck, but the following description and structural drawings focus on the details that most likely represents the original structure.

Restraints to Recording

It was not safe to access the bridge outside of the safety grating placed along the sides of the deck, so some measurements have been extrapolated by assuming that each quarter of the structure reflects a mirror image of the others. The bridge has also been represented as if all current measurements are “in true” although there were some timbers that had clearly warped slightly from true right angles and parallels over the course of the years. There were also some issues with encroaching and obscuring vegetation in clearly viewing the bridge from a distance. So again, some extrapolations were made.

Main Structure

The bridge is composed of two main trusses, each with a top and bottom chord separated from each other by four diagonal struts and end posts, tensioned into place by vertical iron rods. The tension is adjusted by means of turnbuckles attached to the top of the rods which are screwed on over wooden blocks above the top chord (see Illustration 19 for a basic cross-section of a Howe Truss bridge). On the Beechwood Lane bridge, the top chords are somewhat unusually reinforced by an additional, supporting transom type beam. There are double iron rods sandwiching and bracing each end of the two top chords with single rods drilled up through the supporting transoms (see Illustration 20 and Illustration 37). The main chord and strut timbers are all 330mm deep x 250mm wide. Timber samples were taken of the two bottom chords, a stringer and an end post strut. Analysis of these by Dr. Rod Wallace of the University of Auckland Anthropology Department has confirmed that those timbers were all exotic, Australian hardwood, specifically gum (*Eucalyptus* sp. -see Appendix 1).

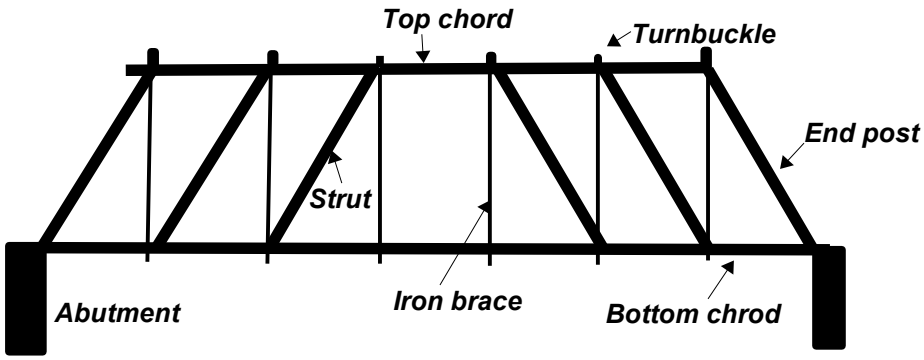

Illustration 19: Basic structure of a Howe Truss bridge

Deck Structure

The deck is supported by two additional stringer beams that run parallel to the bottom chords. The bottom chords and stringers are all supported by a series of 6 floor beams, two longer than the others (see Illustration 38). There were originally four (now three) reinforcing struts or buttresses attached from the ends of these beams to the ends of the top chords. It was not possible to safely sample the reinforcing struts, but it is likely that they were a native timber rather than the exotic hardwood used on the main frame. The decking timbers originally ran from base chord to base chord and it was 3.2m wide. It has presently been reduced to running from stringer to stringer and is 1.8m wide (see Illustration 38). A sample of deck timber was identified by Wallace as beech, a native hardwood (*Nothofagus* sp.-see Appendix 2) which suggests that the timbers are original or at least were replaced before the widespread use of tanalised pine. Beech is locally available in the Wellington region.

Illustration 20: Basic bridge structure (22nd May 2020).

Jointing

The diagonal struts and end post have all been set into the bottom chord beam by means of recessed heel joints (see Illustration 22). Most other joints were simple end butt joints generally cut to a square end or 45-60 degree angle (see Illustration 23). Other joints were flush with one timber simply laid on top of another and nailed or bolted on.

All the beams were bolted or nailed together with iron bolts or driven iron spikes and forged nails (see Illustration 25). The top chords and end post joints were all also reinforced and secured by iron plates on the underside (see Illustration 24). The buttresses were rebated at the base secured to the floor beam ends with bolts (see Illustration 26).

Illustration 21: Underlying deck structure (22nd May 2020).

Illustration 22: End post heel joint into bottom chord (north-west end- 22nd May 2020).

Illustration 23: Butt joint between transom and diagonal strut (22nd May 2020).

Illustration 24: Iron reinforcing plate underneath top chord and end post joint (9th June 2020).

Illustration 25: Sample forged, square-shanked, rose head iron nails (in stringer) and square-headed bolt (in end post bracket) (9th June 2020).

Illustration 26: Recessed buttress timber secured to end of floor beam (9th June 2020).

Abutments
The wooden truss structure is supported by and secured to cast concrete abutments at either end with an additional, short supporting beam placed under each stringer at both ends (see Illustration 30). The abutment at the south end is a substantial structure, a little under 5m high to the timbers (see Illustration 27, Illustration 29 and Illustration 37). This appeared to have been cast into place using boxing and the date of construction (1902) had been carved or cast into the southern abutment on the eastern side (see Illustration 28). The northern abutment was not readily visible from the stream or southern end, but it is clearly a much smaller structure than that at the southern end (see Illustration 37).

2.5 Probable Building Phases

While the essential structure of the original bridge remains, it has undergone some alterations over the years. This has included complete replacements of some timbers, additions of bolted, galvanised plates and the insertion of resin fillers in degraded members. While some of the bridge fabric and structure is undoubtedly original to the 1902-04 construction, there are elements and modifications that have occurred since that time. These, in essence, represent building phases. The probable sequence of construction and modification is as follows:

Original Construction 1902-04
The probable, original appearance of the bridge can be seen in a photograph dating to 1924 (see Illustration 40). This shows a very similar structure to that present today, with hardwood trusses (top chords, transom beams, bottom chords, diagonal struts) supported by floor beams and present concrete abutments.

Somewhat differently, there were two wooden, safety rails running along each side of the deck. These were supported at the centre of the bridge by a vertical post with diagonal strainer attached to an elongated deck plank and the deck planks also extended across from bottom chord to bottom chord (as opposed from stringer to stringer as they do today- see Illustration 40 dating to 1924). There was also an additional foot rail running the length of each base chord (note people standing on this in Illustration 40).

As today, the bridge was supported by the adjustable iron turnbuckles to control sag along the length of the trusses and create the necessary compression and tension to keep everything secure.

There were additional, diagonal sub-deck floor bracing timbers secured to the floor beams. This would have increased general stability and rigidity. Most of these have since rotted away as they were made from totara, rather than the more robust Australian hardwood, gum of the main bridge frame (see Appendix 1). Totara would also have been locally available to the Wellington region. It was traditionally used for outdoor purposes, particularly house piles and fence posts, as its weather resistance in heartwood form was well-recognised.

Illustration 27: Concrete abutment and stone wall at south end from rear of (22nd May 2020).

Illustration 28: Building (1902) date on concrete abutment south end (22nd May 2020).

Illustration 29: Concrete abutment south end from north bank (22nd May 2020).

Illustration 30: Beams and stringers secured to concrete abutment at south end (22nd May 2020).

Illustration 31: Concrete abutment at south end looking towards northern end (22nd August 2019).

Repairs ca 2010

Several modifications were carried out by Downer in 2010. This included forcing grout into rotten areas in timbers, encasing the wooden turnbuckle hanger blocks inside metal plates and bolting on galvanised metal plates at joints of chords and floor beams in the area of the abutments. Several original hardwood timbers were also replaced with tanalised pine including the transom beam on the eastern side and the external, floor beam to top chord buttress on the south-east corner (see Illustration 32 to Illustration 34). Modifications were also made to the deck structure, with installation of a waist-high, braced and slotted, galvanised metal safety railing along the length of the stringers and non-slip metal mesh over the deck planks (see Illustration 36 and Illustration 32).

Repairs 2014

Downer carried out further modifications in 2014 with additional plugging of rotted truss and turnbuckle block timbers with epoxy resin (see Illustration 32).

Illustration 32: Beechwood Lane bridge showing modifications to original timbers with resin filler in bottom chord, eastern side and galvanised, bolted reinforcing plates on south-eastern end post (22nd August 2019).

Illustration 33: Replacement pine timber transom (22nd August 2019).

Illustration 34: Metal plates bolted to bottom chord (22nd August 2019).

Illustration 35: Metal cap over turnbuckle timber block (9th June 2020).

Illustration 36: Modern safety railing and deck cover (22nd May 2020).

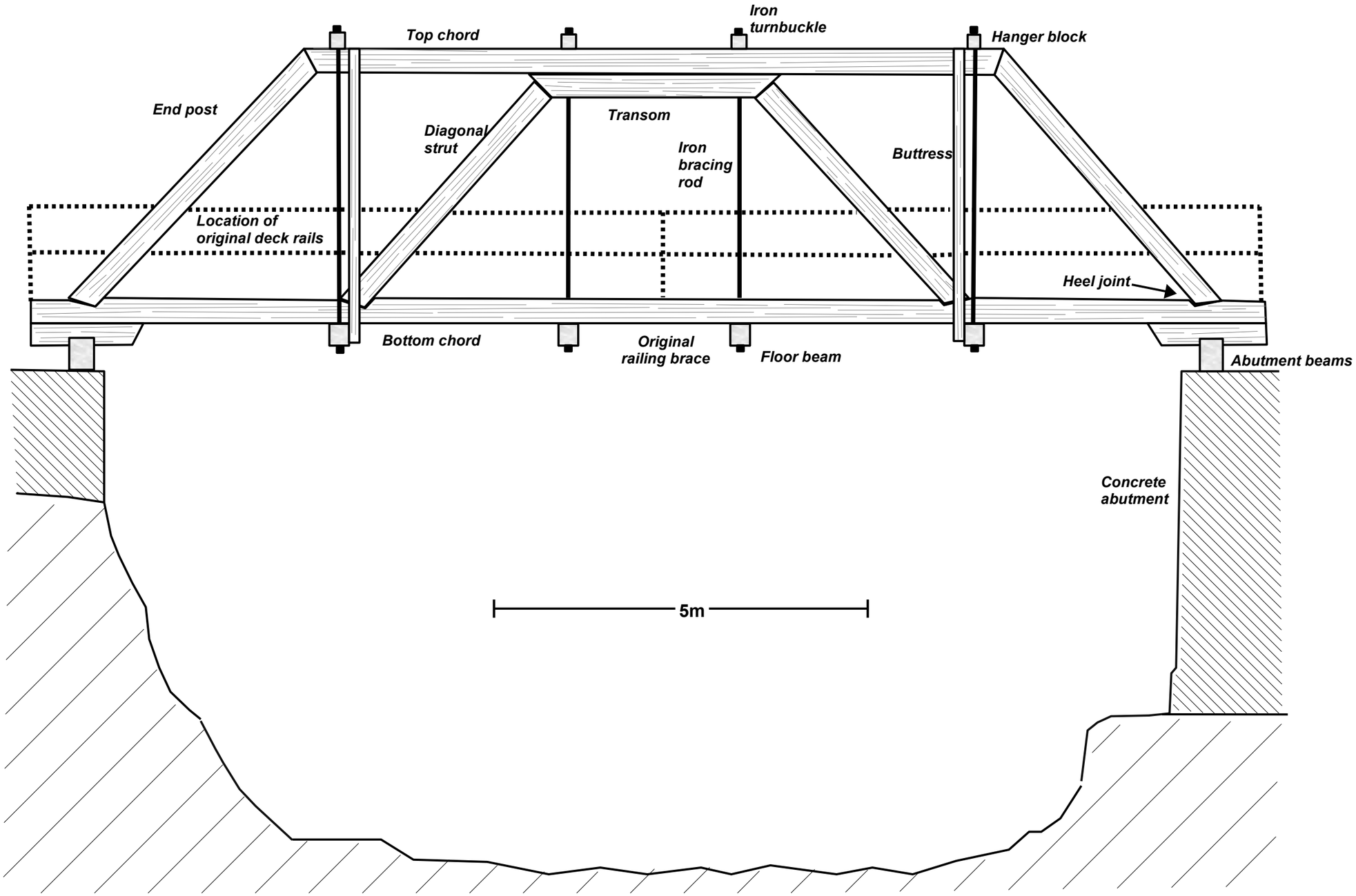

Illustration 37: Beechwood Lane Bridge – Elevation of main truss structure west side facing east

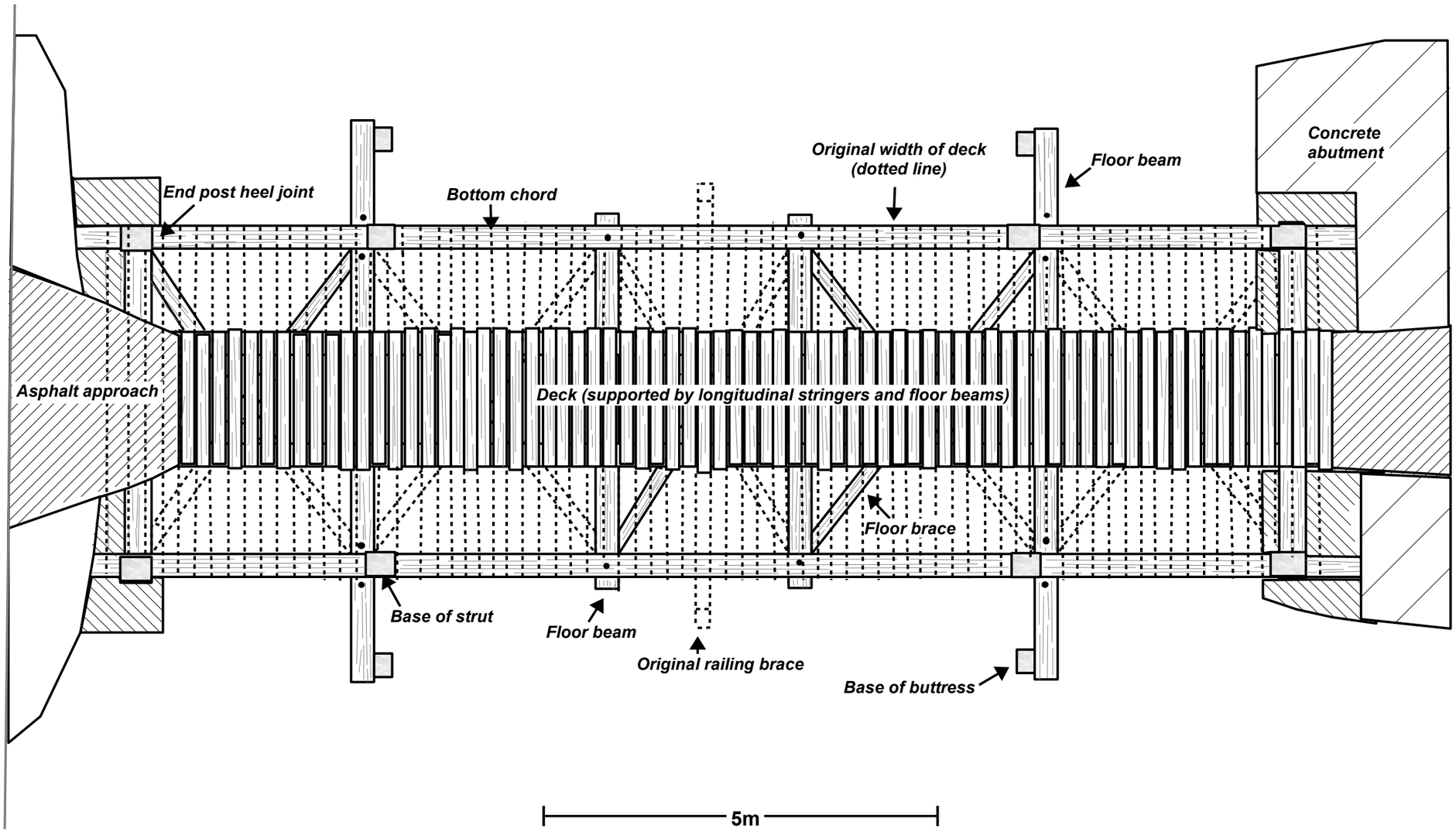

Illustration 38: Beechwood Lane Bridge – Plan view of deck and underlying structure (missing timbers represented by dotted lines).

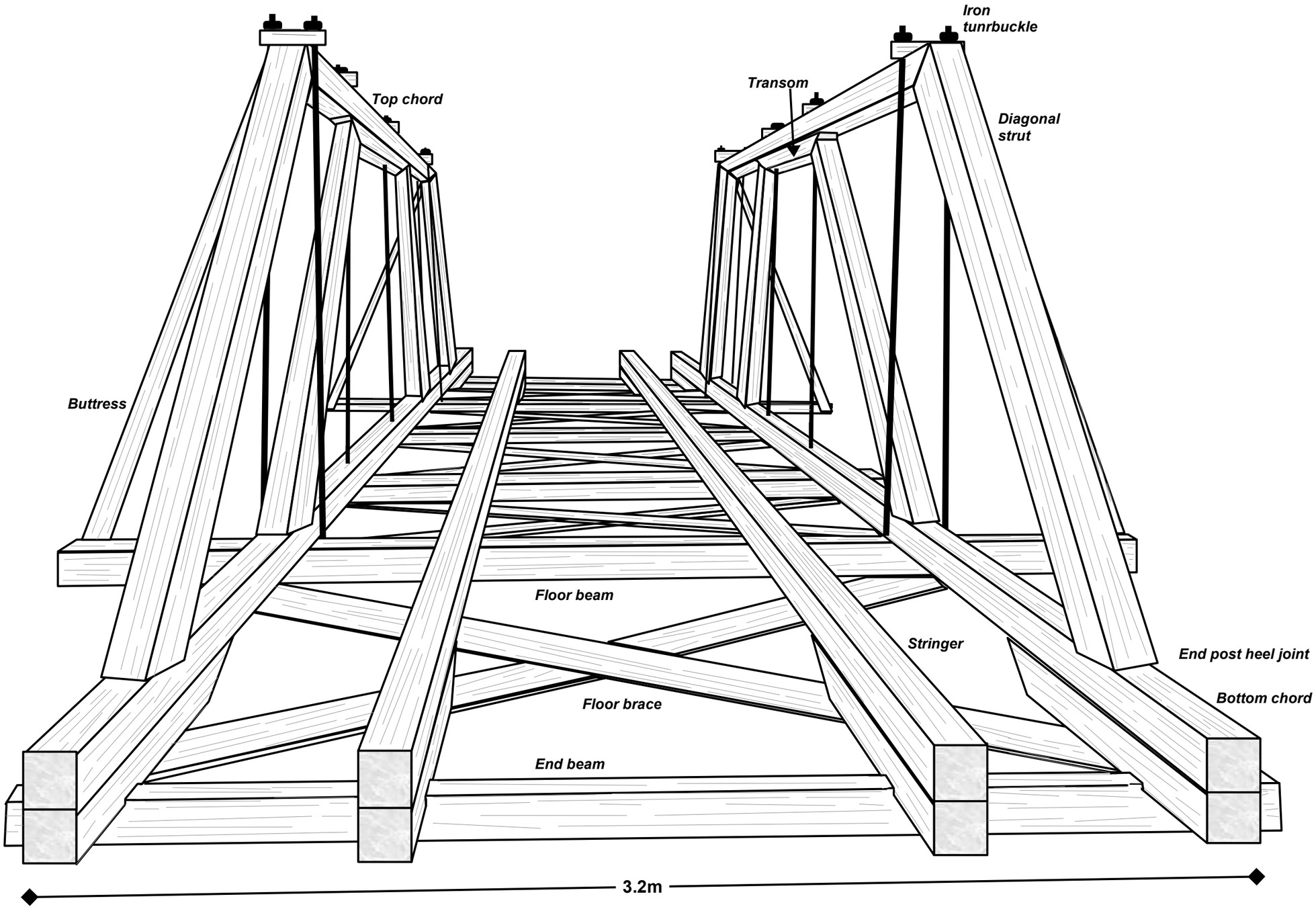

Illustration 39: D-3 projection of wooden elements of bridge showing underlying structure (deck timbers removed for visibility)

Illustration 40: Detail of Traffic Bridge, Mangaroa River, 1924 (ATL APG-1305-1/2-G)

Illustration 42: Beechwood Lane facing east to bridge (22nd May 2020).

Illustration 43: Beechwood Lane facing south-east to bridge (22nd May 2020).

Illustration 44: Beechwood Lane bridge facing south from close to SH2 (22nd August 2019).

3 Summary

This report documents an historic, wooden truss bridge located on Beechwood Lane, Te Marua, Upper Hutt on a former part of the SH2 road alignment. There is documentation to indicate that there were at least 4 bridges constructed to carry traffic over the Mangaroa River (Stream) between 1840 and 1927, of which the Beechwood Lane bridge was the third, constructed 1902-1904. The former traffic bridge has been primarily used as a pedestrian access since it was replaced as a road bridge in 1927. It has also been incorporated into the Hutt River trail, linking Lower and Upper Hutt to the Remutaka Incline cycle path.

The bridge was primarily constructed from imported, Australian hardwood timber (gum) (stringers, floor beams, diagonal struts and chords), with native timbers used for the deck (beech) and at least some of the reinforcing braces (totora). It has had a remarkably long life, with relatively little alteration until the 21st Century, but it is now in poor, unsympathetically altered and degraded condition some 114 years after it was completed. It has been assessed as unsafe for continuing use in its present condition. Consideration had been given to a number of remedial options, such as:

- Partial demolition and reconstruction of bridge replacing severely degraded timbers with imported, exotic hardwood members (at least 40% replacement needed);
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- Replication of original wooden structure using original abutments and new materials.
- Retention of original bridge with placement of new, independently supported replacement span over the top;
- Demolition and removal of wooden elements with retention of original concrete abutments;
- Complete demolition and removal of current bridge with construction of a new bridge in the same alignment.

The above options have been evaluated by Upper Hutt City Council in relation to feasible retention of heritage values, costs and long-term survivability. Following contractor costing and in consideration of advice from Heritage New Zealand Pouhere Taonga relating to desirability or otherwise of heritage structure replication, it has been decided to remove the original wooden structure, leaving the original concrete abutments and to construct a new deck and span using the original abutments. Replication of the historic bridge was not advised by HNZPT.

In view of its probable demolition, this report has been prepared to provide recorded and publicly available documentation of the existing bridge, giving a background history to its presence in the area and detailing elements of form and general construction. The fact that it has lasted well into the 21st Century is testament to the builders who put it up it in 1902-1904 and to William Howe who refined the design in the 1840s.

4 References

4.1 Written Material

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Thorndon, G. 2001 *Bridging the Gap: Early Bridges in New Zealand 1830-1939.* Reed Books, Auckland.

4.2 Electronic Sources

Dominion, 15th May 1912:4.

Evening Post 13th May 1902:6, 17th September, 1904:5, *13*th June, 1911:8.

New Zealand Times, 4th April 1877:3, *23rd* November *1898:3.*

Upper Hultt City District Plan https://www.upperhuttcity.com/Your-Council/Plans-policies-bylaws-and-reports/District-Plan/Operative-District-Plan-2004

Wellington Independent, 24th June, 1848:3, 5th June 1866:6, 16th May, 1867:5, 21st April 1868:5 *Evening Post* 13th May 1902:6.

4.3 Historic Survey Plans and Titles

SO 10509, ca1871 (from Quickmap).

B287, 1909 (from Quickmap)

SO 18079, 1925 (from Quickmap)

DP 8821, 1927 (from Quickmap)

5 Appendices

5.1 Appendix 1 – Wood sample Analysis Results

Identification of wood samples from Beechwood Lane Truss Bridge, Upper Hutt Wellington

Report to

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Dr. Rod Wallace
School of Social Sciences
University of Auckland
27th June 2020

Six wood samples were submitted for identification. The result were as follows.

[1] Floor Strut
Totara

[2] End Post
Gum (*Eucalyptus* sp.)

[3] Bottom Chord West side south end
Gum (*Eucalyptus* sp.)

[4] Bottom Chord North East side
Gum (*Eucalyptus* sp.)

[5] Stringer left side
Gum (*Eucalyptus* sp.)

[6] Deck timber
Beech (*Nothofagus* sp.)