NEWSLETTER - NOVEMBER 2009

Contents:

1. EASTERN COURIER ARTICLE SEPTEMBER 4TH 2009

PAKURANGA/PANMURE SWING BRIDGE RESTORATION

Grateful acknowledgements to Matt Bowen and the Eastern Courier.

Harking back to bridge's good old days

By Matt Bowen

A skeletal tribute to corrosion is all that remains of Pakuranga's once grand swing bridge.

But a dedicated group of historians, engineers and Manukau City Council staff are pulling strings to preserve what remains of this structure on the banks of the Tamaki River.

The bridge was commissioned then opened in 1866 to replace the rickety old punt ferrying people across to Panmure. Its star feature was a 40ft section that was manually opened to allow ships through.

Its glory days however are long gone – a council commissioned condition report completed in March says the salty environs have taken their toll.

"It's clearly of great cultural significance within the Auckland area, nationally and possibly internationally," the report says.

"The bridge will require remedial work and stabilisation to prevent ongoing deterioration," the report says.

"Unless this is done in the short term the continued decay will result in further loss of material and significantly compromise the structure's heritage values."

Auckland's engineering heritage committee chairman John La Roche says 143 years ago it was one of Auckland's largest structures.

"We think it's very important to preserve. It's a very early structure and the circular rail turning mechanism underneath the bridge is still there although badly deteriorated."

Stakeholders engaged in a "very amicable" meeting recently to discuss the next step in the project. But Mr La Roche says no decision was made about who would pay for what.

"Those are issues that need to be resolved. We have to get costs and reports then lay them at the feet of the people who we hope will give us some money."

The structure is scheduled in the city council's district plan as being of heritage value and an application to the Historic Places Trust is being prepared.

Council heritage and urban design specialist Richard Knott says ultimately responsibility for any swing bridge project lies with their property department because they own it.

"I think properties are currently trying to work out what money they may have in the budget to put towards it And obviously it's competing against other council properties."

A timeframe of five years has been suggested to complete preservation work to coincide with the 150th anniversary of the bridge opening.

Engineering heritage: John La Roche and others are working to stop the swing bridge deteriorating further.

Photo: MATT BOWEN

Glory days: The Pakuranga/Panmure swing bridge in its heyday.

2. ENGINEERING HERITAGE CONFERENCE

3rd Australian Engineering Heritage Conference to be held in Dunedin in 2009

Engineering in the Development of a Region – Heritage and History

Salmond College, University Of Otago, Dunedin, New Zealand 22–25 November 2009

Planning for this biennial event is well advanced with many registrations already received from New Zealand, Australia and UK delegates.

An excellent range of papers on engineering achievements and their effects on communities and people's lives will be presented during the conference sessions on 23–24 November.

Conference Themes and Topics are listed on the IPENZ web site (see link below).

Seven keynote speakers will make presentations to the conference, including Sir Neil Cossons, former Chair of English Heritage, who will also give a public lecture.

More than 25 authors have submitted papers for presentation.

Topics of papers range from exploring the future of personal mobile and GPS devices for advocacy and education in heritage engineering, to engineers in history and the importance of archives. Others cover the management and use of historic sites and industrial landscapes including the monitoring, analysis and management of historic structures; timber milling and gold mining; construction of the Waitaki and Manapouri Hydro-electric power stations; irrigation schemes and dams; railways.

The conference has 123 registrations. Registrations have now closed.

3. THE FLOATING CRANE HIKITIA

This crane is normally birthed close to Te Papa Museum. It is believed to be the only true ship crane as contrasted to barge mounted cranes in working order in the world today. The name Hikitia means "to lift" in the Maori language.

Description

The ship platform was built by Fleming and Ferguson of Paisley, Scotland, in 1926. She measures 48.58m in overall length with a beam of 15.88m and a moulded depth of 3.44m. It is a twin screw vessel driven by two compound surface condensing direct drive engines which were supplied with steam from a coal fired Scotch boiler with two furnaces. A similar but oil fired boiler replaced the original boiler in 1963. In 1980 this was also removed and the present two small modern package boilers were installed.

The crane, which is a separate unit mounted on the flat deck, was built by Sir William Arrol and Co of Glasgow. It was designed to lift 80 tons at 15m radius but bettered this on test by 25%. The crane can lift 60 tons at 19.5m and 15 tons at 22.5m. The speed of lift at 80 tons is 1.2m per minute, at 40 tons is 2.4m per minute, at 25 tons is 3.6m per minute and at 15 tons is 7.2m per minute. The crane weighs 310 tons and at a radius of 19.5m the maximum height of the hook above water is 28.5m.

The ships displacement is recorded in the International Register of Historic Ships as 926 tonnes.

The vessel is piloted from a small bridge on the deck and the crane controlled from a room high on the tower.

No modifications have been made other than to the boilers as mentioned above.

This ship crane made a notable journey under its own power from Scotland to New Zealand. It encountered stormy weather, particularly in the Pacific ocean, but proved to be a good sea boat. The journey took 82 days as her speed was limited to 7.5 knots (approx. 15kph). She arrived in Wellington on the 21 December 1926. This journey was made with the crane jib in place. It was usual to stow the jib on the deck as was done in the case of its sister ship. This may have been a world record journey for such a vessel with jib in place.

Service

After a brief inspection on the patent slip she entered service with Wellington Harbour Board. Duties included constructing wharves, erecting navigation lights around the harbour and many heavy lifts from cargo ships including railway locomotives and equipment for the Maui platform. She lifted many sunken fishing boats and sadly was involved in heavy lifting in connection with the removal of the sunken Ferry Wahine which sank in the harbour on the 10th April 1968 consequent upon damage suffered in a violent storm as she entered the harbour. The busiest time was during WW II when demands for heavy lifting were great.

By mid 1980 the Hikitea became surplus to the requirements of the Wellington Harbour Board and was laid up and offered for sale. It was finally purchased by Hikitea Heavy Lift Ltd on 12th April 1990 for preservation and to be retained as a working machine. Having been laid up for some years the Hikitea was in need of much maintenance. The new owners with a small band of supporters substantially restored the upper structure. Because the hull had not been surveyed it was considered a barge and was not permitted to be self propelled though the propulsion machinery was all intact. From 1990 to 2006 close to 300 lifts were carried out including in September 2004 a test lift of 100 tonne to maintain the survey limit of 80 tonne. In March 2006 ownership passed to the Maritime Heritage Trust of Wellington, a fully incorporated Charitable trust. The trust aims to retain the vessel as a working ship to continue to demonstrate the purpose for which it was built and to earn income towards its upkeep. Funds have been raised from various charities to enable the ship to be docked and a full survey done and all necessary remedial work completed. It is now hoped that permission can be given for it to be again self propelled.

References

1. Wellington Maritime Museum. Fact sheet no.20. “The floating Crane Hikitea”
2. Hikitea – A brief History by Geoff Bennett.

3. Wellington Harbour - By David Johnson.
4. Maritime Heritage Trust of Wellington.

4. THE KELBURNE CABLE CAR

History

The first organised European settlement of Wellington commenced in 1840. The available flat land for development was very limited and by 1898 was substantially taken up. This led to the formation of the Upland Estate Company in that year. Transport was limited to horses. The directors of this Company recognised that they would need to provide some more convenient means of transport and so formed the Kelburne & Karori Tramway Company with the object of building a cable car system to give access to the hill tops. Mr James Fulton, a Consulting Engineer, was commissioned to design the system. Interestingly he was one of the first Professional Engineers to be trained in New Zealand and to have his qualification recognised overseas by the Institution of Civil Engineers of Great Britain. Cable car technology was then only 40 years old.

Construction commenced in 1899. Prison labour was used in the construction. On the 22nd of February 1902 the system commenced operation. During the first year of operation 425,000 passengers were carried. The demand was so great that in 1903 horse drawn trams of 1882 were converted as trailers and were coupled to the uphill side of the grip cars. In 1933 the propulsion was converted from steam to electric haulage. In 1974 as a consequence of an accident the inspecting authority ordered the removal of the trailers and shortly after the system was taken out of service in preparation for the installation of a new system.

In 1993 after much pressure from residents the Council agreed to preserve the original winding house as a museum, a decision the Council have never regretted.

Description

The system was comprised of a double track of 1,050mm gauge set at 2.7m centres on which ran two cars. The cars were connected by a balance rope which passed around a horizontal bull wheel at the top of the tracks. A separate continuous rope was driven by a steam engine and coal fired boiler. The down car gripped this rope at the commencement of a journey and this in turn pulled the up car up by the balance rope thus preventing this rope becoming slack. Thus the system was not a pure cable car system but a combination cable car and funicular railway system. Three braking systems were provided, conventional wheel shoe brakes, wooden shoes pressing on the rail and a calliper system which gripped a centre rail and was operated by a hand wheel. The length was 608m and the rise 119m. The line was straight, on a consistent grade of 5.1 with a level section at each end. It included three tunnels each 79m in length and

three viaducts. The operating speed was 4.38m/sec and the acceleration 0.36m/sec/sec. The winding machinery was located alongside the track at the top of the incline. This consisted of a traction wheel 3m diameter driven by a compound steam engine through a cast pinion and spur gear. These gears were replaced at an early stage machined helical gear wheel and pinion. A second engine was provided as a standby, and either was engaged by sliding the traction wheel shaft along the bed plate 30mm. This was arranged that at the mid position both pinions were meshing so that the steam engines maintained control of the rope. The gear ratios were 6.3 to 1 and 6.27 to 1 as one engine was more powerful than the other.

There was an idler wheel, and a tensioning wheel mounted on a carriage. The driving rope passed around the traction wheel in a vee groove, then around the idler wheel which was tilted 1 degree so that the rope fed into a second vee groove and again around the traction wheel and so around the idler wheel and then around the tensioner wheel and back around the idler and so four times around the traction wheel. Thus 720 degrees of wrap were obtained on the traction wheel. The rope then went out under the street around two pulleys through 180 degrees, down the centre of the first track around a bull wheel at the bottom, back up the centre of the second track round two pulleys through 180 degrees and back into the winding room.

The rope was 75mm circumference, plough steel, lang lay 6/7 construction with a breaking load of 31.5 tonnes. Three cars were provided, two in service and a spare to facilitate servicing. The grip cars weighed 4.06 tonnes and the trailers 2.29 tonnes.

The traction rope was reversed at the end of each journey and stopped at each intermediate stop in response to a signal from either driver, initially by means of cranking a telephone magneto connected to the engine room by pantographs and overhead cables.

The system was converted to electric traction in1934. The original gear and traction wheels and roping were retained. The provision for transferring from one motor to another was retained. Two 150hp 730rpm 400volt B.T.H. slip ring induction motors were provided in place of the steam engines and these were coupled to the pinions through two David Brown 200hp, 730/206rpm reduction gear boxes with integral electrically operated shoe brakes. Change over switches enabled either motor to be coupled to either controller with interlocks so that all switches have to be in correct sequence before the OCB could be closed. The motors were controlled from the cars through a pantograph system and "up down and off switches" in each car. Both car switches had to be set in the appropriate direction before the motor would respond. There were also track over-ride switches and over-speed switches on each motor.

Museum

The maintenance room and winding room have been preserved and converted to a museum which is open daily with free admission. One grip car and trailer have been preserved as taken out of service and one grip car restored to its original condition. The winding gear has been restored except that the rope runs around a pulley in the original tunnel leading to the street.

This system is operated by a 15hp motor driving through a vee belt pulley fitted to the shaft of one of the motors in place of the original slip rings. The control gear in service at the time of closure is preserved but not in service.

5. KAIKOURA COAST ROUTE, A SEA-LEVEL MOUNTAIN RAILWAY AND ROAD

New Zealand's latest phase of mountain-building is known, with good cause, as the Kaikoura Orogeny. These mountains are an expression of crustal crumpling as the Pacific Tectonic Plate is pushed against the Indian Plate. Their counterpart is an extremely deep trench a short distance offshore. The Kaikoura Mountains are still rising, at a rate of around 5 mm a year, as the flat wave-cut surface of the Kaikoura Peninsula (behind the township of that name) attests.

Overland routes between the Marlborough Province in the north and the centre east of the South Island (Canterbury Plains) were sought from 1849. A practicable route was found via the Wairau River (which the train crosses as it leaves the hills a few miles south of Picton) and across passes at its headwaters far inland at the main divide between the east and west coast rivers' catchments. Any route that way would have had some 60 miles at an elevation above 3,000 ft above sea level including two passes between large river valleys. In 1852 a coastal route was tried for, 1500 ewes being driven south. At the rockiest points south of the Clarence River, each animal had to be carried on shepherds' shoulders over the rocks and around to the next beach.

A bridle path from Blenheim to Kaikoura was cut for horses, with a ferry over the Clarence River, this opening in 1865. Kaikoura gained a coach road from the south via an inland route in 1887, which was extended along the bridle path northward, to open as a through route in 1890. There matters might have rested, as land suitable for grazing sheep was occupied by squatters who were content with the status quo. Their only significant freight needs were to send out the wool clip and to bring in supplies each year. Coastal shipping could anchor off a suitable beach for that purpose.

As part of his 1870 immigration and public works programme, colonial Treasurer Julius Vogel envisaged rail connection between the main settlements of each main Island. In the upper South Island, a giant X of routes to reach Christchurch, Greymouth in Westland, Nelson, and Blenheim, meeting well up the Wairau River was considered possible. Engineers of the Public Works Department explored possible routes from 1874 until 1883, when a Royal Commission heard evidence on the subject. The Commission decided that the big X was impracticable because of the length of it at high altitude, winter conditions, and because there was minimal traffic potential en route. They decided a rail line along the eastern coast was the best option to link Blenheim and Christchurch. Nelson never got to be connected by rail to anywhere significant and Greymouth was reached via the direct route you will travel later in this tour.

Railway building began early, at Picton. John Brogden and Sons had the contract to build the first section, which opened to the outskirts of Blenheim in 1875. Progress from there was slow, with Seddon, across the Awatere River and 35 miles from Picton, only being reached in 1902.

Land reform was initiated during the 1890s. Squatters were occupying large areas in both Islands, blocking expansion of more intensive forms of farming. The invention of the centrifugal cream separator in 1874 and development of practicable refrigerated transport by sea from 1882 provided great potential for growth of food exports when New Zealand was in a long, severe depression. A Liberal government enacted compulsory purchase of squatters' holdings, thus breaking an impasse. In both North Canterbury and in Marlborough, surveys to break up large estates into smaller arable farms included setting aside land for practicable routes for railways to serve the transport needs of those new farms. At the end of 1915, the northern and southern railheads had progressed as far as 56 miles and 85 miles respectively. A gap down the coast and inland to Parnassus of some 77 miles remained.

Progress after the First World War was even slower. Work only commenced in 1925 and it was not until two years later that the present coastal route south from Kaikoura was

decided upon as the best option. In the meantime, work began on clothing the coastal sand dunes with marram grass, lupins and trees to stabilise them. Otherwise, completed rail formation would be buried in wind-blown sand. All this came to an abrupt halt in 1931. Men were laid off and machinery sold.

The year 1935 brought a Labour government into power, and as with President Roosevelt and his New Deal in the USA, public works were used as a means of reinvigorating the economy. Work resumed on the railway down the Kaikoura coast with a target of completing it in 1941. Workmen were given huts to live in instead of tents, YMCAs were set up, electricity was provided for lighting and for broadcasting radio receivers (but not electric irons - a housewife caught using one of those was liable to a penalty of losing electricity supply for a month). All this was geared to getting rid of the evils caused by gambling and excessive alcohol consumption in construction camps. The new Ministers had been on the wrong end of that when mining coal and working building the Otira Tunnel on the railway to the West Coast.

New construction machinery was bought, diesel powered this time. Many tunnels, mostly short had to be driven. Extensive lengths of seawalls were needed because of the narrowness of the raised ground behind beaches. Usually a seawall was built, the road moved across to it, and the rail line built under the cliffs. In places, tunnels had to be linked by substantial shelters, to further protect trains from rock falls. Completion was achieved in December 1945. I can recall travelling up to Picton from Christchurch by train within about two weeks of the opening. Eight years later, State highway 1 at the northern end of the Kaikoura coast was still a gravel road.

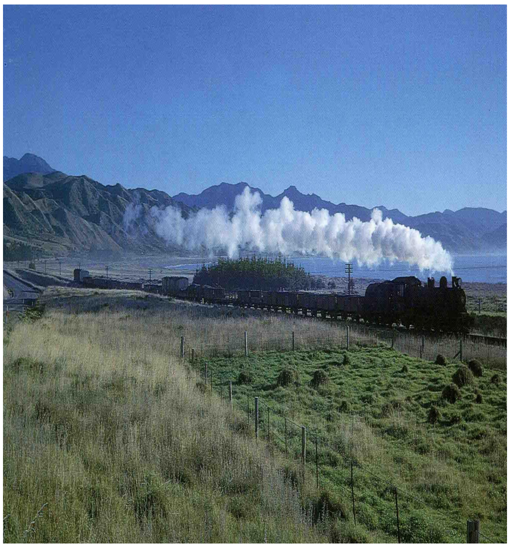
Since then, this railway and road have changed from being a minor inter-provincial link to become the prime north-south link with the North Island. The traditional ferry service was an overnight voyage between Wellington and Christchurch. Additional ferry services sailed between Wellington and Picton, and Wellington-Nelson. These minor services ceased as alternatives, notably by air, became more accessible. As coastal shipping had been affected through wartime losses of ships and other shortages, for well over 20 years railways ran an airfreight operation across Cook Strait.

This began in 1945 as a conventional operation that developed until roll off-roll on trays carried the cargo. Trays were loaded in Christchurch or Wellington and transferred on compatibly fitted rail wagons and trucks to and from the aircraft. Even complete rail wagons were transferred between Islands this way, at one stage. Begun as a desperate measure, it turned into a commercial success.

A preserved Bristol Freighter aircraft used for the Rail-air service, seen here on display at Blenheim. Note the winged locomotive symbol.

Through the 1960s, as ships had to be replaced, there was a change to the present roll on-roll off rail ferry service with Wellington-Picton becoming the main inter-Island link.

This completely altered the nature and volume of traffic up and down the Kaikoura coast, increasing both tonnages and the importance of the route.



Rob Merrifield
5 October, 2009

6. FERRYMEAD HERITAGE PARK

The two photographs show the need for railway and tunnel to link city and deepwater port. The Ferrymead Branch extended from the triangular junction to the river just upstream to Ferrymead Bridge, as seen at right. Ferrymead Heritage Park is built around the rail line.

The beginnings of the present heritage park go back to about 1963 when the Heathcote County Council, encouraged by railway and tramway preservation organisations, bought 100 acres of land now used as Ferrymead Heritage Park. The site took in the formation of the first steam railway in New Zealand, a branch off the main line between Christchurch city and its port of Lyttelton.

The Ferrymead Branch became necessary because of the difficulty of trans-shipping goods from the deepwater port to the new city. Christchurch was established as a settlement in 1850. Within ten years the need for a railway had been argued through, the advice of the Stephenson family had been received, and the little settlement of 12,000 people was on its way to building a tunnel and railway to their port using the Indian gauge (5'-6"). The contract to build these was let on 16 April, 1861. The first sod was turned at Ferrymead, on 17 July. The branch line was needed so materials and rolling stock could be brought in for the construction works. The first engine steamed on 17 November, 1863, and the branch line officially opened on 1 December. Its gauge had become 5'-3" because the contractor was able to get the first locomotive cheaper by buying it from the near-bankrupt Melbourne & Essendine Railway, in Victoria, Australia. Some 74 miles of broad gauge lines were built before gauge conversion to 3'-6", which was completed in December 1878. For nearly 90 years the Ferrymead branch formation stood empty in the midst of swampy fields.

The railway centenary of 1963 and the coming end of steam locomotion on NZR concentrated the attention of the community on Ferrymead. In that year, at the behest of Christchurch Jaycees and transport enthusiasts, the local County Council bought the 100 acres the present complex is built on. Railway track-laying began on site from 1965

and the Tramway Historical Society (THS) moved their rolling stock and equipment to the site in 1967. All else of the pioneer town and other facilities have been brought to the site since. A large number of interests and societies are housed on site under an umbrella Trust.

The pioneer village is a fully working town, set mainly in the Edwardian period. I can thoroughly recommend the baker's shop, for instance! Numerous museum buildings around the village cater for many interests. Aircraft, fire engines, other vehicles, models, all are on display, for example. Part of the heritage electrical equipment is a walk-through substation that displays the mercury arc rectifiers that are providing DC traction power for the electric railway, the street tramway, and trolley buses.

The first locomotive to run on the present Ferrymead Railway (FR) steamed there on 11 March, 1967. Since then, bigger tender engines have gone off site for restoration and main line running under the control of related organisations. There is a permanent connection to Kiwirail's main line, across which rolling stock is inter-changed.

FR has concentrated on restoring rolling stock for use on its own line, which extends from the main line junction to Ferrymead station, site of the original railway wharf. Passenger trains run between Ferrymead and Moorhouse station, at the pioneer village. The latest major achievement has been to electrify this at 1500 volts DC. FR has mainly smaller steam locomotives that came from industrial use or date from pre-WW I, including the first locomotive built in NZR's own workshops, W 192, a 37 ton 2-6-2T built in 1889. Examples of all DC electric locomotives and of earlier diesel ones are held. The Diesel Traction Group has recently finished overhauling an English Electric 750 h.p. locomotive and a diesel railcar of 1939 for a celebration weekend based on Dunedin's Taieri Gorge Railway at the end of this October. The heritage train comprises four-wheeled rolling stock from the 1870s beautifully restored. Work is proceeding on restoring some of NZR's earliest bogie carriages.

The next big project, which is at the funds-raising stage, is to build a national rail museum across the yards from Moorhouse station building.

THS has built an electric tramway about a mile long paralleling the FR and based on vehicles used in the streets of Christchurch. After an initial period restoring vehicles in the Christchurch Transport Board workshops, THS moved on site in 1967. Operations opened on 6 January, 1968, using the last of the city's eight Kitson steam motors to haul trailers that saw through the whole of the steam and electric tram eras. The tramway is now fully electrified, with trams leaving from Ferrymead station to go to a loop around the streets of Moorhouse and return. Amongst the trams working at Ferrymead is Christchurch No. 1, originally built in New York in 1905. The New Zealand trams operating on the city centre heritage tramway have all been restored at Ferrymead. Others are being worked on, or await their turn.

Rob Merrifield
10 October, 2009

7. CHRISTCHURCH TRAMWAYS

Christchurch had the most extensive electric street tramway in New Zealand, some 54 route miles when at its maximum length. It began to develop in 1880 when a standard gauge line was built from the city's railway station to its central square at the Anglican cathedral. Five, later eight, Kitson steam tram motors hauled double-decked trailers. (The steam tram motors continued on odd duties through the electric era, and one – the only operational Kitson in the world – survives in use today at Ferrymead). Horses were also extensively used. Three companies built and operated the network in the 19th century.

In 1903 a Tramway Board was established and it set about electrifying and extending the system. The first electric line, to Papanui, opened in 1905. It took about ten years to electrify all the steam operated routes. Because of the low density of settlement along many lines, and the extensive use of bicycles in the flat terrain, the Christchurch Tramways did not enjoy the financial security of the other large city tramways in the pre-motorcar era, and were always a shoestring operation. The extensive use of trailers was an unusual feature of the system. Most of the Victorian rolling stock continued in use throughout the electric era, and indeed two such items survived the closure in 1954. The last new line was built in 1922, and abandonments of low-density routes started in 1930.

Nevertheless, the Tramway Board was quite progressive. The first electric trams had heaters, air brakes, and other features not seen elsewhere in NZ for some years after. In 1922 a fleet of powerful 4-motor cars with automatic acceleration, in advance of anything in other NZ cities, was introduced. (These cars were later converted to 'single-ended' configuration, unique in NZ, and No. 178 is now in daily service on the Christchurch Tramway.) The Board was also an early adopter of trolleybuses, in 1931.

The last original Christchurch electric tram line closed in 1954 and all the electric trams were dismantled, their metal parts scrapped and their wooden bodies sold for use as sheds and seaside or mountain holiday accommodation.

In 1960 a group of visionary young men began collecting all the equipment they could with the object of again being able to run trams "somewhere, sometime". They were inspired by what was being done overseas to preserve operational trams. Sympathetic people in the management of the Christchurch Transport Board (formerly Tramway Board) were willing to help. In 1964 the Tramway Historical Society (THS), as the group became named, ran the surviving single-deck horse tram to give the public rides on a short stretch of remaining tram track at Papanui. The resulting publicity established the Society as a major player in the Christchurch heritage preservation scene.

The THS was a founding participant in the Ferrymead Historic (now Heritage) Park, and were able to build an electric tramway route that paralleled the railway rebuilt on the formation of New Zealand's first steam operated railway. From those beginnings both Ferrymead's park and the tramway have grown.

Slowly, over the years, a number of former Christchurch trams were restored to operational condition. There are several more in the back of the workshop awaiting, or under restoration. As Ferrymead Tramway matured, more visionary thoughts began to emerge. What if a tramway could be re-established in the central city?

A very professional sales pitch was made to the City Council, proposing a circular route around Christchurch's most historic sites. The proposal was accepted for its enhancement of the city and as a strong tourist attraction. Aided by a city planner who belonged to the THS, the proposal worked its way through formal approval processes, despite objections that ranged to irrational. Its construction was co-ordinated with

construction of the Worcester pedestrian mall at the Arts Centre, west of Christchurch's central square, and the Cathedral Junction shopping arcade.

The present Christchurch tramway opened in 1995, with joyous celebrations. The City Council built the fixed equipment, electrical and track. THS provided trams restored at Ferrymead for operation, including No. 11, a little four-wheeler from Dunedin. All were restored to a definite time in their operational lives and the liveries are authentic. The fleet used here now includes two ex-Melbourne trams, one of which is fitted for use as a travelling restaurant in the evenings. Day to day operation and marketing are by a large New Zealand tourist operator. One tram driver, a retired university lecturer, makes his own bow ties, having become quite an expert on these!

The central city tramway was the first new operation to be licensed under present national rail safety regulations. At present an extension is being built through another pedestrian mall. Eventually, the extension will provide a streetcar circulator-type service to the City's polytechnic campus, more than doubling the length of the tramway. The trams will operate in a figure of eight, including the 1995 route.

Rob Merrifield
6 October, 2009

8. TAMAKI RIVER BRIDGE, PANMURE

The original Panmure Bridge

The first bridge across the Tamaki River at Panmure was a very early example of a swing span bridge. It was built in 1864-65 with a 40 foot swing and connected the important outpost of Howick to Panmure and Auckland.

Fencible settlements had been established by the New Zealand Government in 1847 at Howick, Panmure, Otahuhu and Onehunga, as outposts to protect Auckland from a possible Maori attack from the south. "The Fencibles" were retired soldiers from Britain and Ireland who were given land and a cottage in return for being available to defend Auckland.

In 1857 local residents petitioned the Auckland Provincial Council for a bridge. The Tamaki River Bridge was designed by Mr W R Collett under direction of William Weaver, Engineer in Chief to the Auckland Provincial Government from 1864 to 1868. It was 576 feet long and 21 feet wide and was fabricated from wrought iron by P N Russell & Co in Sydney before being shipped to Auckland. The abutments were made from bluestone blocks brought from Melbourne, each weighing one and a half to two tons. The bridge had 18 fixed spans and the opening span which provided 40 feet of clear waterway for ships to pass.

There was considerable difficulty in obtaining the totara timber piles of up to the necessary 65 feet in length. These in turn had to be sheathed in Muntz metal (brass, 60% copper and 40% zinc) to prevent the attack of teredo worms.

Foundations for the bridge at the eastern abutment under the swinging span were also difficult, requiring excavation to 14 feet below the bed of the river using a cofferdam. The ground conditions were particularly difficult changing from silt to hard blue clay and rock within a short depth.

John La Roche

9. WATER FROM THE WAITAKERES - UPPER NIHOTUPU DAM

Although there was much talk about water from the Waitakere Ranges, it was a water crisis in 1898 that forced the Auckland City Council to act.

The NZ Observer Newspaper refers to Council procrastination in January 1898 — "*To allay the public alarm, and that something usually takes the form of a series of pleasant picnics to all the creeks and water falls within a radius of thirty miles. They gaze upon the beauties of nature and discuss the gastronomic charm of succulent ham sandwiches washed down with libations of sparkling champagne, as they lie a-basking in the sun after the exertions of climbing to the falls.*"

Various schemes to bring Waitakere water to the city were proposed and investigated by the Council. To meet the water crisis after a gift of land in Titirangi for part of the pipeline route, a 30 foot (9 m) high timber dam was built near the Nihotupu falls to provide a temporary supply to Western Springs from 1902. This dam was demolished in 1914 during the building of the present Upper Nihotupu dam. A smaller dam was also built on Quinns Creek to provide additional water. From this time the Council adopted a policy of future planning to provide water for an ever growing city.

Although the completion in 1910 of the first permanent water supply dam at Waitakere was a great relief, earlier in 1909 it was obvious to Waterworks Engineer James Carlaw that more water would soon be required and a permanent supply from Nihotupu was the next choice.

The steep country through which the temporary pipeline was constructed was prone to slips and disruption of supply.

Type	Gravity Mass Concrete
Maximum height dam completed 1923	165 feet (25.3 m)
Length of dam	275 feet (162 m)
Reservoir Storage	520,000,000 gallons (2,363,000 m3)

Tunnels under ridges were dug shortening the pipe length by 4 kilometres and reducing its vulnerability. A 2 foot gauge tramline (now used by Watercare's Rain Forest Express) was laid for the installation of the 24 inch (609 mm) cast iron pipes imported from Britain.

Walter Bush, City Engineer, favoured a site north of Piha Road where he considered an earth dam could be built with good storage capacity. Henry Metcalfe (1851 - 1918) consulting engineer was engaged to report on Bush's proposals, found foundation difficulties at this site favouring of a concrete dam further down the valley just above the main Nihotupu Falls. After further reports Bush designed the present Upper Nihotupu dam.

Tenders were called in 1915 and Gisborne firm, Langlands and Company were awarded the contract. Supplies were brought by boat to a special wharf and storage hoppers at Big Muddy Creek. A tramline was constructed up the valley to —The Incline, a steep assent where trucks were hauled up to the pipeline track by a steam-powered hauler.

A quarry site for aggregate was cleared at the head of the reservoir and a tramline constructed to the dam site. But in March 1916 in a freak accident during blasting for this tramline, a flying rock from 100 meters away killed the Contractor, William Langlands. The contract continued under the control of Langlands' partner but progress was very slow after very heavy rain falls and flooding of the site.

Transportation of materials was delayed by washouts and tunnel collapses. World War 1 caused major shortages of men and materials.

By 1919 foundation trenches had been dug and the first concrete was poured, but the Council was increasingly concerned about the slow progress and water shortages. To provide additional water storage, James Tyler, the Assistant City Engineer designed an 18 foot (5.48 m) high concrete slab and buttress dam at the original site north of Piha Road. With rapidly increasing water consumption due to the installation of flush toilets and new consumers joining the supply there was a great need to provide additional storage of 75 million gallons (1,650,000 m^3). This dam was completed under urgency by June 1921. To provide additional water storage, James Tyler, the Assistant City Engineer designed an 18 foot (5.48 m) high concrete slab and buttress dam at the original site north of Piha Road. With rapidly increasing water consumption due to the installation of flush toilets and new consumers joining the supply there was a great need to provide additional storage of 75 million gallons (1,650,000 m^3). This dam was completed under urgency by June shortages. To provide additional water storage, James Tyler, the Assistant City Engineer designed an 18 foot (5.48 m) high concrete slab and buttress dam at the original site north of Piha Road. With rapidly increasing water consumption due to the installation of flush toilets and new consumers joining the supply there was a great need to provide additional storage of 75 million gallons (1,650,000 m^3). This dam was completed under urgency by June 1921.

Langlands' contract continued to get further behind and after a request for an extension of time in January 1921 the Council refused and took over control of the contract deciding to complete the contract with their own engineering staff and day labour. James Tyler was given the responsibility for completing the dam by 1923. He reorganised the whole contract with supply contracts for cement and sand and re-graded the tramway from Big Muddy creek replacing the wooden rails of with steel rails. He reorganised the quarry and purchased new locomotives along with other improvements.

Exceptional heavy rainfall and gales on the harbour caused difficulties but by February 1923 the last concrete had been poured and the dam was officially opened by the Hon J G Coates, Minister of Works on 14 April 1923.

John La Roche

10. LOCOMOTIVE R 28, AT REEFTON.

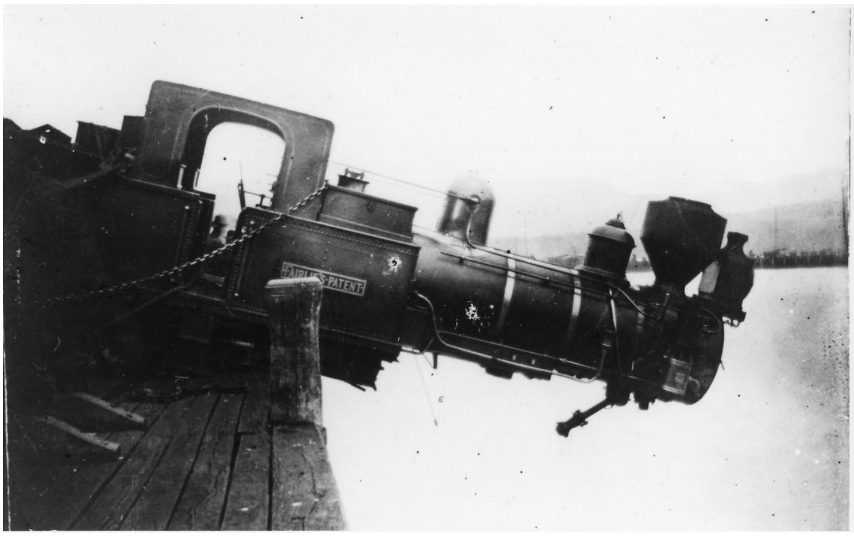
On display at Reefton are the visually complete remains of R 28, a single Fairlie locomotive built in Bristol, 1878. Fairlie patent locomotives were an early form of articulated steam locomotives intended for work under difficult conditions.

The earliest were of a double form, as seen on today's Ffestiniog Railway. Essentially, they were two locomotives in one, controlled by one crew. The first was a standard gauge engine, put to work on the Neath & Brecon Railway, in Wales in 1865. The first double Fairlie built for the Ffestiniog Railway began work in 1869, where its performance had a strong influence on the New Zealand Government's Railway Commissioners. They were on a fact-finding visit to Europe before deciding on the fundamental technical choices for a national rail system. New Zealand Railways used double Fairlie locomotives from 1872 until sometime in the First World War.

Robert Fairlie also envisaged the single Fairlie type, still with an articulated steam bogie, but otherwise more like a conventional tank locomotive. The first two were built by the Irish Great Southern Railway at its Inchicore Workshops in 1869. Another three were built 1874-6 for Welsh narrow gauge lines. All were successful. The type was built under licence in the USA until as late as 1914, some 165 engines the longest-lived of which worked until the lines using them electrified in the 1930s. In recent years the Ffestiniog Railway has built another for work on its line from Portmadoc to Blaenau Ffestiniog.

At the initial suggestion of John Carruthers, Engineer-in-Chief of the Public Works Department here, 25 single Fairlie locomotives were built in Bristol for New Zealand 1878-81. R28 was one of the earlier, lighter class. Reports of the time showed they were all well liked. They steamed well, rode well, had a roomy cab, and gave little trouble. On test 11 July 1879 an R ran at speeds up to 48 mph uphill and 53 mph downhill between Lower Hutt and Upper Hutt stations (now Wellington suburbia). Its load was ten four-wheeled vehicles, probably about 50-60 tons tare weight.

R 28 had a few adventures in its career. Soon after the general introduction of the Westinghouse brake in New Zealand, the engine was hauling a boat train out onto a finger wharf at Lyttelton, port for Christchurch. The driver mis-judged or mishandled the brake, with the result that the engine over-ran the end of the wharf. Its steam bogie fell into the sea and the coupling restrained the rest of the engine until a substantial chain could be anchored around it. R 28 was repaired and worked for NZR until 1945, when it was sold to a coal mine near Reefton. Ending work in 1959, it was placed on display in 1961. The engine is visually complete, though time, weather, and non-ferrous metals thieves have not been kind to R 28.



Rob. Merrifield

5 October, 2009

11. WESTPORT, DENNISTON, AND COAL

Denniston Incline brakehead as reconstructed.

Empty wagons came up on the outside roads, loads were lowered on the central three-rail road to maintain separation from ascending empties as they passed partway up. Concrete foundation at right was for the winding drums and hydraulic brake.

The Brunner coal measures were laid down some 34 to 46 million years ago, under conditions probably dictated by the rifting that was widening the young Tasman Sea. Some of this coal is visible in road cuttings around Charleston, south of Westport. Better quality coal was available on the Mount Rochfort Plateau, some 2,000 ft above sea level and north of Westport. First evidence of this was found by John Rochfort (who later did much survey work route-finding for the North Island Main Trunk railway line) in 1859, after a canoe capsize up the Buller River forced him to retreat back to Westport on foot. Gold had already been found in the area and was being mined. A geologist and a mining engineer explored the Plateau further in 1860. Coal was found reasonably continuously over some 40 miles parallel with the coast.

Small quantities of coal began to be shipped out of Westport from 1873. Work on a railway to connect port and mines began in 1874, funded from Julius Vogel's loans monies. It came to run some 30 miles up the coastal plain, with short branches and connections up valleys to the various mines. One such was the Conns Creek Branch, which was completed in 1879. From the terminus of this, a self-acting incline used two ropeways consecutively to lower loaded coal wagons from bins at Denniston, at the edge of the Mt Rochfort Plateau.

Its maximum gradient was 1 in 1.3 (sine of the angle of inclination) and the easiest about 1 in 7. The total fall on the incline was about 1700 ft in a horizontal distance of just over one mile. In total, some 12.6 million tons of coal was brought down the Denniston Incline 1879-1967. Peak year for traffic was 1910, when 350,000 tons of coal was transported down it. The incline could handle up to 15 wagons an hour, 120 tons of coal an hour. Closure of the incline was a consequence of the declining market for coal in NZ, deterioration of bridges carrying the incline, deterioration of the rail track, and the increasing pace of scrapping the old, low capacity wagons suited to use on the incline.

Initially, conventional open four-wheeled wagons were used, these discharging into the waiting ships from Staithes. These wagons were later fitted with fixed internal hoppers to speed their discharge. Following on from this, fixed hopper wagons were built. After much complaint about the breakage of coal into slack and dust in shipment, the idea was borrowed from Newcastle, NSW, of having a wagon with its hopper separate from the underframe, so a crane could lift the loaded hopper over ships' holds for discharge

with minimum damage to the coal, then swing the empty hopper back into the wagon frames.

For very many years, Denniston and related coal mining townships on the plateau had no road access. All goods had to come up the incline in empty coal wagons. Men, their wives and families either plodded up a track through the bush or rode the coal wagons. This last practice was highly dangerous. There were many, invariably spectacular, breakaways over the years.

The West Coast coal traffic was the last traffic on NZR where there was no Westinghouse brake on the wagons. Once away from the escarpment, the line north from Westport was effectively level. The last hopper wagons built in the traditional form were fitted with the air brake, but these were all allocated to the traffic based on Greymouth. Westport's rail link to the south, via the Buller Gorge, was only completed in 1943. Nowadays it is busy with export coal, carried from the present railhead of Ngakawau, north of Westport, to the port of Lyttelton, at Christchurch. This is a very closely managed traffic, not at all comparable with the way coal was carried to ships in the pre-1970 period.

To catch a glimpse of the traditional means of transporting coal to ships, visit Coaltown Museum at Westport. A prime exhibit in the museum is a loaded Q class removable-hopper wagon, displayed as if on the maximum gradient of the incline. All that is missing is the rush and noise of day to day operations. "Denniston's Incline" edited by Bill Prebble, on sale at Coaltown, is a very full account of this highly spectacular railway operation.

Close-up of a "loaded" wagon just leaving Denniston brakehead. Gradient here is 1 in 2.6. Photos courtesy of W W Prebble.

The Friends of the Hill have established an information centre and another museum at Denniston. Department of Conservation has been restoring both the Brakehead area at Denniston, and the Middle Brake, partway down, where wagons were handed from one rope to another. The Brakehead is visually complete including wagons, from a rail point of view, though mine buildings such as bins were completely destroyed by a fire soon after closure of the incline.

Rob Merrifield
9 October, 2009