



Bay of Plenty metro passenger service opportunities



Extract from the Hamilton and Tauranga Metro Passenger service opportunities report May 2020

Waikato & Bay of Plenty Metro Passenger Service Opportunities Report (KiwiRail)

Additional Supporting Points to the Report

This report is an extract from a bigger report that was commissioned jointly on behalf of the SmartGrowth and Futureproof partners to examine the potential for metropolitan services both in Hamilton and Tauranga under different population growth scenarios.

The extract contains advice in terms of the Tauranga network only.

The report did not address inter-regional passenger transport services.

- The scope of this project was explorative (total cost of \$12,500). The intent was to determine whether or not it was feasible to use the rail network for public transport. It is a screening tool only, not an exhaustive technical assessment. The was commissioned from KiwiRail as the rail network operator not as a professional consultant. It therefore contains technical language and jargon relevant to their business and environment. Whilst the report does not use the same language as the brief the answers provided give us the information needed to evaluate the option. As a consequence, the UFTI partners have reframed/clarified some of the language as set out in Table below.
- Demand modelling of the impact of a 50% and/or 100% increase in freight demand on the current network was not specifically modelled given the latent excess capacity of the network and the various ways increased demand may be presented i.e. Longer trains rather than additional services. However, known existing constraints i.e. single track areas creating timetabling constraints, then additional improved infrastructure is noted in the report as a result of the Metro operation. A full demand modelling exercise was beyond the scope of the commission and would require more detail to be provided to Kiwirail about station location, timetabling expectations etc.
- The exact location of rail loops to enable frequencies needs to be aligned to future customer timetable requirements. As the Client specification is not yet at this point of detailing, KiwiRail advised generic (not location specific) loop requirements and average costs. More detailed specification and costing of double tracking, level crossing improvements, strand grade separation etc is beyond the scope of the report. The UFTI economic case has taken a conservative approach and instructed Beca to assume double tracking for much of the network for the "world class" scenario.
- KiwiRail have not identified specific locations of where future rail stations may be within the Report. They advocate for stabling at or near the ends of the lines, with an emphasis on outer stations to meet customer timetabling requirements in peak times, however believe that the customer timetable and frequency requirements should be identified first by the client rather than allowing land ownership to drive decisions around station location. This makes sense as any public transport system should be designed for optimal performance not convenience as far as possible.
- The Report doesn't outline in detail how new innovative rolling stock could be possible in the future i.e. bus on rails concept. KiwiRail have noted that testing a new type of rail vehicle would be expensive, and given the scale of uncharted territory it is more a result of whether sufficient information is able to be provided to answer the network access providers and regulator's questions based on a multitude of international rail standards. This concept has yet to be demonstrated outside of trials elsewhere in the world and could take many years before it was proven safe to use in a New Zealand context.
- Given the specific scope of the work (total cost of \$12,500) detailed interventions such as specification and costing of double tracking, level crossing improvements, strand grade separation etc is beyond the scope of the report. Such detailing would be done through future business cases.
- The Maps have a specific colour key that is relevant to KiwiRail business. The yellow, blue, purple dots are KiwiRail reference points to the rail location. Given the budget for the project UFTI decided not to commission further work from KiwiRail to remove these dots or improve the quality of the maps.
- The consideration of long term resilience issues has not been included in this current report due to the specified scope. Location specific testing and costings would need to be considered through further business case work. Instead we have assumed that, as with the road operator the costs of maintaining the network will be addressed by the infrastructure operator as part of quality asset management practices.
- European Train Control System (ETCS) is becoming a requirement for existing Metro systems and it is KiwiRail's advice that this will be considered a minimum for any new Metro operation with a frequency of less than 60minutes.

Scope

In writing this report the following information was requested.

What can be accommodated on the rail network

- For the identified potential rail journeys please identify the rail infrastructure requirements and expected journey time/train speed for:
 - 15, 30 and 60 minute frequency
 - With a 50% or 100% increase in freight demand on the same network
 - Also identify whether there are suitable sites for stations already along the identified corridors and in KiwiRail ownership
- Provide initial cost estimates for additional infrastructure required at P50 level of accuracy
- The identified potential rail journeys are:
 - Te Awamutu to Hamilton CBD (and/or Frankton station)
 - Huntly-Ngaruawahia-Base-Hamilton CBD (and/or Frankton station)
 - Cambridge-Ruakura-Hamilton CBD (and/or Frankton Station)
 - Morrinsville-Ruakura-Hamilton CBD (and/or Frankton Station)
 - Omokoroa-Otumotai-Tauranga CBD
 - Paengaroa-Te Puke-Baypark-Tauranga CBD
 - A “bus on rails” service from Baypark/Bayfair to Tauranga CBD via Matapihi [**Not undertaken by KiwiRail as it has limited expertise in evaluating this option**]
 - Mt Maunganui to Tauranga CBD

KiwiRail assumptions and qualifications

The scope is not sufficiently defined. Accordingly, no meaningful cost analysis can be carried out and consequently any costs provided are no more than high-level, indicative points to enable project discussion. To achieve P50 level of accuracy, the project should define a scope and procure a separate piece of work to build a cost model against the scope, together with appropriate price risk weighting and with contingency allowed. No funding decisions should be made in reliance on the points raised.

Note:

- The scope of capital works and infrastructure requirements has not been determined
- The scope of service has not been determined: this impacts on design and consequently, required capex
- Any indicative costs provided are based on 2019 numbers, with no allowance for inflation
- No demand modelling has been undertaken or assumed
- No geotechnical costings have been undertaken
- No contingency has been allowed
- No pricing, delivery or programme risk has been allowed

Infrastructure and Rolling Stock Capex Assumptions

- Rolling Stock refurbishment, assumes design and key components would need to be submitted to market to confirm pricing

- European Train Control System (ETCS) required for any new material Metro operation ie. Beyond every 60minutes.
- New maintenance and servicing facility will be required
- KiwiRail does not have any spare locomotives or rolling stock that can be used for any Metro operation. New rolling stock will be required – typically this has a 5 year procurement timeframe.

Major discrete infrastructure is noted in the report and indicative costs may be provided separately, however unless specifically noted other costs are presented as indicative generic values not specific to a location and relate more to the infrastructure function.

While the client request was for the impact of a 50% and 100% increase in freight demand on the same network, given the latent excess capacity of the Network and the various ways increased demand may be presented ie. Longer trains rather than additional services, no explicit demand modelling was deemed necessary for this level of detailing. Network modelling is very complicated and in order to undertake modelling that would provide meaningful results the network parameters would need to be explicitly identified. However, given known existing constraints ie. Single track areas creating obvious timetabling constraints, additional improved infrastructure is noted in the report as a result of the Metro operation.

The exact location of rail loops to enable 15, 30, 60 min frequencies needs to be aligned to the customer timetable requirements. As the Client specification is not yet at this point of detailing, KiwiRail is advising of generic (not location specific) loop requirements and average costs. More detailed specification and costing of double tracking, level crossing improvements, grade separation etc is beyond the scope of the report. In general, double tracking is only required for a high frequency service ie. 15minute or less, and 30, 60minute frequencies will require significantly fewer passing loops. Such loop placement detailing, and specific location costing work is typically done through the business case process with the requisite amount of investigation / research cost associated to such a programme of works. For the economic case we have taken a conservative approach and assume double tracking for much of the network for the “world class” scenario.

KiwiRail would advocate that there is stabling at or near the ends of the lines, with an emphasis on outer stations to meet customer timetabling requirements in the morning and into the evening. As a state-owned enterprise KiwiRail manages its property interests in a commercial way and as such some KiwiRail land may be assigned for Freight / strategic purposes. At this stage of the investigation KiwiRail believes that the customer timetable and frequency requirement should be prioritised, and then what land is required to support this understood. For the purposes of a programme business case we only require estimates for the costs of a stabling facility. Land costs are assumed at market rates.

Any infrastructure costs presented assume no freight contribution to paying for the stated improvements, and that the Metro business case stands alone, even in the instance where freight demand drives the capacity constraints.

Existing planned renewals spending is not factored into any costings provided – all costings provided are in addition to what is already planned for.

Geotechnical and long-term resilience (ie.sea-level change) considerations have been explicitly excluded from KiwiRail’s representations and will require location specific costings to be applied in the business case.

Any network spending increase required for freight tonnage i.e. Over 18 tonne per axle, will be paid for outside of the any Metro costings presented.

Traction Electricity provision – while some of the routes have existing traction electricity, no investment scenario has been assumed for this to be implemented elsewhere. Unless future installation is envisaged, depending on the decision-making timeframe this could have the downside of requiring new rolling stock unless a hybrid rolling stock is procured. Provision of traction electricity requires a step change in costs as existing signalling needs to be replaced to ensure that resulting signalling is immunised from the effects of 240KV electrical field.

KiwiRail has no expertise on the 'Bus on Rails' concept and understands this is only being undertaken in limited trials overseas. It is important to be aware that each vehicle type accessing the Network undergoes significant safety assessment and would need to be compatible with all rail Network operating codes and signalling systems, to ensure that there is compatibility with other Networks users. Testing a new type of rail vehicle would be expensive and time-consuming, and as this is largely uncharted territory, no timeframe can be given. It is essential that sufficient information is provided to answer the Network Access providers and the Regulator's questions based on a multitude of international rail standards; concerning topics such as crashworthiness, fire hardiness, compatibility with signalling systems etc. As this concept has yet to be demonstrated outside of trials elsewhere in the world this could take many a significant amount of time and resource.

Inter- Regional Trains is outside the scope of this document. Any reference is only as a part of a 'world class' solution, to highlight potential public transport linkages.

New Rolling Stock price estimates

Until a specific rolling stock design is presented to the market will it be difficult to get a tighter rolling stock cost range, this is because the following factors can have a material impact on the price:

- Bespoke requirements
- Base design platform specified and design setup costs
- Currency implications
- Manufacturers production schedule (cheaper if you can get onto the end of an existing production run)
- Client design flexibility
- Number of units ordered
- Delivery timeline required
- Diesel Multiple / Electric multiple units or carriages loco hauled

Level crossings

Level crossings are presented as a current number of instances rather than the type of remediation required. This is because they vary in type and safety risk posed (which is dependent on the number and type of rail services operating). Grade separation may be required in specific instances, costings and specification is outside of the scope of this report.

	Main Road Level Crossing	Private crossing	Pedestrian crossing
Omokoroa-Otumotai-Tauranga CBD	8	6	2
Paengaroa-Te Puke-Baypark-Tauranga CBD	13	6	

Location specific points to be aware of:

Tauranga Metro

The Tauranga Harbour bridge has seismic risk profile and minimal passenger evacuation capability that would need to be remedied. An Engineering Assessment Report completed recently, presents a short summary of the key issues:

1. Seismic performance

The bridge has limited seismic capacity under Ultimate Limit State for key structural elements.

Summary: The bridge has significant seismic deficiencies and does not comply with current standards

2. Scour potential

The bridge has suffered from historic settlement of some piers and there is potential for more scour to occur.

Summary: From the assessment it appears that scour has reached an equilibrium being an estuary, however with storm tides, additional scour can take place which and given the limited pile embedment this remains a risk.

3. Current long-term planning

The bridge will be maintained with upgrade and renewal of key structural elements over the next 10 years until such time to address the key seismic risk.

This will require either underpinning of all piers at significant cost compared to full replacement.

Summary: Pier underpinning and/or replacement planned to be done in 10 to 15 years period

It is the assumption that for passenger operation that the Harbour Bridge would need to be replaced as a part of the minimum investment case.

The Strand has a level crossing that would be very expensive to grade separate, remediation of this has not been factored into the cost estimates.

The rail route through to the Mount is currently very highly utilised and a freight operation is going to struggle to operate around a Metro schedule unless there is a track separation. Given the land constraints associated with the isthmus no costing nor investment scenarios are provided to provide track separation between the freight and passenger operations.

KiwiRail Network

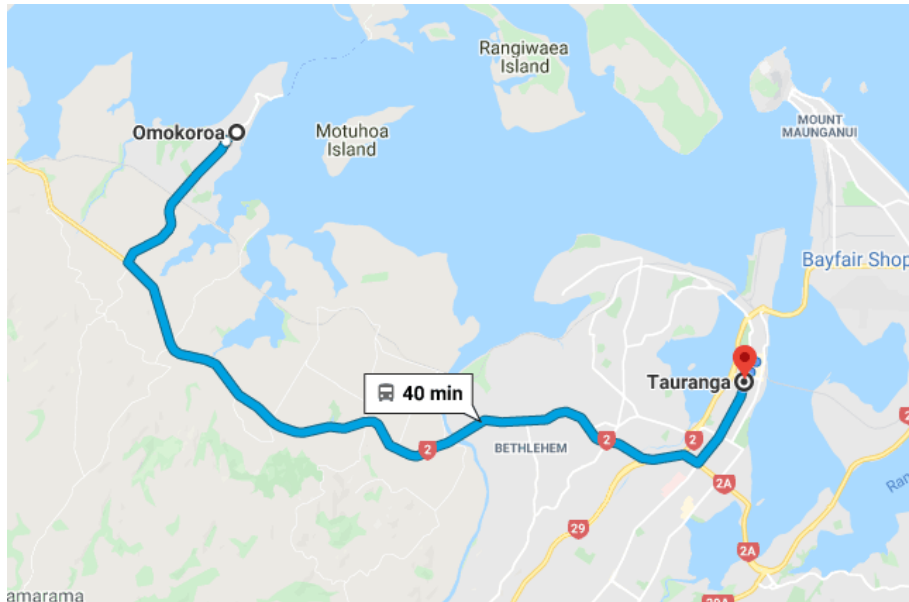
Omokoroa – Tauranga



Rail specific Information (current)

- Omokoroa is located 83 rail kilometres from Hamilton on the ECMT
- Tauranga (the Strand) is located 98 rail kilometres from Hamilton on the ECMT
- The rail distance between Omokoroa and The Strand (Tauranga) is 15 kilometres
- The ECMT runs from Hamilton to Kawerau and is single line with passing loops for trains to cross each other.
- The line between Hamilton and Kawerau is not electrified and only allows for diesel hauled services to operate.
- Currently most public road crossings on the rail route between Omokoroa and Tauranga are protected by flashing lights and bells, and some are fitted with half arm barriers.
- The Strand level crossing ideally would be grade separated, however this would be very difficult to achieve in reality. The costing and scope of such a change is outside the scope of this report.
- Currently the rail route between Omokoroa and Tauranga is designed for a maximum line speed of 80 km/h. Due to the undulating terrain the lowest curve speed through this section of track is 60 km/h.
- There are no current passenger amenities on the ECMT between Omokoroa and Tauranga
- The East Coast Main Trunk is a heavily used section of KiwiRail's network and the Omokoroa to Tauranga section is used by freight trains between Mount Manganui and Hamilton, Tauranga to Auckland, Mount Maunganui to Kinleith and Mount Maunganui and the Glenbrook steel mill.
- The rail currently services the Ports of Tauranga and also freight forwarders and other freight businesses that are rail served.
- As of today a mid week timetable has 31 freight trains pass between Tauranga and Omokoroa, 18 of these are between the hours of 06:00 & 20:00
- There is a direct rail link between Omokoroa and Te Puke (Te Maunga Junction) meaning that trains can travel between Omokoroa and Te Puke passing through Tauranga's CBD without changing direction or tracks.
- The Tauranga Harbour bridge has seismic risk profile and minimal passenger evacuation capability that would need to be remedied ie. Replaced in order to enable passenger services.

Distance and Time comparison (Omokoroa - Tauranga)



The rail distance between Omokoroa and Tauranga (Strand Station) is **15.1 km**

The road distance between Omokoroa and Tauranga (Strand Station) is **20.6 km**

The average transit time by road between the two stations is 29 minutes

The average transit time by rail between the two stations at

70 km/h = 13 minutes

65 km/h = 14 minutes

60 km/h = 15 minutes

50 km/h = 18 minutes

Given the undulating terrain and low speed curves in the area the a 50 km/h average speed has been used to allow for acceleration / deceleration

***average speeds to allow acceleration / deceleration times for intermediate stops if required**

KiwiRail Rail Corridor Omokoroa - Tauranga options

Current State:

No service frequency is achievable with the current state of the network between Omokoroa and Tauranga due to the current constraints

- Network is currently designed as a freight network of high tonnage and medium density of trains.
- No passenger infrastructure
- No Rollingstock maintenance or stabling facilities
- KiwiRail does not have passenger rolling stock or excess locomotives available
- The Omokoroa area does not have any other tracks apart from the main line that passes through the area
- Traction electricity not currently provided on this route

Current with minimum Investment

- 30 minute frequency is achievable with a loop track with passenger facilities built at Omokoroa
- Maintenance and stabling facilities built
- Rolling stock procured
- intermediate stations as required but will impact timetabling (overall journey time) Otumoetai
- Level crossing requirement
- ETCS requirement if frequency less than 60minutes
- Harbour bridge replacement to enable passenger services

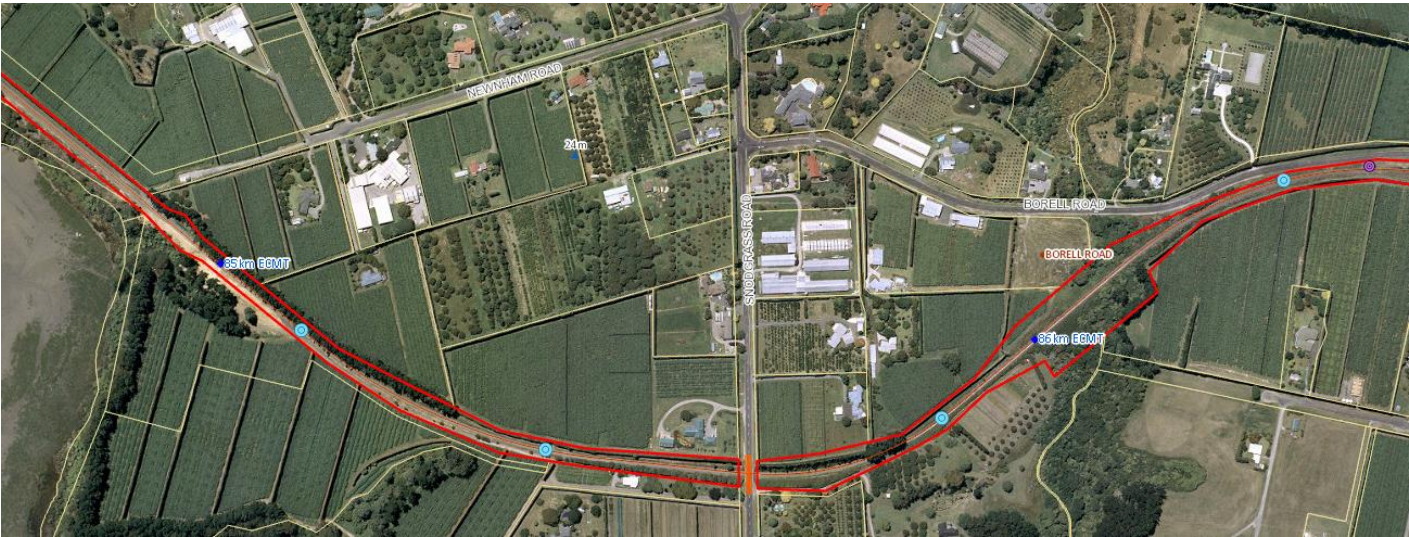
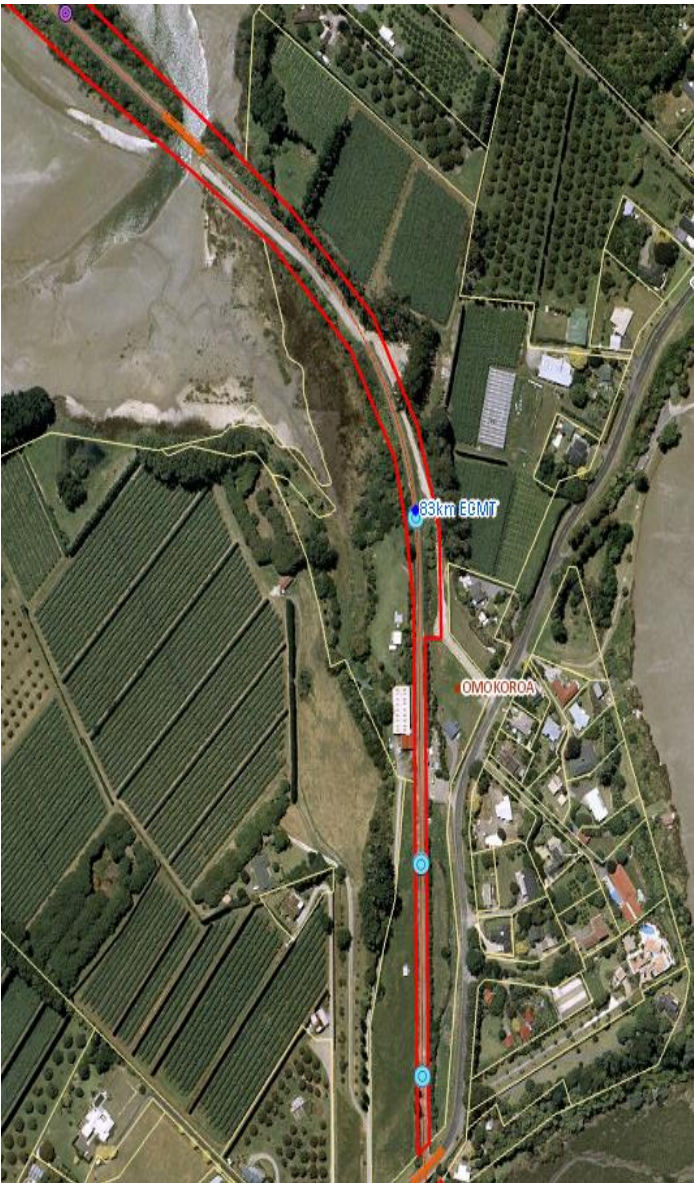
Capacity for growth

- Increase to a higher frequency with partial duplication of the network through Te Puna
- Additional intermediate stations (Otumoetai, Bethlehem)
- Resignalling to allow a higher frequency and separate passenger platforms clear of the main line .
- Level crossing requirement
- Traction electricity

World Class

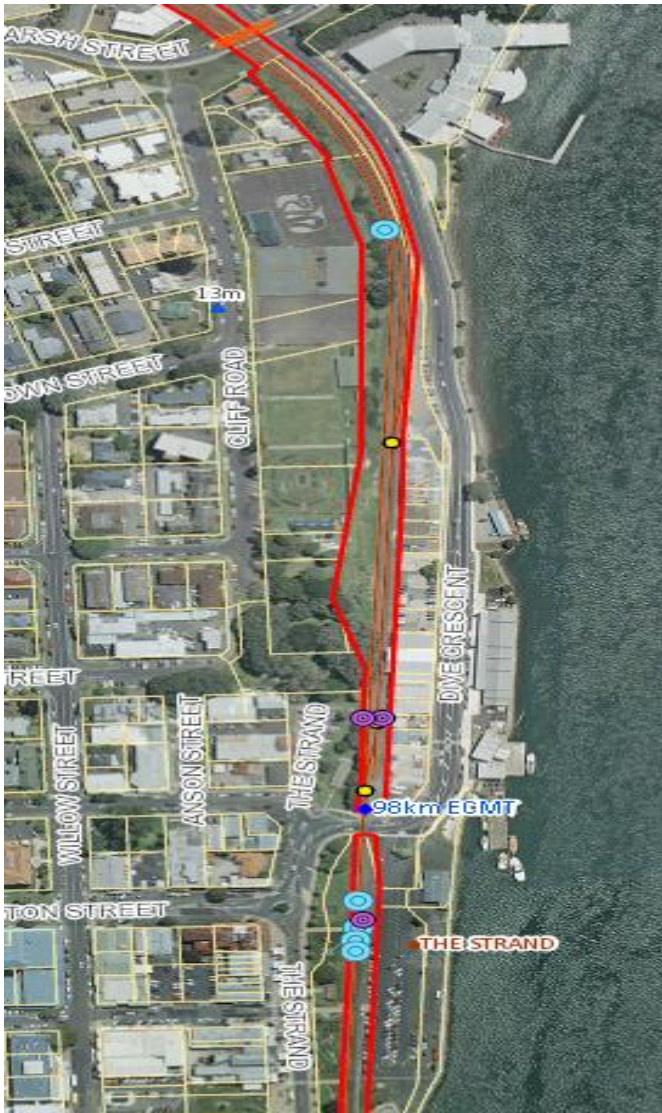
- Duplication of the line between Apata and Tauranga
- 10 minute frequency achievable
- Additional intermediate stations at locations as required as demand grows
- Tauranga CBD station to allow bus interchange
- Dedicated maintenance and stabling facilities
- Tauranga becoming a rail hub for Regional trains as well as local suburban trains (Hamilton service)
- Traction electricity
- Higher operating line speeds
- Grade separation of all level crossings
- The Strand level crossing ideally would be grade separated, however this would be very difficult to achieve in reality. The costing and scope of such a change is outside the scope of this report.

Omokoroa to Tauranga

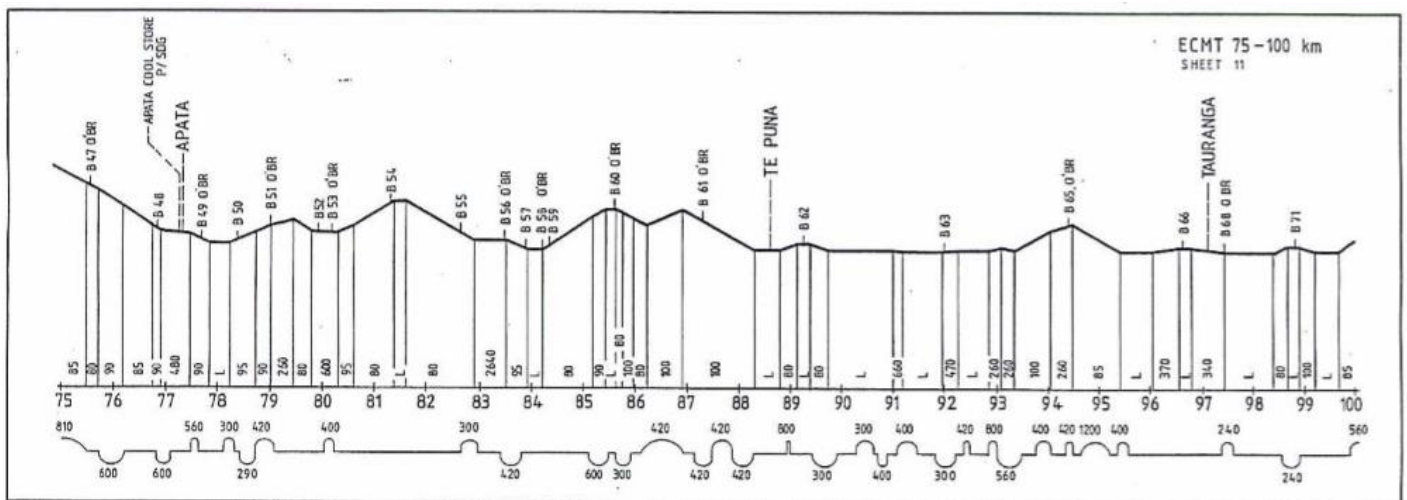








Gradient and Curve Diagram Omokoroa to Tauranga



KiwiRail Network

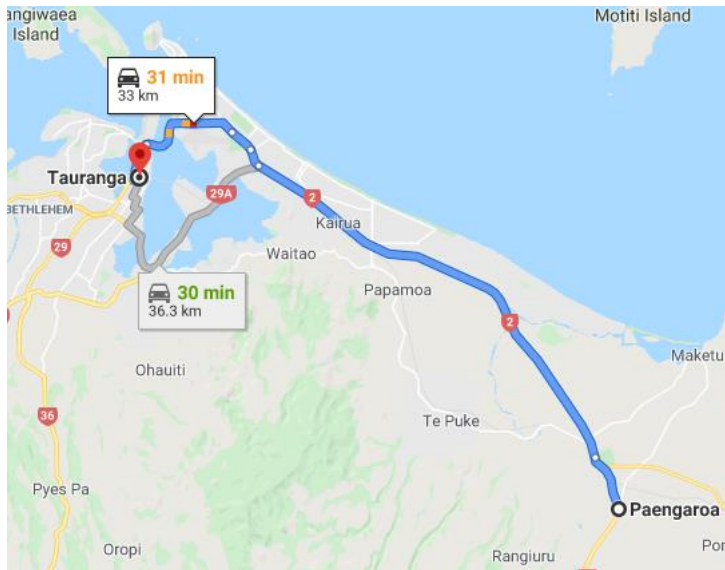
Paengaroa – Tauranga



Rail specific Information (current)

- Paengaroa is located 123 rail kilometres from Hamilton on the ECMT
- Tauranga (the Strand) is located 98 rail kilometres from Hamilton on the ECMT
- The rail distance between Paengaroa and The Strand (Tauranga) is 25 kilometres
- The ECMT runs from Hamilton to Kawerau and is single line with passing loops for trains to cross each other. This section currently has passing loops at Te Puke, Te Maunga and Tauranga
- The line between Hamilton and Kawerau is not electrified and only allows for diesel hauled services to operate.
- Currently most public road crossings on the rail route between Paengaroa and Tauranga are protected by flashing lights and bells, and some are fitted with half arm barriers.
- The Strand level crossing ideally would be grade separated, however this would be very difficult to achieve in reality. The costing and scope of such a change is outside the scope of this report.
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- Currently the rail route between Paengaroa and Tauranga is designed for a maximum line speed of 80 km/h. With the undulating terrain the lowest curve speed through this section of track is 60 km/h
- There are no current passenger amenities on the ECMT between Paengaroa and Tauranga except for the station platform at Te Puke which has not seen service in over 30 years.
- This section of the East Coast Main Trunk is a moderately used section of KiwiRail's network and the Paengaroa to Te Maunga section is used by freight trains between Murupara, Kawerau and Mount Maunganui. Predominately used by bulk trains of logs, paper and forestry products.
- As of today a mid week timetable has 14 freight trains pass between Paengaroa and Te Maunga, 8 of these are between the hours of 06:00 & 20:00
- As of today a mid week timetable has 16 freight trains pass between Te Maunga and Tauranga, 8 of these are between the hours of 06:00 & 20:00
- There is a direct rail link between Paengaroa and Tauranga meaning that trains can travel between Paengaroa and Omokoroa passing through Tauranga's CBD without changing direction or tracks.
- The Tauranga Harbour bridge has seismic risk profile and minimal passenger evacuation capability that would need to be remedied ie. Replaced in order to enable passenger services.

Distance and Time comparison (Paengaroa - Tauranga)



The rail distance between Paengaroa and Tauranga (Strand Station) is **25 km**

The road distance between Paengaroa and Tauranga (Strand Station) is **36 km**

The average transit time by road between the two stations is 29 minutes

The average transit time by rail between the two stations at	70 km/h = 22 minutes
	65 km/h = 23 minutes
	60 km/h = 25 minutes
	50 km/h = 30 minutes

Given the undulating terrain and low speed curves in the area the a 50 km/h average speed has been used to allow for acceration / deceleration

***average speeds to allow acceleration / deceleraton times for intermediate stops if required**

KiwiRail Rail Corridor Paengaroa - Tauranga options

Current State:

No service frequency is achievable with the current state of the network between Paengaroa and Tauranga due to the current constraints

- Network is currently designed as a freight network of high tonnage and medium density of trains.
- No passenger infrastructure except for a platform at Te Puke
- No Rollingstock maintenance or stabling facilities for passenger vehicles
- KiwiRail does not have passenger rolling stock or excess locomotives available
- The Paengaroa area does not have any other tracks apart from the main line that passes through
- Traction electricity not currently provided for on this route

Current with minimum Investment

- 60 minute frequency is achievable with a loop track with passenger facilities built at Paengaroa or Te Puke is considered as an originating station (not Paengaroa)
- Maintenance and stabling facilities built
- Rolling stock procured
- intermediate stations as required but will impact timetabling (overall journey time) Papamoa
- Level crossing requirement
- Harbour bridge replacement to enable passenger services
- ETCS required if the frequency is less than 60 minutes

Capacity for growth

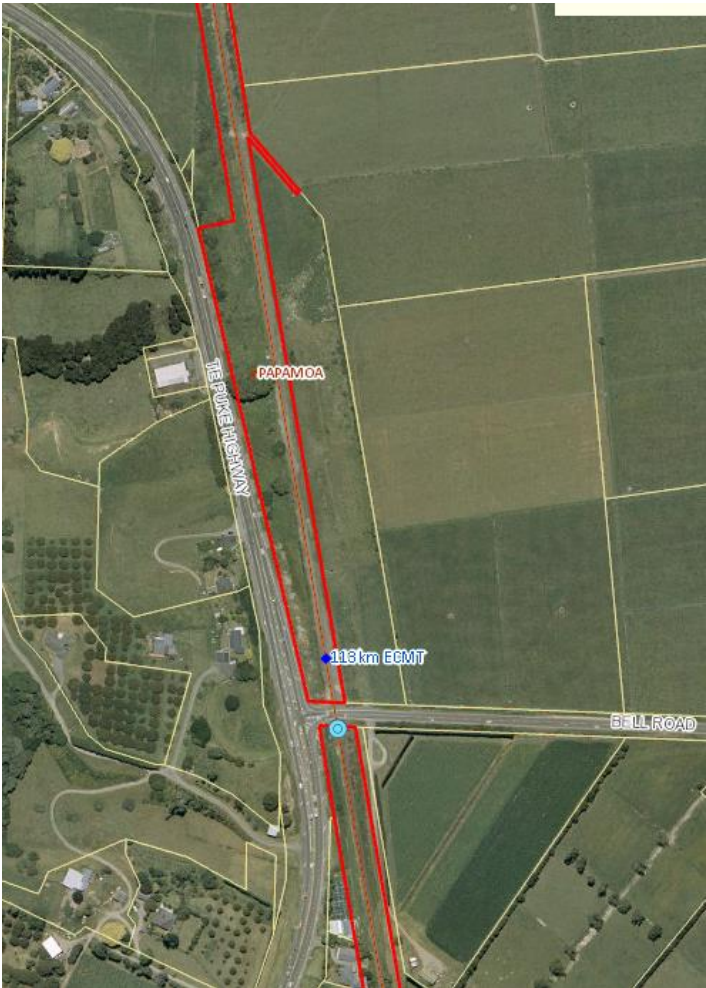
- Increase to a higher frequency with partial duplication of the network between Te Maunga and Te Puke
- Additional intermediate stations (Te Maunga)
- Resignalling to allow a higher frequency and separate passenger platforms clear of the main line
- Level crossing requirement
- Traction electricity
- ETCS

World Class

- Complete duplication of the line between Paengaroa and the rail bridge at Tauranga
- 10 minute frequency achievable
- Additional intermediate stations at locations as required as demand grows
- Tauranga CBD station to allow bus interchange
- Tauranga becoming a rail hub for Regional trains as well as local suburban trains (Hamilton service) with two platforms to allow crossing and multiple departures in either direction.
- Higher operating line speeds
- Level crossing requirement.
- The Strand level crossing ideally would be grade separated, however this would be very difficult to achieve in reality. The costing and scope of such a change is outside the scope of this report.

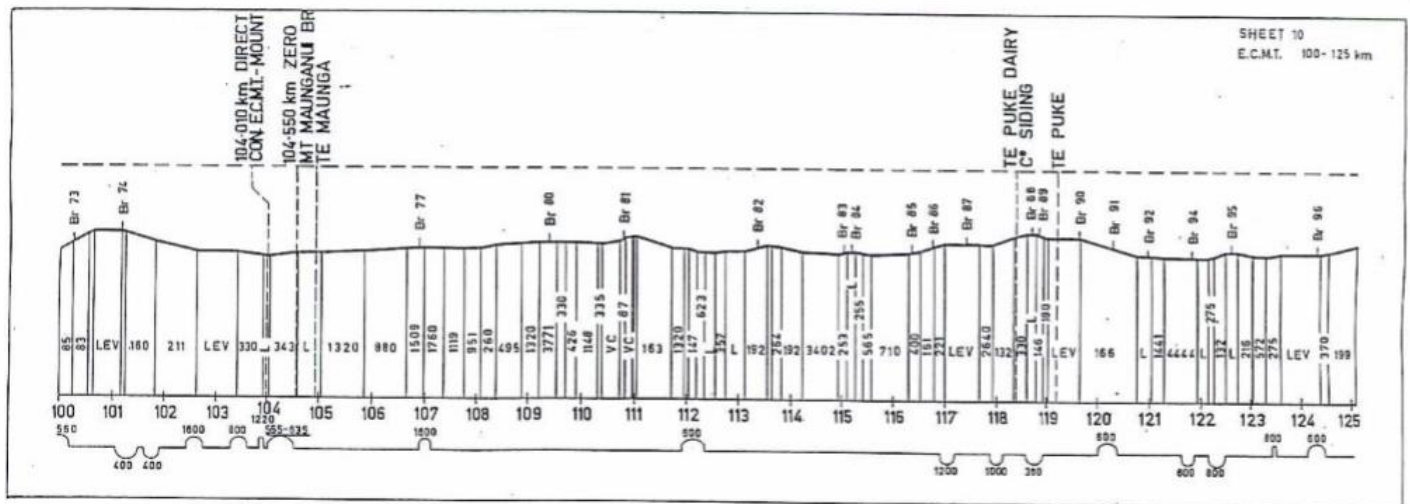
KiwiRail Corridor points of interest between Paeangaroa and Tauranga





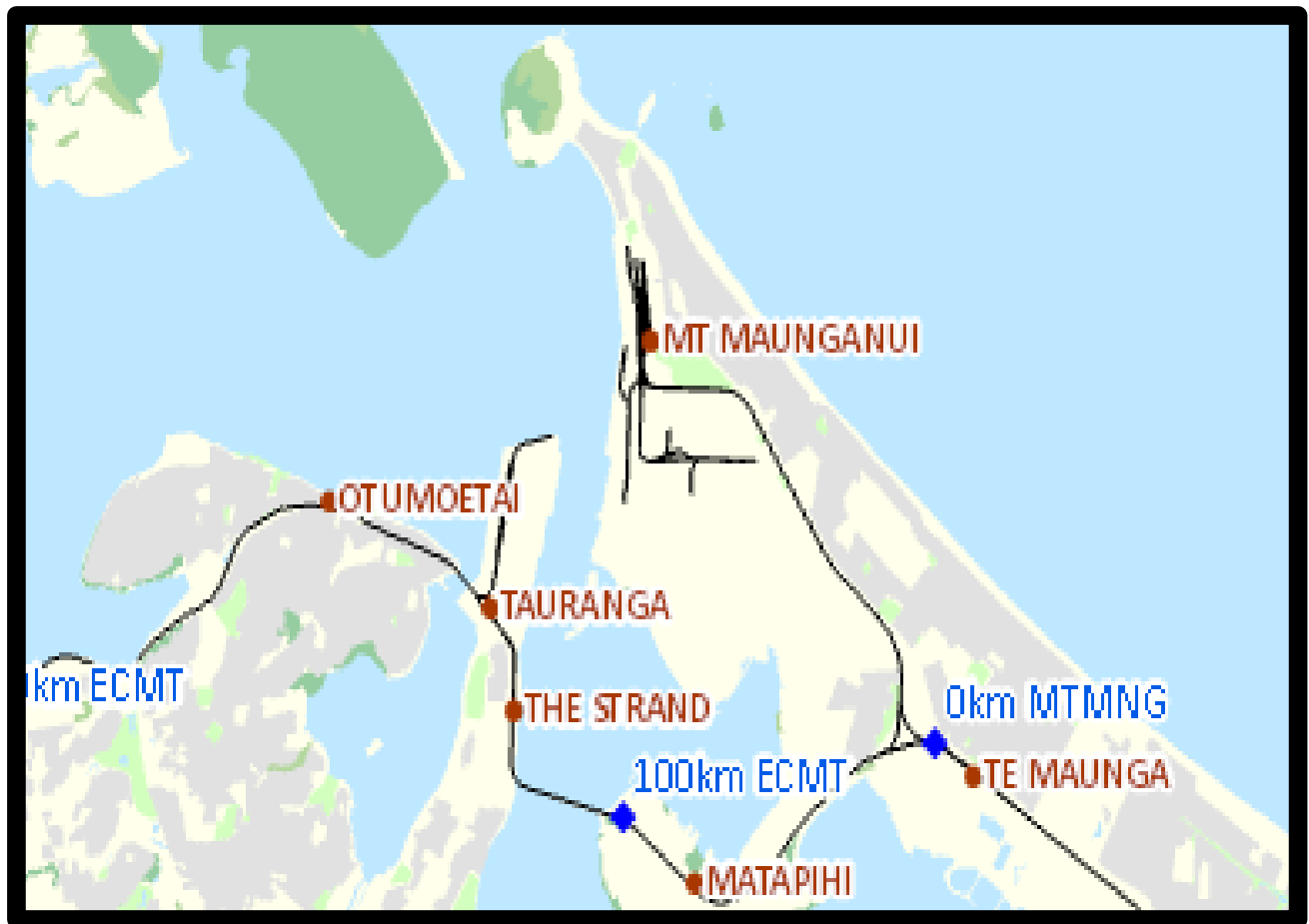


Gradient and curve diagrams for Paengaroa to Tauranga



KiwiRail Network

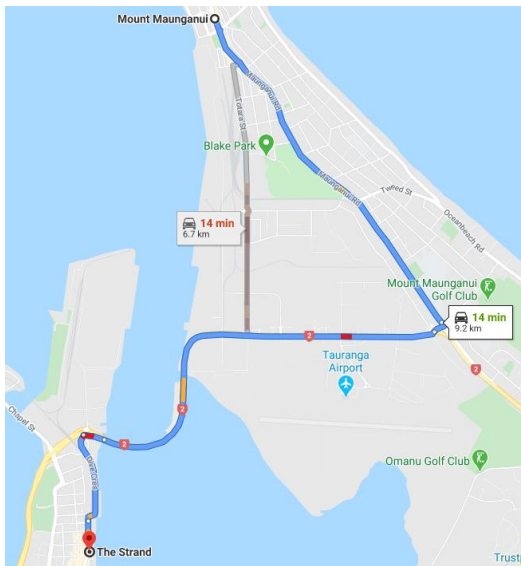
Mount Maunganui – Tauranga



Rail specific Information (current)

- Mount Maunganui is located 6 rail kilometres from Te Maunga on the ECMT
- Tauranga (the Strand) is located 98 rail kilometres from Hamilton on the ECMT
- The Mount Maunganui Branch is a separate branch line connected to the ECMT at Te Maunga and is 6 kilometres in length
- The rail distance between Mount Maunganui and The Strand (Tauranga) is 14.5 kilometres
- The ECMT runs from Hamilton to Kawerau and is single line with passing loops for trains to cross each other.
- The Mount Maunganui Branch runs between Te Maunga and Mount Maunganui and is single line the length of the branch line
- The Mount Maunganui Branch is not electrified and only allows for diesel hauled services to operate.
- Currently all public level crossings are fitted with half arm barriers.
- Currently the rail route between Paengaroa and Tauranga is designed for a maximum line speed of 80 km/h. The undulating terrain means the lowest curve speed through this section of track is 60 km/h
- There are no current passenger amenities on the ECMT or Mount Maunganui Branch between Mount Maunganui and Tauranga.
- The Mount Maunganui branch is a heavily used section of KiwiRail's network and the branch is used by freight trains between Murupara, Kawerau, Tauranga, Kinleith, Hamilton and Auckland.
- As of today a mid week timetable has 27 freight trains pass between Mount Maunganui and Te Maunga, 16 of these are between the hours of 06:00 & 20:00
- There is a direct rail link between Mount Maunganui to Tauranga and Mount Maunganui to Kawerau meaning that trains can travel between Mount Maunganui and Omokoroa passing through Tauranga's CBD and Mount Maunganui to Paengaroa passing through Te Puke.
- The Strand level crossing ideally would be grade separated, however this would be very difficult to achieve in reality. The costing and scope of such a change is outside the scope of this report.
- The Tauranga Harbour bridge has seismic risk profile and minimal passenger evacuation capability that would need to be remedied ie. Replaced in order to enable passenger services
- **The rail route through to the Mount is currently very highly utilised and a freight operation is going to struggle to operate around a Metro schedule unless there is a track separation. Given the land constraints associated with the isthmus no costing is provided to provide track separation between the freight and passenger operations.**

Distance and Time comparison (Mount Maunganui - Tauranga)



The rail distance between Mount Maunganui and Tauranga (Strand Station) is **14.5 km**

The road distance between Mount Maunganui and Tauranga (Strand Station) is **6.7 km**

The average transit time by road between the two stations is 19 minutes

The average transit time by rail between the two stations at

70 km/h = 12 minutes
65 km/h = 13 minutes
60 km/h = 14 minutes
50 km/h = 18 minutes

Given the low speed curves in the area the a 50 km/h average speed has been used to allow for acceration / deceleration

***average speeds to allow acceleration / deceleraton times for intermediate stops if required**

KiwiRail Rail Corridor Mount Maunganui - Tauranga options

Current State:

No service frequency is achievable with the current state and configuration of the network between Mount Maunganui and Tauranga due to the current constraints

- Network is currently designed as a freight network of high tonnage and medium density of trains.
- No passenger infrastructure in place
- No Rollingstock maintenance or stabling facilities for passenger vehicles
- KiwiRail does not have passenger rolling stock or excess locomotives available

The rail route through to the Mount is currently very highly utilised and a freight operation is going to struggle to operate around a Metro schedule unless there is a track separation. Given the land constraints associated with the isthmus no costing nor future investment scenarios are provided to provide track separation between the freight and passenger operations.

