ENGINEERING HERITAGE
REGISTER REPORT

Makatote Viaduct, North Island Main Trunk, Ruapehu District

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Makatote Viaduct. Photo: Roy Sharp, 2020.

CONTENTS

CONTENTS 2

General information 3

Description 6

Summary 6

Historical narrative 7

Design and construction of the Makatote Viaduct 10

Social narrative 17

Physical narrative 28

Key physical dates 32

Assessment of significance 33

Supporting information 34

List of supporting information 34

Bibliography 34

Published sources 34

Unpublished sources 38

GENERAL INFORMATION

Name: Makatote Viaduct

Alternative names: Bridge 179 North Island Main Trunk; (old) Bridge 113 North Island Main Trunk

Location: North Island Main Trunk, Between Pokaka and Erua, Manawatū-Ruapehu

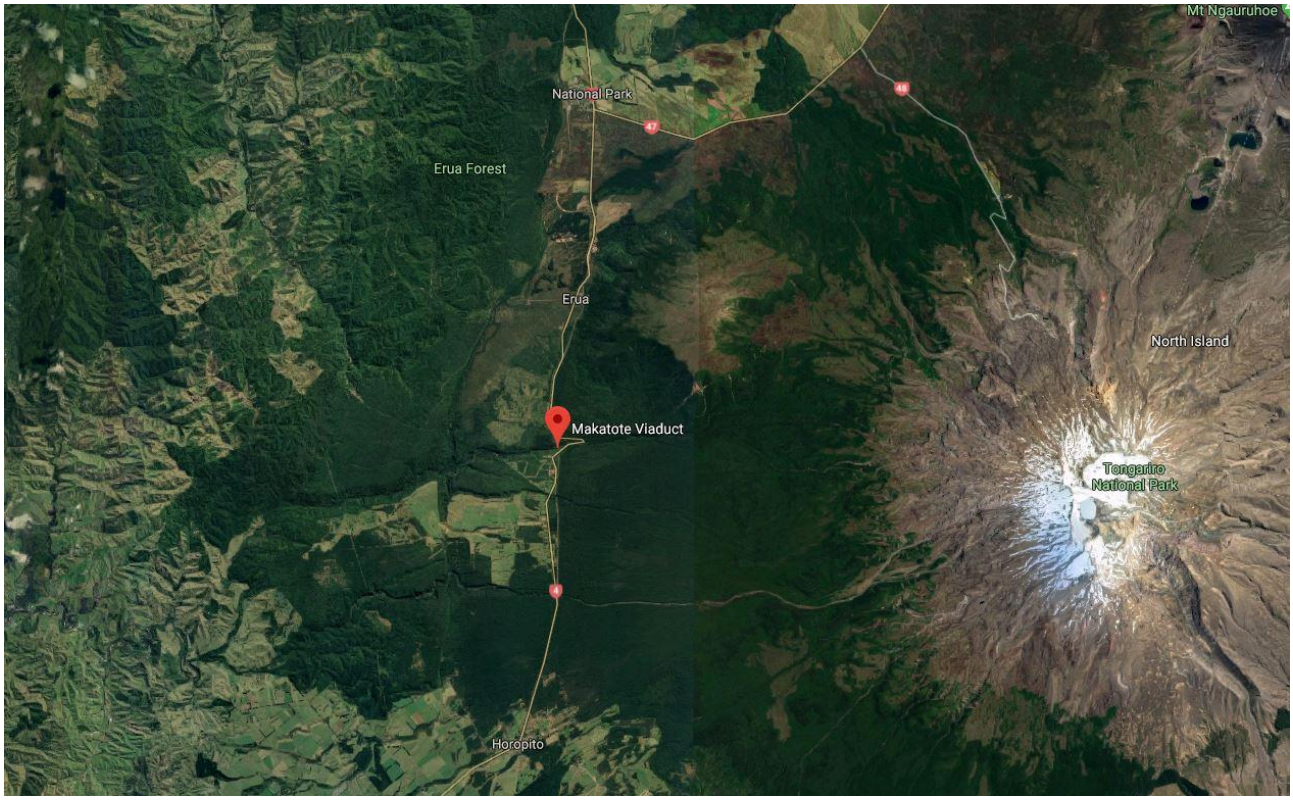
The viaduct bridges the Makatote Gorge 12km south of National Park, between Pokaka and Erua.

Geo-reference: Latitude -39.266118; Longitude 175.389991

Legal description: The Makatote Viaduct has no legal description. The structure and abutments are part of the NIMT rail corridor.

NZ Gazette 1910, pp.596-597

Access information: There are viewing areas for motorists on State Highway 4 (SH4) between Pokaka and Erua at a rest stop beneath the southern piers of the viaduct, and also from the Makatote Scenic Reserve at the northern end of the viaduct.



City/District Council: Local Authority: Ruapehu District Council

Date registered: 01 September 2022

Other Engineering New Zealand recognition: An IPENZ plaque was unveiled in February 2009. The plaque is mounted in a large stone in front of an information panel in the viewing area off SH4 on the southern side of the viaduct.

Other heritage recognition:

Heritage New Zealand Pouhere Taonga

> New Zealand Heritage List/Rārangi Kōrero, Makatote Viaduct (List Number 7778). **https://www.heritage.org.nz/the-list/details/7778**
>
> New Zealand Heritage List/Rārangi Kōrero, North Island Main Trunk (NIMT) Historic Area (List Number 7793). **https://www.heritage.org.nz/the-list/details/7793**

Local Authority District Plan: Ruapehu District Council list the Makatote Viaduct in the heritage schedule of their District Plan 2014.

The council class it as a Category A structure:

> Category A items are, in general, those that are listed with the New Zealand Historic Places as a Category I site, or those that are not listed but are regarded as having outstanding District-wide significance (eg, War Memorials, etc).

The Council recognises the viaduct for the following features of interest:

Built between 1905 and 1908. The viaduct is the tallest and last structure to be completed on the NIMT. When originally constructed the viaduct was ranked among the highest viaducts in the world, and the highest in New Zealand.

DESCRIPTION

Summary

Completed in 1908, the Makatote Viaduct spans the deep gorge of the Makatote River in the Ruapehu District. The viaduct enabled the eventual connection of the North Island Main Trunk (NIMT) railway line through the challenging topography of the Central Plateau. The structure is an outstanding feat of engineering, designed by important engineer Peter Seton Hay (1852/53?-1907) and constructed by Andersons Ltd. The Makatote Viaduct is an icon of the NIMT and essential to the story of the completion and operation of this significant transport route.

The NIMT was part of a wider programme of infrastructure and immigration which has had lasting economic and social impact. In selecting a route for the NIMT that passed through Māori land in the Central North Island the government embarked on a deliberate strategy to break up and open the area to Pākehā settlement. Work on the NIMT began in 1885 and was completed 23 years later in 1908. The line connected the major cities of Auckland and Wellington, changed the way goods and people moved about the country and facilitated changing demographic and land use patterns.

Construction of the Makatote Viaduct began in 1906 and the structure was complete by July 1908. The surrounding topography and harsh weather conditions made it a challenging build and the isolated location promoted the contractor, Andersons Ltd., to construct a special on-site workshop. At the time of its construction the viaduct was the highest in New Zealand and ranked among the tallest in the world. The viaduct is of steel truss design and comprises five latticed steel piers supporting steel plate girders. Minor modifications and additions and remedial work have kept the viaduct fit for purpose. It remains an essential structure on the NIMT.

From the outset, the Makatote Viaduct was a poster piece for the NIMT and for New Zealand Railways. The viaduct received wide public interest at the time of its construction. Its height and dramatic setting in the Central Plateau drew admiration for both its technical and aesthetic merit. For many at the time, it represented the advance of civilisation into the wilderness, the progress of modern technology and a significant transport and telecommunications connection through the last of New Zealand's wild country. In the years since, the viaduct has continued to be recognised and admired for its technical achievement, visual appeal and amenity value.

HISTORICAL NARRATIVE

The Makatote Viaduct spans the deep gorge of the Makatote River between Pokaka and Erua in the North Island's Central Plateau. The viaduct is a significant engineering achievement and was essential to the completion of the North Island Main Trunk (NIMT), a rail line that has had lasting social and economic impact. The last and highest viaduct to be built on the NIMT it quickly became, and has remained, an icon of the line.

The NIMT connected the main centres of Auckland and Wellington and greatly reduced travel times for goods and passenger services. In the decades prior to the line's completion passengers travelled by a combination of rail and coastal shipping. The line encouraged population growth in the North Island and accelerated the alienation of Māori land by opening up new areas to Pākehā settlement. Rail building also facilitated deforestation and the replacement of New Zealand's native bush and swamplands with pasture. The NIMT was widely hailed as a symbol of colonial accomplishment and technological and economic progress.[1]

Railway building in New Zealand began in the 1860s with short stretches of rail laid in Canterbury and Southland.[2] In 1870, Colonial Treasurer Julius Vogel set out his plan for an ambitious programme of rail construction financed by overseas borrowing. Vogel's plan included the development of the telegraph network, roads, public buildings and port facilities.[3] Borrowing also financed an assisted immigration scheme, rapidly growing New Zealand's Pākehā population.[4] New Zealand's rail network grew from 74 kilometres (km) in 1870 to 2,000km by 1880.[5] The South Island main trunk connecting Christchurch and Invercargill opened in 1879. In the North Island, short sections of rail opened through the 1870s.[6] Surveying for the NIMT began in 1882, construction began in 1885 and the line was finally completed in 1908.[7]

Surveying the North Island Main Trunk

By 1880, rail lines reached north from Wellington as far as Marton and south from Auckland as far as Te Awamutu. In between lay a vast and unsurveyed wilderness typified by thick bush, unstable ground and deep river gorges, much of it, Māori land. The route the NIMT would take through this country was as yet undecided. Three routes were investigated from 1882 and a parliamentary committee appointed to consider the evidence and make a recommendation. The routes were: a western route via Hāwera and Stratford, an eastern route via Hastings, and a central route. The committee endorsed the central route and

[1] Neil Atkinson, *Trainland: how railways made New Zealand*, Auckland: Random House, 2007, 25; Neill Atkinson, "Railways - Main trunk line," Te Ara - the Encyclopedia of New Zealand, accessed 4 July 2022, http://www.TeAra.govt.nz/en/railways/page-2

[2] Neill Atkinson, "Railways - Building the rail network," Te Ara - the Encyclopedia of New Zealand, accessed 4 July 2022, http://www.TeAra.govt.nz/en/railways/page-1

[3] Neill Atkinson, "Vogel's vision," Ministry for Culture and Heritage, updated 30 April 2018, https://nzhistory.govt.nz/politics/the-vogel-era/vogels-vision

[4] Neill Atkinson, "The Vogel era," Ministry for Culture and Heritage, updated 5 August 2014, https://nzhistory.govt.nz/politics/the-vogel-era

[5] Ibid.

[6] Neill Atkinson, "Building Vogel's railways," Ministry for Culture and Heritage, updated 25 February 2020, https://nzhistory.govt.nz/politics/the-vogel-era/building-vogels-railways

[7] Neill Atkinson, "Building the main trunk," Ministry for Culture and Heritage, updated 6 August 2019, https://nzhistory.govt.nz/culture/main-trunk-line/building

presented the report of its proceedings to parliament in 1884.[8] Selection of the central route fulfilled the government's plan of 'opening up' Te Rohe Pōtae, the King Country. From the 1870s, the Government had been pushing for European settlement in the Central North Island but had been rebuffed by Waikato and Ngāti Maniapoto leaders.[9] Government officials then purposefully sidestepped King Tāwhiao (1820s? – 1894)[10] who opposed the railway, and focused their energies on gaining the agreement of Ngāti Maniapoto leaders Wahanui Huatare (1820s? – 1897)[11] and Rewi Maniapoto (1810s? – 1894).[12] In 1883 Ngāti Maniapoto agreed that a route for the railway be surveyed through their land. Wahanui and Rewi felt that Pākehā encroachment into the King Country was inevitable and sought to dictate the terms. On 1 November 1884 Wahanui appeared before the House to outline his conditions, these included "the right of the King movement to manage their own affairs, the banning of liquor from Waikato-Ngāti Maniapoto territory, and the right of his people to have sole responsibility for administering their ancestral lands."[13] From early 1885, as surveys were completed, the Māori land required for the railway successively passed into Crown ownership under the Public Works Acts of 1882 and 1894.[14] The government assured Māori that full compensation would be paid. In practice this was problematic as applicants were required to go through the Native Land Court to establish title. The court was also to determine compensation amounts.[15]

The central route was surveyed by John Rochfort (1832-1893). Rochfort's early survey work, begun in June 1883, had informed the parliamentary committee paper.[16] Now with the route chosen and the agreement of the chiefs secured, Rochfort returned to the area, and between 1884 - 1887 made a more detailed study.[17] In the mid-1890s Public Works Department (PWD) civil engineer, Robert West Holmes, began

[8] "Report of the select committee appointed to consider and report on the best route for the North Island Main Trunk Railway: together with minutes of proceedings and evidence and appendix," Appendix to the Journals of the House of Representatives, 1884, Session II, I-06, https://atojs.natlib.govt.nz/cgi-bin/atojs?a=d&d=AJHR1884-II.2.2.4.9&pg=1&e=-------10--1------0--; Neill Atkinson, "Building the main trunk," Ministry for Culture and Heritage, updated 6 August 2019, https://nzhistory.govt.nz/culture/main-trunk-line/building

[9] Kerryn Pollock, "King Country region - Te Rohe Pōtae," Te Ara - the Encyclopedia of New Zealand, (accessed 4 May 2022), http://www.TeAra.govt.nz/en/king-country-region/page-6

[10] R. T. Mahuta, "Tāwhiao, Tūkāroto Matutaera Pōtatau Te Wherowhero," Dictionary of New Zealand Biography, first published in 1993, updated July, 2011, accessed 6 July 2022, Te Ara - the Encyclopedia of New Zealand, https://teara.govt.nz/en/biographies/2t14/tawhiao-tukaroto-matutaera-potatau-te-wherowhero

[11] Manuka Henare, "Wahanui Huatare," Dictionary of New Zealand Biography, first published in 1993, Te Ara - the Encyclopedia of New Zealand, accessed 6 July 2022, https://teara.govt.nz/en/biographies/2w2/wahanui-huatare

[12] Manuka Henare, "Maniapoto, Rewi Manga," Dictionary of New Zealand Biography, first published in 1990. Te Ara - the Encyclopedia of New Zealand, accessed 6 July 2022; https://teara.govt.nz/en/biographies/1m8/maniapoto-rewi-manga; "The Pouakani Report 1993 Part 1." (Wai 33), p95, https://forms.justice.govt.nz/search/Documents/WT/wt_DOC_68466828/Pouakani%201993%20Part1.pdf; Atkinson, *Tainland*, 45.

[13] Manuka Henare, "Wahanui Huatare," Dictionary of New Zealand Biography, first published in 1993, Te Ara - the Encyclopedia of New Zealand, accessed 6 July 2022, https://teara.govt.nz/en/biographies/2w2/wahanui-huatare

[14] Philip Cleaver, "The taking of Māori land for public works in the Whanganui Inquiry District: 1850-2000." Wai 903, p183-186, https://forms.justice.govt.nz/search/Documents/WT/wt_DOC_94586563/Wai%20903%2C%20A057.pdf

[15] Cleaver, Wai 903, p187-195, https://forms.justice.govt.nz/search/Documents/WT/wt_DOC_94586563/Wai%20903%2C%20A057.pdf

[16] "Main Trunk Line, Auckland to Wellington (Reports on) Central Route," Appendix to the Journals of the House of Representatives, 1884, Session I, D-05, https://atojs.natlib.govt.nz/cgi-bin/atojs?a=d&d=AJHR1884-I.2.2.2.5&e=-------10--1------0Rochfort--1884

[17] "Public Works Statement, by the Minister for Public Works, the Hon. Edward Richardson, 25th June, 1886," Appendix to the Journals of the House of Representatives, 1886 Session I, D-01, p29, https://atojs.natlib.govt.nz/cgi-bin/atojs?a=d&d=AJHR1886-I.2.2.2.1&cl=&srpos=0&e=-------10--1------0--; Atkinson, *Trainland*, 45.

location surveys and determined the centre line and location of the pier footings for the Makatote Viaduct.[18]

Building the North Island Main Trunk

The NIMT took 23 years to complete. Construction began in 1885. At a special ceremony on 15 April that year, Maniapoto Chief Wahanui Huatare turned the first sod and Premier Robert Stout (1844-1930) wheeled it away.[19] Progress on the line continued slowly through the 1880s and 1890s hampered by political disagreement and economic depression.[20]

By 1900, with a considerable section still left to do, public dissatisfaction with the slow pace of work drove the government to commit extra funds and to make a dedicated push for completion. By 1904 the rail lines reached Taumarunui in the north and Taihape in the south.[21] The remaining section, a gap of 146km, was renowned for harsh weather and challenging topography. As well as the Makatote Viaduct, other significant engineering on this section included the Hapuawhenua Viaduct and the Raurimu Spiral.

Bad weather over the summer of 1904-05 caused further frustration and prompted the Minister of Public Works, William Hall-Jones (1851-1936), to dedicate even more resources to the job. By 1906, 2700 men were employed on the construction and a new administrative headquarters established at Ohakune.[22] Work now progressed on the central section as well as from the northern and southern railheads. In February 1907 Frederick William Furkert (1876-1949) was appointed Resident Engineer at Ohakune. Much credit for the steady progress made in the final push has been attributed to his determination, ability and good management skills.[23] By May 1908 only a 24km gap remained – between Ohakune and the unfinished Makatote Viaduct.[24] All eyes turned to watch the progress on the viaduct as the PWD raced to complete the NIMT by the end of 1908. Furkert pushed hard to connect the line by 7 August 1908 so that Members of Parliament could travel from Wellington to Auckland by rail to take part in the civic reception for the United States of America Navy's 'Great White Fleet.' Word was that a wager of £1,000 with Hall-Jones was at stake. To make the connection in time Furkert had temporary unballasted tracks laid between Taonui Viaduct and Horopito. The line was officially completed 6 November 1908.[25]

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[18] Jupp, "Great Makatote viaduct," 42; Peter Lowe, "Holmes, Robert West," Dictionary of New Zealand Biography, first published in 1993, Te Ara - the Encyclopedia of New Zealand, accessed 17 June 2022, **https://teara.govt.nz/en/biographies/2h46/holmes-robert-west**

[19] "The North Island Trunk Railway (Report on the ceremony of turning the first sod of), at Puni, 15 April, 1885." Appendix to the Journals of the House of representatives, 1885, Session I, D-06, **https://atojs.natlib.govt.nz/cgi-bin/atojs?a=d&d=AJHR1885-I.2.2.2.11&e=-------10--1------0--**

[20] Atkinson, *Trainland*, 40-41.

[21] Neill Atkinson, "Building the main trunk ," Ministry for Culture and Heritage, updated 6 August 2019, **https://nzhistory.govt.nz/culture/main-trunk-line/building**

[22] Ibid.

[23] "Well-deserved promotion," *Hastings Standard*, 19 June 1908, p2, **https://paperspast.natlib.govt.nz/newspapers/HAST19080619.2.4**

[24] Neill Atkinson, "Building the main trunk," Ministry for Culture and Heritage, updated 6 August 2019, **https://nzhistory.govt.nz/culture/main-trunk-line/building**

[25] Matthew Wright, *New Zealand's Engineering Heritage 1870-2000* (Auckland: Reed, 1999), 41-42; A telegram from Hall-Jones to Furkert arranging payment of the £1000 is held at the Parliamentary Library - Rob Merrifield, message to author 20 July 2022.

Design and construction of the Makatote Viaduct

Design of the viaduct

The Makatote Viaduct was designed by PWD engineer, Peter Seton Hay. Hay began design work for viaducts on the NIMT in 1883.[26] His final design for Makatote was approved in August 1905.[27] Hay's designs for the NIMT viaducts were informed by classic North American trestle viaducts and used design and construction techniques developed and popularised in Europe and the United States. [28]

Hay based his design for Makatote on plans he had developed for the Mangaweka Viaduct (1903). Unlike Hay's earlier design for the Makohine Viaduct (1902), Mangaweka and Makatote use plate girders over the piers, interspersed with lattice truss spans, creating greater visual interest.[29] The Mangaweka Viaduct was demolished in 1982 after the construction of the Mangaweka deviation. The Makatote Viaduct is now the only remaining large scale Hay viaduct of this design.

Peter Seton Hay (1852/3? - 1907)[30]

As well as Makatote, Hay designed several other structures on the NIMT including the Makohine, Mangaweka, Hapuawhenua, Taonui, Manganui-o-te-Ao and Mangaturuturu viaducts as well as a number of smaller bridges.

Hay was born in Glasgow, Scotland. The family emigrated to New Zealand in 1860 when Hay was seven or eight years old. Hay was the first person to graduate from the new established University of Otago, completing a Bachelor of Arts in 1877 and a Master of Arts, with first class honours, in mathematics the following year.

In 1875 Hay had joined the PWD as an engineering cadet. After completing his studies, he worked as a railway surveyor in the Otago region where he gained a reputation as a brilliant young engineer renowned for his mathematical skill. In 1884 Hay transferred to the PWD head office in Wellington. Within two years he was promoted to resident engineer and in 1896 was promoted to superintending engineer.

Hay became Engineer-in-Chief of the PWD in 1906. He made his first and only visit to Makatote to inspect the work then in progress. Young PWD engineer, Peter Keller (1880?-1961), recalled that Hay looked ill at the time of this visit, that the weather was "atrocious," and that Hay got a "real soaking".[31] He died of pneumonia not long after, in March 1907.[32]

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[26] Jupp, "Great Makatote Viaduct," 42.

[27] Ibid.

[28] Karen Astwood, "Registration Report for a Historic Place: Makatote Viaduct," (Heritage New Zealand Pouhere Taonga, 2009), 8.

[29] Ibid.

[30] Peter Lowe, "Hay, Peter Seton," Dictionary of New Zealand Biography, first published in 1993. Te Ara - the Encyclopedia of New Zealand, accessed 4 July 2022, **https://teara.govt.nz/en/biographies/2h24/hay-peter-seton**

[31] Peter Keller, "Early days on railway construction," p10, Alexander Turnbull Library MS-papers-1073.

[32] Peter Lowe, "Hay, Peter Seton," Dictionary of New Zealand Biography, **https://teara.govt.nz/en/biographies/2h24/hay-peter-seton**

As well as his design of the viaducts, Hay's other achievements include his work to identify and recommend a rail route over Arthur's Pass, which included the Otira Tunnel; and his 1904 report on New Zealand's hydro-electric potential.

Andersons Limited

With the exception of some preliminary site work done by the PWD, the Makatote Viaduct was constructed by Andersons Ltd. (Andersons).

Scotsman John Anderson (1820-1897) emigrated to New Zealand in 1850 and set up business in Christchurch as a blacksmith and later engineer, millwright and boiler maker. John Anderson's sons, John (1850-1934) and Andrew (1851-1927), trained in mechanical and civil engineering respectively and entered the family business in the 1870s. By 1905, Andersons Ltd, as the company was then called, was a well-established construction firm with wide experience in the engineering industry. The company's previous work included railways and viaducts in the South Island and a section of the NIMT between Te Kūiti and Mōkau, (between 1887-1889), including the 425-foot-long Waiteti Viaduct south of Te Kūiti.[33]

As well as rail bridges, during its time in business Andersons manufactured gold dredges; undertook ship building and repair at their Lyttelton workshop; developed and manufactured oil engines, milking machines and butter churns; built boilers for dairy factories, freezing works, and hospitals; built harbour cranes; and built pipes and penstocks for hydro-electric power stations.

Andersons merged with Auckland engineering company, Mason Brothers Limited, in 1964 and ceased trading in 1986. [34]

The Andersons Ltd. workshop

The PWD oversaw the construction of the NIMT, built some of the major structures itself and contracted out others. Tenders for the construction of the Makatote Viaduct were called in February 1905 and were open until June.[35] The tender of Messrs. J & A Anderson, including for the manufacture of steelwork, was accepted for the contract price of £53,369.[36] At the time it was the "largest work of its kind carried out in New Zealand by private enterprise."[37] The contract was let on 27 June 1905[38] and the prescribed completion date was 15 June 1907.[39]

All equipment and materials needed for the construction had to be shipped to Auckland and were then transported to the railhead at Ōio, and onwards by a rudimentary road. The contract for the delivery of

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[33] Jupp, "Great Makatote Viaduct," 43.

[34] G.T. Carter, "Andersons Limited – a builder and user of railways," The New Zealand Railway Observer, Vol 51, no 2 (Winter 1994) 43-44; Peter Lowe, "Anderson, John," Dictionary of New Zealand Biography, first published in 1990. Te Ara - the Encyclopedia of New Zealand, (accessed 31 May 2022) **https://teara.govt.nz/en/biographies/1a6/anderson-john**

[35] *Lyttelton Times*, 20 February 1905, p12, **https://paperspast.natlib.govt.nz/newspapers/LT19050220.2.79.7**

[36] "Public Works Statement by the Hon. W. Hall-Jones, Minister for Public Works, 29 August, 1905," Appendix to the Journals of the House of Representatives, 1905 Session I, D-01, v, **https://atojs.natlib.govt.nz/cgi-bin/atojs?a=d&d=AJHR1905-I.2.3.2.1&cl=&srpos=0&e=-------10--1------0--&st=1**

[37] Andersons, *100 years, being an account of the founding, development & progress of Andersons: 1850-1950* (Christchurch: Caxton, 1950), 58.

[38] Andersons, *100 years*, 54.

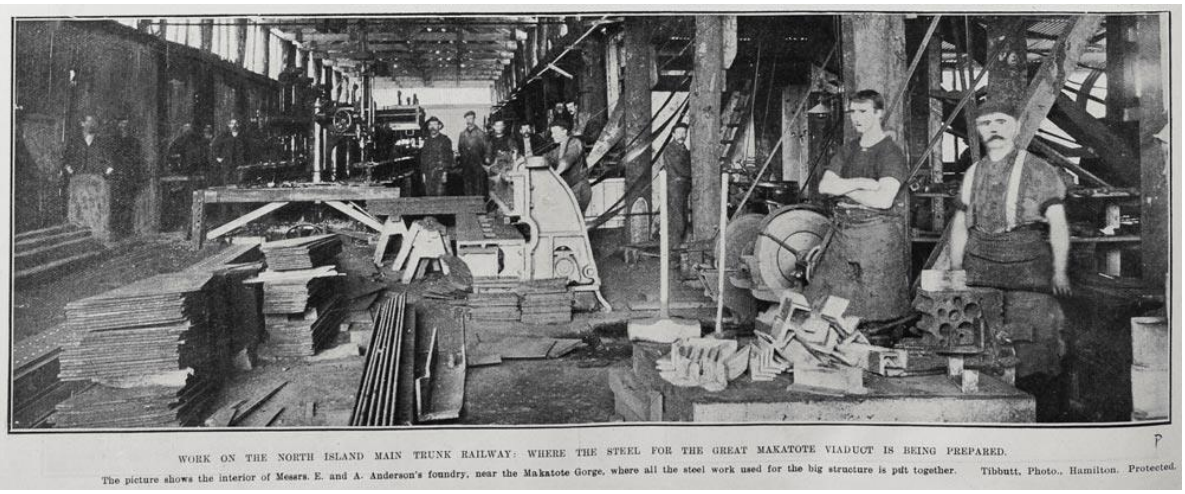
[39] Jupp, "Great Makatote Viaduct," 43.

materials for the approximate 30 km from Ōio to the stockyard at Makatote was let to Clarkin Brothers of Paeroa. Using their five- or eight-horse teams, depending on the weight of the load, Clarkin Bros delivered 1,200 tons of cement and 1,000 tons of steel to Makatote.[40]

Because of the difficult site access and large quantities of steelwork required, Andersons opted to manufacture all the steelwork on site. To do this they began building a workshop in 1905, close to the northern end of the viaduct site. [41] By the autumn of 1906 the workshop was complete, and they were ready to begin manufacturing the steelwork. The workshop was cutting edge for its time.[42] The site was 87x9metres (m) and included two gantry-mounted cranes, powered by a steam-driven electric generator. A wood-fired portable steam engine provided power for nine radial drills, a plate-planer and straightening rolls. A water turbine drove the stone crusher and concrete mixer.[43]

Andrew Anderson managed the construction of the viaduct and moved with his family to live on site. He was assisted by young engineer George Pascoe, who in January 1906 was appointed as engineer in charge. Mr Turnbull acted as inspector on behalf of the PWD.[44] Up to 100 men were employed in the workshop.[45]

In July 1906, Andersons won contracts to manufacture the superstructure for two other NIMT viaducts, the Manganui-o-te-Ao and Mangaturuturu. The steelwork for these viaducts was also manufactured at the Makatote workshop.[46]



WORK ON THE NORTH ISLAND MAIN TRUNK RAILWAY: WHERE THE STEEL FOR THE GREAT MAKATOTE VIADUCT IS BEING PREPARED.
The picture shows the interior of Messrs. E. and A. Anderson's foundry, near the Makatote Gorge, where all the steel work used for the big structure is put together. Tibbutt, Photo., Hamilton. Protected.

"Work on the North Island main Trunk Railway: where the steel for the great Makatote Viaduct is being prepared," supplement to the Auckland Weekly News 1907, p14. Auckland Libraries Heritage Collections AWNS-19070411-14-3.

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[40] Bill Pierre, *North Island main trunk : an illustrated history*, (Wellington: Reed, 1981), 74-75; Andersons, *100 years*, 58; "The Makatote Viaduct," *Wanganui Herald*, 6 July 1905, p7, **https://paperspast.natlib.govt.nz/newspapers/WH19050706.2.71**; "A big undertaking," *Manawatu Standard*, 13 November 1906, p5, **https://paperspast.natlib.govt.nz/newspapers/MS19061113.2.34**

[41] Andersons, *100 years*, 54.

[42] "A big undertaking," *Manawatu Standard*, 13 November 1906, p5, **https://paperspast.natlib.govt.nz/newspapers/MS19061113.2.34**

[43] Andersons, *100 years*, 54.

[44] Andersons, p57; "A big undertaking," *Manawatu Standard*, 13 November 1906, p5, **https://paperspast.natlib.govt.nz/newspapers/MS19061113.2.34**; Keller, "Early days on railway construction," 10.

[45] Jupp, "Great Makatote Viaduct," 44.

[46] Andersons, *100 years*, 57; Mangaturuturu Viaduct, Category 2 historic place, New Zealand Heritage List/Rārangi Kōrero (List no. 7779), Heritage New Zealand Pouhere Taonga, **https://www.heritage.org.nz/the-list/details/7779**, accessed 29 July 2022.

Technology and techniques of construction – the Blondin

The challenging topography of construction in such a deep gorge was overcome by the use of a piece of equipment fondly referred to as the 'Blondin,' after the famous French Niagara Falls tightrope walker, Charles Blondin.[47] Wooden gantries were constructed on each side of the gorge and two 6-inch steel cables strung between them.[48] These cables carried the Blondin – a wheel and pulley from which a bucket or pieces of steelwork could be attached and moved into place. A steam winding engine on the western side of the gorge close to the workshop moved the Blondin back and forth along the wires. The driver could raise and lower the Blondin's freight to the required height. The Blondin was used both for the concrete and the steelwork.

The concrete for the pier foundations was mixed alongside the creek at the bottom of the gorge, with a turbine water wheel supplying the power. Buckets of concrete were then lifted by the Blondin to the required spot.[49] The Blondin was also used to lift all of the steelwork into place, the heaviest piece being a steel girder weighing 20 tons.

The construction of the viaduct and the use of the Blondin drew a great amount of interest and several descriptions of it appeared in the papers.[50] The most romantic of these appeared in the *Evening Post* in June 1907:

> The marvel to the lay mind is that these huge steel girders are being placed in position by swinging them out in the blue ethereal on a 2 ½ inch wire rope….Objects are swung out by attaching them to a wheel and pulley arrangement working along the wire and called a traveller, or, more picturesquely, a Blondin. A winding engine works the Blondin backwards and forwards, and when the Blondin is over the desired spot, its freight is lowered to the level required. Sometimes a bucket with a human freight it attached to the Blondin. What must it feel like working two hundred odd feet in mid-air, with enough drop beneath you to accommodate two Grand Hotels placed one on top of the other, or three Government Buildings?[51]

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[47] Pierre, *North Island Main Trunk*, 281.

[48] Ibid.

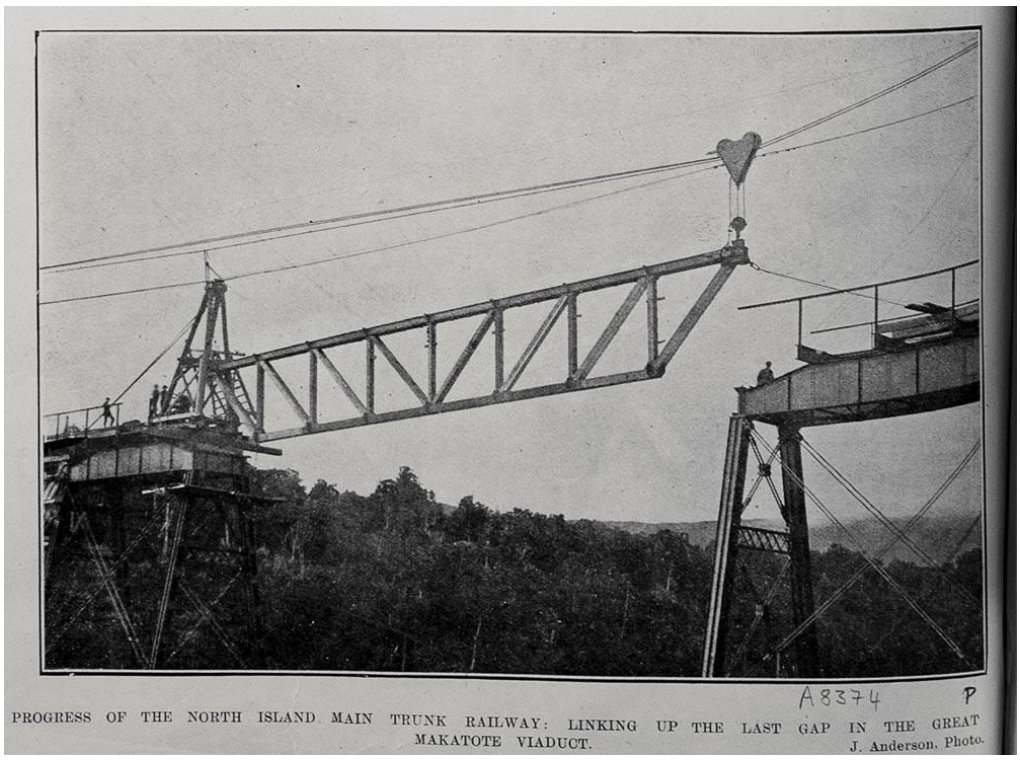
[49] "A big undertaking," *Manawatu Standard*, 13 November 1906, p5, **https://paperspast.natlib.govt.nz/newspapers/MS19061113.2.34**

[50] "Wellington to Auckland," *New Zealand Times*, 3 April 1906, p7, **https://paperspast.natlib.govt.nz/newspapers/NZTIM19060403.2.41**; "Giant viaduct and huge earthworks," *Evening Post*, 28 June 1907, p2, **https://paperspast.natlib.govt.nz/newspapers/EP19070628.2.6**; "A big undertaking," *Manawatu Standard*, 13 November 1906, p5, **https://paperspast.natlib.govt.nz/newspapers/MS19061113.2.34**; "The Makatote Viaduct," *Press*, 2 October 1906, p5, **https://paperspast.natlib.govt.nz/newspapers/CHP19061002.2.11**

[51] "Giant viaduct and huge earthworks," *Evening Post*, 28 June 1907, p2, **https://paperspast.natlib.govt.nz/newspapers/EP19070628.2.6**

THE POPPET HEADS AT THE GREAT MAKATOTE VIADUCT.

"The poppet heads at the great Makatote Viaduct," supplement to the Auckland Weekly News, 25 April 1907, p3. Auckland Libraries Heritage Collections AWNS-19070425-3-1.



PROGRESS OF THE NORTH ISLAND MAIN TRUNK RAILWAY: LINKING UP THE LAST GAP IN THE GREAT MAKATOTE VIADUCT. J. Anderson, Photo.

"Progress of the North Island Main Trunk Line Railway: linking up the last gap in the Great Makatote Viaduct," supplement to the Auckland Weekly News, 18 June 1908, p6. Heritage Collections AWNS-19080618-6-6.

Construction

After months of delay, the PWD finally completed the service road, providing Andersons access to the Makatote site in early 1906.[52] Work began in March to excavate the foundations for the large piers.[53] Andersons' workshop was completed by autumn 1906 and the manufacture of steelwork continued through the winter.[54] Structural work on the viaduct began in August 1906 with the pouring of the concrete for the northern-side piers and pier footings.[55] By February 1907, piers 8-11/H-K were constructed, but the foundation piers on the opposite bank had only been started the previous month.[56] In June 1907 the papers reported that "the concrete work is almost all done, and a great deal of the iron work is in position."[57] The highest, central pier was completed in January 1908 and work then began on positioning the girders.[58] The final girder was laid in early June 1908.[59] The cableway was then dismantled to allow the completion of earthworks up to the abutments. The final touches, including coating the steelwork with haematite paint, were completed soon after.

The original contract stipulated that the viaduct be completed in two years, by June 1907. This date was overshot by a year due to the delay in the building of the access road and challenges during construction.

Throughout the construction period the weather proved challenging. Makatote is at an elevation of 800m above sea level and experiences cold winters and highly changeable weather conditions. In October 1906 the *Press* lamented that the last winter and summer at Makatote "was very bad, there being rarely a complete fine day throughout the whole year."[60] In September 1906 flooding in the gorge washed away a section of the flume and work was delayed several weeks while this was repaired.[61] The flume directed water to a turbine that drove a stone crushing machine and the concrete mixer.[62]

The instability of the ground was another factor that led to unanticipated delays. In July 1906 the discovery of unstable ground during the excavation for pier 7/G meant that the footing for this pier now had to be made considerably deeper. Time was lost while revised plans were sent to the section engineer at Raurimu for approval.[63] The deeper foundation needed extra concrete, and the use of the Blondin to transport it.

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[52] "The North Island Main Trunk Railway," *Grey River Argus*, 11 April 1906, p1, **https://paperspast.natlib.govt.nz/newspapers/GRA19060411.2.2**; "The Makatote Viaduct," *Press*, 2 October 1906, p5, **https://paperspast.natlib.govt.nz/newspapers/CHP19061002.2.11**

[53] "Wellington to Auckland," *New Zealand Times*, 3 April 1906, p7, **https://paperspast.natlib.govt.nz/newspapers/NZTIM19060403.2.41**

[54] Andersons, *100 years*, 57.

[55] Jupp, "Great Makatote Viaduct," 46.

[56] Ibid.

[57] "Giant viaduct and huge earthworks," *Evening Post*, 28 June 1907, p2, **https://paperspast.natlib.govt.nz/newspapers/EP19070628.2.6**

[58] Jupp, "Great Makatote Viaduct," 51.

[59] "North Island Main Trunk," *Manawatu Standard*, 8 July 1908, p5, **https://paperspast.natlib.govt.nz/newspapers/MS19080708.2.30**

[60] "The Makatote Viaduct," *Press*, 2 October 1906, p5, **https://paperspast.natlib.govt.nz/newspapers/CHP19061002.2.11**

[61] Andersons, *100 years*, 57-8.

[62] "The Makatote Viaduct, *Press*, 2 October 1906, p5, **https://paperspast.natlib.govt.nz/newspapers/CHP19061002.2.11**

[63] Andersons, *100 years*, 57.

The roll-on effect of this was that the erection of the steelwork, which also required the use of the Blondin, was delayed.[64]

Andersons declared the viaduct finished 10 July 1908.[65] Weight tests were made later that month using temporary tracks.[66] The Parliamentary Special made its way over the temporary tracks 8 August 1908.[67] The line was officially opened on 6 November 1908 and regular express trains ran over the line from February 1909.[68]

[64] Jupp, "Great Makatote Viaduct," 46; "Makatote Viaduct," *Taranaki Herald*, 8 June 1908, p7, https://paperspast.natlib.govt.nz/newspapers/TH19080608.2.58; Andersons, *100 years*, 57.

[65] Andersons, *100 years*, 58.

[66] Jupp, "Great Makatote Viaduct," 57.

[67] "From Wellington to Auckland," *Manawatu Standard* 10 August 1908, p5, https://paperspast.natlib.govt.nz/newspapers/MS19080810.2.35

[68] Neill Atkinson, "Railways - Main trunk lines," Te Ara - the Encyclopedia of New Zealand, accessed 21 June 2022, http://www.TeAra.govt.nz/en/railways/page-2

SOCIAL NARRATIVE

Public interest and recognition of the viaduct

The Makatote Viaduct drew huge public interest at the time of its construction, and in the decades following has earned its place as an icon of the NIMT. The viaduct is recognised and celebrated for its part in the story of the NIMT, for its technical accomplishment, and for the visual and emotive appeal of its natural setting.

Even before construction began, the Makatote Valley and the enormous scale of the work to be undertaken there had drawn public interest. In 1903 the papers reported the visit of Minister for Public Works, Mr. Hall-Jones to the site. The valley was described as a "narrow, deep, picturesque gorge, over which must be constructed the biggest viaduct on the line – 864ft long and 257ft high."[69] Numerous articles kept the public up to date during construction, praising technical aspects and commenting on how the work was progressing.

A special reporter for the *Evening Post* made a visit to Makatote in February 1908 and described both his reaction to seeing the almost finished viaduct and the work in hand.

> This structure has often been described both in these columns and elsewhere, and photographs of every stage of its creation are to be seen. Yet no pictures and no descriptions can reduce it to common place. It stands, and it will stand, it is hoped, for many years as our finest monument of structural engineering. It ranks in height among the great viaducts. In the beauty of its situation it acquires enhanced magnificence…On the viaduct the bridge builders are already at work. The first two columns at the northern end are already complete…Painters, shiny-red with smears of hematite, are crawling about the next pier, rapidly covering the steelwork in a first coating…The rivetters are busily engaged on their little platforms about the junction of the lattice work and the four main columns…Meanwhile the aerial cable is preparing to hoist another leg into position…[70]

Upon completion, the viaduct was widely celebrated. The first train to make the trip over the viaduct was the Parliamentary Special on 7-8 August 1908, an event which received much popular press. Announcing the "historic journey" of the Parliamentary Special, a correspondent for the *Star* described the line as the "greatest engineering work that the New Zealand government has undertaken." The article proudly stated that the Makatote is the highest and longest viaduct in New Zealand and made the claim that engineering achievements on the NIMT, including the Makatote, have "drawn attention to the dominion in the engineering circles of the world."[71] The Parliamentary Special stopped on the Makatote Viaduct to allow the politicians and invited guests to admire the view.

> At Makatote Viaduct, the centre of which is 257 feet above the bottom of the gully, the train was stopped in the middle, and many walked across. The view here of the Makatote Gorge, covered in thick bush, with the Makatote stream winding along, with Ruapehu away to the right, and to the

[69] "The north main trunk line," *Evening Post*, 27 May 1903, p5, https://paperspast.natlib.govt.nz/newspapers/EP19030527.2.52

[70] "The big viaduct on the main trunk line," *Evening Post*, 13 February 1908, p3, https://paperspast.natlib.govt.nz/newspapers/EP19080213.2.35

[71] "The Trunk Line," *Star*, 7 August 1908, p1, https://paperspast.natlib.govt.nz/newspapers/TS19080807.2.15

left in the distance snow-capped Egmont, gleaming like some white Soracte in the sun, was superb.[72]

Official opening ceremony

The line officially opened on 6 November 1908. Officials travelled from Wellington and Auckland on the evening of Thursday 5 November and met at Manganui-o-te-Ao, just south of the Makatote Viaduct, on Friday morning. Several hundred people attended the ceremony. Dignitaries included the Minister of Railways and Public Works, Mr William Hall-Jones; Members of Parliament and the senior engineers of the Railways and PWD; L.D Nathan, Chairman of the Wellington Railway League and Mr Peacock, Chairman of the Auckland Railway League.[73] Prime Minister Sir Joseph Ward drove the official last spike and speeches were given.[74] Hall-Jones then presented Ward with a commemorative spike of sterling silver, now held at the National Museum, Te Papa Tongarewa.[75] After the ceremony, invited guests travelled on to Auckland for a banquet held at the Tiffin,[76] a high-end restaurant and tea rooms on Queen street opened just the year before.[77]

The driving of the last spike was commemorated with the erection of a monument at Manganui-o-te-Ao less than six months later.[78]

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[72] "From Wellington to Auckland," *Manawatu Standard*, 10 August 1908, p5, **https://paperspast.natlib.govt.nz/newspapers/MS19080810.2.35**

[73] Merrilyn George, *Ohakune: opening to a new world* (Ohakune: Kapai Enterprises, 1990), 127.

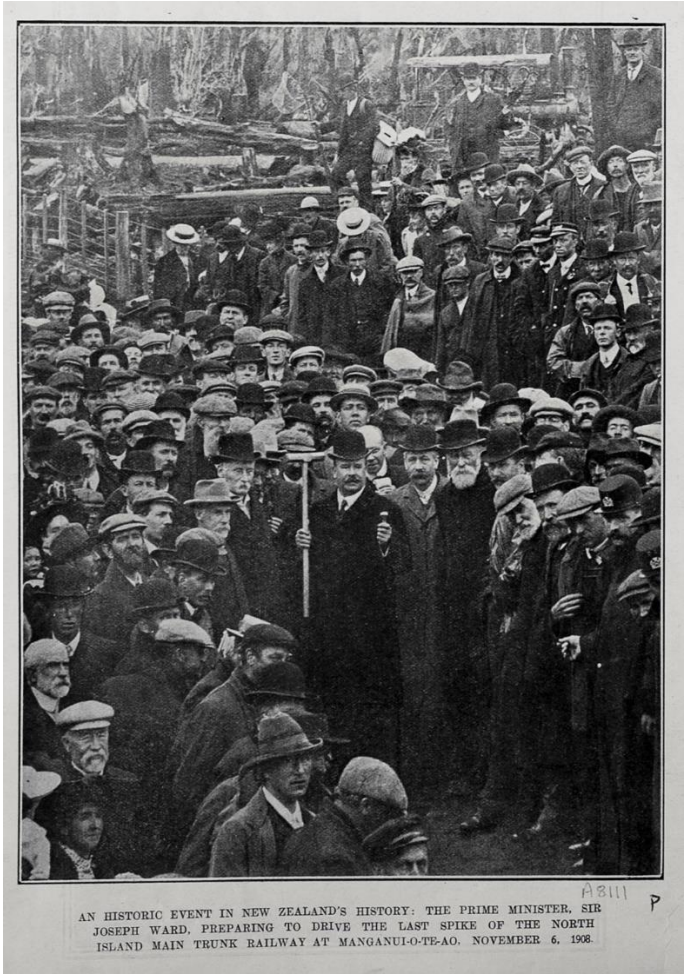
[74] "Main Trunk Line," *Waikato Argus*, 7 November 1908, p2, **https://paperspast.natlib.govt.nz/newspapers/WAIGUS19081107.2.11**

[75] "Railway spike," Museum of New Zealand Te Papa Tongarewa, **https://collections.tepapa.govt.nz/object/212434**

[76] "The banquet," *New Zealand Herald*, 7 November 1908, p8, **https://paperspast.natlib.govt.nz/newspapers/NZH19081107.2.81**

[77] "The Tiffin. Auckland's latest and most up to date restaurant and tea rooms," *The New Zealand Graphic*, 22 June 1907, p11, Auckland Libraries Heritage Collections NZG-19070622-11-1.

[78] *Wanganui Herald*, 25 February 1909, p4, **https://paperspast.natlib.govt.nz/newspapers/WH19090225.2.23**



AN HISTORIC EVENT IN NEW ZEALAND'S HISTORY: THE PRIME MINISTER, SIR JOSEPH WARD, PREPARING TO DRIVE THE LAST SPIKE OF THE NORTH ISLAND MAIN TRUNK RAILWAY AT MANGANUI-O-TE-AO. NOVEMBER 6, 1908.

"An historic event in New Zealand's history: the Prime Minister, Sir Joseph Ward, preparing the drive the last spike of the North Island Main Trunk Railway at Manganui-o-te-Ao." Supplement to the *Auckland Weekly News* 12 November 1908 p6, **http://www.aucklandcity.govt.nz/dbtw-wpd/exec/dbtwpub.dll**

At the time of the Parliamentary Special, and again at the official opening of the NIMT, the papers published photographs of the viaduct. For the official opening, the *Press* produced a three-colour souvenir supplement on the NIMT including "two excellent views of the Makatote Viaduct" in its publication *The Weekly Press*.[79] Photos of the NIMT, including pictures of the Makatote Viaduct also appeared in the Public Works Statement, September 1908.[80]

The first public train made the journey between Wellington and Auckland on 10 November 1908. The passengers were "impressed by the scenery en route and also by the various engineering feats seen, as, for instance the Makatote Viaduct."[81]

Living and working at Makatote

The Makatote Viaduct drew hundreds of people to its construction site, with lasting social and economic impact.

[79] "Makatote Viaduct nearing completion," *New Zealand Times*, 8 August 1908, p11, **https://paperspast.natlib.govt.nz/newspapers/NZTIM19080808.2.115.3.1**; "The North Island main Trunk Railway," *Otago Witness*, 19 August 1908, p54, **https://paperspast.natlib.govt.nz/newspapers/OW19080819.2.164.9.18**; "News of the day," *Press*, 9 November 1908, p6, **https://paperspast.natlib.govt.nz/newspapers/CHP19081109.2.22**

[80] "Public Works Statement, 22 September 1908," Appendix to the Journals of the House of Representatives, 1908 Session I, D-01, **https://atojs.natlib.govt.nz/cgi-bin/atojs?a=d&d=AJHR1908-I.2.3.2.1&pg=1&e=-------10--1------0--**

[81] "Main Trunk Line," *Hawera & Normanby Star*, 11 November 1908, p8, **https://paperspast.natlib.govt.nz/newspapers/HNS19081111.2.50**

As the railway construction progressed, temporary towns kept pace with the railheads. The construction of the Makatote Viaduct involved a huge amount of manual labour. At key stages of the project between 400-500 people lived and worked at the Makatote site. Many were immigrants from Britain and Australia.[82] Makatote township boasted a store, several boarding houses, four billiard tables and a post office.[83] Supplies came from Auckland to the railhead at Ōio and then travelled the last 30km along the rough service road to Makatote.[84] North of Makatote, the railway township of Raurimu was temporary home to some 1,500 people, 800 of them railway workers.[85]

Andrew Anderson, the junior partner in the Andersons firm, oversaw the construction of the viaduct. He had a house built at Makatote, and from August 1906 lived there with his wife Laura and their four children for the duration of the construction.[86] Andrew's niece, Muriel, also spent much time at Makatote with the family.[87] The Anderson family were a central part of the Makatote community. In preparation for remote living, Laura trained in first aid and stocked up on medicines.[88] She was often the first port of call for those in need. The Anderson's house was also a centre of social activity for PWD staff who were often invited to dine with the family.[89]

Living conditions at Makatote were tough. Workers survived the harsh winters in temporary accommodation. Hugh Anderson, son of Andrew Anderson, recalled that upon arrival workers were

> issued on hire (2/6 weekly) with a tent and fly, shown roughly how to pitch it and how to fix up the corrugated iron chimney that would sit at one end and be their only means of heating and cooking for two long cold winters.[90]

In July 1906 the *Evening Post* reported that "the Public Works Department is now building and supplying wooden huts to the men on the Waimarino Plains and the Makatote Viaduct at a small rental, as tents will not stand the snowfall."[91] Engineering Cadet, Peter Keller described the cold, wet winter of 1905 that he spent surveying just north of Raurimu. "I had my first experience of muscular rheumatism" he wrote, "as many men did in the bush."[92]

Working conditions at Makatote were also tough and hazardous. Seven men fell to their death after slipping from icy steelwork.

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[82] H. B. Anderson, H. B., *The day's run* (Christchurch: Caxton Press, 1977), 60-61.

[83] "A big undertaking," *Manawatu Standard*, 13 November, p5, **https://paperspast.natlib.govt.nz/newspapers/MS19061113.2.34**; "Main trunk railway mails," *New Zealand Herald*, 24 August 1906, p6, **https://paperspast.natlib.govt.nz/newspapers/NZH19060824.2.76**

[84] Anderson, *The day's run*, 62.

[85] R.S. Fletcher, *Single track: the construction of the North Island Main Trunk Railway*, (Auckland: Collins, 1978), 189.

[86] Jupp, "Great Makatote Viaduct," 46.

[87] Keller, "Early days on railway construction," 10.

[88] Anderson, *The day's run*, 59.

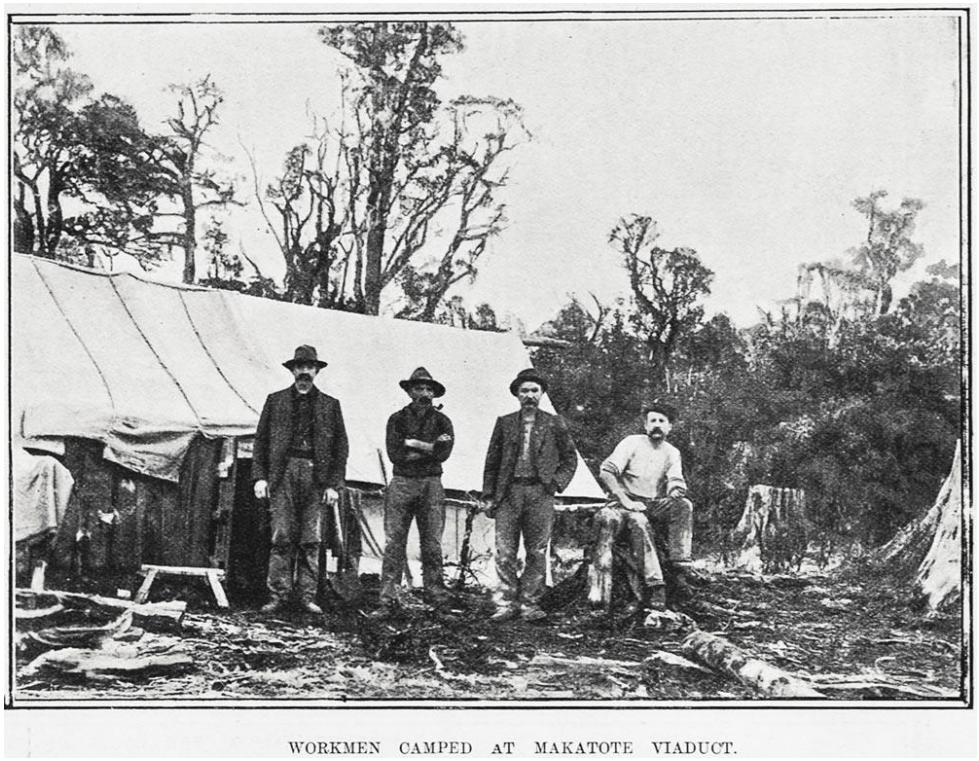
[89] Anderson, *The day's run*, 61.

[90] Anderson, *The day's run*, 60-61.

[91] *Evening Post*, 16 July 1906, p4, **https://paperspast.natlib.govt.nz/newspapers/EP19060716.2.19.6**

[92] Keller, "Early days on railway construction," 8.

"North Island Main Trunk Railway: a panoramic view of Makatote township on the Main Trunk Line." Auckland Weekly News, 13 December 1906(?), Auckland Libraries Heritage Collections 7-A8227.



"Workmen camped at Makatote," supplement to the Auckland Weekly News, 27 April 1905, p11. Auckland Libraries Heritage Collections AWNS-19050427-11-3.

Of the once bustling community at Makatote, little physical evidence remains. Worker accommodation, Andersons' workshop, offices and storehouses were always intended as temporary structures and were dismantled once the viaduct was complete. The social and economic impacts, however, are still evident today. Work on the railway drew many Pākehā to the central North Island, an area that had previously been closed to them. Once completed, the railway and the new service towns it supported offered other

work opportunities for these men, including newly available land for farming.[93] The construction of the railway also affected the area's Māori population and demographic spread. Local Māori sought work on the railway construction and did not afterwards return to settlements on the lower Manganui-o-te-Ao river and these areas became depopulated.[94] The NIMT delivered Vogel's goal of 'opening up' the central North Island to European settlement. The railway facilitated forest clearance, loss of Māori land and a transition to pastoral farming.[95] The total population of the King Country region grew from 5,475 in 1901 to 27,086 in 1926.[96] As a key piece of infrastructure that enabled the completion of the NIMT through the Central Plateau, the Makatote Viaduct is closely connected with this wider legacy.

Amenity value, visitor experience and continued public interest

In the years following the opening of the NIMT, sustained interest in the viaduct was demonstrated by the numerous feature articles and photographs.[97] The two recuring themes were the scenic wonder and the technical achievement, often mentioned in the same breathless sentence. Superlatives – 'highest,' 'longest,' and 'most striking' - abound.

The *Marlborough Express* described a journey taken by rail in 1910:

> As the train rolls over the Makatote Viaduct, the sunlight throws a clear-cut shadow in the gulf 260 feet below, and the engine-men, raising their eye, see the dazzling glory of snowclad Ruapehu. Cool it looks —so cool and quiet—and they are hot and filled with the clamour of effort and speed.[98]

In 1909 the *Taranaki Herald* wrote that "The Makatote Viaduct…is certainly the most striking on the line…"[99] and in 1913 the *Auckland Star* enthused that "One of the finest sights in the North Island is obtained when you stand on the Makatote Viaduct…"[100]

As one of the county's recent great achievements, the viaduct was proudly presented to visiting dignitaries. Field Marshal Lord Kitchener visited New Zealand in 1910 at the invitation of the New Zealand government to advise on the country's military defences. He toured the country accompanied by Prime Minister Sir

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[93] Nicholas Bayley, "Aspects of the Economic History of Whanganui Māori in the Whanganui Inquiry District (Wai 903) 1880-2000." Waitangi Tribunal, September 2007, 30, **https://forms.justice.govt.nz/search/Documents/WT/wt_DOC_93872513/Wai%20903%2C%20A145.pdf**

[94] Bayley, "Aspects of the Economic History of Whanganui Māori (Wai 903)," 73; Craig Innes, "Māori population trends in the Whanganui inquiry district 1880-1945, A scoping exercise." Report commissioned by the Waitangi Tribunal for the Whanganui (Wai 903) district inquiry, October 2006, 12, **https://forms.justice.govt.nz/search/Documents/WT/wt_DOC_94584190/Wai%20903%2C%20A082.pdf**

[95] "Vogel's legacy," Ministry for Culture and Heritage, updated 30 April 2018, **https://nzhistory.govt.nz/politics/the-vogel-era/vogels-legacy**; "Māori land loss, 1860-2000," Ministry for Culture and Heritage, updated 21 April 2021, **https://nzhistory.govt.nz/media/interactive/maori-land-1860-2000**.

[96] Kerryn Pollock, "King Country region - Population and society," Te Ara - the Encyclopedia of New Zealand, accessed 6 July 2022, **http://www.TeAra.govt.nz/en/king-country-region/page-7**

[97] *Otago Witness*, 19 August 1908, p54, **https://paperspast.natlib.govt.nz/newspapers/otago-witness/1908/08/19/54**; "Testing Makatote Viaduct," *Evening Post*, 26 June 1912, p15, **https://paperspast.natlib.govt.nz/newspapers/EP19120626.2.128.2**; "One the North Island main trunk," *New Zealand Herald*, 24 November 1930 p12 (supplement), **https://paperspast.natlib.govt.nz/newspapers/NZH19301124.2.168.29.1**; "Mountain bush and railway," *Manawatu Standard*, 28 February, 1936, p6, **https://paperspast.natlib.govt.nz/newspapers/MS19360228.2.51.1**; "The Makatote Viaduct," *New Zealand Herald*, 8 August 1936, **https://paperspast.natlib.govt.nz/newspapers/NZH19360808.2.167.3.1**

[98] "Southward Ho! Through Blenheim," *Marlborough Express*, 18 June 1910, p2, **https://paperspast.natlib.govt.nz/newspapers/MEX19100618.2.3**

[99] "Main trunk railway," *Taranaki Herald*, 31 August 1909, p4, **https://paperspast.natlib.govt.nz/newspapers/TH19090831.2.72**

[100] "Waimarino forest," *Auckland Star*, 9 April 1913, p8, **https://paperspast.natlib.govt.nz/newspapers/AS19130409.2.88**

Joseph Ward and members of the Defence Council. The party travelled from Wellington to Auckland by train and stopped to pose for a photo on the Makatote Viaduct.[101]

In 1912 the *Evening Post* produced a multi-page feature "Ten years of the Main Trunk: wealth from the wilderness. A country in the making."[102] Mention of the Makatote Viaduct is couched within a narrative of colonial advancement, national progress and the civilisation of nature.

> There were several big viaducts, including Makatote, the largest on the whole line, several tunnels…awkward hills to surmount at a reasonable grade, and a forest to be pierced for miles along. It was the new spirit abroad – the spirit of 'get busy' and 'get it done' – that conquered the wilderness.[103]

Potted histories of the NIMT and commemoration of anniversaries connected with its construction abound in the newspapers.[104] Where technical praise is given the Makatote Viaduct often attracted special mention as a "remarkable feat of construction."[105] Newspaper pictorial travel features also continued to celebrate the Makatote Viaduct. In 1936 the *Auckland Star* published images of scenic features along the NIMT and described the Makatote Viaduct as a

> wonderful framework of steel…the highest bridge in the North Island…[across which] nightly thunder the expresses, carrying passengers who, in the comfortable sleepers of steam-heated carriages, little think of the skill and daring of the engineers who planned and brought the railway up here, through a maze of bush, to connect North and South by links of shining steel.[106]

In a pictorial feature of 1938, the Makatote Viaduct is "a symphony in latticed steel."[107]

Anniversary celebrations

New Zealand Railways celebrated the 50th anniversary of the opening of the NIMT in 1958. Commemorative activities included a half-hour radio documentary "Main Trunk" produced by the New Zealand broadcasting Service,[108] and a short National Film Unit picture "The Silver Spike,"[109] which includes footage of a train crossing the Makatote Viaduct. The Railways Department produced an anniversary edition of their NIMT brochure and selected the Makatote Viaduct to feature on the cover. A programme of activities was held in

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[101] "Lord Kitchener in the heart of the North Island," *New Zealand Herald*, 2 March 1910, p9, **https://paperspast.natlib.govt.nz/newspapers/NZH19100302.2.95.1**

[102] "Ten years of the Main Trunk," *Evening Post*, 26 June 1912, p13, **https://paperspast.natlib.govt.nz/newspapers/evening-post/1912/06/26/13**.

[103] "Steady progress at the start," *Evening Post*, 26 June 1912, p15, **https://paperspast.natlib.govt.nz/newspapers/EP19120626.2.128**

[104] Some examples include: "Main Trunk History," *New Zealand Herald* 24 November 1930, p2, **https://paperspast.natlib.govt.nz/newspapers/NZH19301124.2.168.4**; "Main Trunk Line," *King Country Chronicle*, 7 November 1931, p5, **https://paperspast.natlib.govt.nz/newspapers/KCC19311107.2.36**; "Linking two cities," *New Zealand Herald* 3 August 1933, p6, **https://paperspast.natlib.govt.nz/newspapers/NZH19330803.2.26**

[105] "Main trunk railway," *Ellesmere Guardian*, 20 February 1934, p2, **https://paperspast.natlib.govt.nz/newspapers/EG19340220.2.7**

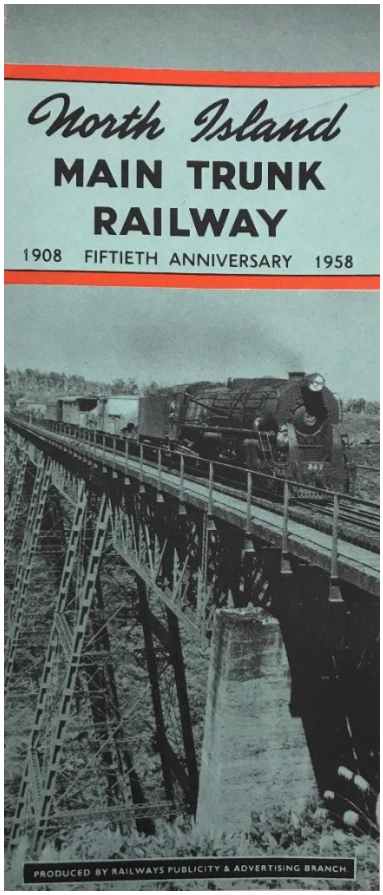
[106] "Along the Main Trunk: Mid-Island scenery," *Auckland Star*, 22 February 1936, p1 (supplement), **https://paperspast.natlib.govt.nz/newspapers/auckland-star/1936/02/22/29**

[107] "A symphony in latticed steel," *Auckland Star*, 24 September 1938, p1 (supplement), **https://paperspast.natlib.govt.nz/newspapers/AS19380924.2.165.4**

[108] "Main Trunk," 1958, Nga Taonga Ref: 27537, **https://www.ngataonga.org.nz/collections/catalogue/catalogue-item?record_id=217471**

[109] Pictorial Parade No. 81 (1958), National Film Unit, **https://www.youtube.com/watch?v=PFhHTgP3ZTQ**

Ohakune, and official guests arrived by train from Auckland and Wellington. The Minister of Railways unveiled a plaque commemorating the completion of the line. Other social functions included a hangi, evening film screenings and a dance. The Railways Department supplied copy and advertising to all the major newspapers. Many of the newspapers published celebratory articles about the NIMT focused on the importance and impact of the railway and the engineering challenge of its construction. However, a number of articles also comment on the uncertain future for rail in the face of increasing competition from road and air.[110]



North Island Main Trunk Railway. Fiftieth anniversary, 1908-1958 brochure. National Library Ref: Eph-A-RAIL-1950s.

The 75th anniversary celebrations had a local focus and included rail enthusiasts as a major audience. The commemoration was a joint event organised by the New Zealand Railways, Steam Incorporated and the Railway Enthusiasts' Society. Special vintage trains brought railway enthusiasts from Wellington and Auckland, and students from Ruapehu College staged a re-enactment of the driving of the last spike. As well as rail enthusiasts, the guests included local dignitaries and current and past railways staff.[111]

The centenary in 2008 was marked with commemorative train journeys and local festivities.[112] New Zealand Post produced a set of five stamps commemorating the centenary, one of which featured the Makatote

[110] Archives New Zealand, R21513005, folder: "Commemoration of 50th Anniversary completion of North Island Main Trunk Railway and purchase of Wellington and Manawatu Railway."

[111] Archives New Zealand file, R21904144, folder: "75th Anniversary Celebrations - Driving of last Spike of North Island Main Trunk Railway 6 November 1983."

[112] "North Island Main Trunk centenary," 6 August 2008, Beehive.govt.nz, https://www.beehive.govt.nz/speech/north-island-main-trunk-centenary; Graeme Carter, "Commemorating the last spike," New Zealand railway observer, n.292 (Dec 2008/Jan 2009): 181-182; Erika Currie, "All

Viaduct.[113] The centenary celebrations focused on rail as heritage and featured steam trains for some commemorative passenger programmes. Good public attendance at commemorative events and the enthusiastic involvement of rail societies demonstrated the continued interest in the NIMT and its engineering features, including Makatote.

Image courtesy of NZ Post, 2008 North Island Main Trunk Line Centenary stamp issue.

Passenger services

When it first opened, the NIMT transformed the way people and goods travelled through the North Island. Rail passenger numbers grew from 3.5 million in 1895 to 13.3 million in 1913 and freight carried rose from 2 million tonnes to 3.9 million tonnes over the same period.[114] Although road and air travel now dominate, the NIMT and the Makatote Viaduct is still a key part of New Zealand's transport infrastructure.

Daylight services, to allow passengers to see the sights of the Central Plateau including the Makatote Viaduct ran intermittently from 1925.[115] Patronage was not strong enough to continue the service through the winter months. Between 1929 -1941 and again from 1950, daylight services ran during summer holiday weekends.[116] New Zealand Railways produced brochures for NIMT passengers on daylight services describing the route and its special engineering features - "lofty steel viaducts – Makatote (258ft. high), Taonui (111ft.) and Hapuawhenua (149ft.) – are outstanding feats of engineering."[117] The *New Zealand Railways Magazine* (1926-1940) also regularly featured the Makatote Viaduct.[118]

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aboard in friendly Feilding," *Heritage matters*, n.18 (Autumn 2009): 22-26; "Steam Week attracts worldwide attention," *Manawatū Standard*, 31 January 2009, https://www.stuff.co.nz/manawatu-standard/news/614039/Steam-Week-attracts-worldwide-attention

[113] "North Island Main Trunk Line centenary stamps," Ministry for Culture and Heritage, updated 3 February 2021, https://nzhistory.govt.nz/media/interactive/nimt-stamps

[114] "Makatote Viaduct," Ministry for Culture and Heritage, updated 21 September 2021, https://nzhistory.govt.nz/media/photo/makatote-viaduct

[115] The Daylight Limited commenced in 1925.

[116] Pierre, *North Island main trunk*, 255.

[117] "Daylight 'Limited' Express North Island," c.1948. Archives New Zealand, R21512773, folder: North Island Main Trunk Railway

[118] *New Zealand Railways Magazine*: Volume 2, Issue 9 (January 1, 1928); Volume 3, Issue 3 (July 2, 1928); Volume 6, Issue 6 (December 1, 1931); Volume 4, Issue 11 (June 1, 1933); Volume 11, Issue 6 (September 1, 1936); Volume 14, Issue 2 (May 1, 1939).

Daylight Limited Express northbound Makatote Viaduct K941 from south bank, October 1949. Photographer: J.F. Le Cren. and R.A.O. Morgan. Archives New Zealand: Item Code: R25562770.

Rail services throughout New Zealand declined in the second half of the twentieth century and most long-haul passenger services were withdrawn.[119] The NIMT held on with a reduced timetable and was rebranded with an emphasis on capturing the tourist market. With a focus on tourism, promoting the line's special features such as Makatote, as part of the experience of traveling by rail became more important than ever. Recent news articles[120] demonstrate the continued popularity of the Makatote Viaduct among rail travellers, and of the NIMT as an internationally notable rail journey. The articles describe Makatote as an "engineering feat"[121] and "internationally renowned."[122]

The Makatote Viaduct has also long been admired from dedicated viewpoints by people travelling by road. In 1914 the Makatote Scenic Reserve was established at the northern end of the viaduct to provide travellers and picnic goers with a convenient and safe spot from which to view the viaduct. [123] Recent reviews on Trip Advisor from both local and international visitors, experiencing the viaduct from these

[119] Neill Atkinson, "Railways - Rail transformed," Te Ara - the Encyclopedia of New Zealand, accessed 6 July 2022, http://www.TeAra.govt.nz/en/railways/page-11

[120] Bess Manson, "The Great Northern explorers: From Wellington to Auckland," 10 January 2021, accessed 7 July 2022, https://www.stuff.co.nz/travel/experiences/train-journeys/300174415/the-great-northern-explorers-from-wellington-to-auckland

[121] Katrina Lobley, "Meet the mysterious train expert behind the successful website seat61.com," 1 August 2019, accessed 7 July 2022, https://www.stuff.co.nz/travel/114718471/meet-the-mysterious-train-expert-behind-successful-website-seat61com

[122] Matthew Martin, "Rail trips to Ruapehu feature spectacular landscapes, engineering triumphs, and tourism packages," 21 March 2022, accessed 7 July 2022, https://www.stuff.co.nz/national/300546065/rail-trips-to-ruapehu-feature-spectacular-landscapes-engineering-triumphs-and-tourism-packages

[123] Archives New Zealand, folder: "Wellington Land District - North Island Main Trunk Railway - Preservation of Bush Scenery - Includes Makatote Scenic Reserve," R12051172.

roadside viewpoints, describe the viaduct as an "Awesome sight to behold,"[124] "Magnificent,"[125] and an "Amazing feat of engineering."[126]

Heritage recognition

The Makatote Viaduct has drawn wide recognition and praise. Engineering heritage specialist, Geoffrey Thornton, wrote that "without doubt the Makatote Viaduct is an engineering masterpiece of its time, a truly impressive structure built in harmony with its bush environment."[127]

In 1997 the American Society of Civil Engineers awarded the NIMT its International Historic Civil Engineering Landmark Award in recognition of the engineering achievement of the structures in the challenging Central Plateau section.[128]

Heritage New Zealand Pouhere Taonga listed the viaduct in 2009 as a Category 1 historic place[129] and it featured as part of their North Island Main Trunk Line Centenary Project, 2008-09. As part of this celebration, an IPENZ (now Engineering New Zealand) plaque was also unveiled in February 2009. The plaque is set in a large stone in the viewing area off SH4 on the southern side of the viaduct.

The IPENZ plaque at the viewing area off SH4 on the southern side of the viaduct. Photo: Karen Astwood, February 2013.

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[124] 'Carol J', Palmerston North NZ, reviewed 12 September 2020, Trip Advisor, https://www.tripadvisor.co.nz/ShowUserReviews-g8113379-d12282320-r769836858-Makatote_Viaduct-Ohau_Manawatu_Wanganui_Region_North_Island.html

[125] Lynda G, Plymouth, England, UK, Reviewed 15 June 2018, Trip Advisor, https://www.tripadvisor.co.nz/ShowUserReviews-g8113379-d12282320-r769836858-Makatote_Viaduct-Ohau_Manawatu_Wanganui_Region_North_Island.html

[126] Julie O, UK, Reviewed 22 October 2019, Trip Advisor, https://www.tripadvisor.co.nz/ShowUserReviews-g8113379-d12282320-r769836858-Makatote_Viaduct-Ohau_Manawatu_Wanganui_Region_North_Island.html

[127] Geoffrey Thornton, *Bridging the gap*, p159

[128] "North Island Main Trunk Railway," American Society of Civil Engineers, accessed 7 July 2022, https://www.asce.org/about-civil-engineering/history-and-heritage/historic-landmarks/north-island-main-trunk-railway

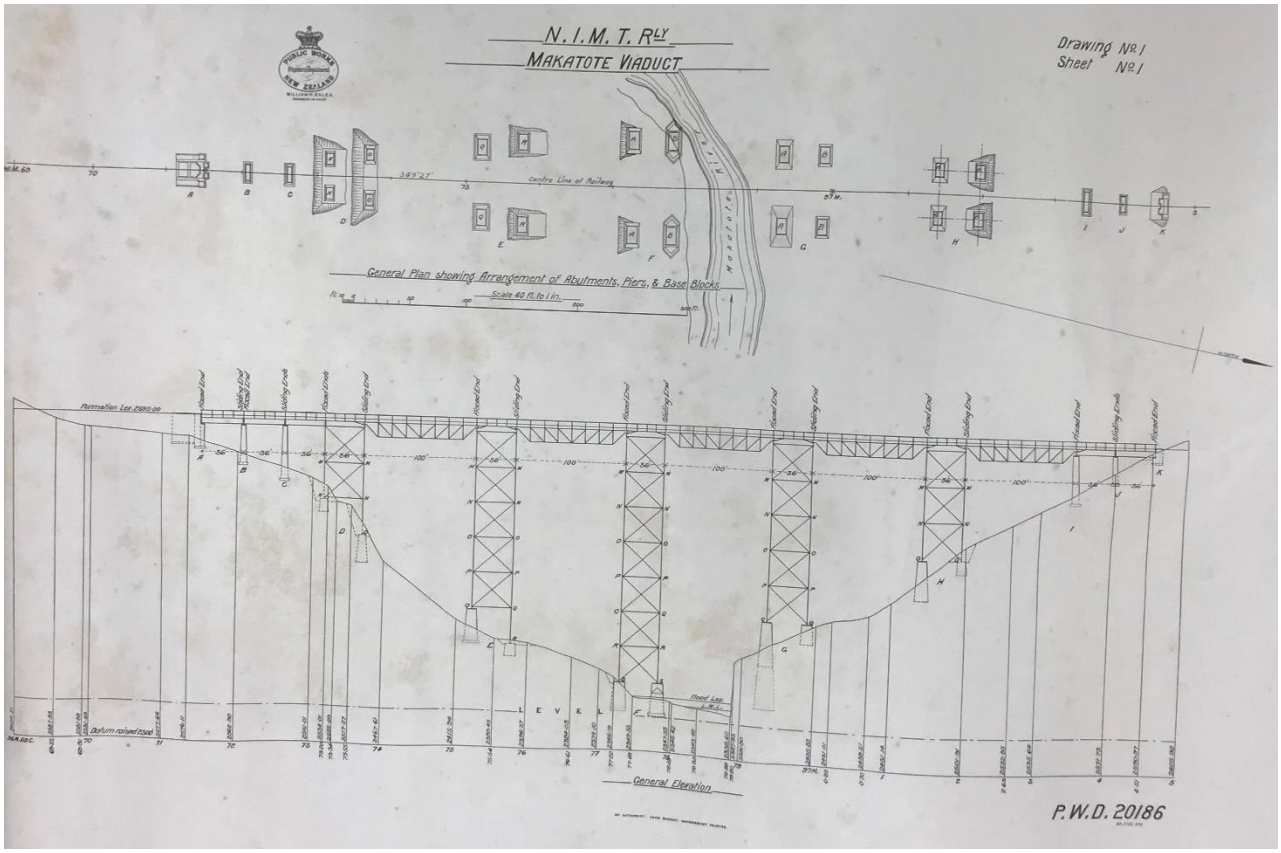
[129] "Makatote Viaduct," Heritage New Zealand List number 7778, https://www.heritage.org.nz/the-list/details/7778

PHYSICAL NARRATIVE

Description

The Makatote Viaduct spans the Makatote river that runs through a deep gorge from the western slopes of Mt Ruapehu. The viaduct is 78.6 metres high and 262 metres long and is of steel truss design.

The viaduct has 11 piers, supporting ten steel spans. Piers 1-3 and 9-11 are concrete pillars and piers 4-8 are steel towers on concrete foundations. The concrete pillars support two leaf steel plate girder spans of 11 metres and the steel towers support five steel Pratt truss spans of 30.5 metres.[130]



Archives New Zealand, R16564617. J and A Anderson – Makatde [?] Viaduct, North Island Main Trunk [NIMT] Railway.

[130] Thornton, *Bridging the Gap*, 158-9; Fran Loader, "Makatote Viaduct," KiwiRail heritage assessment, 8 March 2011.

Fabric and design

The Makatote Viaduct follows developments in material and design in Europe and the United States. From the 1870s steel was affordable and readily available. Its high tensile strength allowed engineers to design structures with longer spans. In Europe, Gustave Eiffel and his associates designed steel viaducts of truss design with a central supporting arch. The most well-know of these is the Garabit Viaduct in France, completed 1884.[131] The technique and design principles developed by Eiffel are also most famously on display in the 300-metre-high Eiffel Tower (1889).

Railway viaducts need to be able to carry heavy loads. Truss designs and the use of steel became a popular design solution. Makatote Viaduct along with others on the NIMT conform to the classic North American steel trestle pattern. The fabric and design of the viaduct are characteristic of the period, but the scale and the challenging topography in which it was built make it a unique and outstanding example.[132] At the time of its construction Makatote was the highest viaduct in New Zealand.[133] It was surpassed in 1937 by the Mohaka Viaduct in the Hawke's Bay on the Napier to Gisborne line, and again in 1981 by the North Rangitikei Viaduct, constructed as part of the NIMT's Mangaweka Deviation.

Upgrades and modifications

The Makatote Viaduct sits in an exposed environment almost 800m above sea level. Over the years it has been subject to snowstorms, floods and severe gales. The structure is currently in good condition, a repair and strengthening project having been completed in 2016.

Maintenance, strengthening and minor modification over the decades have ensured that the viaduct retains its viability as a functioning rail bridge. This work has not compromised the original form of the structure and much of the original fabric remains.

During the period 1925 to 1932 all bridges and viaducts along the NIMT were checked and, where necessary, strengthened to enable them to carry the new heavier class of locomotive, weighing up to 140 tons and having maximum axleloads of 14 tons, then being introduced.[134] The Makatote Viaduct's truss spans were strengthened at this time. It is unclear exactly what this work involved but may have included new rolled-steel joists and strengthening of the floor beams.[135]

In 1959 the viaduct was given a full abrasive blast and repainted with a red lead primer and two coats of a MIO alkyd build and finish coat.[136] The original 1908 finish on the steel and ironwork was coats of haematite paint.[137]

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[131] Kenneth Frampton, *Modern architecture: a critical history* (London: Thames and Hudson, 1985), 36; "Garabit Viaduct (1884)" Bridges of Dublin, accessed 11 July 2022, http://www.bridgesofdublin.ie/bridge-building/famous-bridges/garabit-viaduct-1884

[132] Karen Astwood, "Registration Report for a Historic Place: Makatote Viaduct," (Heritage New Zealand Pouhere Taonga, 2009), 8.

[133] Kerryn Pollock, "King Country region - Transport and infrastructure," Te Ara - the Encyclopedia of New Zealand, accessed 5 August 2022, http://www.TeAra.govt.nz/en/photograph/34904/north-island-main-trunk-line-building-the-makatote-viaduct-1906

[134] Karen Astwood, "Registration Report for a Historic Place: Makatote Viaduct," (Heritage New Zealand Pouhere Taonga, 2009), 13.

[135] "Railways Statement by the Minister of Railways, the Hon. W. A. Veitch," Appendix to the Journals of the House of Representatives, 1931, Session I-II, D-02, pxxxiv, https://atojs.natlib.govt.nz/cgi-bin/atojs?a=d&d=AJHR1931-I-II.2.2.2.2&cl=&srpos=0&e=-------10--1------0--

[136] G. Matthews, M. Keenan, D. Jansen, "Refurbishment of the Makatote Viaduct, New Zealand," *Corrosion & Materials*, August 2017,54.

[137] Jupp, "Great Makatote Viaduct," 55.

Strengthening work on some of the piers was undertaken in the early 1980s. Concern about the risk of scour damage to the footing of pier 6/F prompted work to underpin this pier in 1982.[138] Two new 1800mm cylinders were inserted into the 1907 footings closest to the river.[139] Piers 3/C & 9/I were also strengthened at this time, with the addition of reinforced caps and stressing cables installed for seismic resilience.[140]

The central section of the NIMT was electrified between 1984-1988. Makatote Viaduct was strengthened in 1986 to take the greater axleloads of 18 tonnes and higher tractive forces of the electric locomotives. The way beams which supported the track were completely replaced at this time and steel brackets fitted on one side of the viaduct to carry the concrete electrification masts. [141]

Piers 4 and 5 were given a partial paint touch up in 1997 "using a spot abrasive blast and full overcoat with moisture cured urethane."[142]

Between May 2006 and February 2007 Pier 7/G was underpinned to protect the structure from scour of the stream bed. This was the same pier that had caused delay during construction due to the instability of the ground encountered during the initial excavation. The remedial work to stabilise the pier involved the construction of new piles to take the load from the affected pier legs. Two large diameter bored piles, supporting a 3m deep x 35m long post-tensioned concrete cross beam was installed alongside the pier legs. To ensure the longitudinal stability of the pier, the cross beam was secured to surrounding ground beams.[143] The work cost $4.2 million and was a collaborative venture between ONTRACK, Fulton Hogan Ltd and specialist engineering consultants.[144] The project won the Roading & Transport Award and the Building & Construction Award at the 2007 New Zealand Engineering Excellence Awards.[145] The judging panel considered the work to show "world best-practice in retrofitting…and a fine example of engineering excellence."[146]

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[138] Ibid.

[139] Karen Astwood, "Registration Report for a Historic Place: Makatote Viaduct," (Heritage New Zealand Pouhere Taonga, 2009), 15.

[140] G. Matthews, M. Keenan, D. Jansen, "Refurbishment of the Makatote Viaduct, New Zealand," *Corrosion & Materials*, August 2017, 54.

[141] Karen Astwood, "Registration Report for a Historic Place: Makatote Viaduct," (Heritage New Zealand Pouhere Taonga, 2009), 15.

[142] Matthews, Keenan, and Jansen, "Refurbishment of the Makatote Viaduct, New Zealand," Corrosion & Materials, August 2017, 54.

[143] Matthews, Keenan, and Jansen, "Refurbishment of the Makatote Viaduct, New Zealand," Corrosion & Materials, August 2017, 54; "Makatote Viaduct," Novare Design, accessed 11 July 2022, **https://www.novaredesign.com/makatote-viaduct**; Peter Wissel, Alastair Blackler, Walter Rushbrook, Matthew Callaghan, "Makatote Viaduct – underpinning pier 7: challenging nature with a collaborative approach," New Zealand Concrete Industry conference 2007 paper, **https://cdn.ymaws.com/concretenz.org.nz/resource/resmgr/docs/conf/2007/s5_p2_wissel_blackler_rushbr.pdf**

[144] "Makatote Viaduct – Underpinning Pier 7," *Concrete*, Vol 51: 4 (December 2007): 1-2.

[145] The New Zealand Engineering Excellence Awards are hosted by a consortium of five partners and 10 contributing organisations. The partners are: Centre for Advanced Engineering (CAE); Association of Local Government Engineering New Zealand Incorporated (INGENIUM); Electricity Engineers Association of New Zealand (EEA); Association of Consulting Engineers New Zealand (ACENZ); and the Institution of Professional Engineers New Zealand Inc (IPENZ).

[146] "Makatote Viaduct Claims Two NZ Engineering Awards," 22 November 2007, **https://www.scoop.co.nz/stories/BU0711/S00450.htm**

Showing the new piles and crossbeam. Photo: "Makatote Viaduct – Underpinning Pier 7," Concrete, Vol 51: 4 (December 2007): 1.

Repair, strengthening and repainting work was carried out in 2014-2016. Lead-based paint, applied in the late 1950s, had deteriorated and parts of the structure had suffered corrosion. A desire to future-proof the structure by increasing its live load capacity was a further prompt for the 2015 project. Opus International Consultants designed the project and the work was completed by TBS Farnsworth. Physical works started in September 2014 and were completed by October 2016. The old paint was removed, and 15,300 litres of new paint applied. The steelwork was repaired and strengthened, and the live load capacity upgraded. The work cost $13m.[147] The project was recognised by the Institution of Structural Engineers (UK) at their 2017 awards ceremony in London. Judges praised the care taken to maintain heritage values. With new tension rods hidden behind existing members the live load capacity of the structure was increased without changing its original look.[148]

[147] "Makatote Viaduct's massive $13m refurbishment," *Contractor*, March 2017.

[148] "Viaduct strengthening work wins award," *Whanganui Chronicle*, 21 November 2017; " Rejuvenation of the heritage Makatote rail viaduct," The Institution of Structural Engineers, accessed 11 July 2022, **https://www.istructe.org/structuralawards/winners/structural-heritage/2017/rejuvenation-of-the-heritage-makatote-rail-viaduct**

Showing the scaffolding in place during the 2014-2016 restoration work. The 1959 coat of red lead primer was removed, and the piers covered during this process to prevent lead escaping into the environment. Photo: K. Astwood, 26 November 2015.

Key physical dates

Mid-1906	Construction began with the clearing of the bush and the excavation for the piers
1906, August	Northern side concrete and pier footings poured so that work could begin on erecting the steel piers.
1906, Autumn	Andersons factory set up
1906, 25 June	Steel fabrication begins
1908, 4 June	Last girder placed
1908, 3 August	Rail track laid
1925 –1932	Viaduct strengthened to carry the new heaver class of locomotive
1959	All steelwork repainted with a micaceous iron oxide topcoat
1982	Pier 6/F underpinned and piers 3/C & 9/I strengthened
1986	Viaduct strengthened and modified to take electric locomotives
1997	Piers 4 and 5 partially repainted
2006–2007	Pier 7/G underpinned to protect the structure from scour of the stream bed.
2014–2016	Refurbishment work, including strengthening and repainting

ASSESSMENT OF SIGNIFICANCE

The Makatote Viaduct is widely recognised as one of New Zealand's most impressive and special engineering structures. This monumental viaduct enabled the completion of the NIMT, a railway that has had significant and lasting economic and social impact. The construction of the line was one of the most ambitious government projects then undertaken. It created a direct link between Wellington and Auckland, changed the way goods and passengers moved around the country and spearheaded other infrastructure such as telegraph lines. As the government intended, the NIMT prised open the King Country and changed demographic and land use patterns in the North Island.

The Makatote Viaduct is an outstanding technical achievement. The fabric and design are characteristic of the period, but the scale and the challenging topography in which it was built make it a unique and outstanding example. At the time of its construction the viaduct was the highest on the NIMT. The contractor, Andersons Ltd., overcame the difficult site access by building a workshop and manufacturing the steelwork onsite. Another innovation was the use of the Blondin to manoeuvre the steelwork into place, a technique which drew much attention.

As well as its association with Anderson's Ltd., a firm which played an important role in New Zealand's engineering history, the viaduct is also connected with other significant New Zealand figures including Wahanui Huatare, Rewi Maniapoto, John Rochfort and Peter Seton Hay.

Makatote Viaduct drew huge public attention at the time of its construction and in the decades following has been celebrated as an icon of the NIMT. Continued interest in the viaduct is demonstrated through numerous photographs, news and magazine articles and visitor accounts. Writing about the viaduct recognises its aesthetic, emotive and technical appeal.

The viaduct has withstood decades of use within a harsh environment. It is still an essential structure on the NIMT and repairs and maintenance have continued to keep it functional and fit for purpose. It continues to provide an important amenity value. Strengthening projects have received international praise. The Makatote Viaduct is recognised nationally and internationally for its historic, technical and social values.

Therefore, Makatote Viaduct is of sufficient engineering heritage to merit inclusion on the Engineering New Zealand Engineering Heritage Register.

SUPPORTING INFORMATION

List of supporting information

Heritage New Zealand. "Makatote Viaduct." Heritage New Zealand List number 7778, https://www.heritage.org.nz/the-list/details/7778

BIBLIOGRAPHY

Published sources

Atkinson, Neill. "Railways." Te Ara - the Encyclopedia of New Zealand, accessed 4 July 2022. https://teara.govt.nz/en/railways

Atkinson, Neill. "The Vogel era." Ministry for Culture and Heritage, updated 5 August 2014. https://nzhistory.govt.nz/politics/the-vogel-era

Atkinson, Neil. *Trainland: how railways made New Zealand*. Auckland: Random House, 2007.

American Society of Civil Engineers. "North Island Main Trunk Railway." Accessed 7 July 2022. https://www.asce.org/about-civil-engineering/history-and-heritage/historic-landmarks/north-island-main-trunk-railway

Anderson, H. B. *The day's run*. Christchurch: Caxton Press, 1977.

Andersons. *100 years, being an account of the founding, development & progress of Andersons: 1850-1950*. Christchurch: Caxton, 1950.

Beehive.govt.nz. "North Island Main Trunk centenary." 6 August 2008. https://www.beehive.govt.nz/speech/north-island-main-trunk-centenary

Bridges of Dublin. "Garabit Viaduct (1884)." http://www.bridgesofdublin.ie/bridge-building/famous-bridges/garabit-viaduct-1884

Carter, G.T. "Andersons Limited – a builder and user of railways," *The New Zealand Railway Observer*, Vol 51, no 2 (Winter 1994) 43-44.

Carter, Graeme, "Commemorating the last spike," *New Zealand railway observer*, n.292 (Dec 2008/Jan 2009): 181-182.

Currie, Erika. "All aboard in friendly Feilding," *Heritage matters*, n.18 (Autumn 2009): 22-26; "Steam Week attracts worldwide attention," *Manawatū Standard*, 31 January 2009. https://www.stuff.co.nz/manawatu-standard/news/614039/Steam-Week-attracts-worldwide-attention

Fletcher, R.S. *Single track: the construction of the North Island Main Trunk Railway*. Auckland: Collins, 1978.

Frampton, Kenneth. *Modern architecture: a critical history*. London: Thames and Hudson, 1985.

George, Merrilyn. *Ohakune: opening to a new world*. Ohakune: Kapai Enterprises, 1990.

Henare, Manuka. “Wahanui Huatare,” Dictionary of New Zealand Biography, first published in 1993, Te Ara - the Encyclopedia of New Zealand, accessed 6 July 2022. https://teara.govt.nz/en/biographies/2w2/wahanui-huatare

Henare, Manuka. “Maniapoto, Rewi Manga.” Dictionary of New Zealand Biography, first published in 1990. Te Ara - the Encyclopedia of New Zealand, accessed 6 July 2022. https://teara.govt.nz/en/biographies/1m8/maniapoto-rewi-manga

Institution of Structural Engineers. “Rejuvenation of the heritage Makatote rail viaduct.” Accessed 11 July 2022, https://www.istructe.org/structuralawards/winners/structural-heritage/2017/rejuvenation-of-the-heritage-makatote-rail-viaduct

Jupp, Graeme. “Constructing the Great Makatote Viaduct 1905-1908.” *New Zealand Railfan*, September 2008.

Loader, Fran. “Makatote Viaduct.” KiwiRail heritage assessment, 8 March 2011.

Lobley, Katrina. “Meet the mysterious train expert behind the successful website seat61.com.” 1 August 2019. Accessed 7 July 2022. https://www.stuff.co.nz/travel/114718471/meet-the-mysterious-train-expert-behind-successful-website-seat61com

Lowe, Peter. “Anderson, John.” Dictionary of New Zealand Biography, first published in 1990. Te Ara - the Encyclopedia of New Zealand. Accessed 31 May 2022. https://teara.govt.nz/en/biographies/1a6/anderson-john

Lowe, Peter. “Hay, Peter Seton.” Dictionary of New Zealand Biography, first published in 1993. Te Ara - the Encyclopedia of New Zealand. Accessed 4 July 2022. https://teara.govt.nz/en/biographies/2h24/hay-peter-seton

Lowe, Peter. “Holmes, Robert West.” Dictionary of New Zealand Biography, first published in 1993, Te Ara - the Encyclopedia of New Zealand. Accessed 17 June 2022. https://teara.govt.nz/en/biographies/2h46/holmes-robert-west

“Makatote Viaduct’s massive $13m refurbishment.” *Contractor*, March 2017.

“Makatote Viaduct – Underpinning Pier 7.” *Concrete*, Vol 51: 4 (December 2007): 1-2.

Mahuta, R.T. “Tāwhiao, Tūkāroto Matutaera Pōtatau Te Wherowhero.” Dictionary of New Zealand Biography, first published in 1993, updated July 2011. Accessed 6 July 2022, Te Ara - the Encyclopedia of New Zealand. https://teara.govt.nz/en/biographies/2t14/tawhiao-tukaroto-matutaera-potatau-te-wherowhero

Manson, Bess. “The Great Northern explorers: From Wellington to Auckland.” 10 January 2021. Accessed 7 July 2022. https://www.stuff.co.nz/travel/experiences/train-journeys/300174415/the-great-northern-explorers-from-wellington-to-auckland

Martin, Matthew. “Rail trips to Ruapehu feature spectacular landscapes, engineering triumphs, and tourism packages.” 21 March 2022. Accessed 7 July 2022. https://www.stuff.co.nz/national/300546065/rail-trips-to-ruapehu-feature-spectacular-landscapes-engineering-triumphs-and-tourism-packages

Matthews, G., M. Keenan, and D. Jansen. “Refurbishment of the Makatote Viaduct, New Zealand.” *Corrosion & Materials*, August 2017, 54-60.

Ministry for Culture and Heritage. “Makatote Viaduct.” Updated 21 September 2021. https://nzhistory.govt.nz/media/photo/makatote-viaduct

Ministry for Culture and Heritage. “Māori land loss, 1860-2000.” Updated 21 April 2021. https://nzhistory.govt.nz/media/interactive/maori-land-1860-2000

Ministry for Culture and Heritage. “North Island Main Trunk Line centenary stamps.” Updated 3 February 2021. https://nzhistory.govt.nz/media/interactive/nimt-stamps

Museum of New Zealand Te Papa Tongarewa. “Railway spike.” https://collections.tepapa.govt.nz/object/212434

Pierre, Bill. *North Island main trunk: an illustrated history*. Wellington: Reed, 1981.

Pollock, Kerryn. “King Country region” Te Ara - the Encyclopedia of New Zealand. Accessed 4 May 2022. http://www.TeAra.govt.nz/en/king-country-region

Thornton, Geoffrey. *Bridging the gap: early bridges in New Zealand 1830-1939*. Auckland: Reed, 2001.

Scoop. “Makatote Viaduct Claims Two NZ Engineering Awards.” 22 November 2007. https://www.scoop.co.nz/stories/BU0711/S00450.htm

Wissel, Peter, Alastair Blackler, Walter Rushbrook and Matthew Callaghan. “Makatote Viaduct – underpinning pier 7: challenging nature with a collaborative approach,” New Zealand Concrete Industry conference 2007 paper. https://cdn.ymaws.com/concretenz.org.nz/resource/resmgr/docs/conf/2007/s5_p2_wissel_blackler_rushbr.pdf

Wright, Matthew. *New Zealand’s Engineering Heritage 1870-2000.* Auckland: Reed, 1999.

“Viaduct strengthening work wins award.” *Whanganui Chronicle*. 21 November 2017.

Appendix to the Journals of the House of Representatives

1884, Session I, D-05 “Main Trunk Line, Auckland to Wellington (Reports on) Central Route.” https://atojs.natlib.govt.nz/cgi-bin/atojs?a=d&d=AJHR1884-I.2.2.2.5&e=-------10--1------0Rochfort--1884

1884, Session II, I-06 “Report of the select committee appointed to consider and report on the best route for the North Island Main Trunk Railway: together with minutes of proceedings and evidence and appendix.” https://atojs.natlib.govt.nz/cgi-bin/atojs?a=d&d=AJHR1884-II.2.2.4.9&pg=1&e=-------10--1------0--

1885, Session I, D-06 “The North Island Trunk Railway (Report on the ceremony of turning the first sod of), at Puni, 15 April, 1885.” https://atojs.natlib.govt.nz/cgi-bin/atojs?a=d&d=AJHR1885-I.2.2.2.11&e=-------10--1------0--

1886, Session I, D-01	"Public Works Statement, by the Minister for Public Works, the Hon. Edward Richardson, 25th June, 1886." https://atojs.natlib.govt.nz/cgi-bin/atojs?a=d&d=AJHR1886-I.2.2.2.1&cl=&srpos=0&e=-------10--1------0--
1905 Session I, D-01	"Public Works Statement by the Hon. W. Hall-Jones, Minister for Public Works, 29 August, 1905." https://atojs.natlib.govt.nz/cgi-bin/atojs?a=d&d=AJHR1905-I.2.3.2.1&cl=&srpos=0&e=-------10--1------0--&st=1
1908, Session I, D-01	"Public Works Statement, 22 September 1908." https://atojs.natlib.govt.nz/cgi-bin/atojs?a=d&d=AJHR1908-I.2.3.2.1&pg=1&e=-------10--1------0--
1931, Session I-II, D-02	"Railways Statement by the Minister of Railways, the Hon. W. A. Veitch." https://atojs.natlib.govt.nz/cgi-bin/atojs?a=d&d=AJHR1931-I-II.2.2.2.2&cl=&srpos=0&e=-------10--1------0--

PapersPast

Auckland Star: 9 April 1913, 22 February 1936, 24 September 1938

Ellesmere Guardian: 20 February 1934

Evening Post: 27 May 1903, 16 July 1906, 28 June 1907, 13 February 1908, 26 June 1912

Grey River Argus: 11 April 1096

Hawera & Normanby Star: 11 November 1908

King Country Chronicle: 7 November 1931

Lyttelton Times: 20 February 1905, 5 June 1908

Manawatu Standard: 13 November 1906, 8 July 1908, 10 August 1908, 28 February 1936

Marlborough Express: 18 June 1910

New Zealand Graphic: 22 June 1907

New Zealand Herald: 24 August 1906, 7 November 1908, 2 March 1910, 24 November 1930, 3 August 1933, 8 August 1936

New Zealand Mail: 12 July 1905

New Zealand Times: 3 April 1906, 8 August 1908

Otago Witness: 19 August 1908

Press: 2 October 1906, 9 November 1908

Star: 7 August 1908

Taranaki Herald: 8 June 1908, 31 August 1909

Waikato Argus: 7 November 1908

Wanganui Herald: 6 July 1905, 25 February 1909

Waitangi Tribunal

Cleaver, Philip. "The taking of Māori land for public works in the Whanganui Inquiry District: 1850-2000." (Wai 903, A57). https://forms.justice.govt.nz/search/Documents/WT/wt_DOC_94586563/Wai%20903%2C%20A057.pdf

Bayley, Nicholas. "Aspects of the Economic History of Whanganui Māori in the Whanganui Inquiry District (Wai 903) 1880-2000." Waitangi Tribunal, September 2007. https://forms.justice.govt.nz/search/Documents/WT/wt_DOC_93872513/Wai%20903%2C%20A145.pdf

Innes, Craig. "Māori population trends in the Whanganui inquiry district 1880-1945, A scoping exercise." Report commissioned by the Waitangi Tribunal for the Whanganui (Wai 903) district inquiry, October 2006. https://forms.justice.govt.nz/search/Documents/WT/wt_DOC_94584190/Wai%20903%2C%20A082.pdf

"The Pouakani Report 1993 Part 1." (Wai 33). https://forms.justice.govt.nz/search/Documents/WT/wt_DOC_68466828/Pouakani%201993%20Part1.pdf

Unpublished sources

Astwood, Karen. "Registration Report for a Historic Place: Makatote Viaduct." Heritage New Zealand Pouhere Taonga, 2009.

Keller, Peter. "Early days on railway construction." Alexander Turnbull Library, MS-Papers-1073.

Pictorial Parade No. 81 (1958). National Film Unit. https://www.youtube.com/watch?v=PFhHTgP3ZTQ

Ngā Taonga Sound & Vision

"Main Trunk." 1958. Ngā Taonga Ref: 27537.
https://www.ngataonga.org.nz/collections/catalogue/catalogue-item?record_id=217471

Archives New Zealand

R21513005 Folder: "Commemoration of 50th Anniversary completion of North Island Main Trunk Railway and purchase of Wellington and Manawatu Railway."

Years: 1958 – 1983

R21512773 Folder: "North Island Main Trunk Railway."

Years: 1949 – 1976

R21904144 Folder: "75th Anniversary Celebrations - Driving of last Spike of North Island Main Trunk Railway 6 November 1983."

Years: 1908 – 1988

R12051172 Folder: "Wellington land district – preservation of Bush Scenery – Including Makatote Scenic reserve."

Years: 1904 – 1959