greater WELLINGTON
REGIONAL COUNCIL
Te Pane Matua Taiao

If calling please ask for: Democratic Services

15 June 2018

Sustainable Transport Committee

Order Paper for the meeting of the Sustainable Transport Committee to be held in the Council Chamber, Greater Wellington Regional Council, Level 2, 15 Walter Street, Te Aro, Wellington

Wednesday, 20 June 2018 at 9.30am

Membership

Cr Donaldson (Chair)
Cr Ponter (Deputy Chair)

Cr Blakeley
Cr Gaylor
Cr Laban
Cr Lamason
Cr Ogden
Cr Swain

Cr Brash
Cr Kedgley
Cr Laidlaw
Cr McKinnon
Cr Staples

Marama Tuuta

Recommendations in reports are not to be construed as Council policy until adopted by Council

Sustainable Transport Committee

Order Paper for the meeting to be held on Wednesday, 20 June 2018 in the Council Chamber, Greater Wellington Regional Council, Level 2, 15 Walter Street, Te Aro, Wellington at 9.30am

Public Business

Public Excluded Business

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Please note that these minutes remain unconfirmed until the Sustainable Transport Committee meeting on 20 June 2018

Report 18.178
9/05/2018
File: CCAB-20-474

Minutes of the Sustainable Transport Committee meeting held on Wednesday, 9 May 2018, in the Council Chamber, Greater Wellington Regional Council, Level 2, 15 Walter Street, Te Aro, Wellington at 9:30am

Present

Councillors Donaldson (Chair), Ponter (Deputy Chair), Blakeley, Brash (from 9:51am), Gaylor (from 9:35am), Kedgley, Laban, Laidlaw, Lamason, McKinnon, Ogden, Staples, and Swain.

Public Business

1 **Apologies**

There were no apologies for absence.

2 **Declarations of conflict of interest**

There were no declarations of conflict of interest.

3 **Public Participation**

Marian Horan, Karen Serjeantson, Meaghan Serjeantson, Marie Smith, Ada Donaldson, Tom Halliburton, and Chris Hare, gave a presentation to the Committee on the changes to the number 14 bus route.

Crs Brash and Gaylor arrived during Public Participation.

4 **Confirmation of the minutes of 21 March 2018**

Moved *(Cr Lamason/ Cr Brash)*

That the Committee confirms the public minutes of the meeting of 21 March 2018, Report 18.96.

The motion was **CARRIED**.

5 **Action items from previous Sustainable Transport Committee meetings**

Report 18.168 File ref: CCAB-20-463

Moved *(Cr Blakeley/ Cr Laban)*

That the Committee:

1. *Receives the report.*
2. *Notes the content of the report.*

The motion was **CARRIED**.

6 **Metlink Park and Ride Terms and Conditions**

Wayne Hastie, General Manager, Public Transport, spoke to the report.

Report 18.143 File ref: CCAB-20-450

Moved *(Cr Ponter/ Cr Brash)*

That the Committee:

1. *Receives the report.*
2. *Notes the content of the report.*
3. *Endorses the Metlink Park and Ride Terms and Conditions contained in Attachment 1 to this report.*
4. *Notes that the Metlink Park and Ride Terms and Conditions may need to be amended or updated from time to time as the staged approach to demand management is progressed.*
5. *Authorises the General Manager, Public Transport to make any subsequent minor changes to the Metlink Park and Ride Terms and Conditions.*

The motion was **CARRIED**.

Noted: The Committee was concerned to ensure that the Metlink Park and Ride terms and conditions of use are legally enforceable by GWRC, and requested officers to report to the next meeting on this matter.

7 **Regional traffic congestion 2012-2017**

Report 18.147 File ref: CCAB-20-471

Moved *(Cr Swain/ Cr Staples)*

That the Committee:

1. *Receives the report.*
2. *Notes the content of the report.*

The motion was **CARRIED**.

Noted: The Committee complimented officers on a balanced report, and requested that officers circulate a map showing the cordon of the central business district.

The meeting adjourned at 10:54am and recommenced at 11.12am.

8 **General Managers' report to the Sustainable Transport Committee meeting on 9 May 2018**

Wayne Hastie, General Manager, Public Transport, spoke to the report and circulated a revised record of public participation on 21 March 2018.

Report 18.142 File ref: CCAB-20-465

Moved *(Cr Ponter/ Cr Gaylor)*

That the Committee:

1. *Receives the report.*
2. *Notes the content of the report.*

Moved as an amendment (as an addition to the motion) *(Cr Kedgley/ Cr Blakeley)*

3. *Recommends to Council that a provision for design, development and testing of tailpipe testing of 10% of the bus fleet be provided for in the Long Term Plan.*

The amendment was withdrawn by a majority decision.

Moved as an amendment (as an addition to the motion) *(Cr Ponter/ Cr Kedgley)*

3. *Requests officers work with NZ Transport Agency to identify opportunities for nationwide tailpipe testing of bus emissions.*

The amendment was put to the vote and was **CARRIED**, and became part of the substantive motion.

The following substantive motion was put to the vote:

That the Committee:

1. *Receives the report.*

2. *Notes the content of the report.*

3. *Officers work with NZ Transport Agency to identify opportunities for nationwide tailpipe testing of bus emissions.*

Voting on the motions was taken in sections. Motions 1 and 2 were put to the vote and were **CARRIED**. Motion 3 was put to the vote and was **CARRIED**.

Noted: Officers advised that they will need some time to report back because of immediate priorities with PTTP in the coming months.

The meeting closed at 11:47am.

B Donaldson
(Chair)

Date:

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Te Pane Matua Taiao

Report	**18.201**
Date	11 June 2018
File	CCAB-20-488
Committee	**Sustainable Transport Committee**

Action items from previous Sustainable Transport Committee meetings

Attachment 1 lists items raised at Sustainable Transport Committee meetings that require actions or follow-ups from officers. All action items include an outline of current status and a brief comment. Once the items have been completed and reported to the Sustainable Transport Committee they will be removed from the list.

No decision is being sought in this report. This report is for the Committee's information only.

Recommendations

That the Committee:

1. ***Receives** the report.*

2. ***Notes** the content of the report.*

Attachment 1: Action items from previous Sustainable Transport Committee meetings

Attachment 1 to Report 18.201

Action items from previous Sustainable Transport Committee meetings

Meeting date	Action point	Status and comment
5 December 2017	**Noted** *The Committee requested officers to provide a plan of proposed community education opportunities regarding the stormwater treatment and rain gardens installed at the Porirua Park and Ride.*	**Status:** *Awaiting action* **Comments:** Education opportunities will be explored when the rain gardens are installed.
9 May 2018	**Noted:** *The Committee was concerned to ensure that the Metlink Park and Ride Terms and conditions of use are legally enforceable by GWRC, and requested officers to report to the next meeting on this matter.*	**Status:** *Completed* **Comments:** See General Managers' report
9 May 2018	**Noted** *The Committee requested that officers circulate a map showing the cordon of the central business district.*	**Status:** *Completed* **Comments:** Map distributed
9 May 2018	**Resolution** *Requests officers work with NZ Transport Agency to identify opportunities for nationwide tailpipe testing of bus emissions.* **Noted** Officers advised that they will need some time to report back because of immediate priorities with PTTP in the coming months.	**Status:** *Awaiting action* **Comments:** Will be actioned when PTTP priorities have been completed.

Report	**18.200**
Date	6 June 2018
File	CCAB-20-479
Committee	**Sustainable Transport Committee**
Author	**Matthew Lear, Acting Manager, Bus and Ferry Operations**

Metlink Advertising Policy

1. Purpose

This report seeks the Sustainable Transport Committee's (the Committee) endorsement of the Metlink Advertising Policy (the Policy).

2. Background

The Land Transport Management Act 2013 establishes a new framework for planning and contracting public transport services, known as the Public Transport Operating Model (PTOM).

With the commencement of the PTOM bus contracts on 29 April, 17 June and 15 July 2018, Greater Wellington Regional Council (GWRC) has the right to sell and retain income from on-bus exterior and interior advertising spaces. Prior to these dates, bus advertising was managed by bus operators who retained the associated revenue.

In March 2018, GWRC began a procurement process to appoint a media agency partner to administer and manage GWRC's advertising interests.

In order for GWRC to achieve value for money in its procurement, and to ensure consistency with GWRC's internal procurement policies, the procurement process followed was consistent with requirements of the Transport Procurement Strategy and the Transport Agency Procurement Manual.

3. Metlink Advertising Policy

The Policy set out in **Attachment 1** has been developed from a number of sources. The foundation is from the New Zealand Advertising Standards Authority (ASA) Codes of Practice, which can be found at http://www.asa.co.nz/codes/.

3.1 ASA Codes of Practice

The Codes of Practice were developed by the ASA to cover the entire range of advertising activity, and amended whenever there is an issue that requires review or updating. The following list highlights the various codes:

- Advertising Code of Ethics
- Code for Advertising and Promotion of Alcohol
- Code for Comparative Advertising
- Code for Environmental Claims
- Code for Financial Advertising
- Code for Advertising Food
- Code for Advertising Gaming and Gambling
- Code for People in Advertising
- Code for Advertising Vehicles
- Therapeutic and Health Advertising Code
- Children and Young People's Advertising Code

The Codes include a Code of Ethics, which is the overall philosophy covering fairness, respect for people, and honest practice, plus a number of Codes covering either particular issues (e.g. advertising to children) or product areas (e.g. advertising financial services). In interpreting the Codes, emphasis will be placed on compliance with both the principles, and the spirit and intention.

3.2 Guiding documentation

A review of the media policies of Auckland Transport and public transport operators in Australia, were considered when developing the attached Policy.

Officers also received input and support from our preferred media agency in considering the key aspects of the Policy.

3.3 Policy application

Application of the Policy and consideration of what advertising Metlink will and will not permit on our network, means we are making decisions that align to GWRC's brand and values, as well as the ASA Codes of Practice. While these decisions will decrease risk to the Metlink and GWRC brands, they may also decrease revenue potential as we will not be advertising certain things that could offer revenue streams.

The Policy will be applied by our media agency to all advertising on the Metlink network, the first phase of which is advertising on bus backs. Officers will act as a support to our media agency, by approving or rejecting any questionable advertising (and if necessary, relevant political escalation). The process for this is included in the Policy. Audits will be undertaken to ensure the Policy is being appropriately applied.

4. Community Support

Officers have required our media agency to retain ten percent of the available exterior and interior space on available assets, for promotion of GWRC, including Metlink communications and marketing and to provide advertising space to aligned organisations (e.g. community groups) to promote corporate

social responsibility. Providing a percentage of the advertising space for Metlink promotion and community groups contributes to the Long Term Plan objective of having an engaged community by utilising advertising channels to tell our story and support our communities. Note that community advertising will not be available until appropriate internal systems and processes are in place.

5. Next steps

On approval of the Policy, officers will work with our media agency and bus operators to ensure a smooth transition between the contracts bus operators have with media agencies to our Metlink contract.

Following this, we have a phased approach to our future advertising plans which is seen in the table below. Please note that Phases 2 onwards have not yet been set up as projects. Councillors will be updated as officers move forward with this work.

Project Phase	Summary	Status
1	Bus exterior, bus back panels only	In progress, advertising goes live on 15 July.
2	Bus interior	Scope work in October 2018
3	Rail vehicles owned by Greater Wellington Rail Limited	Scope work in January 2019
4	Station buildings owned by Greater Wellington Rail Limited (subject to obtaining necessary KiwiRail approvals) – note that this does not include Wellington Station	Scope work in January 2019
5	Park and Ride car park land owned by GWRC and Park and Ride car park land leased by KiwiRail to Greater Wellington Rail Limited	Scope work in January 2019
6	Digital small format - Metlink website and social media channels, mobile service updates and APP for advertising space.	Late 2019
7	Bus exterior - side panel (not covering windows)	Late 2019

6. Communication

No external communication is proposed as an outcome of this report.

7. Consideration of climate change

The matter requiring decision in this report has been considered by officers in accordance with the process set out in the GWRC Climate Change Consideration Guide.

7.1 Mitigation assessment

Mitigation assessments are concerned with the effect of the matter on the climate (i.e. the greenhouse gas emissions generated or removed from the atmosphere as a consequence of the matter) and the actions taken to reduce, neutralise or enhance that effect.

Officers have considered the effect of the matter on the climate. Officers recommend that the matter will have no effect.

Officers note that the matter does not affect the Council's interests in the Emissions Trading Scheme (ETS) or the Permanent Forest Sink Initiative (PFSI)

7.2 Adaptation assessment

Adaptation assessments relate to the impacts of climate change (e.g. sea level rise or an increase in extreme weather events), and the actions taken to address or avoid those impacts.

Officers have considered the impacts of climate change in relation to the matter. Officers recommend that climate change will have an impact, but not a material effect on the matter.

8. The decision-making process and significance

Officers recognise that the matters referenced in this report may have a high degree of importance to affected or interested parties.

The matter requiring decision in this report has been considered by officers against the requirements of Part 6 of the Local Government Act 2002 (the Act). Part 6 sets out the obligations of local authorities in relation to the making of decisions.

8.1 Significance of the decision

Part 6 requires GWRC to consider the significance of the decision. The term 'significance' has a statutory definition set out in the Act.

Officers have considered the significance of the matter, taking the Council's significance and engagement policy and decision-making guidelines into account. Officers recommend that the matter be considered to have low significance.

Officers believe that by adhering primarily to the New Zealand Advertising Standards Authority Codes of Practice, risk to the Metlink brand or GWRC is mitigated.

8.2 Engagement

Engagement on the matters contained in this report aligns with the level of significance assessed In accordance with the significance and engagement policy, no engagement on the matters for decision is required.

9. Recommendations

That the Committee:

1. ***Receives** the report.*

2. ***Notes** the content of the report.*

3. ***Endorses** the Metlink Advertising Policy contained in Attachment 1 to this report.*

4. ***Notes** that the Metlink Advertising Policy is a living document which will be subject to change*

5. ***Authorises** the General Manager, Public Transport to make minor subsequent changes to the Metlink Advertising Policy.*

Report prepared by:	Report approved by:
Matthew Lear Acting Manager, Bus and Ferry Operations	**Wayne Hastie** General Manager, Public Transport

Attachment 1: Metlink Advertising Policy

Metlink Advertising Policy

1. Policy Purpose

The purpose of this policy is to set out our principles and criteria governing the advertisements permitted to appear on Metlink controlled assets, infrastructure and facilities.

2. Policy Objectives

We recognise that advertising is an influential method for companies and organisations to communicate with members of the public. In delivering on Metlink and GWRC values, the Advertising Policy ensures that advertising presented on the Metlink public transport network is appropriate and ethically responsible.

3. Background

The Metlink brand provides overarching direction for the behaviours of Metlink, including the nature of the companies and organisations that we partner with to advertise on the Metlink network.

The Metlink Advertising Policy will be applied by our media supplier to all advertising on the Metlink network. Both the supplier and officers will carry out audits to ensure the policy is being appropriately applied.

4. Criteria

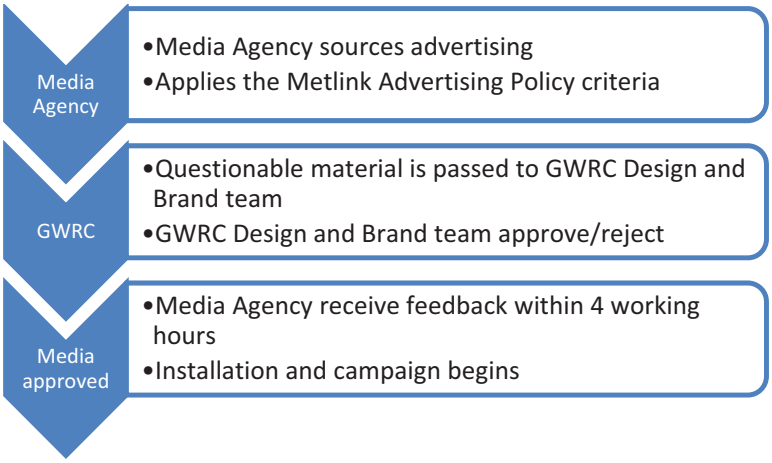
Metlink is committed to ensure that advertising on Metlink controlled assets is consistent with Metlink and GWRC brand values, as well as adhering to all Codes of Practice by the Advertising Standards Authority and all applicable laws.

In considering alignment with Metlink and GWRC brand values, the policy identifies a number of themes which Metlink will not permit to be advertised on Metlink controlled assets. These are:

- any advertising that breaches the Codes of Practice set by the Advertising Standards Authority and/or any applicable law;
- products that significantly harm the environment and conservation;
- advertising that could negatively impact on any conservation or social effort within the community;
- political or religious organisations;
- weaponry for promotion or sale;
- gambling or casinos, but not gaming e.g. Lotto; and /or
- anything which GWRC/Metlink may feel harms our reputation.

4.1 Policy Process

The following diagram details the key points for agreeing advertising content.



When questionable material is passed to GWRC there is a process involving three points of protection to prevent any objectionable material appearing on Metlink controlled assets. These three points are,

1. GWRC Design and Brand team to consider and check against policy
2. Escalation to General Manager, Public Transport, or General Manager, People and Customer.
3. Escalation to Chair of Sustainable Transport Committee or Chair of Council for final approval/rejection.

4.2 Breach of Policy

If a complaint is received that the Metlink Advertising Policy has been breached, an investigation will be undertaken. This investigation will be led by General Manager, Public Transport.

If it is found that the Metlink Advertising Policy has been breached, the Manager Bus Operations will collaborate with the relevant parties to ensure the advertising is removed with urgency and a review undertaken of the advertising sales process that permitted the advertisement.

5. On board advertising

Metlink can support local projects, events or organisations by providing free media placement internally across our buses and trains. We will offer use of poster holders inside buses and trains to community groups across our region.

Use of this space will be approved and administered by the GWRC Customer Engagement Team. There will be no charge for use of the poster holders, however, the costs of installation and removal of posters may be charged to the advertiser.

Poster content is subject to the criteria outlined in **Section 4** of this policy.

6. Glossary

Term	Summary
Significant	Something that is deemed to have a material effect as measured by industry standards.
Negatively impact	A fact, situation, or experience which would be viewed as having a strong negative influence.

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Report	**18.143**
Date	20 June 2018
File	CCAB-20-484

Committee	**Sustainable Transport Committee**
Author	**Barry Fryer, Team Leader, Rail Assets**

Metlink Wairarapa rolling stock independent investigation

1. Purpose

This report presents the findings into the cause(s) of the rolling stock performance issues on the Wairarapa Line.

2. Why was the investigation commissioned

Wairarapa customers have been experiencing an unacceptable level of poor performance for years, largely due to longstanding issues with the age and condition of the track infrastructure. The issue with the track is well known and understood, and Greater Wellington Regional Council (GWRC) and KiwiRail have requested $100m to renew the track from central government which will increase the punctuality, reliability and resilience of the Wairarapa service.

During November and December 2017 customers also experienced acute overcrowding, poor communication during disruptions, an all-day rail strike, and significant disruption from rolling stock (carriages and locomotive) failures.

An independent investigation was commissioned to determine the root causes of the rolling stock failures and provide recommendations to improve service reliability and punctuality. The global rail consultancy company SNC-Lavalin was engaged to undertake the investigation. The investigation involved GWRC, and our rail partners, Transdev (operations and rolling stock maintenance) and KiwiRail (locomotive supplier).

3. Future rolling stock and network improvements

Complementary to the $100m track infrastructure funding bid mentioned above, GWRC and KiwiRail have also requested a further $100m to unlock additional network capacity across the network. The second programme delivers network improvements that allow higher frequency peak services and longer peak trains to cater for forecasted peak passenger demand through to 2030.

A further business case, under development, provides for a fleet of new longer distance trains to address long-term challenges facing both Wairarapa and Capital Connection service levels. A key utilisation of the new fleet would be to contribute to managing forecast growth in the metro (electrified) area, with the longer distance services stopping at major stations to supplement peak capacity.

While not a guarantee of NZ Transport Agency funding approval, all three proposals currently sit in Priority Band 1 within the Regional Land Transport Programme.

4. Key Findings

The full SNC-Lavalin investigation report is in **Attachment 1**. The key findings are summarised below:

Rolling stock

1. The overall contribution of rolling stock faults to service failures and delays is relatively minor in comparison to other sources (**4%** of total delays and **9%** of service failures were caused by rolling stock during 2017). The report suggests that it is unrealistic to expect zero rolling stock breakdowns, and therefore, the ability to improve overall performance of the Wairarapa service through a sole focus on rolling stock maintenance is relatively minimal.

2. The report recommends that Transdev implement a Wairarapa Operators forum to improve the interface between Transdev, the locomotive provider (KiwiRail) and the carriage maintenance provider (Hyundai-Rotem).

Locomotives

3. The locomotive failure rate experienced on the Wairarapa Service was broadly consistent with similar equipment operating in Australia.

4. As these locomotives are operating on passenger services, "above-average" performance should be the target. On this basis, with reference to similar operations and associated reliability targets, it should be possible to achieve close to half the current locomotive failure rate (i.e. the five locomotive failures experienced during 2017, down to a rate of three locomotive failures per year.).

5. The key factors to achieve this improvement have already been implemented by KiwiRail since the two locomotive failures in November 2017. The change was to increase communication between Transdev and the locomotive maintenance team, and create a more formal process to increase focus on fault finding, developing solutions to issues and applying them to the fleet. The process is a continuous improvement process call Failure Reporting, Analysis and Corrective Action System (FRACAS).

Carriages

6. The carriage failure rate experienced on the Wairarapa Service was approximately 25% higher than that experienced on similar services

operating in Australia. Therefore the 38 carriage related failures experienced during 2017, could be reduced to a rate of approximately 29 failures per year.

7. It is worth noting that the carriages on the Wairarapa fleet (re-built 1970s British Rail Carriages) are not new vehicles, and are approaching the need for a mid-life refurbishment.

8. The investigation found that improvements to carriage fleet reliability could be obtained through:

   i) Increasing the amount of time the carriages are available for maintenance

   ii) Improving the response to faults and implementing corrective actions (through the FRACAS process)

   iii) Resolving uncertainties relating to reliability improvements that should be undertaken as part of carriage maintenance repairs (which is within the carriage maintenance contract scope), and as part of mid-life refurbishment (out of maintenance contract scope).

5. Key Actions

a. **Implement a Wairarapa Operators forum**
The forum is now established, and is meeting quarterly to discuss areas of improvement.

b. **Locomotive FRACAS**
Following the two significant locomotive failures in November 2017, a locomotive FRACAS process was implemented in December 2017. A number of fleet improvements have been undertaken as a result. Locomotive reliability should improve over time.

c. **Improving Carriage Access Time**
The parties working at the Carriage Maintenance Depot have now established a working group with the objective of improving maintenance productivity, and maintaining the required level of safety.

d. **Carriage FRACAS**
A review of the current carriage FRACAS process is underway to improve the speed and efficiency of fleet reliability changes.

e. **Maintenance vs mid-life overhaul**
Contractual boundaries are being clarified.

Work on the mid-life overhaul is on hold pending the outcome of the business case for new rolling stock, which is in the final stages of preparation.

6. Conclusion

While the investigation has not uncovered any ‘silver bullets’ to solve Wairarapa rolling stock failures, it has provided context on the influence of

rolling stock on the services performance, and provided a focus on processes that wrap around the fleet where there was distinct room for improvement.

The report has highlighted a need to improve communications between parties, sharpen up the fundamental maintenance procedures and redouble efforts to increase the time carriages are actually accessible each day to be maintained.

Since the investigation was announced, there has been a 19% reduction in rolling stock failures.

Wairarapa Line peak punctuality was at 74.3% in April 2018, which is nearly twice as high as the same time last year.

Peak patronage continues to grow strongly at 4% year to date at April 2018. This is placing an increasing strain on the busiest services. Following various risk assessments, measurements, tests, and communications with customers and staff, Metlink hopes to start an in-service trial of a nine-car train on the busiest peak services in June 2018.

7. Consideration of climate change

This report presents the findings of an investigation. There is no need to conduct a climate change assessment of this matter.

8. The decision-making process and significance

No decision is being sought in this report.

8.1 Engagement

Engagement on this matter is not necessary.

9. Recommendations

That the Committee:

1. ***Receives** the report.*
2. ***Notes** the content of the report.*
3. ***Notes** that officers will provide this Committee with updates on the implementation of recommendations contained in the SNC-Lavalin investigation report.*

Report prepared by:	Report approved by:	Report approved by:
Barry Fryer Team Leader, Rail Assets	**Angus Gabara** Manager, Rail Operations	**Wayne Hastie** General Manager, Public Transport

Attachment 1: Investigation of Wairarapa Line Rail Services

SNC·LAVALIN

Investigation of Wairarapa Line Rail Services

Report Number RTNZ/TZ511/01

Issue No. 1

snclavalin.com

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SNC-Lavalin has, in preparing any cost estimates, followed methodology and procedures, and exercised due care consistent with the intended level of accuracy, using its professional judgement and reasonable care, and is thus of the opinion that there is a high probability that actual costs will fall within the specified error margin. However, no warranty should be implied as to the accuracy of estimates. Unless expressly stated otherwise, assumptions, data and information supplied by, or gathered from other sources (including the Client, other consultants, testing laboratories and equipment suppliers etc.) upon which SNC-Lavalin's opinion as set out herein is based has not been verified by SNC-Lavalin; SNC-Lavalin makes no representation as to its accuracy and disclaims all liability with respect thereto.

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Title	:	Investigation of Wairarapa Line Rail Services
Report No.	:	RTNZ/TZ511/01
Issue	:	1
Date	:	18/05/2018

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SNC·LAVALIN

1 Executive Summary

Greater Wellington Regional Council (GWRC) has contracted with Transdev Wellington (Transdev) to operate the services linking Wellington and the Wairarapa using loco-hauled carriages. Transdev has sub-contracts with KiwiRail for the provision of a locomotive and driver for each train – "Transdev's Locomotive Provider" (TLP); and with Hyundai Rotem for provision of the carriages – "Transdev's Carriage Maintenance Provider" (TCMP). Transdev has overall responsibility for delivering the services.

GWRC has engaged SNC-Lavalin Rail & Transit NZ Limited (SNC-Lavalin) to undertake an independent investigation of the Wairarapa Line trains, to identify the root causes of rolling stock failures and opportunities for improvement.

The scale of the investigation has covered a significant number of different areas with multiple stakeholders.

Key conclusions:

1. The overall contribution of rolling stock faults to service failures and delays is relatively minor in comparison to those attributed to other sources (4% of total delays and 9% of service failures were caused by rolling stock during 2017).
2. During 2017 there were 5 DFB locomotive breakdown failures, which represent an overall failure rate of 1 failure, per locomotive, per year. This is broadly consistent with similarly equipped locomotives operating in Australia however this failure rate is unlikely to be acceptable for passenger services. Hence, "above-average" performance is required from the DFB fleet. When all failure events are included, locomotives travel approximately 18,000 km between failures. V/Line in Australia operates equivalent loco-hauled passenger services, and their locomotives achieve approximately 23,000 km between failures against a target of just under 30,000km.
3. The root cause of the 5 locomotive breakdown failures was most likely insufficient focus on fault finding, developing solutions and applying these to the fleet. This is the intent of the Failure Reporting, Analysis and Corrective Action System (FRACAS) which appears to have been introduced by TLP following the two breakdowns in November 2017. TLP have also recently "W"-tagged the pool of locomotives, meaning they remain captured hence reliability improvements can be applied throughout the fleet as failure modes are identified. The locomotive technology employed is suitable and is capable of reliable performance provided the FRACAS continues to be improved.
4. On this basis, and with reference to similar operations and associated reliability targets, it should be possible to achieve close to half the current locomotive failure rate. It would be unrealistic to expect zero locomotive breakdowns and there will continue to be a residual level of DFB locomotive failure on the Wairarapa Line. This may, at times, result in cancellation of services.
5. During 2017 there were 38 carriage rolling stock faults that caused delays, cancellation of services (subsequent cancellations and delays excluded) or passenger discomfort. Hence on average, Wairarapa carriages travelled approximately 47,000 km between faults. Using a basis for comparison, the V/Line carriages operating in Australia achieve approximately 25% more kilometres between faults than Wairarapa carriages.
6. The root causes of carriage faults most likely relate to issues which are summarised below:

   6.1. The maintenance regime used by TCMP does not check, and sign-off, every carriage consist every day. The purpose of these checks is to capture existing faults to allow them to either be repaired or, if necessary be isolated to prevent failure in service. There is however no long-term maintenance benefit to these checks, and with limited resource and time available for maintenance activities, time spent on daily checks is at the expense of time spent on activities that improve long-term reliability.

6.2. The response by TCMP to faults that have been identified through their FRACAS is too slow, delaying implementation of corrective actions and reliability improvements. Despite recent review and development, the engineering change approval process is robust but too slow within TCMP and between all stakeholders.

6.3. A number of components on the carriage fleet are approaching end-of-life. There is a level of uncertainty about how long the Wairarapa carriage fleet is expected to last considering possible replacement vehicles. This results in disagreement between GWRC and TCMP about whether some repairs are a reliability improvement (i.e. TCMP responsibility), or an extra to the contract and a mid-life refurbishment (i.e. GWRC responsibility). Disagreement is leading to delays to improvements in long-term reliability. Also, carriage inventory stock levels are too low and the spare parts ordering process is too slow.

6.4. There are a few critical components and systems in the carriages which have inherent limitations in the design (the auxiliary generator in particular). These have been the subject of a number of previous investigations and work, however until they are resolved, TCMP, through maintenance activities, has to manage the risk of failure due to these limitations.

6.5. TCMP are significantly constrained by the limited "touch time" that they have to access the trains for maintenance (this time totals nominally 4 hours during the middle of the day). They are also constrained due to the shared use of the depot which has a legacy design and is inefficient. This impacts on their ability to perform engineering investigations and refurbishment work in particular, which subsequently limits the potential for long-term reliability gain.

7. Hence overall service reliability improvements are primarily dependent upon:

7.1. The capacity for TCMP to improve their response to faults and implementing corrective actions, as well as inventory and engineering change.

7.2. The integration of agreed staged carriage refurbishment into maintenance activities and resolution of rolling stock design limitations.

7.3. Improving access to the trains to allow this to happen.

7.4. Continued improvement in the locomotive FRACAS.

8. There is some opportunity to improve both locomotive and carriage reliability. Overall however, the opportunity for improved levels of service on the Wairarapa Line is likely to be minor, considering the contribution of rolling stock faults to delays and service cancellations (4% and 9% respectively).

Key Recommendations:

[R1]: It is recommended that Transdev implement a Wairarapa Operators forum for improved interface between Transdev, TLP and TCMP.

[R4]: It is recommended that TCMP obtain stakeholder approval as soon as possible, for the maintenance checks that differ from those specified in the MOS.

[R10]: It is recommended that stakeholders resolve uncertainty relating to carriage repairs for mid-life refurbishment, versus repairs for reliability improvement.

[R11]: It is recommended that stakeholders work to resolve the critical carriage design limitations as soon as possible and in particular those relating to the auxiliary generators.

[R12]: It is recommended that Transdev facilitate progression of discussions between stakeholders to improve access time to the carriage consists for maintenance and servicing.

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Contents

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2 Glossary of Abbreviations and Acronyms

Abbreviation	Description
1250km check	Loco 652 Rev. 4 "1250km Maintenance Check Procedure for SW/SE Consist"
54D Book	Book located in each train consist used by train crew to record faults
AG Van	Power and luggage van (located at either end of the train)
BOL	Block of Line (refers to infrastructure works on a section of network)
BP	Brake Pipe hose
Consist	The group of carriages forming the train for each Wairarapa service
DFB	Locomotive class used to haul Wairarapa trains
DMU	Diesel Multiple Unit
ECR	Engineering Change Request
EMD	Electro-Motive Division of General Motors for traction equipment
EMU	Electric Multiple Unit
FRACAS	Failure Reporting, Analysis and Corrective Action System
GWRC	Greater Wellington Regional Council
HVAC	Heating, ventilation and air conditioning system
LE	Locomotive engineer – works for KiwiRail and drives the locomotives
MR	Main Reservoir hose
MOS	Minimum Operating Standards for efficient, reliable and safe operation.
NRSS	National Rail System Standard
OEM	Original Equipment Manufacturer
OJTCR	On Job Training & Competency Record
QMS	Quality Management System
RCO	Remote Controlled (locomotive) Operator
ROC	KiwiRail Rail Operating Code
RPMS	Rail Performance Monitoring System
Shuttle	The train operating the off-peak Wairarapa Line services
SE, SEG, SES	Classes of carriage used in the trains – 6-car consist
SNC-Lavalin	SNC-Lavalin Rail & Transit NZ Limited
SW, SWG, SWS	Class of carriage used in the trains – 6-car consist and 8-car consist
Transdev	Transdev Wellington - Operator of the Wellington passenger rail network
TCMP	Transdev's Carriage Maintenance Provider
TLP	Transdev's Locomotive (and driver) Provider
TM	Train Manager – Transdev person in charge of operating the train
Train crew	All staff on board a train including the TM
TX, TXO	Train examiners
VLV	Variable Load Valve used to adjust braking effort with passenger load

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3 Introduction

Greater Wellington Regional Council (GWRC) has contracted with Transdev Wellington (Transdev) to operate the Wellington passenger rail network. This includes the provision of services linking Wellington and the Wairarapa operated by loco-hauled carriages. The carriages, which are owned by GWRC, have been operating in this service since 2007.

For operating the Wairarapa services, Transdev has sub-contracts with two separate parties:

- With KiwiRail using a "Hook & Tow" agreement, for the provision of a diesel-electric mainline locomotive and driver for each train – henceforth "Transdev's Locomotive Provider" (TLP); and
- With Hyundai Rotem to manage formation of the carriages that make up each train (consist), and any required maintenance and servicing – henceforth "Transdev's Carriage Maintenance Provider" (TCMP).

Hence the TLP and TCMP work for Transdev, and ultimately it is the responsibility of Transdev to deliver the service.

Separately, Hyundai Rotem work closely with KiwiRail to coordinate the maintenance of carriage consists using the Carriage Depot and facilities shared with KiwiRail.

Following a number of rolling stock breakdowns that occurred towards the end of 2017, GWRC has engaged SNC-Lavalin Rail & Transit NZ Limited (SNC-Lavalin) to undertake an independent investigation of the Wairarapa Line trains. The purpose is to identify the root causes of rolling stock failures and to provide recommendations for improvement.

Faults and failures relating to the network, operator, or due to a 3rd party (e.g. power failure, incidents, trespassers) are excluded from this investigation. There has already been significant work done to investigate the network and a $100M investment in track upgrades has been submitted to Government.

This independent investigation report details the causes of rolling stock faults and failures, identifies any areas of high risk and contains recommendations for reducing the likelihood and/or consequence of failure.

4 Objective and Scope

The objective of this study is to conduct an independent investigation to identify the causes of rolling stock faults and failures and to provide recommendations to improve service reliability.

The investigation has required consultation with the following parties:

- Transdev as the operator of the Wairarapa services.
- Transdev staff who operate the remote controlled shunt locomotives (RCOs) to form the trains at Wellington Platform, and the Transdev staff who inspect and certify the trains to run at Wellington Platform (TX or TXOs).
- Transdev train crew including Train Managers (TMs) who start and prepare the trains in Masterton, and then operate the trains between Masterton and Wellington.
- TLP, who maintain and provide:
  - the DFB class locomotives used to haul these trains, and
  - the shunt locos used to exchange the consists.
- TLP who also provide Locomotive Engineers (LEs) who drive the Wairarapa trains.
- KiwiRail Carriage Depot staff, who share the maintenance facilities with TCMP.
- TCMP maintenance and servicing staff.
- GWRC Rail Operations Team, who administer the overall running of the services, including maintenance and servicing strategies.

To manage the scale of the investigation, the study has revolved around the delays caused during the period Dec 2016 to Dec 2017. Failures of note that have occurred since Dec 2017 have also been included. Specifically, GWRC provided delay information covering the period 19/12/2016 to 19/12/2017, which was extracted from their RPMS (Rail Performance Monitoring System). This information formed the basis of the investigation.

Faults or failures that have caused:

- a delay of 5 minutes or more, recorded at journey end; or
- the train to not operate (i.e. it needed to be replaced by buses); or
- the train to not complete its journey (i.e. it needed to be "rescued"); or
- one or more carriages to be unavailable to operate a service; or
- passenger discomfort e.g. carriage generator and subsequent Heating Ventilation Air Conditioning (HVAC) failure,

were the focus of the investigation. This aligns with the performance measures GWRC use to measure performance on the Wairarapa services.

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5 Method

5.1 Outline of the Investigation

The investigation was carried out between January and March 2018, with each of the parties who combine to provide train services on the Wairarapa Line. The investigation included the following key steps:

1. Introductory meetings between stakeholders outlining the objectives, scope and method proposed. Individual meetings were subsequently held with parties to target areas for closer investigation.
2. With reference to the RPMS report data covering Dec 2016 to Dec 2017, the fault and failure history logs and information from each party was reviewed for each identified event (a delay of 5 or more minutes, service failure etc).
3. High level engineering inquiry of rolling stock condition and suitability to meet reliability targets (locos and carriage stock). This inquiry referenced relevant information such as the time since last major overhaul or refurbishment, state of repair, and overall suitability for operating the Wairarapa services.
4. A review of Minimum Operating Standards (MOS) for the rolling stock and their fitness for purpose. The MOS define standards for efficient, reliable and safe operation.
5. A review of maintenance and servicing procedures/regimes for locomotives and carriages and in particular with respect to the identified potential causes of failure. This involved numerous visits to the KiwiRail Carriage Depot and servicing roads where the carriage fleet is maintained. This also included a visit to the KiwiRail Rolling Stock Asset Services Depot in Wellington where the DFB locos are maintained by TLP.
6. A review of operating procedures used during start-up In Masterton prior to the morning peak, during pre-departure checks and train formation in Wellington prior to the afternoon peak, and while operating the trains on route on the Wairarapa Line. This involved site visits in Masterton to witness start-up, and in Wellington to witness the preparation of trains prior to the afternoon peak. The onboard operations were observed during a journey outbound to Masterton, and again on the return journey back into Wellington.
7. The investigation also looked into the Failure Reporting, Analysis and Corrective Action System (FRACAS) system used by TLP for the locomotives, and by TCMP for the carriages. Also of interest was whether the respective FRACAS allowed effective cooperation between contracted parties to identify root causes of faults and failure.
8. A review of the engineering change processes used by TLP and TCMP to address defects and to improve the reliability of the rolling stock.
9. High level review of whether staff are adequately trained and have sufficient knowledge to form the trains, undertake start-up, check and certify the train to operate, and then operate the trains while minimising the potential to cause faults or failures. Also of interest was the capability to manage incidents and events that have occurred due to rolling stock failure.
10. With respect to poor track condition leading to rolling stock failure, SNC-Lavalin used fault and failure data to form a view on whether there are any aspects of the infrastructure which are likely to significantly contribute to rolling stock defects.

A review of the contracts that exist between the parties was excluded from the scope. On occasion, some specific parts of the contracts were presented by stakeholders in response to questions during the investigation.

5.2 Constraints

Generally there were no significant constraints to the investigation within the agreed timeframe and budget. There was a natural limit to the information available within the agreed timeframe and our investigations have been at a high level only in some areas. For example the FRACAS history has been explored in detail in regards the recent failures, but records of scheduled maintenance have not been scrutinised. The contents of the scheduled maintenance procedures/checks have been reviewed during the investigation, but in this case we have assumed that TCMP and TLP have performed the maintenance activities in accordance with the procedures provided to the investigation.

Generally, all parties involved were happy to participate and provide information and access for the investigation. In particular the maintenance, servicing and operating staff in Wellington and Masterton were open in providing information, discussing the potential causes of fault/failure or opportunities for improvement. This was especially appreciated given that the investigation activities caused interruption to their daily tasks.

TLP were asked to respond to questions relating to the example Engineering Change Request (ECR) that they provided to the investigation, and what if any response they had had from their supplier of locomotive auxiliary generators. To date TLP have not responded to these questions.

Transdev has been asked to confirm the MOS as they apply under their Rail Licence and has only just responded prior to issue of the report.

TCMP has responded fully throughout the investigation and without hesitation.

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6 Description of the Fleet and Operations

6.1 Rolling Stock

6.1.1 DFB Locomotives

The locomotives used to haul the Wairarapa Line services were originally built from 1979 to 1981 by Diesel Division of General Motors Canada using Electro-Motive Division of General Motors (EMD) traction equipment and were designated as the DF class. They were subsequently upgraded to DFT class configuration between 1992 and 1997 to increase power and fuel efficiency using EMD equipment upgrades. A further upgrade to the traction control system using GE Brightstar™ equipment has been carried out progressively from 2006 to form the current DFB class configuration. The DFB locomotives operating on Wairarapa Line services also have an on-board fire suppression system fitted for passenger safety when working through tunnels.

TLP provides a pool of 5 DFB locos to operate these services. These are dedicated to the service and designated "W" by TLP.

KiwiRail operate a number of DFB locos throughout New Zealand – those fitted with on-board fire suppression are used on passenger services that KiwiRail operates including the Northern Explorer and Tranz Alpine.

The vast majority of maintenance on the DFB locomotive fleet is performed in Wellington at the TLP Depot.

Up to three of the DFB locomotives are required to operate the services during peak periods. One DFB is required during the off-peak and weekends. Hence with 5 locomotives there are two spares, one of which is utilised by TLP during the off-peak to operate a freight service. TLP rotate the use of these 5 locomotives within the Wairarapa-Wellington area so they travel approximately equal distances each year.

TLP provide an LE for each service, but cannot move the locomotive from the yard to the platform without a second person for observation down the "blind side" (this ensures safe operation). Transdev staff perform the second-person-duties. Hence both KiwiRail and Transdev staff are required for DFB locomotive operations at the end of each journey.

Under the "Hook & Tow" agreement, TLP are contracted to maintain, fuel and service these locomotives.

6.1.2 Shunt Locomotives

Under the "Hook & Tow" agreement the TLP is contracted to provide two shunt locomotives to Transdev in Wellington. The shunt locomotives are remote controlled hence require an RCO to operate. The RCOs work in gangs of 2 to transfer the consists between the depot and platform, for any required movements within the depot, and if necessary to re-marshall when carriages are exchanged within a consist.

TLP are contracted to maintain and service these locomotives but the fuelling is done by the RCOs (Transdev have opted to do this for reasons of flexibility).

TLP are also contracted to provide the remote control packs for these locomotives.

6.1.3 Carriages

The carriages used to operate the Wairarapa Line services were originally built by British Rail Engineering Limited for British Rail in the early 1970s.

From 2007 the SW/SWS/SWG and SE/SES/SEG Class carriages entered service on the Wairarapa Line. The SE variants were originally rebuilt to operate on the Kapiti Line but

were subsequently modified for the Wairarapa Line. The SW variants were rebuilt from ex-British Rail Mark 2 carriages specifically for the Wairarapa Line. Both the SE and SW carriage fleet is owned by GWRC.

The consists are formed using a number of SE or SW cars, a "servery" car (SWS or SES) which contains a wheelchair hoist, and a generator car (SWG or SEG) which provides the auxiliary power supply for the trains as well as additional space for bikes or large items of luggage. The auxiliary power supply is critical for operating the HVAC and main lighting system on the trains. It is also used to charge the batteries for the emergency power supply.

The Wairarapa trains make up three services per peak period:

- A train of 8 SW cars (including an SWG and SWS) – "8SW"
- A train of 6 SW cars (including an SWG and SWS) – "6SW"
- A train of 6 SE cars (including an SEG and SES) – "6SE"

One of either of the 6-car trains operates the off-peak services (Shuttle), as well as the weekend services. The 6SE and 6SW consists are alternated to provide these services.

There is one additional vehicle that is operated in the Wairarapa services – an AG Van, which is used on all weekend services for additional luggage space, or for when there are "group bookings" for the train which also necessitates the need for additional luggage space. The AG van is also equipped with an auxiliary generator and hence is used as a back-up generator car in the event of failure of the SEG or SWG car, or if the SEG is required to be removed from service for maintenance (there is no spare SEG car in the fleet).

Total fleet spares comprise four in total: SWG, SWS plus 2 SW.

TCMP are contracted to supply vehicles to make up each of the 8SW, 6SW and 6SE trains. In the weekends or when significant luggage is anticipated, the AG Van is also supplied.

There are no spare SE vehicles, hence it is challenging for TCMP to continue to supply 6 for the 6SE consist[1]. There is one SW that has recently been modified to be compatible with the SE train (air bag alerts, automatic park brake and ride height being key factors for interchangeability). This ability to interchange SW with SE has been under trial and has just been approved, which will provide some flexibility to the SE train.

There are a significant number of carriage variants operating in the Wairarapa fleet. This constrains maintenance and flexibility to mix-and-match carriages to meet demand.

6.2 Complexities of the Operation

6.2.1 Wellington Operations

After completion of the first inbound service from Masterton (1601), the locomotive is removed from the train, turned using the turntable located in the yard and then relocated back to the platform (the LE and TX/TXO work together for this). Separately the carriage consist is removed from the platform and transferred into the depot for fuelling of the SEG/SWG (Transdev staff and TCMP work together for this). After fuelling the consist returns to the platform and is coupled with the locomotive to form the outbound train (1602). The carriage consist has to return to the platform prior to the locomotive for correct train ordering. This locomotive and consist continues to operate throughout the day as the Shuttle (i.e. off-peak services). During the day the consist can remain at the platform while the locomotive is cut-out and turned, provided the allocated platform allows the locomotive to be

[1] TCMP has stated that they get penalised for operating the SE consist short, yet the contract allows for one vehicle to be out for maintenance.

run-around without needing to remove the consist (this is not possible at all Wellington platforms).

The second and third morning peak services from Masterton (1603 and 1605) terminate at Wellington. The carriage consists and locomotives are removed separately from the platform and transferred to the depot. The locomotives are turned on the turntable and then placed in the exchange area which is located adjacent to TCMP office.

The DFBs and carriage consists can only move between the platform and yard after clearance from Train Control. During the morning peak period there are a significant number of metro services operating in/out of Wellington station. Train Control will be managing both platform availability and route clearance through the approach to Wellington station.

KiwiRail contract Transdev to perform shunting duties on the services they operate in/out of Wellington i.e. Capital Connection and Northern Explorer. This includes transfer of these consists to/from Wellington station platform and also movement of these trains within the Carriage Depot.

To set up the trains for the afternoon peak, the operations are the same i.e. the RCOs transfer the consists from the depot servicing roads to the platform, and the LEs and TX/TXOs transfer the locomotives to the platform.

Transdev, TLP and TCMP all have to work closely to coordinate the Wellington operations. The ground staff are critical to the operation.

6.2.2 Shared use of Wellington Carriage Depot

The Carriage Depot is owned by KiwiRail and used to maintain and service the Wairarapa carriages as well as those operated by KiwiRail on the Capital Connection and Northern Explorer. The depot is shared with TCMP under an access agreement.

The depot has 3 roads, each of which has specific purposes. 12 Road is the only full-length road with a usable pit – this is used to perform checks of the under-body equipment, bogies and brakes. 12 Road is critical for both TCMP and KiwiRail. 11 Road is used for exchanging HVAC units and setting up bogies. 10 Road is used for replacing broken windows. The depot design is inefficient – the design of the depot and interface with the fuelling/wash road limits the potential for use of 11 Road and 12 Road.

The respective Team Leaders work closely to minimise any potential for disruption and to be able to respond flexibly to unplanned maintenance work. The maintenance of the Wairarapa fleet is highly sensitive to the ongoing shared use of this depot.

It is understood that KiwiRail wish to transfer the maintenance of additional AK cars (from the Northern Explorer train) to this facility. It is also understood that stakeholders are in discussions regarding the potential impact of additional AK cars, and to identify any opportunities for improvements to procedures, yard layout or facilities.

6.2.3 Wellington Yard Lock-Down

For safety reasons, when the depot and yard areas are "unlocked", staff are not allowed within this area except for the RCOs operating the shunt locomotive, and the TX/TXOs assisting the LE during mainline locomotive movements. This is to protect staff from harm.

The yard is only locked after all carriage fleets are transferred from the platform to the depot. This includes the Capital Connection and any required Northern Explorer carriage movements.

After the yard is locked, maintenance and servicing staff can access the consists to perform their tasks. Train 1603 from Masterton arrives into the yard at approximately 9:30am but it is not possible to access this consist until the yard is locked down at 10:30-11:00am. The yard

is unlocked each day at 3:00pm in preparation for the afternoon services. Hence the window for servicing and maintenance is between approximately 11:00am – 3:00pm.

TCMP refer to this window as "Touch Time" and have stated that this is a significant constraint to use of the depot and effects their ability to perform maintenance and servicing activities.

It is understood that this constraint, the associated yard and depot lock-down, and initiatives to improve access time while maintaining site safety have been discussed and reviewed between TCMP and KiwiRail on a number of occasions. It is understood that discussions had ceased for some time but KiwiRail are now actively seeking a solution to improve access time for TCMP.

6.2.4 Masterton Operations

During the off-peak the Shuttle arrives into Masterton, the locomotive is cut-out and then run-around the carriage consist out to the turntable in the yard. The difference between Masterton and Wellington is that the TM assists the LE to second-man and turn the locomotive (the TX/TXO does this in Wellington). There are no other passenger trains operating on this line hence the consist remains at the platform during locomotive-turning.

It takes a minimum of 10 to 15 minutes to turn a locomotive and return to the platform.

In Masterton when the arriving train is significantly delayed, staff will utilise the spare locomotive to shorten the turnaround time by having the spare locomotive "ready-to-go" facing forward.

The turnaround operations in Masterton are significantly simpler than those in Wellington. The locomotive still has to be cut-out, turned and re-coupled. However, shunt locomotives do not operate in Masterton, the consist can remain at the platform during locomotive turning, and only two parties are involved in setting up the train to operate in the opposite direction – TLP and Transdev (TCMP staff are not located in Masterton).

Start-up in Masterton is done by the TM who unlocks the train, turns on the auxiliary generator, walks down the train turning on HVAC and lighting, and performs the required checks. External checks are also performed by the TM and after the LE arrives, they coordinate to perform a brake test. There are no staff from TCMP located in Masterton so if faults occur it can take some time for a response/fix. Ideally any fault is found during start-up, however (while infrequent) some are found at the platform or at departure of the service.

Following completion of the evening peak services, the TM assists the LE to transfer the consists into the stabling area, detach and turn the locomotive, and couple up to the south end of each consist so trains are "ready to go" for the next day.

It is understood that there is some mismatch of capacity to demand i.e. some of the services are overcrowded while others are relatively empty. Hence it would be advantageous to be able to easily swap carriages between the consists to better match demand. Currently re-marshalling is only performed in Wellington, hence consists can be re-configured prior to the afternoon peak but they would have to remain that way until returning to Wellington the following morning.

6.2.5 Opportunity to simplify with DMUs

GWRC have proposed new rolling stock for the Wairarapa services, which would utilise Diesel-Multiple-Units (DMUs). The use of this type of rolling stock would eliminate some of the existing complexity and importantly provide an in-built level of redundancy. There would be no need to swap the locomotive between ends of the train because DMUs operate in either direction without needing to reform the consist.

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7 Results

7.1 Contribution of Rolling Stock Faults and Failures to Poor Service

7.1.1 Origins and use of the RPMS

GWRC utilise the RPMS to monitor the performance of rail services operated by Transdev in the Wellington region. The RPMS data contains information about any delays that occur on any of Wellington's rail services including the Wairarapa trains. The RPMS is used by stakeholders to identify delays and therefore areas of the operations that require attention.

Specifically, attribution codes are assigned to each delay event, which may be comprised of a number of different sources. For example, a Wairarapa train delayed by 12 minutes at arrival into Wellington may have been delayed by 6 minutes due to track speed restrictions, 3 minutes due to high passenger loadings, and 3 minutes due to a door fault. Delay minutes are attributed to each party, and hence for the door fault in this example TCMP would be responsible for 3 minutes delay.

The main inputs to the RPMS come from a GPS unit on each train (referred to as "KMC"), which is used to confirm departure and arrival times at each station. KiwiRail have a system (referred to as "OMS") which is used to verify train make-up. The TM on each train is responsible for completing a "Mis7b" form – this includes information on delay minutes, causes, where the delays occurred and attributions. Passenger numbers are also recorded (estimated based on empty seats or the number of standing passengers).

The "Mis7b" form information is entered into RPMS by Transdev who subsequently analyse and validate the attributions with reference to information from various other sources including KiwiRail Network, Train Control, and TCMP etc.

The RPMS report information for each day is reviewed in a "Daily Performance Meeting" with KiwiRail Network. The delay minutes associated with each party (Transdev, TLP or TCMP) are debated in the meeting:

- If they are agreed there is no further action and the RPMS report data is finalised.
- If there is disagreement, further investigation is required and the delay minutes are then debated in a "Weekly Performance Meeting".

The RPMS forms a framework with which the parties that are contracted to operate the trains are incentivised to strive for continuous improvement.

7.1.2 Analysis of RPMS for the Wairarapa Trains

The RPMS data for Wairarapa trains for the period 19/12/2016 to 19/12/2017 was analysed to identify locomotive or carriage faults and failures.

There were two purposes:

- To identify faults or failures that caused a delay of 5 minutes or more, or service failure. This information formed the basis for the investigation and each event was scrutinised using additional information made available from TLP and TCMP.
- To form a view on the contribution of rolling stock faults and failures to the overall service reliability

7.1.3 Contribution of Rolling Stock Faults and Failures - Delays

The total delay attributed to each component of the operation was calculated for the period Dec 2016 to Dec 2017. The contribution, as a percentage, could then be determined for each cause of delay:

- NETWORK –
  - speed restrictions,
  - other faults in the track, signalling etc,
- ROLLING STOCK –
  - faults/failures on the carriages,
  - faults/failures on the locomotives,
  - LE error or other issues associated with the services provided under the "Hook & Tow" agreement,
  - other rolling stock delays,
- OPERATOR –
  - "Yard Staff" issues that occurred during train make-up,
  - passenger loadings that have caused long station dwell times,
  - other operator error (Transdev onboard staff i.e. train crew),
- 3RD PARTY – network power failure, incidents, trespassers, weather etc.

This is illustrated in Figure 1.

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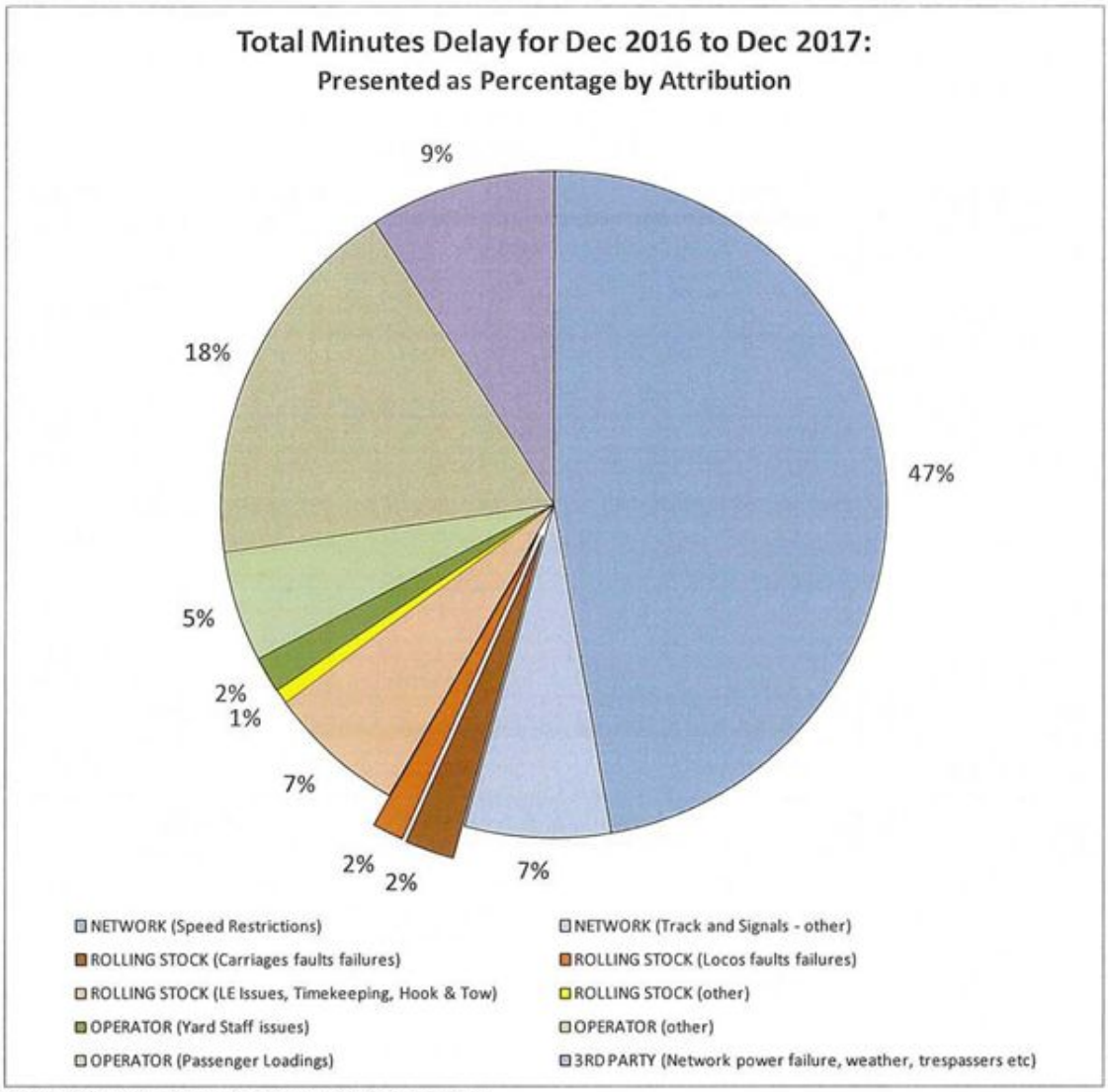

Fig 1: Contribution of rolling stock to delay

From Figure 1 we can form a perspective on the contribution of rolling stock failures:

- NETWORK speed restrictions account for the vast majority of delays (47%), and when combined with the remaining NETWORK faults account for more than half the total delays.
- ROLLING STOCK faults/failures contribute to delays in a minor way – in total 4% of the delays – or about 2% each for locomotives and carriages.
- ROLLING STOCK delays that relate to the operation of the trains including attribution codes "LE Issues", "Timekeeping", and "Hook & Tow" total 7% of all delay minutes.
- Attribution code "Yard Staff issues" has been itemised in the graph because these relate to the exchange of rolling stock between the depot and platform in Wellington. This equates to 2% of the delays.
- The OPERATOR attribution code "Passenger loadings" accounts for 18% of all delays. This code is used when station dwell times are extended due to a high number of passengers boarding or disembarking, for passengers who are slower than

average, or when there are a number of bikes or passengers with luggage to load/unload from the end car in the train.

Hence if we look at the potential for this investigation to reduce delays on the Wairarapa services, this is likely to be limited – rolling stock faults and failures contributed to 4% of total delays.

7.1.4 Contribution of Rolling Stock Faults and Failures – Service Failure

The number of services that did not operate, or could not complete the journey as a result of rolling stock failure were determined relative to all other sources of service failure. These were determined based on the number of services replaced by buses. This is illustrated in Figure 2.

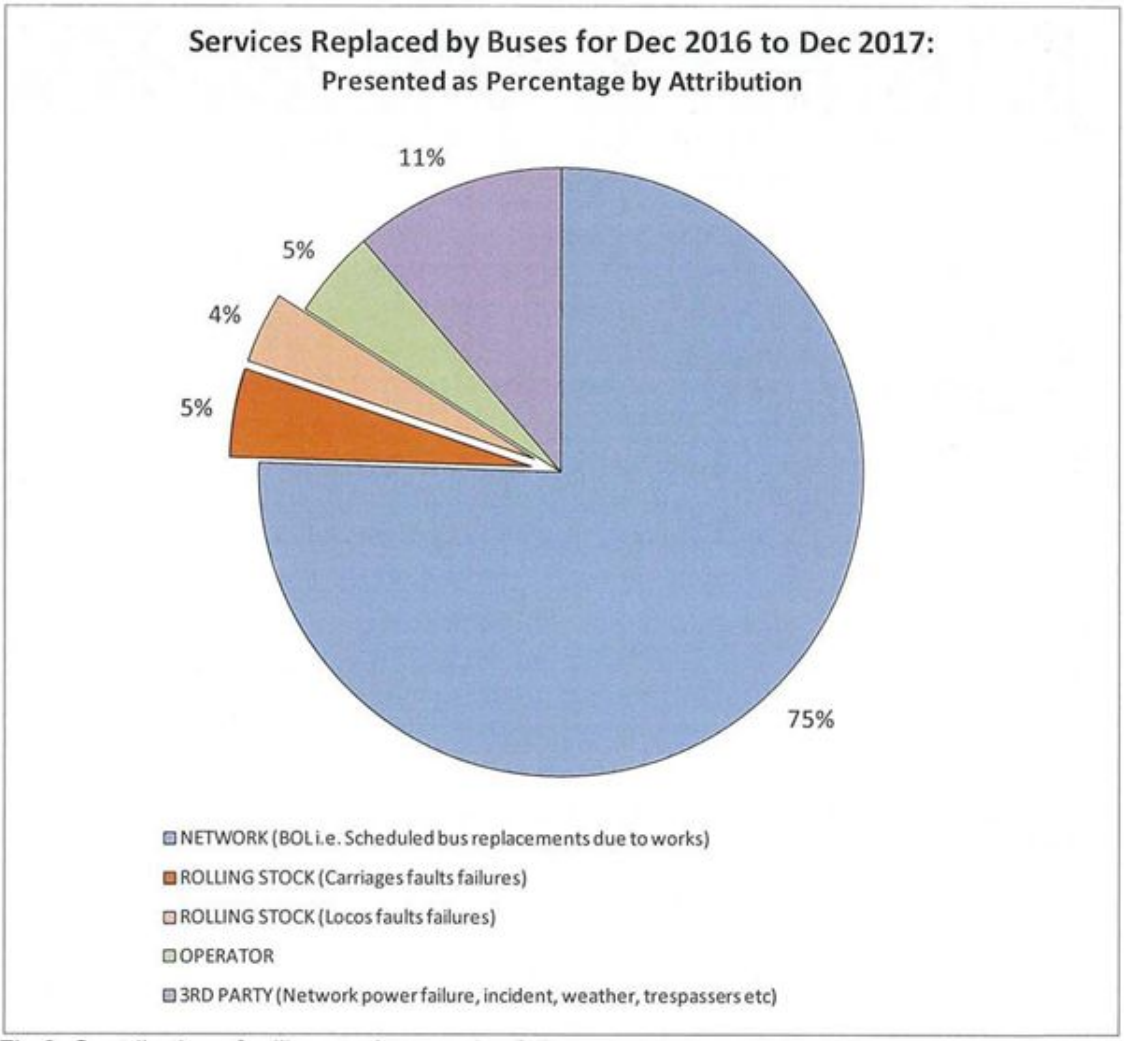

Fig 2: Contribution of rolling stock to service failure

Figure 2 identifies that the vast majority of services replaced by buses were due to network-related issues, but there is one important distinction – these were planned infrastructure works on specific sections of the network (called Block of Line or "BOL") with bus replacements scheduled to replace rail services on the Wairarapa Line. Passengers had the opportunity to plan for this event.

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The majority of services that were replaced with buses were for scheduled infrastructure works. This allows passengers to plan accordingly. Service cancellations due to rolling stock failures are unplanned and hugely disruptive to passengers. A key focus for the investigation was to look into faults and failures that may lead to the failure of a service, either on route, or prior to departure.

7.2 Rolling Stock Faults and Failures Identified from RPMS

RPMS data was used to identify faults or failures. This information formed the basis for the investigation.

Based on the types of faults/failures found in the data, faults and failures have been categorised in Table 1.

Criticality Rank:	Description of Fault/Failure Consequences:	Types of Faults/Failures:
1	Locomotive failure leading to swapping with spare, breakdown on route, service failure, subsequent service failure or significant delays	Locomotive failure
2	Cause considerable delay, short consist, passenger discomfort and/or cancellation of subsequent services	Carriage generator failure Braking/pneumatic system faults Door circuit faults Locomotive system faults Operator error
3	Cause delays of more than 5 minutes	Door / step faults BP/MR hose leaks Bogie fault Locomotive system faults "Yard staff" issues / Operator error

Table 1, Rolling stock faults and failures – criticality rank

Using the criticality ranking of 1-3 described in Table 1, the fault and failure information for the period Dec 2016 to Dec 2017 is presented in Table 2.

Rolling Stock:	Component / group responsible:	Criticality Rank 1: Locomotive failure leading to swapping with spare, breakdown on route, service failure, subsequent service failure or significant delays	Criticality Rank 2: Cause considerable delay, short consist, passenger discomfort and/or cancellation of subsequent services	Criticality Rank 3: Cause delays of more than 5 minutes
DFB Locomotive:		5 + 2 subsequent	3 + 1 subsequent	4
Locomotives Subtotal:		7	4	4
Carriages:	Auxiliary generator		5 + 2 subsequent	
	Brakes/pneumatic system		6	7 (including subsequent)
	Bogies			1
	MR/BP hoses			5 (including subsequent)
	Doors		1 + 2 subsequent	11 (including subsequent)
	Operator error		4	9
Carriages Subtotal:		0	20	33
	Yard / Transdev Staff Issues			8
	Unconfirmed			2
Other Subtotal:				10
TOTAL:		7	24	47

Table 2, Rolling stock faults and failures – identified from RPMS Dec 2016 to Dec 2017

Based on the information presented in Table 2, the following findings are relevant:

1. There were 5 locomotive failures where the DFB had to be either swapped for the spare or rescued. The cause of the failure inconsistent i.e. different components had failed to cause the breakdown. Fortunately, during 3 of these events the spare locomotive could be used to operate the service. During November 2017 there were 2 failures which left the train stranded until able to be rescued.
2. There were 5 occurrences of the auxiliary generator on the carriages failing (including one which was attributed to operator error). Failure of the auxiliary generator leads to shut-down of the HAVC system and main lighting throughout the train (emergency lighting and other safety-critical systems remain active via the emergency battery power supply). The HVAC is critical for maintaining acceptable internal temperatures and for exchanging air – failure of this system quickly leads to hot and stuffy conditions.
3. There was 1 door circuit fault on a carriage consist at the platform in Wellington that caused subsequent cancellation of two services. This was an electrical fault that effected the entire consist.
4. There were 6 brake / pneumatic systems failures on the carriages, with various causes. These resulted in delays in cutting the effected vehicle out, short consists, and passenger discomfort (due to wheel flats).
5. There were 3 locomotive system faults causing delays of 10 or more minutes.
6. There was one incident (attributed to operator error) which caused the 6SE consist to have to operate with 5 carriages throughout November 2017. This occurred because all of the carriage wheels locked up when braking into a station. The consist was inspected in the depot and found to have no brake faults, hence it was assumed to be LE error by Transdev. The incident caused wheel flats on all carriage wheels.

7.3 Rolling Stock Faults and Failures – Primary Causes

The faults and failures listed in Table 2 were reviewed with the operator or maintainer responsible in order to establish the primary cause(s) of failure:

- Locomotives – with TLP
- Carriages – with TCMP
- Operation of the trains – with Transdev

The causes of failure identified by each of these groups for rolling stock failures, together with existing corrective actions are listed in Appendix A. The listed causes of failure focused on identification of the failed component (for a fault type attribution), or of the failed action or inaction (for an operator error type attribution). These were not necessarily the root cause(s) of failure, which is discussed in Section 8.

7.4 MOS

The Minimum Operating Standards (MOS) define the minimum in-service parameters essential to reliable, efficient and safe operation.

7.4.1 DFB Locomotives

Transdev, through their sub-contract with TLP, require locomotives to be supplied that are fit for purpose, comply with applicable laws and meet the specifications required to operate the Wairarapa services. This includes compliance with the National Rail System Standard (NRSS), and in particular NRSS/6–Engineering Interoperability.

The MOS for locomotives are set out in KiwiRail M2000 Mechanical Code. M2000 is a comprehensive document covering minimum requirements for all vehicle types operated or

maintained by or for KiwiRail. Its purpose is to ensure that these vehicles comply with the conditions of KiwiRail's Rail Operating Licence (and in this case those of TDW's Rail Licence), NRSS, and meet safety and commercial expectations.

M2000 defines the minimum requirements that are applied:

- Whenever a rail vehicle undergoes a scheduled inspection check.
- Whenever any evidence of non-compliance can reasonably be noticed, or is advised by operating staff, members of the public, customers, or passengers.
- Following an incident where inspection is required.
- When random inspection is being performed.

The in-service limits are designed to assure safety provided that scheduled inspections are carried out by the due date.

M2000 requires a Radio Test to be performed prior to each journey. TLP complete this immediately prior to the operation of each Wairarapa service.

7.4.2 Carriages

Transdev, through their sub-contract with TCMP, require carriages to be supplied that are fit for purpose, comply with applicable laws and meet the specifications required to operate the Wairarapa services including NRSS Standards.

The MOS for carriages were previously defined in M2000 when KiwiRail operated these services (this was prior to Transdev taking over the contract from July 2016). Transdev, as the new operator, are in the process of developing a new "Asset Engineering Code" (currently in draft form under review), and have stated that the MOS will be updated shortly thereafter. In the meantime, and since taking over the contract, the MOS have been defined by:

- Primarily the GWRC Carriage Fleet Maintenance Plan (Document ROLST-10-24, Issue 1), which was included in the operating contract, and which defines the maintenance and servicing intervals, procedures and checks.
- KiwiRail Rail Operating Code (ROC) is also used to ensure compliance with the NRSS standards.
- Applicable ROC supplements – specifically the Operating Manuals for each of the SW and SE Class rolling stock.

During the investigation the critical procedures, check sheets and operating manuals were reviewed. Table 3 below details where the standards that TCMP use differ in comparison to those used in the GWRC Carriage Fleet Maintenance Plan (any differences are highlighted in the colour red).

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Check Classification:	GWRC Carriage Fleet Maintenance Plan:	Used by TCMP:
A Check	SW – Loco 482A Rev. A SE – Loco 557 Rev. 5	SW – Loco 482A Rev. B SE – Loco 557 Rev. 6
B Check	SW – Loco 482B Rev. A SE – Loco 558 Rev. 5	SW – Loco 482B Rev. C SE – Loco 558 Rev. 6
C Check	SW – Loco 482C Rev. A SE – Loco 559 Rev. 5	SW – Loco 482C Rev. C SE – Loco 559 Rev. 6
Daily	SW – Loco 651 & 652 Rev. 1 SE – Loco 556 Rev. 4	SW – Loco 652 Rev. 4, Loco 651 Rev. 5 SE – Loco 652 Rev. 4, Loco 651 Rev. 5
Servicing	SW – Loco 651 & 652 Rev. 1 SE – Loco 556 Rev. 4	SW – Loco 652 Rev. 4 SE – Loco 652 Rev. 4
Electrical WOF	M9377 Rev. 2	M9377 Rev. 2
Generator Servicing	Loco 441. Rev 6	Loco 441. Rev 6
D1 & D2 Check	"SE SW Car D1 and D2 Maintenance Check", dated Tuesday, March 03, 2015	"SE SW Car D1 and D2 Maintenance Check", dated Tuesday, March 03, 2015
SW Brakes	M9352 & M9305, Rev. 9	M9352 Rev. 10 M9305 Rev. 4
SW Operating Manual	M9383 Rev. 2	M9383 Rev. 2
SE Operating Manual	M9398 Rev. 2	M9398 Rev. 2

Table 3, Carriage MOS

Hence on a number of checks, TCMP is using revisions that differ from that specified in the contract. In most cases the revision numbers are more current than that specified in the contract so this may not necessarily represent an issue provided the amendments enhance the quality or extent of the check. However, it is understood that these changes have not been submitted as a change request to GWRC, hence are not yet approved.

There is however one level of checking that differs significantly in comparison to the GWRC Carriage Fleet Maintenance Plan – the Daily check.

TCMP utilise one check sheet, Loco 652 Rev. 4 "1250km Maintenance Check Procedure for SW/SE Consist" ("1250km check") for checking and servicing the consists. The content of the check is similar to the "Daily" check specified in GWRC Carriage Fleet Maintenance Plan, except that instead of inspection on a daily basis, a kilometre interval is used. Loco 651 Rev. 5 is used to record the 1250km check and has been further developed by TCMP to include an additional page of checks required prior to release from the depot following any maintenance.

The 6SE and 6SW consists are used to operate the Shuttle during the off-peak – normally the 6SW operates these services Mon, Wed and Fri, and the 6SE operates these services Tues and Thurs. The 6-car consist operating the Shuttle is not seen by TCMP except briefly in the morning in between services 1601 and 1602 for fuelling. Hence it is not possible to perform daily checking in the depot on this consist. In terms of pre-departure checks for the day to confirm that the consist is fit-for-service, the Shuttle relies on checking performed during start-up by the TM in Masterton (this is not performed using the 1250km check – a separate Transdev-derived check is used).

The 6-car consist that is not operating the Shuttle is in the depot for the day and is checked using the 1250km check. The 8-car consist is not used during the off-peak, hence is received every day into the depot. This is currently checked Mon, Wed, and Fri using the 1250km check.

Hence, in practice every consist that is in the depot during the off peak period receives a check on a daily basis utilising the 1250km check except the 8SW which misses out on Tues and Thurs. This consist travels up to 364 km in between checks (i.e. 2 days running), hence relatively low kilometres for the 1250km check. It is understood that the 8SW does receive a basic check after arrival into the depot and prior to release for the afternoon services, but this is not documented nor performed to a particular check sheet.

Hence, while the checking has in some cases been enhanced (the Loco 651 Rev.5 contains additional checks), there is no formal inspection of the 8SW each day prior to operating in the afternoon peak. Every consist should receive an inspection by TCMP and a signature confirming it is fit-for-service prior to operating in service. The purpose of this is to identify any existing faults, to allow either a rapid repair or isolation to prevent faults appearing at the platform or while operating in revenue service. The 1250km check has not been approved by GWRC, hence is a non-compliance to the MOS.

Table 4 below contains distances normally travelled by each of the Wairarapa consists in between each 1250km check.

Consist:	Maximum distance travelled in between 1250 check:
6SW	1456 km
6SE	910 km
8SW	364 km

Table 4, Carriage km in between 1250 checks

The 6SW operates both the Friday and then the Monday shuttle, hence has travelled 1456 km before it is able to be captured in the depot.

There is no upper kilometre tolerance limit specified on the 1250km check, so with 1456 km travelled between checks this consist does not comply with the checking level.

TCMP is aware of this and is considering a number of options to address this, including swapping the AG van from the 6SE to the 6SW on Saturday night in Masterton, and by using weekend maintenance. Based on the current consists weekly plan, is not possible to reduce the kilometres travelled below 1250 km without weekend maintenance.

7.5 Maintenance and Servicing Specific to Key Causes of Failure

7.5.1 Locomotive Breakdown

The locomotive servicing checklists were reviewed and found to be consistent with good locomotive maintenance practice when the duty cycle of these locomotives operating under New Zealand conditions was compared to Original Equipment Manufacturer (OEM) maintenance programme intervals[2]. The locomotive maintenance Checks are based on kilometres only with a time based upper limit.

It is understood that there is engineering oversight of locomotive performance which informs decisions around the timing of overhaul and of refurbishing locomotive components. Overhauls for the locomotive fleet are based on several factors that are controlled by KiwiRail Engineering. Based on the information provided to the investigation, the DFBs are overhauled every 7-9 years. The date of last overhaul in listed in Table 5.

DFB No.	Date last overhauled:
7010	11/12/2015
7158	1/12/2012
7200	18/04/2016
7307	21/04/2015
7348	29/07/2016

Table 5, DFB overhaul dates

TLP have stated that all rotable equipment is replaced with refurbished items as part of the overhaul, and that KiwiRail Engineering review failure data as part of FRACAS to determine best practice for rotable equipment replacement.

On this basis, and with integration of their FRACAS into the regime, the locomotives are maintained and serviced to good industry practice. FRACAS has only recently been developed, has some opportunities for improvement, and is discussed further in Section 7.7.

7.5.2 Carriage Auxiliary Generator Failure

Overheating leading to shut down

The level of required generator maintenance is dependent upon the application. The SEG/SWG utilise a design whereby the generator is contained inside an enclosure, inside a room at the end of the carriage. The containment inside an enclosure is not uncommon – it is a typical configuration for generators provided by hire companies. The difference here is that the enclosure is contained within the carriage but without a full-sized opening at the front and rear to allow for free-flowing air for cooling. The "box-in-a-box" aspect to this application contributes to the maintenance requirement. In particular the generator is subjected to high ambient temperatures due to poor airflow across the engine and through the radiator. High temperatures can reduce the life cycle of components such as the radiator hoses and fuel injectors.

There are 3 variations of generator on the SEG/SWG fleet:

- 2 new CAT™ units (recently installed in two of the three SWGs). These have a number of advantages over the original units – they have a more efficient cooling system (bigger fan, improved radiator core), and access to the radiators for steam cleaning is significantly improved in comparison with the original unit. They produce the same power output but have a smaller engine (7.0L versus 8.7L). Hence these units are likely to suffer less in comparison to the original unit. Separately, KiwiRail have purchased a number of these new CAT™ units for their "tourist trains".

[2] EMD M.I. 1743 Rev B, Scheduled Maintenance Program, Turbocharged Export Locomotives (645 Engines)

- 1 remaining original Olympian™ / Perkins unit in the SEG (due for replacement with a new CAT™ unit in July 2018). This has approximately 22,000 operating hours use. The supplier has recommended changing out this unit as soon as possible due to potential reliability concerns.
- 1 relatively new Olympian™ / Perkins unit, purchased by GWRC prior to TCMP taking up the rolling stock maintenance. This is installed the remaining SWG. This is not as advanced as the new CAT™ unit but it has the improved radiator design to allow easier access for steam cleaning, which is considered to beneficial in reducing susceptibility to overheating and shut down.

The critical aspects of generator maintenance and servicing in this application are:

- Maintaining airflow i.e. inspecting and cleaning the air intake filters
- Inspecting and cleaning the radiators
- Inspecting the radiator hoses for signs of damage, cracks, leaks etc
- Maintaining coolant quality and level
- Inspecting the fan, pulley and belts for signs of damage – the fan belt in particular

The auxiliary generators on the SEG/SWG carriages are checked and serviced to Loco 441 Rev. 6. The "250 hour check" is not currently performed (TCMP have used the GWRC Carriage Fleet Maintenance Plan for reference which is inconsistent with Loco 441 Rev. 6).

This leads to the question about whether the "250 hour check" is appropriate in this application. This check includes a number of inspections, an oil and oil filter change and cleaning of the engine and air filter. In the OEM documentation, there is wide variation in the recommended maintenance schedules between the generators – for the Olympian™ unit, the 250 hour check does not exist, whereas for the CAT™ unit the oil and oil filter change would occur at approximately 60 hours (weekly)[3].

Auxiliary generator maintenance - there is a discrepancy between Loco 441 Rev. 6 and the GWRC Carriage Fleet Maintenance Plan. The "250 hour check" is not currently performed but considering the criticality of the generators to train functions, this check is recommended to be implemented into the maintenance regime.

The capability to effectively wash radiator cores during the "500 hour" checks has been improved significantly on all of the SWG cars but the SEG retains the original inaccessible design.

The Loco 441 check sheet needs to be updated to include battery checks (listed in the OEM 450 hour maintenance check) and radiator hose inspection/replacement (these have failed previously due to excessive heat environment).

Running out of fuel

There was one occurrence of "failure" of the auxiliary generator due to running out of fuel. This was due to a number of causes:

- It is difficult to fill the fuel tank completely – while the theoretical tank capacity is 550L, the capability to fill to this level is limited by the filler pipe shape, poor auto-shut off function, the location of the "manual fill" spout/cap and/or possibly the internal pick-up location inside the tank.
- The fuel gauge on the side of the tank is known to be fairly inaccurate. There is no separate low-level alarm or more-easily-read gauge inside the carriages.

[3] The generator supplier would not confirm maintenance requirements but did suggest that they were under-maintained in this application at present.

- The carriage consists can be swapped in/out of operating the Shuttle at short notice due to unforeseen events. There is no refuelling facility in Masterton, hence it can be difficult to guarantee access back at the depot in Wellington for refuelling.

As a consequence of this "failure", TCMP refuel every consist every day, regardless of operating hours. This includes the Shuttle, which is captured immediately following the first inbound service (1601) at approximately 7:45am. Based on fuelling information that was gathered by TCMP during a one week period[4], the amount of fuel put into each of the consists each day varied from between 80L and 190L throughout the week. This suggests that TCMP, and Transdev RCOs who are required for fuelling, are at times unnecessarily expending man-hours because of the uncertainties surrounding the fuelling and risk of running out.

Checks during Start-Up in Masterton

At present the TMs do not check the generator fuel level or coolant level prior to start-up.

The fuel gauge on the side of the tank is visible during the external "walk-around" inspection. However as stated this is considered to be fairly inaccurate and hence it may be difficult to know with certainty whether the fuel level is low. Options for refuelling in the Wairarapa are limited because there is no refuelling facility in the stabling yard. Refuelling in Masterton has been done before on an ad-hoc basis but there are complexities in providing access for mobile refuelling trucks and they are not readily available at short notice at 4:00am.

At present it is not practical for TMs to check the water level. There is a design deficiency in the auxiliary generators – no catchment tank exists for radiator coolant, hence every time the generator is used the coolant system heats up resulting in the inevitable release of some coolant. Over time, the coolant level reduces below the minimum. The coolant level can only be checked by removing the radiator cap, which is fairly inaccessible inside the generator compartment. TCMP have proposed a design change – a catchment tank that will enable quick and easy checking from inside the generator car. If the water level was extremely low this could be topped up in the stabling area (akin to topping up water in a motor vehicle at a service station). This has not been implemented.

7.5.3 Susceptibility to skidding wheels causing "flats"

The carriages are susceptible to wheel skids which can cause "flats" on the wheel profile. If these are significant the vehicles have to be removed from the consist and taken to the wheel lathe where the wheels are re-profiled. This can cause the consist to have to run short while each carriage is repaired. The Wairarapa fleet is susceptible because:

- The carriages are not equipped with anti-skid technologies
- The brakes on the SW in particular are challenging to adjust correctly (the SE is easier due to bogie-mounted brake cylinders)
- Areas of the network are prone to low adhesion (leaves, rain and rail corrugations)

The incident resulting in the entire 6SE consist receiving wheel flats has been discussed. It is challenging for LEs to operate the Wairarapa services to timetable.

The carriages are equipped with Variable Load Valves (VLVs), which adjust the braking effort relative to passenger loads. It is important that these are functioning correctly to minimise the potential for causing skids. It is proposed that TCMP review checking, lubrication and adjustment intervals and procedures for these valves.

[4] This was manually gathered during the investigation.

7.5.4 Door Circuit Fault

There was a door fault that caused cancellation of two Wairarapa services and significant disruption in the platform at Wellington station. This was due to an earthing fault in the electrical circuit. TCMP is aware of the need to update the electrical system checks and is looking at adapting the Matangi electrical testing process for carriages with a specific focus on the door circuit. SNC-Lavalin has not performed detailed investigation of the content of the Annual Electrical WOF Test (refer to Table 3), however these types of earthing faults have been shown to cause considerable disruption to passenger services, and adequate testing must carried out on a regular basis in order to improve reliability.

7.6 Pre-Departure Checks

7.6.1 In Masterton prior to morning peak

In Masterton, the pre-departure checks are completed by the TM working together with the LE. The TM starts at 3:30am and performs start-up and checks on all three of the train consists inside the stabling area. This involves external checks, unlocking the train, starting the auxiliary generator, switching on HVAC, lighting and internal checks. The Terminal Brake Test is performed prior to pulling/placing the trains to the platform. The first train arrives at the platform at approximately 5:00am unless there are any issues found during the checks that require attention.

The TM performs checks to Transdev document "On Job Training & Competency Record (OJTCR), Version 1.1. The checks are recorded on "Mis7b" (no specific revision stated on the form). This is a check sheet that lists a number of pre-departure checks including those relating to doors, concertina curtains, tail lights, end-of-train doors, interior lights, HVAC, fire safety equipment, Train Management System – displaying safe state, cleanliness, and radio test. There are check boxes for each item, including for each specific item of onboard safety equipment.

This is considered a fairly comprehensive check but there may be opportunity to improve the door checks. Mis7b states "Doors – Manually unlocked & checked". Additional detail could be contained in this check to enable testing of all doors open/closed prior to departure.

The OJTCR and Mis7b lacks detail in some other areas also – TMs were observed to inspect the carriage under-body (leaks, damage etc), bogies and brake system components, inter-car area (couplers, gangways, power/communication and earth cables) and the 54D book. These are not covered in any detail in the existing checking documentation.

It is understood based on discussions with Transdev that the TMs use the Operating Manuals M9383 and M9398 (refer to Table 3) in training. It is not confirmed that these are formally part of the training documentation and within their Quality Management System (QMS).

There is one critical additional test performed by the TM during start-up. The first rostered LE arrives at approximately 4am starts and prepares the locomotives for service (this includes a specific radio test in accordance with the KiwiRail ROC). The LE is under the direction of the TM. The TM is in charge of preparing the train and coordinates with the LE for coupling up (if required), and for completing a Terminal Brake Test. After successful completion of the test, the TM signs the Work Order to verify that the train is fit-for-service.

7.6.2 In Wellington prior to afternoon peak

Transdev expect that TCMP have completed any servicing and checks on the carriage consists prior to the yard being unlocked at approximately 3:00pm. This includes verification that the carriage consists are fit-for-service.

The RCO and TX/TXO staff are trained and certified to document "Yard Activities OJTCR", Version 1.1. Transdev have stated that this document aligns with the KiwiRail ROC. This covers train examination, shunting and all required activities for preparing the trains for operating in service.

The RCO gang arrive at the depot and collect each consist and place at Wellington station platform from approximately 3:30pm onwards. They utilise a shunt locomotive and after coupling up they perform a "walk-around" external inspection (which involves checking bogies, brakes, inter-car connections etc), one RCO on each side, to the far end of the consist. They then board the consist, close all doors and verify they have a door light (indicating the doors have all closed correctly). They will not move from the depot without receiving a door light.

The RCO gang then place the consist at the platform where it receives pre-departure checks by the TM (using OJTCR, Version 1.1 and "Mis7b" as used in Masterton).

The TX/TXO performs pre-departure checks at the platform, including a Terminal Brake Test after the DFB locomotive has been coupled up.

The TM is in charge of preparing the train and once these checks and tests have been completed the Work Order is signed by the TM to verify the train is fit-for-service.

There is opportunity for TCMP to improve the checks that occur within the Carriage Depot prior to collection of each consist by the RCO. This is to ensure all consists receive a check prior to departure and is discussed further in Section 8.

Other than this, there were no areas of deficiency identified in the pre-departure checks in Wellington.

7.7 FRACAS and Engineering Change

The investigation also looked into the FRACAS used by TLP for the locomotives, and by TCMP for the carriages. Rail operators use a FRACAS to identify root causes of faults and failures, and to prioritise defects to resolve. They are an essential element in an asset maintenance regime to implement corrective actions which are monitored to verify that the failure mode has been eliminated.

7.7.1 Locomotives – TLP

FRACAS

A FRACAS has been introduced by TLP for the DFT locomotives during late 2017 (presumably following the two locomotive failures that occurred during November), which is a positive improvement process to prevent repeat failures of the same type across the locomotive fleet. Areas where FRACAS actions have been identified and implemented or flagged for implementation on all Wairarapa Line locomotives are:

- Locomotive brake pipe hose replacement – to eliminate coupling hose leaks
- Radiator fan contactor wiring modification – to prevent locomotives overheating
- Cleaning compressor governor air filter – to ensure the air compressor functions
- DID panel tight wiring loom – modified to ensure DID panel operation
- No. 2 end coupler knuckle replacement – to ensure reliable coupling to the train
- Filter Blower Motor circuit breaker tripping – checking panel wiring continuity for reliable operation

The use of FRACAS by TLP appears to be generally sound. The work identified at the Locomotive Depot that is being applied to "W" tagged DFB locomotives aligns with the primary causes of faults/failures found in the RPMS Report.

This is a positive thing and should result in improved locomotive reliability over time. It will take time for the latent faults in the fleet to manifest and be addressed. As the locomotives progress toward their next overhaul the FRACAS will be a key process for keeping reliability up. Given this has only been in place since late 2017 it is difficult to quantify the benefit at this early stage but the failure rates should drop over time using this approach.

The root cause of failure of the auxiliary generator on DFB7200 in Nov 2017 has not yet been established. This component was replaced during the overhaul that occurred approximately 1 ½ years prior to this breakdown. Hence this was a premature failure of a critical machine component. The replacement auxiliary generator was refurbished at KiwiRail Hutt Workshops. It is critical in FRACAS to follow through with suppliers in order to identify potential causes of failure. Assuming this has not been done[5], TLP are relying on the component failure being a "one-off" event with low probability of reoccurrence. This highlights the sensitivity of locomotive reliability to the quality of refurbishment of the critical machine components in the DFB. It is recommended that TLP, using their FRACAS, follow through with their Hutt Workshops for any such failures of machine components that have failed prematurely. The purpose is to identify root causes of failures and reduce the likelihood of reoccurrence through adjustment of overhaul specifications and methods if necessary.

TLP maintenance staff have reviewed the various information sources for identifying/describing locomotive faults and failures. Their conclusion was that the RPMS Report data was the most definitive and trustworthy source because it best reflects what the customer is experiencing. Prior to February of this year, TLP have not been involved in the "Weekly Performance Meetings" conducted by Transdev. Hence during 2017 this has been a failure within the systems and interface used by Transdev and TLP.

Separate to the faults identified in the RPMS data Dec 2016 to Dec 2017, there were two completely separate train parting incidents that occurred in February 2018. Both occurred between the mainline locomotive and carriage adjacent to the locomotive. Both occurred as the train was pulling away to depart from the origin station (one was Journey 1606 ex Wellington, the other Journey 1609 ex Masterton). In both cases there was no "failure" of the coupler – after re-coupling the train departed and completed the journey normally, and the consist completed the daily roster without further incident. The event appeared in the weekly RPMS Report due to the delay caused to the service. Following these two incidents, Transdev worked together with TLP to assess the couplers and coupling up operations using the specific vehicles involved in the incidents (there were two different locomotives and two different carriages involved). The results from these tests were that it was not possible to repeat the train parting and the couplers appeared to perform normally. The conclusion was that it was likely to be operator error, although it could not be confirmed whether this was due to Transdev (TX/TXO) or TLP (LE) error.

Although a firm conclusion could not be established, the joint follow-up analysis of the train parting incident demonstrated good cooperation between Transdev and TLP to determine the root causes of faults and improve the level of service.

Engineering Change

Engineering changes for locomotives are controlled under an Engineering Change Request (ECR) process[6].

[5] To date, the TLP have failed to respond to questions relating to this.
[6] KiwiRail M2000 Mechanical Code Issue 11.10, section 1.7

TLP has provided an example of an ECR in response to the compressor failure that occurred on DFB7158 on 24/11/2017. The ECR amended the 36,000 km check to include cleaning of the compressor control valve inline strainer.

The ECR identifying blocked strainers was originally proposed 4/9/2017[7]. The failure occurred 24/11/2017. Based on the dates on the ECR form we have to conclude that the potential failure mode was identified prior to the locomotive failure[8].

The FRACAS did not appear to be in place prior to the two locomotive breakdowns in November 2017. TLP have subsequently introduced a FRACAS but there is opportunity for further improvement in the investigation of premature failure of machine components such as auxiliary generators, and in the timely implementation of corrective actions for any identified failure modes.

7.7.2 Carriage fleet – TCMP

TCMP have a FRACAS for the Wairarapa carriage fleet. There are a significant number of failures being monitored in FRACAS.

Items are entered into the FRACAS due to the following:

- Safety- related faults/failures.
- Faults/failures that have caused a delay of 5 minutes or more.
- "Trending" faults/failure where there is evidence to suggest that the potential for delay could increase beyond the existing minor level and become more significant.

There is a FRACAS register and a process used to identify and prioritise progress of engineering investigation of faults/failures within TCMP. This process is applied to both the "Matangi" EMUs that operate in Wellington, as well as the Wairarapa trains. For the Wairarapa carriage fleet, maintenance staff have been tasked with performing these investigations. Completed engineering investigation reports are submitted internally within TCMP. Any associated engineering changes need to be reviewed internally within TCMP and approved by each section engineer. It is understood that the internal review does not occur in parallel i.e. after one of the section engineers has approved the change it is passed to the next for review. Hence any delays in processing accumulate.

Based on discussions with maintenance staff, there were a number of engineering changes identified that have been submitted by maintenance staff that have not yet been approved. Some of these were submitted more than 12 months ago. Examples of unapproved engineering changes were:

- Brake rigging component drawings (KiwiRail previously refurbished these components without any drawings, hence drawings were prepared by TCMP for a number of existing minor components where drawings did not already exist – this "engineering change" was awaiting approval) – change request first submitted – 12/07/2017[9]
- Fuel tags for tracking of fuel usage by Wairarapa trains (system already used and implemented by KiwiRail; Transdev and TCMP asked to comply by KiwiRail; limited if any cost) – change request first submitted 18/11/2016.
- Carriage vestibule light replacement (lower cost alternative for obsolete part) – change request first submitted 18/11/2016. The current status is that this is back with

[7] Ref SFR TG-LO-SFR DFB7158
[8] TLP were asked to comment but have not responded.
[9] As at 6th April 2018 TCMP have stated this engineering change has now been approved.

maintenance staff – they have been asked to submit another engineering report to justify the change.

The examples listed above suggest that the TCMP response to faults that have been identified through the FRACAS is too slow. It is critical when faults have been identified that solutions are developed, approved and implemented without delay in order to achieve reliable service.

There were two further examples cited for corrective actions that require approval from other stakeholders in addition to TCMP:

- Door faults caused by door control piping leaks. "ECS-M-0064 Replacement of external door flexible conduit, fittings and tubing, was submitted and requires approval for full fleet install. Current failure rate is 1 door a week." This failure mode was apparently originally identified in 2016.
- Door step faults caused by worn parts and adjustment. "Steps have no overhaul interval and the carriage mid life refurbishment is the responsibility of GW who in the contract may or may not decide to do this. In the latest submission of the asset management plan, TCMP has stated that gangways and steps should be addressed first as projects."

Collectively, these examples suggest the following:

- While the system is robust, there are deficiencies in the process used to approve engineering changes. Generally, approval is far too slow.
- The level of process and approval is not flexible to the level of cost and risk. There may be an opportunity to streamline the process by agreement from stakeholders.
- There appears to be disagreement between GWRC and TCMP about whether the responsibility for some of the repairs is part of the agreed contract, or an extra to the contract.

The disagreement between TCMP and GWRC causes delays to the implementation of some corrective actions.

It is understood that resource has been a limiting factor for TCMP in processing investigation of FRACAS items and developing any associated engineering changes. In response to this, TCMP has provided two additional engineering staff specifically for the Wairarapa fleet during the last 6 months. Transdev have also advised they have recently increased resource for processing engineering change. Given this relatively short timeframe may be too early to form a view on whether this has improved the response time.

Transdev have just provided additional information to the investigation for further background. The FRACAS and engineering change systems have been under review and development by stakeholders for some time. Transdev have taken a very cautious approach to handling of change cases during this period. This conservative response is appropriate to ensure safety is maintained, but appears to have impacted on approval of maintenance and reliability initiatives.

Related to the deficiencies identified through the FRACAS, there is also concern about the level of inventory kept in order effectively to service the Wairarapa fleet.

Based on discussions with maintenance staff, the two spare SW cars are not currently available for service. One has been unavailable for many months awaiting the brake rigging components (delayed awaiting approval of the brake rigging drawings[10]). Seats, lights and

[10] Which as of 6th April 2018 have been approved.

pressure switches were being removed from the spare cars to service the remaining fleet. The use of spare cars as "donor" vehicles is not good practice as it requires the reinstating of removed parts to put the vehicle back into service.[11]

This suggests that inventory stock levels are too low, and the spare parts ordering process is too slow.

7.7.3 Engineering change interface

TCMP provided a sample page from their "engineering change status" system. This includes a series of columns – one for each stakeholder – to indicate where the responsibility for the change request lies. The information presented indicates the following:

- The approval process has several layers – "ECS", "ECPSS", "ECP" and "ECR".
- Approval is required from within TCMP, Transdev and GWRC for each change.
- There appears to have been a change in format which has delayed final approval and implementation due to requests having to be resubmitted to revised format.
- The time intervals between receiving and then acting on change requests, is in some cases significant i.e. slow to process internally by stakeholder.
- The total time is cumulative i.e. assessing and processing by one stakeholder does not begin until it is formally approved by the other.
- The process appears to be robust, which is critical for items such as "Carriage SE to SW compatibility".
- However, the overall process for change approval does not support continuous improvement in a timely manner. Even relatively minor changes (i.e. low cost low risk such as "Removal of coffee machines from SWS carriages" initiated 24/04/2017) are slow to implement because of this approval process.

Transdev have advised that the engineering change systems have been under review for some time. This suggests the entire engineering change process needs further attention – internally within each stakeholder, and also between the stakeholders.

7.8 Lines of Communication

Having effective lines of communication between stakeholders is vital for delivery of the Wairarapa service. There are many stakeholders involved in the operation. Communication lines are required to allow direct interface when appropriate.

There are a number of areas where communication could be improved for the overall benefit of the Wairarapa services. This includes within the interfaces between Transdev, TLP and TCMP for rolling stock faults/failures and in the processes used to operate the services. There is also likely to be benefit with improved incident/delay event response procedures that have been developed collaboratively by Transdev, TLP and TCMP.

In their role as operator, Transdev is responsible for making changes to enhance the lines of communication.

[11] TCMP have stated that they inherited a very low level of inventory when they took over maintenance of these carriages – as at 6th April 2018, they currently hold 583 active part numbers of which 205 existed when they took over. Hence TCMP are increasing stock levels.

7.9 Staff Training

In general, staff maintaining and operating the Wairarapa services appear sufficiently trained to perform their respective tasks. There are some areas where additional training would be beneficial:

- TMs and Train Crew – response to breakdowns, faults and failures, specifically technical knowledge of HVAC, brakes/pneumatic system, isolating cocks, auxiliary generator. Assuming the Operating Manuals M9383 and M9398 are the reference for Transdev staff, these should be updated and formally integrated into the QMS for Transdev.
- TCMP "front line" staff (e.g. station fitters) – fault finding, isolating faults quickly, "book of faults"
- RCO / TX/TXO / LE – coupling auto-couplers (reducing likelihood of partings), and uncoupling BP/MR hoses i.e. avoiding use of "pull apart" as this leads to failure of the support straps and damage to hose head seals leading to leaks.

7.10 Track Condition

The train suspension and the track infrastructure are two parts of a single mechanical system. Poor performance by one part will have a detrimental effect on the other which in turn has a more detrimental effect on the first and so on.

Any track defect that reduces the size of the contact patch between the wheel and rail head or the downward force on the wheels will increase the likelihood of skidded wheels under poor adhesive conditions such as drizzling rain coupled with contaminants on the rail head such as grass or leaves.

Corrugations were evident on the rail head of some sections of network north of Upper Hutt. These have the effect of reducing the contact patch between wheel and rail head and causing wheel unloading. Corrugations will contribute to the susceptibility for wheel skids hence exacerbate the potential for causing "flats" on the carriages.

Suspension performance of the train is important to this interaction as it functions to minimise wheel unloading and hence facilitates better contact between the wheels and rail. It is noted that suspension checks (air bags, dampers etc) occur at least every second day on the carriages. A higher level of checking to ensure that the spring rates have not deteriorated occurs approximately every 6 weeks. These components will be susceptible to failure due to corrugations and this degree of inspection and maintenance is considered appropriate. Higher failure rates may present if the extent of track corrugations increases.

Provided train suspension performance is maintained, the effects of corrugations will be unlikely to significantly impact rolling stock failure rates. The corrugations will certainly impact the failure rate of the suspension components themselves.

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8 Discussion

The investigation was tasked with identifying failures, areas of high risk, and determining the root cause of the rolling stock faults and failures. Faults and failures were analysed based on RPMS data and information from stakeholders. This has identified areas of risk and common causes of failure.

8.1 Locomotive Failure

8.1.1 Areas of risk and root causes of failure

Locomotive breakdown causes significant disruption to passengers and other services operating on the network. During 2017, there were two such failures that occurred on route i.e. the locomotive required rescuing using another locomotive and the service had to be cancelled. These both occurred in November of that year. There were an additional three occasions when the locomotive was faulty and the spare loco was used to operate the service – on two of these occasions this occurred prior to departure hence caused delay but did not cancel the service. There was one locomotive that failed intermittently and returned to Masterton to be connected to the spare loco – on this occasion the train completed its journey through to Wellington, although arrived significantly delayed.

During 2017 there were no carriage faults that prevented the train from completing its journey (there was one journey cancellation at Upper Hutt but this was attributed to vandalism). Locomotive breakdowns however, have the potential to stop the train and cancel the service on route and this risk needs to be managed through use of an effective maintenance and servicing regime, and by utilising rolling stock that is fit-for-purpose.

This leads to the question about whether the DFB Class locos are suitable given their original form is approximately 35 years old. They have been rebuilt or overhauled on a number of occasions from the time they were originally built as DF Class until adopting their current configuration as DFB locos. During this time the locomotive structure has generally remained the same but some of the components and systems have been upgraded when possible. This includes adding the Brightstar™ traction management system for improved adhesion on the DFBs. Nevertheless there are limitations to the extent to which locomotives of this generation can be upgraded. Hence a number of components remain that are of an older design, but which are maintained to an acceptable state through regular servicing and periodic overhaul.

Table 6 shows the locomotives currently operating on the Wairarapa Line and the date of the last overhaul. The "Breakdowns 2017" column shows the number of breakdown failures that occurred in 2017.

DFB No.	Overhaul date:	Breakdowns 2017:
7010	11/12/2015	
7158	1/12/2012	2
7200	18/04/2016	2
7307	21/04/2015	
7348	29/07/2016	1

Table 6, Locomotive overhaul dates

During 2017, there were 5 breakdown failures. Some of these failures were highly evident in the service – in particular the two breakdown failures in November 2017. But some failures were less obvious, for example, on one occasion the spare locomotive was coupled "on top" of the failed locomotive at Masterton Platform prior to departure.

All the listed locomotives have been overhauled within the last 2 to 5 years, and on average exhibit 1 breakdown failure per locomotive per year, which is broadly consistent with locomotive reliability for similarly equipped locomotives in service in Australia. The challenge for the FRACAS system is to reduce the failure rate below 1 per locomotive per year through proactive maintenance actions. Certain EMD-powered fleets of similar vintage to the DFBs in Australia have achieved 1 failure per locomotive per year on twice the annual distance experienced in Wairarapa duty.

During 2017 there were in total 15 failure events on the DFB fleet, which resulted in breakdowns, service failure (including subsequent) and/or delays of at least 5 minutes. Averaged, this equates to approximately 18,000 km between failure events[12].

V/Line in Victoria Australia operates services similar to those operated by Transdev on the Wairarapa Line. V/Line utilise N class diesel-electric locomotives to haul carriages for delivery of inter-city and inter-urban services within the state of Victoria. During the 12 months 1 July 2016 to 30 June 2017, the N class locomotives exhibited an average annual failure rate of just under 23,000 km per locomotive, against a target of just under 30,000 km[13]. In 2015 V/Line changed their maintenance approach from "fix on fail" to "predict and prevent", and the locomotive failure rate is trending downwards as a result (relative to the previous year, a 15% improvement occurred in the N class fleet). Hence with reference to the Wairarapa Line, the failure rate of the DFB fleet is approximately 30% higher (worse) than an equivalent fleet operating in Australia.

Maintenance in terms of scheduled maintenance inspections was found to be consistent with usual good industry practice and it was assumed that maintenance actions are being delivered to schedule as listed on the Check Sheets. Locomotive maintenance inspections are distance-based with an upper tolerance limit on time since last inspection[14].

TLP have given the Wairarapa locomotives the unique "W" identification tag, to ensure they remain in the pool utilised for these passenger services. This is beneficial for service reliability, because it enables any reliability improvements to be implemented quickly throughout the "W" fleet, and also allows for standardisation of any minor variations in the systems and components. This is critical because, while 1 locomotive breakdown failure per year is considered to be within international norms, this failure rate is unlikely to be tolerable for operating passenger services where there is limited equipment redundancy and hence high service delivery impact from a failure. This means that an "above-average" reliability performance is required from the "W" DFB fleet for the Wairarapa services.

The root cause of the 5 locomotive breakdown failures during 2017 was most likely due to insufficient focus on fault finding, developing solutions and applying these to the fleet. Fault finding and subsequent system upgrade is the intent of the FRACAS which appears to have been introduced by TLP following the two breakdowns in November. It will take time for the latent faults in the fleet to manifest and be addressed. Given this has only been in place since late 2017 it is difficult to quantify the benefit at this early stage, but the failure rates should reduce over time using this approach.

Generally, the TLP FRACAS seems robust – solutions for the root causes of recent failures appear to have been implemented throughout the "W" fleet, but there are opportunities to progress this further with improved communication between Transdev, TCMP and TLP. TLP could also improve the depth of fault finding used in this process and in particular in determining the cause of failure in critical machine components (e.g. auxiliary generators) that fail prematurely rather than just exchanging the item. The auxiliary generator was a refurbished item and the extent to which the component was refurbished (and considering

[12] Wairarapa services travel a total of approximately 264,000 km/yr.
[13] Source: 2016/2017 V/Line Annual Report. Definition of a "failure" was not explicitly detailed in the report but in Australia is typically the same metric as applied in New Zealand i.e. an event causing a delay of at least 5 minutes.
[14] KiwiRail M2000 Mechanical Code Issue 11.10, section 14.2

the age, whether there is a limitation to the amount of times these machines and/or their internal components can be refurbished), appears to remain unknown.

The example ECR provided to the investigation was in response to a locomotive compressor "failure", which was in fact a blocked air filter supply to the compressor. This event caused locomotive breakdown failure on route during November 2017. The concern is that the ECR appears to have been raised in early September, hence the failure mode was known prior to the locomotive failure, but the solution was not implemented in time to prevent the failure. The investigation of FRACAS work by SNC-Lavalin did not include verification that all of the corrective actions from the system had been applied. Based on what was presented to the investigation, the general impression was that solutions from the FRACAS are now applied without delay.

The locomotives are considered to be fit-for-purpose and reliability performance should improve over time provided the FRACAS continues to be improved and faults and associated solutions are applied quickly throughout the fleet.

On this basis and with reference to similar locomotive types operating in Australia, it should be possible to achieve close to half the current locomotive failure rate. It would be unrealistic to expect zero locomotive breakdowns and there will continue to be a residual level of DFB locomotive failure on the Wairarapa Line, which may at times result in cancellation of services. If this is deemed to be unacceptable to stakeholders, alternative options for redundancy may need to be considered such the use of additional locos in each train.

Separately there have been a number of locomotive system faults which have led to delays. Some of these relate to the technologies deployed on the DFBs such as traction motor flash-over, and should be identified and tracked in the FRACAS. Provided the FRACAS is used effectively, the frequency of occurrence of system faults should reduce over time.

8.1.2 Recommendations

[R1]: It is recommended that Transdev implement a Wairarapa Operators forum for improved interface between Transdev, TLP and TCMP.

TTLP has been involved in the "Weekly Performance Meetings" since February when there have been locomotive issues. However, there is opportunity for closer interface between Transdev the operator, TLP the provider of locomotives and LEs, and TCMP the provider and maintainer of carriages. This would specifically target the Wairarapa services (the existing meetings cover all Wellington services). This would utilise delay minutes from the RPMS for the previous week. The attribution codes would be debated, agreed and assigned to each of the three parties, hence used to identify areas for improvement. The purpose would be to:

- Provide TLP with accurate and timely information on any locomotive faults/failures.
- Provide close interface between TCMP and TLP on faults that may relate to either the locomotive, or the carriages, or both (this is relevant on brake system faults for example).
- Clearly, and by mutual agreement on attributions, identify where operations can be improved in order to reduce delays during setting up trains to run, exchange to/from the Wellington depot areas, during turnaround, on route and during ancillary operations required to deliver the service. The attribution codes in question would include: Yard Staff, LE Issues, LE Timekeeping, Hook & Tow Other.

[R2]: It is recommended that Transdev implement improved incident/failure event response procedures in close consultation with stakeholders including KiwiRail Train Control.

There is likely to be benefit in improved incident/delay event response procedures for rolling stock faults (supplementary and/or to be included Transdev OJT and TARPs) – prepared by Transdev and TLP collaboratively with KiwiRail Network Control. These would include the agreed response and best course of action for locomotive breakdown within specific areas of the network, carriage generator failure on route and any other critical scenarios identified that are not covered in existing procedures.

Transdev has also requested a more direct communication line between Transdev and TLP in the event of locomotive faults or failures (currently via Auckland service centre).

[R3]: It is recommended that TLP further develop FRACAS to determine the root cause of failure in machine components (e.g. auxiliary generators).

8.2 Carriages – Faults and Failures

8.2.1 Areas of risk and root cause of failure

As is the case for the DFB locomotives, the risk of faults in the Wairarapa carriages needs to be managed through use of an effective maintenance and servicing regime, and by utilising rolling stock that is fit-for-purpose.

The carriages used on the Wairarapa Line are former British Rail Mk2 stock but they were substantially rebuilt in 2006/2007 with new interiors, corner doors and retractable steps, lighting, HVAC, seating, facilities and train management systems. Like the DFB locomotives, they have been upgraded where possible and cost-effective with modern components and systems. Some key components such as the bogies have also been upgraded – the SE fleet utilises the "S-Ride" type while the SW fleet utilises an older but well proven x28020 bogie.

There have been minor upgrades to the braking systems but the SW fleet in particular is known to be challenging to set-up correctly and both SE and SW fleets are prone to wheel skids. The electrical systems have been replaced during the rebuild hence while some components are likely to need renewal, the system in general should be capable of reliable performance.

The carriages are similar to the DFB locomotives in that while not new they have been recently upgraded and should generally be capable of delivering reliable performance under a robust maintenance regime and with regular overhauls to replace/refurbish all of the key components.

During 2017 there were 20 events from carriage faults that caused significant delays, cancellation of services (including subsequent cancellations and delays), the requirement to operate the train as a short consist and/or passenger discomfort.

There were an additional 33 events from carriage faults that caused delays of 5 minute or more (including subsequent delays). The majority of these related to door or retractable step faults, and brake/pneumatic system faults including leaking BP/MR hoses.

Hence during 2017 there were a total of 53 failure events due to carriage faults, including subsequent cancellations and failures. If subsequent events are excluded, there were 38 failures in total during 2017, which means on average carriages travelled approximately 47,000 km between faults[15].

To benchmark the Wairarapa trains, SNC-Lavalin sought to reference similar passenger operations within the U.K. and Australia. There were very few suitable references found because most train operating companies use diesel-multiple-unit (DMU) or electric-multiple-unit (EMU) vehicles for these types of services. Also, reliability data was not always available for loco-hauled fleets.

[15] Source: Transdev provided to the investigation a value of 1,779,315 fleet km for the 2017 year.

V/Line utilise three classes of carriage in their inter-city and inter-urban services – N, H and Z class. These are similar to the SW/SE class used on the Wairarapa Line i.e. 30-50 years old, refurbished during the last 10 years, equipped with HVAC, powered doors and toilets. They operate as either 5 or 6 car consists. The 5 car consists include a carriage with on-board auxiliary power (similar to the SWG/SEG). For operating the 6-car consists, the auxiliary power supply is provided by the locomotive rather than via an on-board generator. During the 12 months 1 July 2016 to 30 June 2017, "Classic fleet carriages travelled an average of 162,895 kilometres between faults against a target of 130,000 kilometres"[16]. Definition of a "fault" has been confirmed by the V/Line fleet manager to be the same metric as applied in New Zealand i.e. an event causing a delay of at least 5 minutes. It was not able to be confirmed that this included faults that caused cancellation of the service or having to operate as a shortened consist.

For the purposes of comparison, if we ignore the Wairarapa carriage faults that led to service cancellation, shortened consist, or that were attributed to operator error, there were a total of 14 failure events in 2017 (auxiliary generator faults are also ignored in this metric because while failure caused considerable passenger discomfort, they did not cause delay to the services). Based on 14 failure events and the fleet kilometres travelled during 2017, Wairarapa carriages travelled an average of 127,000 km between faults. On this basis, we can form a comparison to the carriages operated by V/Line – V/Line carriages travel approximately 25% more than the Wairarapa carriages before failure. This suggests there should be some potential to reduce the carriage failure rate if we use the V/Line operations as a benchmark.

The investigation has identified a number of areas of concern relating to the maintenance regime:

a. Transdev perform safety-critical checks every day prior to operating the morning services in Masterton, and prior to operating the afternoon services at the Wellington Station platform (refer to Section 7.6). However, the "daily" check is not performed by TCMP during the off-peak – the purpose of this is to identify any existing faults, to allow either a rapid repair or otherwise isolation in order to prevent faults appearing at the platform or while operating in revenue service (this has no long-term benefit to reliability). TCMP use a kilometre-based check, the 1250 check, that is equivalent but does not check every consist every day and has not been approved by stakeholders. To ensure reliable service, TCMP should inspect and sign-off every consist in the depot each day.

b. There are a number of other maintenance procedures used by TCMP that differ from those specified in the assumed MOS. For these, the revision numbers are more current than that specified in the contract so this may not necessarily represent an issue provided the amendments enhance the quality or extent of the check. TCMP has stated that they have enhanced the A, B and C level checks for example to specifically target systems that are degrading including those identified as susceptible to failure from their FRACAS. However these have not been submitted for review and approval by stakeholders.

c. The 6SW consist operates both the Friday and Monday Shuttle. There is no upper kilometre tolerance limit specified on the 1250km check, so with 1456 km travelled between checks this consist does not comply with the checking level.

d. Auxiliary generator maintenance – there is a discrepancy between Loco 441 Rev. 6 and the GWRC Carriage Fleet Maintenance Plan. The "250 hour check" is not currently performed but considering the criticality of the generators to train functions, this check is likely to be appropriate – it is recommended that this check is included in the maintenance regime.

[16] Source: 2016/2017 V/Line Annual Report.

e. Electrical earth checks and circuit testing – TCMP is aware of the need for improved procedures and maintenance staff have discussed adaption of those used on the Matangi EMUs for this purpose. It is recommended that TCMP develop an enhanced electrical circuit test as soon as possible for approval by Transdev and GWRC.

f. The TCMP response to faults that have been identified through the FRACAS is too slow. It is critical when faults have been identified that solutions are developed, approved and implemented as quickly as possible in order to improve reliability. It is understood that additional resource has been provided to resolve this within the last 6 months, however a backlog of work appears to remain.

g. The process for engineering change approval requires approval at many levels within TCMP and also between TCMP, Transdev and GWRC. While the system is robust, there are deficiencies in the process used to approve engineering changes. In general the approval process is far too slow. The level of process and approval is not flexible to the level of cost and risk. Engineering change systems are already under review and development by stakeholders. There may be an opportunity to further streamline the process.

h. A number of components on the carriage fleet are approaching end-of-life (they were newly installed during the rebuild in 2006/2007). TCMP have stated that the door conduits and electrical wiring, lighting, door controls, windows bonding, Public Address system, retractable steps and gangways are in need to refurbishment. There is a level of uncertainty about how long the Wairarapa carriage fleet is expected to last considering possible replacement vehicles. This results in disagreement between GWRC and TCMP about whether some repairs are a reliability improvement (i.e. TCMP responsibility), or an extra to the contract and a mid-life refurbishment (i.e. GWRC responsibility). Disagreement is limiting the extent to which refurbishment is being undertaken, and therefore limiting long-term reliability gains.

i. At the time of the investigation the two spare SW cars were not available for service. Seats, lights and pressure switches were being removed from the spare cars to service the remaining fleet. This suggests that TCMP inventory stock levels are too low, and the spare parts ordering process is too slow.

There are two additional aspects which are limiting service reliability.

j. The first relates to the design and configuration of some of the components:

- The restricted cooling air flow through the auxiliary generators
- The inability to consistently fill to maximum and easily check the fuel level in the auxiliary generator diesel storage tank. Also, there is no catchment tank for radiator coolant on the auxiliary generators.
- The retractable steps and susceptibility to jamming
- The susceptibility to wheel skids causing wheel flats
- The susceptibility to damaging BP and MR hoses

These components have been the subject of a number of previous investigations and work by KiwiRail, GWRC and more recently TCMP to improve the design. However issues remain and these components continue to impact on service reliability. Until they are resolved, TCMP is tasked with performing inspections, servicing and maintenance activities to manage the risk of failure due to inherent limitations in the design.

k. The second relates to the limited access that TCMP has to the consists. TCMP are significantly constrained by the limited "touch time" that they have to access the

consists for maintenance, servicing and for any refurbishment or upgrade work (this time totals nominally 4 hours during the middle of the day). The limited access has to do with protection of staff while shunting movements are occurring so this is not easily resolved while ensuring that safety, which is the most critical aspect, is not compromised. Also, there is a constraint in the use of the Carriage Depot which is used to maintain and service the Wairarapa carriages as well as those operated by KiwiRail on the Capital Connection and Northern Explorer. The depot has a legacy design and is inefficient – the design of the depot and interface with the fuelling/wash road limits the potential for use of 11 Road and 12 Road (12 Road in particular is critical being the only full-length pit road used for checks of the under-body equipment, bogies and brakes). The respective Team Leaders work closely to minimise any potential for disruption and to be able to respond flexibly to unplanned maintenance work. However the maintenance of the Wairarapa fleet is highly sensitive to the ongoing shared use of this depot. The extent to which these constraints were known by TCMP at the formation of contract is unknown. Regardless, these impact significantly on their ability to perform engineering investigations, refurbishment and project work in particular. This in turn limits the potential for improved long-term reliability gain.

Collectively the areas of concern listed in a. to k. represent the root causes and most significant risk to carriage reliability on the Wairarapa services.

The capacity to improve carriage reliability is primarily dependent upon:

- the capacity for TCMP to improve their response to faults and implementing corrective actions, as well as inventory and engineering change,
- the integration of agreed staged refurbishment into maintenance activities and resolution of rolling stock design limitations with GWRC,
- improving access to the consists to allow this to happen.

The FRACAS will become even more critical as the fleet continues to age and without resolution of these aspects.

There may be a number of different options to improve access including weekend maintenance and/or maintenance in Masterton. TCMP and KiwiRail have discussed options for improving access time in the Carriage Depot without compromising safety. It is understood that discussions had ceased for some time, but KiwiRail are now actively seeking a solution[17]. Continuation of these discussions is critical to enable either finding a solution that improves access time without compromising safety, or agreeing that no additional access is possible without compromising safety, hence TCMP will need to find an alternative solution. In their role as operator, Transdev should facilitate these discussions. It may also be appropriate for GWRC to be involved.

GWRC are seeking continuous improvement from the stakeholders. There is opportunity to improve but this will require significant work by Transdev and TCMP in close consultation with GWRC.

Despite the checking performed by TCMP prior to the afternoon peak, and the checking performed by Transdev staff prior to pull/place the consist at Wellington Platform, service 1608 on 20 March 2018 was delayed in departure due to a fault in the toilet of the rear carriage (this service was witnessed as part of the investigation). During discussions with maintenance staff the following day, it was confirmed that there was a fault with the toilet because the cleaner was unable to fill the tank[18]. This servicing had to occur within a very narrow time period due to inability to fill tanks inside the Carriage Depot and the 3pm time

[17] KiwiRail have recently decided to maintain more of their carriage fleet in the depot, hence the need for a better overall solution.
[18] This was due to "blow-back" or words to that effect.

cut-off for unlocking the yard. Hence this fault was not captured before the carriage consist was pulled. Regardless, faults should not appear at the platform – considering the short distances involved it is very unlikely for a fault to occur between the depot and platform. This suggests that checks done by TCMP to certify that the consist is fit to operate in service are inadequate. This also highlights the susceptibly of a relatively minor fault causing more significant delay – the fault was isolated and the train departed only just ahead of an Upper Hutt service. Any further delay and the Wairarapa service would have been held back behind the Upper Hutt service which would have caused a delay in departure of 25-30 minutes or more. These checks are critical but consume man-hours and time within the narrow 4 hour access period. If we assume a practical limit to labour resource and the narrow access window, more time spent performing "fit-for-service" checks means less time available for performing maintenance activities that improve long-term reliability. TCMP has a significant challenge.

In general, the carriages are considered to be fit-for-purpose however the reliability performance is constrained by the areas of concern discussed in a. to k. above. Failure to address these will limit improvements in reliability.

As discussed in Section 7.6, there is opportunity to improve the checking documentation used by Transdev staff to check consists prior to service. This includes the OJTCR, Yard Activities OJTCR, Mis7b and crew manuals. The purpose is to document the level of checking that already occurs, and to provide further enhancements, for example to identify any door or retractable step faults prior to operation in service.

8.2.2 Recommendations

[R4]: It is recommended that TCMP obtain stakeholder approval as soon as possible, for the maintenance checks that differ from those specified in the MOS. TCMP should inspect and sign-off every consist in the depot each day, and the 6SW consist needs to be checked within an agreed upper kilometre limit.

[R5]: It is recommended to implement the "250 hour check" into the maintenance regime for the auxiliary generator.

[R6]: It is recommended that TCMP develop an enhanced electrical circuit test as soon as possible for approval by Transdev and GWRC.

[R7]: It is recommended that TCMP perform an internal review of the FRACAS processes, the extent of work outstanding and if necessary prioritise this in consultation with Transdev and GWRC.

[R8]: It is recommended that Transdev lead a review to further streamline the process for engineering change.

[R9]: It is recommended that TCMP perform an internal review of the inventory levels required to maintain fleet availability, and adjust inventory levels accordingly.

[R10]: It is recommended that stakeholders resolve uncertainty relating to carriage repairs for mid-life refurbishment, versus repairs for reliability improvement.

[R11]: It is recommended that stakeholders work to resolve the critical carriage design limitations as soon as possible and in particular those relating to the auxiliary generators.

[R12]: It is recommended that Transdev facilitate progression of discussions between stakeholders to improve time for TCMP to access the consists for maintenance and servicing.

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8.3 Operations

The focus of the investigation was on faults and breakdowns in the rolling stock. Some additional observations were made regarding the operations.

The total delay minutes from "operator error" were 9% of the total for the period December 2016 to December 2017 (refer to Section 7.1.3). By comparison the total delay minutes for rolling stock (i.e. locomotives and carriages combined) was 4%. Hence, there is significant potential to improve service reliability by also focusing on the delays caused by operator error. The attribution codes assigned to operator error were as follows:

- Yard Staff,
- LE Issues,
- LE Timekeeping,
- Hook & Tow Other.

The cause of Yard Staff delays were difficult to identify in the RPMS notes, and at times were clearly not confirmed by Transdev ("Staffing issues?" for example). Almost certainly some of these delays will relate to the late arrival of the preceding service causing delays to the outbound service, or alternatively the late release of the consist from the carriage depot resulting in delays to the outbound service. Some Yard Staff delays were identified as basic rostering errors (including one which lead to a 49 minute delay). It was not possible to confirm any Yard Staff delays that were caused by rolling stock faults.

There were a number of delays attributed to LE Issues. The cause of these was not always able to be confirmed based on the RPMS notes. There were two delay events where the train overran the platform and needed to be reversed back to the platform. These were attributed to TLP. There were a few delays attributed to "waiting for LE", but it is evident based on the notes that at times the LE was waiting for a Track Warrant or was delayed by another cause.

There were a significant number of delay minutes attributed to LE Timekeeping. These attributions were apparently investigated by Transdev. The extent to which these have been disputed by TLP is unknown. Given the challenges faced by LEs in operating these services, a number of these may be rejected by TLP.

Finally there were a small number of delays relating to "Hook & Tow Other", which based on the RPMS notes were caused by locomotives not being set-up to run in time, crew change, or due to the late arrival of the preceding service (i.e. incorrect attribution code used).

The Wairarapa Operators forum could be used to target these "operator error" delays. This would identify where operations can be improved during setting up trains to run, exchange to/from the Wellington depot areas, during turnaround, on route and during ancillary operations required to deliver the service.

8.3.1 Recommendations

[R13]: It is recommended that Transdev highlight the susceptibility of these trains to skidding during TM / TXO training. Do staff always ensure that the brake pipe pressure is released completely (fully blow-down) prior to recharging the brake pipe during coupling or re-coupling?

[R14]: It is recommended that TLP conduct assessment of potential need for additional LE training on Wairarapa Line to reduce likelihood of wheel skids. The purpose is to assess whether the Wairarapa trains are unique in this respect or otherwise similar to other passenger trains operated in New Zealand.

[R15]: It is recommended to update documentation used for pre-departure checking of the Wairarapa services and for fault-finding by "front-line" staff. Specifically the operating manuals used by Transdev staff, and fault-finding information used by "front-line" staff (e.g. station fitters).

8.4 Auxiliary Generators – Redundancy

8.4.1 Criticality

The criticality of the carriage auxiliary generators has been identified by stakeholders previously and confirmed during the investigation.

If an auxiliary generator fails prior to the morning peak (over-heating, or inability to start being two examples), the service can be operated using an alternative consist, but this can result in subsequent cancellation of services unless the fault in the original consist can be resolved quickly. The TM will attempt to resolve the issue but there are no maintenance staff located here so opportunities to recover are limited.

If an auxiliary generator fails prior to the afternoon peak the service could be operated using an alternative consist and/or the SWG/SEG on the original consist repaired and/or substituted (SWG for the 8-car, AG Van for the 6-car).

If an auxiliary generator fails on route, options are limited. It is possible to operate a train without auxiliary power, however the main lighting and HVAC systems will not operate. The "Cooling Failure" setting on the HVAC system has no benefit in the event of generator failure because without power supply, the fresh air dampers spring to the closed position. This setting is currently used by train crew in the event of generator failure but is ineffective. Without regular exchange of air inside the carriages, the air quality will deteriorate and internal temperatures will increase in particular under hot climatic conditions and/or with crowded trains. At the extreme, on particularly hot days and/or with trains operating at peak capacity this could lead to a situation where the train is no longer safe for passengers and the TM may have to cancel the service on route. The response procedures and system redundancies for this event appear to be insufficient at present.

8.4.2 Reducing effects of a failed generator and adding redundancy

The resolution of the issues relating to the auxiliary generator discussed in Section 8.2.1. (including improved cooling air flow, fuelling capability, increased checking etc) may reduce the frequency of occurrence and hence risk of failure sufficiently.

However, if failure rates continue to be unacceptable, it may be necessary to develop a new method to reduce the impact to passengers from a failed generator, or provide additional redundancy e.g. it may be necessary to purchase or lease an additional AG Van. This would not address the root cause of the failures but would provide an additional source of back-up auxiliary power supply.

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9 Conclusions

The scale of the investigation has covered a significant number of different areas with multiple stakeholders.

Conclusions:

- The overall contribution of rolling stock faults to service failures and delays is relatively minor in comparison to those attributed to other sources (4% of total delays and 9% of service failures were caused by rolling stock during 2017).
- During 2017 there were 5 DFB locomotive breakdown failures, which represents an overall failure rate of 1 failure per locomotive per year. This is broadly consistent with similarly equipped locomotives operating in Australia however this failure rate is unlikely to be acceptable for passenger services. Hence, "above-average" performance is required from the DFB fleet. When all failure events are included, locomotives travel approximately 18,000 km between failures. V/Line in Australia operate equivalent loco-hauled passenger services, and their locomotives achieve approximately 23,000 km between failures against a target of just under 30,000km.
- The root cause of the 5 locomotive breakdown failures was most likely insufficient focus on fault finding, developing solutions and applying these to the fleet. This is the intent of the Failure Reporting, Analysis and Corrective Action System (FRACAS) which appears to have been introduced by TLP following the two breakdowns in November. TLP have also recently "W"-tagged the pool of locomotives used for these services meaning they remain captured in these services and reliability improvements can be applied throughout the fleet as failure modes are identified. It will take time for the latent faults in the fleet to manifest and be addressed but this should result in improved locomotive reliability over time. The locomotive technology employed is suitable and is capable of reliable performance provided the FRACAS continues to be improved.
- On this basis, and with reference to similar operations and associated reliability targets, it should be possible to achieve close to half the current locomotive failure rate. It would be unrealistic to expect zero locomotive breakdowns and there will continue to be a residual level of DFB locomotive failure on the Wairarapa Line. This may, at times, result in cancellation of services.
- During 2017 there were 53 carriage rolling stock faults that caused delays, cancellation of services (including subsequent cancellations and delays), shortened consist and/or passenger discomfort. If subsequent events are excluded, on average Wairarapa carriages travelled approximately 47,000 km between faults.
- For the purposes of comparison, if only faults that caused delays are considered, on average Wairarapa carriages travel approximately 127,000 km between faults. On the same basis, V/Line carriages in operation in Australia are achieving approximately 163,000 km (i.e. 25% more kilometres) between faults.
- The root causes of carriage failures most likely relate to issues which are summarised below:
  - The maintenance regime used by TCMP does not check, and sign-off, every consist every day. The purpose of these checks is to capture existing faults to allow them to either be repaired or, if necessary be isolated to prevent failure in service. There is however no long-term maintenance benefit to these checks, and with limited resource and time available for maintenance activities, time spent on daily checks is at the expense of time spent on activities that improve long-term reliability. There are a number of additional maintenance checks which appear to have been enhanced by TCMP but which require approval by stakeholders.

- The response by TCMP to faults that have been identified through the FRACAS is too slow, delaying implementation of corrective actions and reliability improvements. Despite recent review and development, the engineering change approval process is robust but too slow within TCMP and between all stakeholders.
- A number of components on the carriage fleet are approaching end-of-life. There is a level of uncertainty about how long the Wairarapa carriage fleet is expected to last considering possible replacement vehicles. This results in disagreement between GWRC and TCMP about whether some repairs are a reliability improvement (i.e. TCMP responsibility), or an extra to the contract and a mid-life refurbishment (i.e. GWRC responsibility). Disagreement is leading to delays to improvements in long-term reliability.
- Carriage inventory stock levels are too low and the spare parts ordering process is too slow.
- There are a few critical components and systems in the carriages which have inherent limitations in the design (the auxiliary generator in particular). These have been the subject of a number of previous investigations and work, however until they are resolved, TCMP, through maintenance activities, has to manage the risk of failure due to these limitations.
- TCMP are significantly constrained by the limited "touch time" that they have to access the trains for maintenance (this time totals nominally 4 hours during the middle of the day). They are also constrained due to the shared use of the depot which has a legacy design and is inefficient. This impacts on their ability to perform engineering investigations and refurbishment work in particular, which subsequently limits the potential for long-term reliability gain.

- Hence overall service reliability improvements are dependent upon:
  - The capacity for TCMP to improve their response to faults and implementing corrective actions, as well as inventory and engineering change.
  - The integration of agreed staged carriage refurbishment into maintenance activities and resolution of rolling stock design limitations.
  - Improving access to the trains to allow this to happen.
  - Continued improvement in the locomotive FRACAS.
- GWRC is seeking continuous improvement from the stakeholders. There is some opportunity to improve carriage reliability, but this will require significant work primarily by TCMP but also by Transdev close consultation with GWRC. There is also opportunity for TLP to improve locomotive reliability by further development of their FRACAS and with closer interface with Transdev and TCMP. There is opportunity for Transdev to improve the Wairarapa services in general, by facilitating closer stakeholder involvement, tighter interface and improved co-operation. Overall however, the opportunity for improved levels of service on the Wairarapa Line is likely to be relatively minor considering the contribution of rolling stock faults to delays and service cancellations (4% and 9% respectively).
- There are a significant number of separate stakeholders involved in delivery of the Wairarapa services. The interface, communication and level of co-operation is critical. A breakdown in co-operation due to conflicting priorities for example can easily result in a loss to service quality. If a stakeholder fails to continue to develop systems and processes, continuous improvement becomes challenging. A lean operation is important for low cost and efficiency but can also limit redundancy and the capacity to respond to unforeseen events. There is considerable complexity to the maintenance and

operations activities due to the required level of co-operation. Based on what was witnessed during the investigation, the maintenance and operations staff are doing their utmost to deliver a reliable and comfortable service within the constraints they are required to work with.

10 Recommendations

[R1]: It is recommended that Transdev implement a Wairarapa Operators forum for improved interface between Transdev, TLP and TCMP.

[R2]: It is recommended that Transdev implement improved incident/failure event response procedures in close consultation with stakeholders including KiwiRail Train Control.

[R3]: It is recommended that TLP further develop FRACAS to determine the root cause of failure in machine components (e.g. auxiliary generators).

[R4]: It is recommended that TCMP obtain stakeholder approval as soon as possible, for the maintenance checks that differ from those specified in the MOS. TCMP should inspect and sign-off every consist in the depot each day, and the 6SW consist needs to be checked within an agreed upper kilometre limit.

[R5]: It is recommended to implement the "250 hour check" into the maintenance regime for the auxiliary generator.

[R6]: It is recommended that TCMP develop an enhanced electrical circuit test as soon as possible for approval by Transdev and GWRC.

[R7]: It is recommended that TCMP perform their own internal review of the FRACAS processes, the extent of work outstanding and if necessary prioritise this in consultation with GWRC.

[R8]: It is recommended that Transdev lead a review to further streamline the process for engineering change.

[R9]: It is recommended that TCMP perform an internal review of the inventory levels required to maintain fleet availability, and adjust inventory levels accordingly.

[R10]: It is recommended that stakeholders resolve uncertainty relating to carriage repairs for mid-life refurbishment, versus repairs for reliability improvement.

[R11]: It is recommended that stakeholders work to resolve the critical carriage design limitations as soon as possible and in particular those relating to the auxiliary generators.

[R12]: It is recommended that Transdev facilitate progression of discussions between stakeholders to improve time for TCMP to access the consists for maintenance and servicing.

[R13]: It is recommended that Transdev highlight the susceptibility of these trains to skidding during TM / TXO training. Do staff always ensure that the brake pipe pressure is released to below 100kPa prior to recharging the brake pipe during coupling or re-coupling?

[R14]: It is recommended that TLP conduct assessment of potential need for additional LE training on Wairarapa Line to reduce likelihood of wheel skids. The purpose is to assess whether the Wairarapa trains are unique in this respect or otherwise similar to other passenger trains operated in New Zealand.

[R15]: It is recommended to update documentation used for pre-departure checking of the Wairarapa services and for fault-finding by "front-line" staff. Specifically the operating manuals used by Transdev staff, and fault-finding information used by "front-line" staff (e.g. station fitters).

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Appendices

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Appendix A : Rolling Stock Faults – Primary Causes

Table A1: Severity of fault/failure and consequences: Rank 1 – Failure causing a train to stop on route

- Locomotive breakdown

Fault/Failure and consequences:	Occurrences: (Dec 2016 to Dec 2017)	Causes and existing corrective actions:
Locomotive failure leading to delays, swapping with spare, breakdown on route, service failure, subsequent service failure and significant delays	2017-05-24 / 1605 2017-11-14 / 1606 2017-11-24 / 1609 2017-11-26 / 1613 2017-12-18 / 1608 (5 in total)	• DFB7158 – Tranzlog failure. Tranzlog Brain replaced. Monitoring in FRACAS. • DFB7200 – shorted wire identified at back of circuit breakers. New wire made and fitted. Uncommon failure but all "W" DFBs checked with ongoing monitoring in FRACAS. • DFB7158 – inline filter/strainer to compressor governor became blocked shutting down the compressor. Strainer removed and cleaned, pipework standardised. ECR created – check incorporated into B Check and pipework modification applied to all DFB locomotives. Monitoring in FRACAS. • DFB7348 – loom to DID Panel found to be pulled too tight, which was pulling on the plug into the panel and causing loss of electrical connection. Released tension on loom, re-seated DID Plug into Panel. (Both wiring looms were replaced during the rebuild.) Monitoring in FRACAS – repair applied to the "W" DFB fleet. • DFB7200 – Failed auxiliary generator – this was replaced with a refurbished item. Refurbished Aux Gen fitted during overhaul in April 2016 so the component has failed prematurely, requiring replacement. Cause of premature component failure TBC by TLP after assessment by Hutt Workshops. No response from TLP yet. Monitoring in FRACAS.

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Table A2: Severity of fault/failure and consequences: Rank 2 – Cause considerable delay, short consist, passenger discomfort and/or cancellation of subsequent services

- Carriage generator failure,
- Door circuit fault,
- Braking/pneumatic system fault,
- Loco system faults,
- Operator error

Fault/Failure and consequences:	Occurrences: (Dec 2016 to Dec 2017)	Causes and existing corrective actions:
Carriage generator failure: Prior to departure: delay due to swapping out with alternative consist or with the AG van (Wellington) While on route: Loss of auxiliary power leading to shut-down of HVAC system, main lighting (emergency lighting still operates)	2017-01-26 / 1608 2017-02-16 / 1604 2017-06-19 / 1603 2017-11-07 / 1601 2017-11-23 / 1609 (5 in total)	• SEG3430 – Passenger panicked and pressed emergency stop (confirmed on CCTV). Operational crew did not check all emergency stops were reset before trying to restart generator (they were apparently asked to check this by TCMP during the tele call). Operator error. • SEG3430 – burnt relay card on generator. This is a sealed item that has failed prematurely and has no maintenance actions other than scheduled replacement. Supplier advised. Board replaced and tested ok. Not tracked in FRACAS. • SWG5671 – generator had flat batteries. This was caused initially by an earth fault on another vehicle causing shore supply RCD to trip. The generator batteries on SWG5671 were smaller than most on the fleet. Batteries replaced with up-rated capacity model. Monitored in FRACAS MF407. • SEG3430 - Radiator hose failed causing overheating. SWG5671 hoses replaced as a precaution (the other SWGs have new generators fitted). Has been requested to be added to FRACAS. • SWG3365 – ran out of fuel due to the SW6 car being prioritised as shuttle on repeat days to allow SEG3430 to be wheel lathed and minimal disruption to operations. SWG3365 is the only generator car with a functioning fuel shut off valve, hence is only able to be 3/4 fuelled. This has been attempted to be adjusted on multiple occasions with no success. There was a loco failure the night before. As a consequence, TCMP now refuel all consists every morning regardless of operating hours. Has been requested to be added to FRACAS. Separate to these incidents, a root cause of generator failure is overheating due to poor air flow through the radiators (poor air duct design), and inability to effectively clean radiators (on the old model which now exists only in SEG3430).

Door circuit fault: Resulted in inability to obtain door light – the safety feature correctly activated but this resulted in the train being not able to run, hence caused delays and subsequent cancellation of services.	29/11/2017 / 1606	• 1606 (effected all cars in consist). Caused by an earthing fault in the electrical circuit. After the fault was identified, there was a check of the Wairarapa fleet to minimise the risk of failure of the saloon door mat and checking instructions created to ensure this is carried out consistently. TCMP aware of the need to update the checks and are looking at adapting the Matangi electrical testing process for carriages with a specific focus on the door circuit. Monitored in FRACAS MF 468.
Carriage brakes / pneumatic system failure: Results in delays in cutting effected vehicle out, short consists, passenger discomfort (wheel flats).	2017-07-27 / 1605 2017-01-11 / 1602 2017-01-24 / 1609 2017-02-10 / 1606 2017-06-16 / 1601 2017-11-13 / 1608 (6 in total)	• SE3380 – Park brake stuck on. Carriage taken out of consist. The cause was a pneumatic system fault from water ingress due to incorrect installation, allowing water to back flow. The auxiliary air system on the SE cars is installed differently to SW cars resulting in only 1 check valve in line as opposed to SW having 2 check valves. This caused spring park brake control system to air lock and not release. Monitored in FRACAS MF424. • SWG3365 – wheel flats. Cause unconfirmed. • SW5837 – Variable Load Valve pipe split. Pipe replaced (first occurrence). • SW5837 – brakes not activating. No information available. This could be caused by a loco overcharging (it was coded to LE error and they are responsible for blowing the brakes fully down after coupling). • SE3288 – Brake issues, had to cut brakes out. Cause was a failed system component allowing MR air leak into control reservoir. Component replaced. Monitored in FRACAS. • 1608? (all cars on SE consist) – An incident occurred whereby all of the carriage wheels locked up when braking into a station. The consist was inspected in the depot and found to have no brake faults, hence it was assumed by Transdev to be LE error . The Wairarapa line is subject to low adhesion and there are no anti-skid technologies on the trains. Hence it is challenging for LEs. The incident caused wheel flats on all carriage wheels, leading to removal of each carriage to be repaired in the wheel lathe, one at a time, throughout November.
Loco system faults: Caused delays of 10 minutes or more.	2017-04-26 / 1606 2017-06-02 / 1612 2017-07-13 / 1608	• "Vigilance faults" caused 10 minute delay. Cause not established (information not readily available in TLP systems – this was prior to creating the FRACAS system) • Locomotive issue in Wellington caused 12 minute delay. Cause not established (information not readily available in TLP systems – this was prior to creating the FRACAS system)

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	(3 in total) There were an additional 4 faults causing delays of 5-10 minutes.	• Locomotive failure at Manor Park caused 13 minute delay. Cause confirmed as ground relay fault causing traction motor flashover. After reset the train continued to Masterton. This is a common fault in loco fleets - corrective action is to clean and re-insulate. • Between Dec 2017 and March 2018 there were two additional loco faults causing minor delays (TLP have been asked for details but have not responded): o 2018-01-03 / 1606 "Loco died at Matarawa" o 2018-01-16 / 1609 "DFB7307 Loco issue, restart between Petone and Nga"
Operator error: Specifically, train parting incidents that have occurred in the yard resulting in damage to vehicles, and that have recently occurred during departure from Wellington and Masterton	2017-11-17 / 1608 During the last week of Feb 2018, there were 2 separate train parting incidents which occurred at departure of the service.	• Parting of AG222 and SEG3430 in carriage yard. No defects were identified on either couplers, hence it was assumed to be operator error. The resulting damage to SEG3430 caused cancellation to service. • Two events occurred during the last week of February 2018 – both occurred as the train was pulling away to depart from origin (one was Journey 1606 ex Wellington, the other Journey 1609 ex Masterton). In both cases the safety feature operated correctly and the train brakes applied automatically to stop the train. There was no "failure" of the coupler – after re-coupling the train departed and completed the journey normally, and the consist completed the daily roster without further incident. The event appeared in the weekly RPMS Report due to the delay caused to the service (the operator Transdev have assumed that this incident was reported to NZTA by KiwiRail as part of the normal reporting for these types of incidents). Following these two incidents, KiwiRail and Transdev worked together to perform a detailed assessment of the couplers including the coupling up using the specific vehicles involved in the incidents (there were two different locos and two different carriages involved). It was not possible to repeat the train parting and the couplers appeared to perform normally. The conclusion was this was operator error, although attribution to Transdev (TX/TXO) or KiwiRail (LE) was unable to be confirmed (both are responsible for any coupling between loco and carriages). The auto couplers are a standard design used throughout the world. The coupler is locked when a pin at the top of the coupler is in the "down" position (this occurs when a block under the pin drops into position to lock the coupler).

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Table A3: Severity of fault/failure and consequences: Rank 3 – Cause delays of more than 5 minutes

- Door / step faults
- BP/MR hose leaks
- Bogie fault
- "Yard staff" issues / Operator error

Fault/Failure and consequences:	Occurrences: (Dec 2016 to Dec 2017)	Causes and existing corrective actions:
Door / retractable step faults: Typically occur on route resulting in the train crew needing to isolate the door.	2017-02-22 / 1607 2017-03-06 / 1601 2017-03-29 / 1606 2017-04-19 / 1601 2017-10-06 / 1608 2017-10-24 / 1608 2017-10-25 / 1606 (7 in total)	• SWS5723 - Door faults Masterton and Carterton. Fault unable to be replicated. Obstacle detection adjusted. • SWG5671 – door step fault at Petone. B1 step sticking. 54D booking "step kept getting stuck out occasionally". Cause: stones jammed in step slide area. Step was cleaned & tested in depot ok. Common ongoing fault monitored in FRACAS MF360. • SW3394 – door faults. Caused by air leak from door control piping. Common fault monitored in FRACAS MF299. • SEG3430 – intermittent door fault. Could not always get door light. Internal door control panel wire loose at plug. Remedy: Internal door control panel plug repaired. Monitored in FRACAS MF382. • SE3288 – door step fault. Cause: stones jammed in step slide area. Step was cleaned & tested in depot ok. Monitored in FRACAS MF360. • SWG3422 – A2 door leak. Cause was leaking door control hose. Door control hoses and conduits are overdue replacement. ECS-M-0064 Replacement of external door flexible conduit, fittings and tubing, was submitted and requires approval for full fleet install. Current failure rate is 1 door a week. • SW3339 – door step fault. Step cleaned. Internal parts worn rollers/guide strips etc when step retracts it pulls sideways & can stick.
BP/MR hose leaks: Typically found during maintenance exams or pre-departure checks – in this case delays are unlikely. However on occasion leaks are not found until at the platform and this usually leads to delay.	2017-11-03 / 1607 & 1611 2017-11-06 / 1604 (3 in total)	• SW3376 – MR and then BP hose failure. Cause was hose support straps failed and hoses dragged. Support now being replaced annually on south end of vehicle and both ends of SWG vehicles due to this event. Two new types of straps are being trailed. Due to both pipes needing to be replaced it is likely that these were not separated prior to uncoupling. This caused a total of 38 minutes delay between the two services. • Trailing carriages BP hoses need securing. Not found until departure. Cause was hose support straps failed and hoses dragged.

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Bogie faults: Given the level of inspection, these rarely suffer faults that are not picked up during maintenance exams or pre-departure checks. There was one fault that was identified on route.	2017-05-16 / 1605	• SW3394 #1 bogie bolster spring clearances too low and causing bottoming when vehicle fully loaded. Fault appeared to be a broken side bearer spring hence the speed restriction and maintenance staff travelled onboard. Bogies were replaced as part of heavy maintenance. Monitored in FRACAS MF396.
Operator error specifically: Overrun platforms (causes a delay of 8 minutes in setting back). Late release of vehicle from depot. Insufficient understanding of brake specifics all fleet variants "Loco late to platform" – cause unknown.	2017-06-21 / 1608 2017-07-27 / 1608 2017-07-28 / 1611 2017-08-04 / 1604 2017-08-23 / 1603 2017-08-19 / 1616 & 2017-09-16 / 1616	• Overrun Matarawa platform. Transdev determined the cause to be LE error. • SEG3430 was late to be released for service due to an oil change. TCMP: "Due to operating all SE's every week day we always attempt to supply all 6 vehicles. If we supplied AG222 we would have had passengers standing from Wellington." • Reported as "Train Manager had difficulties in releasing the brakes on AG222." AG222 is different to other vehicles in that both bogies are controlled by one brake cylinder and slack adjuster. Due to the rigging friction, the brake blocks on one bogie can sit closer to the wheels on the other bogie. Train Manager was just uncertain if brakes were released and took more time to confirm this. • Overrun Carterton platform. Transdev determined the cause to be LE error. • Unknown error causing 28 minutes delay – attributed to "LE error". • "Loco late to platform" causing 8 to 10 minute delays – no further information able to be obtained.
"Yard staff" issues: A number of delays of more than 5 minutes caused by "Yard staff" issues i.e. events that occur in shunting of the consists between the yard and platform.	A total of 7 events causing delays of more than 5 minutes. One event caused a delay of 50 minutes	• Causes unable to be identified. This could relate to rolling stock issues, cumulative delays causing late car shunts. Rostering errors were attributed to some delays, one of which was attributed a delay of 50 minutes.

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Amendment Record

Issue	Description	Distribution	Date
1	First Draft Issue	Angus Gabara	6/4/2018
2	Second Draft Issue	Angus Gabara	3/5/2018
3	First Issue	Angus Gabara	18/5/2018

greater WELLINGTON
REGIONAL COUNCIL
Te Pane Matua Taiao

Report	**18.236**
Date	13 June 2018
File	CCAB–20–486
Committee	**Sustainable Transport**
Author	**Paul Kos, Manager, Public Transport Policy**

Wellington Regional Public Transport Plan review

1. Purpose

The purpose of this paper is to seek Committee agreement to initiate a review of the Wellington Regional Public Transport Plan (PT Plan) and to outline the proposed approach, timeframes and deliverables for the review.

2. Background

The Land Transport Management Act 2003 (the Act) sets out the requirements for preparation and review of regional public transport plans.

The current PT Plan was adopted in 2014, and covers a 10 year period. The PT Plan has been varied three times - February 2016, September 2016, and October 2017.[1]

While there is no mandated renewal period, section 126 the Act provides the triggers for review:

- Section 126 (a) states that regional public transport plans "...must at all times be kept current for a period of not less than 3 years in advance, but not more than 10 years in advance"
- Section 126 (b) states that regional public transport plans "…must be reviewed and, if necessary, renewed or varied at the same time as, or as soon as practicable after, the public transport service components of a regional land transport plan are approved or varied".

In effect, this means that regional councils are now effectively committed to three-yearly reviews of the PT Plan.

[1]Variation 1 made minor changes to the PT Plan to ensure consistency with the Council's procurement approach for bus services. Variation 2 enabled the trial of a cross-regional bus service between Levin and Waikanae. Variation 3 enabled the introduction of a new concessions policy, and a new policy to encourage off-peak travel, greater use of public transport and greater use of electronic ticketing. It also included changes to Metlink fares that will come into effect in July 2018.

The Wellington Regional Land Transport Plan is currently undergoing its mid-cycle review, and a variation to that plan will be adopted by the end of June 2018. The proposed variation includes changes to the public transport components of the Wellington Regional Land Transport Plan, which triggers the need to review the PT Plan.

The review is also required to improve the currency and relevance of the PT Plan. While the variations have responded to specific issues (fares being the most relevant), the major initiatives and the majority of the objectives and policies in the current PT Plan have not been changed since before its adoption in 2014. The context has changed significantly since the current PT Plan was prepared, and progress against key objectives and policies has been rapid. As a result, the issues are quite different now to what they were in 2012/13, when the draft of the current PT Plan was being developed. Fare box recovery policies are one such area that requires urgent review.

Conceptually, there are two stages to a review, although in practice there is considerable overlap:

a) the review itself, which requires analysis and engagement with key stakeholders under section 126 of the Act

b) the preparation and adoption of a renewed or varied PT Plan, if necessary. While a review may determine that no changes to a PT Plan are required, this is not a likely outcome for the reasons outlined in the introduction section to this paper.

3. Purpose of the PT Plan

The statutory purpose of the PT Plan (s 117 of the Act) is to provide:

- a means for encouraging regional councils to engage and work with public transport operators and territorial local authorities in developing public transport services and infrastructure

- a means of engaging with the public in the Region, on the public transport priorities for the Region, and the proposed network of public transport services and supporting infrastructure

- a public record of the public transport services that are integral to the Region's network, their arrangement into units for contracting purposes, and the policies and procedures that apply to these services. PT Plans also provide a record of the information (e.g. timetables and frequencies) and infrastructure (such as bus stops and stations) that supports those services.

The high level strategic direction (objectives, targets and performance measures) for public transport are set out in the Regional Land Transport Plan, the Long Term Plan, and the Government Policy Statement on Land Transport (see Figure 1).

Within this framework, the PT Plan is largely an action-oriented document. It sets out objectives, policies and actions for public transport in the Region, providing the 'blueprint' for where we want to take public transport over the next 3-10 years. The PT plan incorporates the key elements of the Regional Rail Plan.

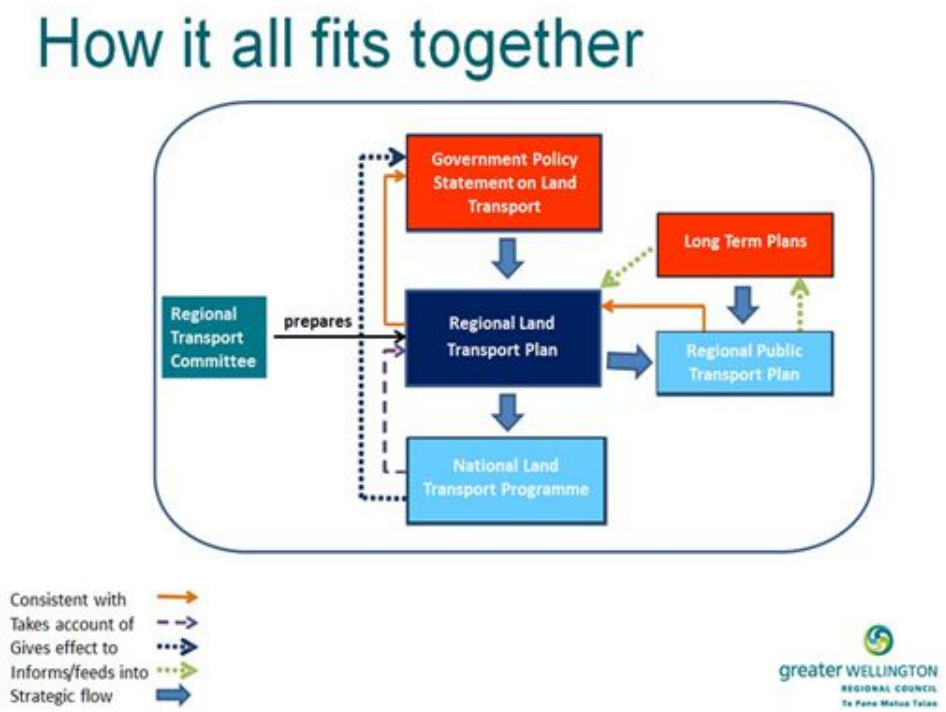

Figure 1

4. Consultation requirements

The Act outlines the approach to consultation when reviewing the PT Plan. There are two key aspects to consider:

- **When preparing a PT Plan** - key stakeholders (operators, Regional Transport Committee, local councils, NZ Transport Agency, Ministry of Education, and KiwiRail) must be consulted.

- **When adopting a PT Plan** - Councils are required to formally consult with the public before adopting a PT Plan. Councils must follow the Local Government Act 2002 consultation principles in section 82, and may instead use the special consultative procedure in sections 83 and 87.

5. Content requirements

Under section 120 of the Act, **a PT Plan must**:

- describe the public transport services that are integral to the public transport network, and provide an outline of the routes, frequencies and hours of operation of these services
- arrange the public transport services into units (for contracting purposes)
- identify the units (and Total Mobility services) that will be financially assisted
- specify objectives and policies for public transport (and Total Mobility) services
- include policies relating to units on:
  - accessibility, quality and performance
  - fares, including the basis for setting and reviewing fares
  - the process for establishing units and for procuring units
  - managing, monitoring and evaluating the performance of units
- include a policy on significance
- include a policy on farebox recovery (NZ Transport Agency requirement).

The Act provides considerable scope for a PT Plan to include other matters relevant to public transport. **A PT Plan may**:

- describe exempt services, but must not make them subject to objectives and policies (s 120(c))
- state or describe any other matters that the regional council thinks fit (s 120(d)).

For example, a PT Plan could include specific consultation on issues and proposals related to public transport (e.g. key initiatives, multimodal developments, Regional Rail Plan).

Although a PT Plan must in general be consistent with the Regional Land Transport Plan, it may include matters outside the scope of the Regional Land Transport Plan (s 124(a)). This means a PT Plan may describe opportunities for improvements that are not included in the Regional Land Transport Plan (e.g. unfunded projects or future proposals). Such initiatives may be included to obtain public feedback, or to indicate they are under investigation, or may be considered in future.

6. Scope of the review

The 2014 review was largely focused on implementing the public transport transformation programme, including the design of the network, implementing Public Transport Operating Model contracts, bus fleet modernisation (including electric buses, and decommissioning the trolley buses) improving the fares and ticketing system, the Public Transport Spine study, and delivery of rail scenario 1 of the Wellington Regional Rail Plan.

By mid-July 2018, most of these changes will be in place and the review will provide an opportunity to reflect on progress, consider what adjustments may be needed to embed and consolidate these changes into the Metlink network.

The review also provides an opportunity to consider the future direction for public transport in the Region over the next three years and beyond, including giving effect to the high level strategic direction set out in the Long Term Plan and Regional Land Transport Plan.

At the same time, there have been major changes in the strategic environment, which will need to be considered. In particular, the draft Government Policy Statement on Land Transport 2018 (the GPS) includes significant changes to the Government's priorities for land transport, with an increased focus on and funding for public transport, particularly in major metropolitan areas and for interregional passenger rail.

The draft GPS 2018 also includes an activity class and funding for rapid transit, and a transitional activity class and funding for rail initiatives previously funded through Crown budget appropriations.

Early engagement within Greater Wellington Regional Council (GWRC) and with key stakeholders will help to further define the scope of the review. A Councillor workshop is proposed in early August to start the process. This will consider:

- progress to date - in delivering the current public transport programme and achieving our goals and objectives for public transport
- strategic context - to identify changes to strategic environment (including central and local government objectives and priorities), issues impacting on the delivery of public transport, and risks and opportunities
- key issues and implications - to identify the future direction for public transport, and the key areas and issues to be included in the review.

7. Proposed schedule and deliverables

The proposed phases, timeframes and deliverables for the review are summarised in the table below.

Phase / tasks and actions	Indicative Timeframe	Key Deliverables
1. Plan and Scope		
1.1 Review paper to STC	20 June 2018	*Report to STC* - process and scope of review
1.2 Scoping workshop	Early August 2018	*Presentation for STC Workshop* - scoping the review
2. Pre-consultation –key stakeholders		
2.1 Presentations to key stakeholders	From August 2018	*Presentation for Stakeholders*
2.2 Discussions with key stakeholders	September 2018– May 2019	
3. Draft PT Plan		
3.1 Review of policies and issues	September 2018 - March 2019	*Technical working papers*
3.2 RTC workshop (Objectives and Policies)	March 2019	*Presentation for RTC Workshop* - draft objectives and policies
3.3 Councillor Workshop/s – (Objectives and Policies)	March 2019	*Presentation for STC Workshop* - draft objectives and policies
3.3 Drafting of PT Plan	March -May 2019	
Review point	**April 2019**	***Review process and timeframes***
3.4 Councillor Workshop (Draft PT Plan)	May 2019	*Presentation to STC* - Overview of draft PT Plan
3.6 Draft PT Plan approved for public release	May 2019	*Draft PT Plan and Report to Council (Council)*
4. Public Consultation		
4.1 Submissions period	May/June 2019	Will look to align with RLTP consultation on LGWM
4.2 Public hearings	June 2019	
4.3 Summary of submissions	June/July 2019	*Report To Council (Hearing Committee*) - summary of submissions and officer comments.
4.4 Analysis of submissions	July 2019	*Report to Council (Council)* - analysis of submissions and Hearing Committee's recommendations
5 Adopt PT Plan		
5.1 Adopt Final PT Plan	July 2019	*Report to Council (Council)* - Final RPTP for adoption
5.2 PT Plan comes into effect	20 days after adopted	

8. Consultation

Pre-consultation with the key statutory stakeholders is proposed during the PT Plan preparation, with the aim of involving these stakeholders early in the planning process.

A presentation is proposed to facilitate feedback from key stakeholders. This would be based on the presentation to Councillors and provide information on the review, and highlight any areas where feedback is sought. Follow up meetings and workshops will be held with key stakeholders as required as the draft PT plan is developed. The NZ Transport Agency will be involved at an early stage and we will meet with them regularly throughout the process. Forums may be held to allow discussions with key stakeholders to take place, including a Regional Transport Committee workshop.

Formal public consultation is proposed once the draft PT Plan is adopted and the Council is satisfied that the views and opinions of all key stakeholders are appropriately and consistently incorporated into the draft document.

If the opportunity arises, we will look to align public consultation on the draft PT Plan with potential further Regional Land Transport Plan consultation on the public transport components of the Lets Get Wellington Moving Programme. A review point (April 2019) has been included in the project schedule to facilitate this.

Officers will prepare a Consultation Plan, which will set out the requirements, approach and timeframe for consulting with stakeholders and other interested parties in compliance with the statutory requirements in the Act.

9. Project governance and management

The proposed project governance structure for the review is set out in figure 2 below. The project will be managed within the PT Policy team, with strategic input from Committee and oversight by the Executive Leadership Team.

Under the Act, the PT Plan must be adopted or varied by the full Council but its preparation can be delegated to the Sustainable Transport Committee. The Committee will be the primary decision making group, with decisions escalated to Council as necessary.

The Project Working Group will ensure wider GWRC input from:

- Public Transport Group (including bus and rail operations, and policy)
- Relevant project teams (e.g. LGWM, Project NEXT)
- Strategy Group
- People and Customer Group

- Finance and legal teams.

A core project team will undertake much of the day to day work, with project workstreams undertaking the detailed technical analysis of key policy areas and issues included in the review.

Work on major public transport related initiatives (e.g. LGWM and Project NEXT) is being delivered through separate project teams, and the results will be incorporated into the draft plan, as required.

An independent reviewer will be appointed to provide policy and technical advice, and review the PT Plan process and the draft PT Plan to ensure it is appropriate and complies with the Act.

Project governance structure

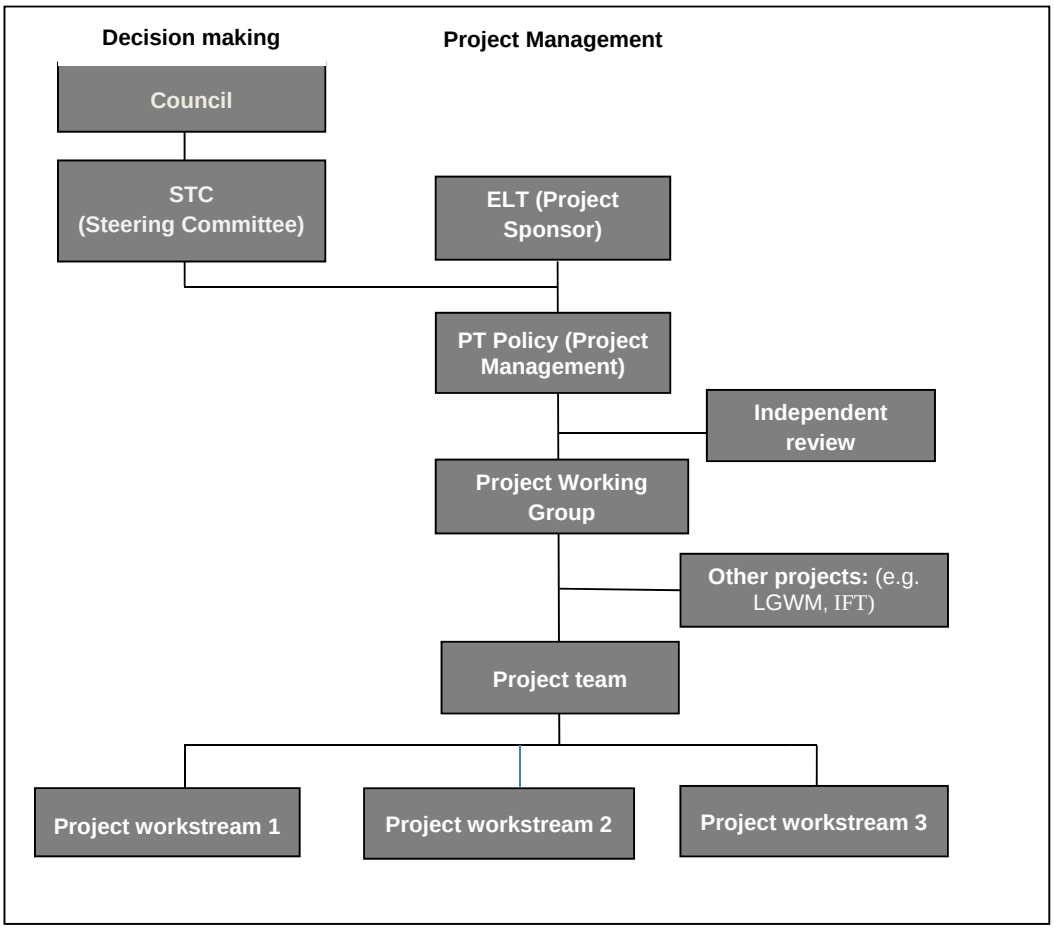

Figure 2

10. Consideration of climate change

The matters requiring decision in this report have been considered by officers in accordance with the process set out in the GWRC Climate Change Consideration Guide. Climate change and the implications of climate change from public transport initiatives and policies will be an important consideration in the review of the PT Plan.

11. The decision-making process and significance

The subject matter of this report commences a decision-making process that will lead to the Council making a decision of high significance within the meaning of the Local Government Act 2002. The decision-making process is explicitly prescribed by section 125 of the Land Transport Management Act 2003 and must include consultation in accordance with the consultative principles specified in section 82 of the Local Government Act 2002, or the special consultative procedure in sections 83 and 87 of the Local Government Act.

12. Engagement

Engagement on this matter is not necessary.

13. Recommendations

That the Committee:

1. ***Receives*** *the report.*

2. ***Notes*** *the content of the report*

3. ***Agrees*** *to initiate the Review of the Regional Public Transport Plan in the 2018/19 financial year.*

4. ***Approves*** *the process, timelines and deliverables for the review in accordance with this report.*

Report prepared by:	Report approved by:
Paul Kos	**Wayne Hastie**
Manager Public Transport Policy	General Manager, Public Transport

greater WELLINGTON
REGIONAL COUNCIL
Te Pane Matua Taiao

Report	**18.211**
Date	21 May 2018
File	CCAB-20-481
Committee	**Sustainable Transport**
Author	**Wayne Hastie, General Manager, Public Transport** **Luke Troy, General Manager, Strategy**

General Managers' report to the Sustainable Transport Committee meeting on 20 June 2018

1. Purpose

To inform the Sustainable Transport Committee (the Committee) of Greater Wellington Regional Council (GWRC) activities relating to the Committee's areas of responsibilities.

This report provides information on key work programmes and linkages between transport projects, programmes and the strategic framework. It is complemented from time to time by other reports, such as quarterly and annual reports.

2. Key issues

2.1 Bus changes in the Hutt Valley

At the time of writing, final preparations are underway for the go-live of Hutt Valley bus changes that come into effect on Sunday, 17 June 2018. The changes will deliver a major upgrade for customers, with most buses new, and some new services added to the mix. The most noticeable change will be the new look, with Metlink's distinctive colours of lime and yellow on most buses. All new buses will feature bike racks and air conditioning, as standard. There are new weekend services to Belmont, Korokoro, Stokes Valley Heights, Trentham, and Pinehaven, while Riverstone Terraces gets its first regular weekday bus service. There are also a number of changes to school bus timetables and routes.

3. Strategic Framework

3.1 Regional Land Transport Plan (RLTP) and Government Policy Statement (GPS)

The Regional Transport Committee (RTC) agreed the content of the RLTP update document and the priority of significant new improvement projects on 29 May 2018.

On 19 June 2018, the RTC will consider the final RLTP variation and recommend this to Council for consideration at the 26 June 2018 meeting. If Council agrees to the RLTP, it needs to submit it to NZ Transport Agency. The deadline set by NZ Transport Agency for submission is 30 June 2018, to enable the national programme to be developed subsequently.

The RLTP variation has been developed to be consistent with the draft GPS 2018 and draft Investment Assessment Framework (IAF). The final GPS is expected to be released by 30 June 2018, with the updated IAF shortly afterwards.

3.2 Regional Public Transport Plan review (PT Plan)

The PT Plan is scheduled for review over the next financial year. The process for the review, including statutory requirements and proposed timeframes is subject to a separate paper to Committee.

4. Significant issues and projects

4.1 Bus contracts and transition

4.1.1 Communications about bus changes

Information on Wellington, Porirua and Kapiti changes (including the changeover to Snapper) went live on the Metlink website on 1 June 2018, as well as a media release and associated social media support. Advertisements were placed that week on radio, community newspaper, online, and via outdoor advertising. Posters were placed on buses and trains, and e-newsletters were sent to customers. Region-wide timetables for services from 15 July 2018 are online, and customers are able to use the journey planner to see what their new journeys look like from 15 July 2018.

Metlink “AmBUSadors” will be on the ground at key locations in the Hutt Valley from 13 June 2018. The AmBUSadors will be deployed ahead of service changes in other areas in the lead up to and during the mid-July changes, which will include the change-over to Snapper for customers in north Wellington, Porirua and Kapiti.

4.1.2 Bus contract negotiations

Final contract details have been agreed with NZ Bus with contract signing planned to occur in the week of 11 June 2018. This will signal the conclusion of the procurement process for all bus operating contracts under the Public Transport Operating Model (PTOM).

4.1.3 Transition activities

Transition activities with all four operators, NZ Bus, Tranzit, Uzabus, and Mana, are progressing to schedule.

All transition activities are on target to enable commencement of new services on 17 June 2018 in Upper Hutt, Lower Hutt and Wainuiomata by Tranzit, and in Eastbourne by NZ Bus.

Civil works have commenced on bus hubs in Miramar, Kilbirnie, Newtown, and Johnsonville, with works scheduled to commence in Brooklyn in the week beginning 11 June 2018. Civil works comprise new kerbing, preparations for new shelter installations and connectivity for CCTV, and electronic information.

4.1.4 Fleet

A number of Tranzit's buses from each of the UK, China and Tauranga manufacturing facilities have been delivered and commissioned, and will continue to be delivered and commissioned over June and July 2018. Many of the commissioned buses can be seen on the road, providing driver training.

The first of the electric double-deckers has been signed out of Kiwi Bus Builders in Tauranga, destined for on-road testing and training of drivers in Wellington from mid-June 2018. Installation works have commenced for the electric bus charging poles and associated equipment at the Island Bay bus terminus in Reef Street.

NZ Bus has continued its testing of two converted trolley buses, with a converted trolley bus fitted with the TEG electric powertrain operating in service.

NZ Bus and Mana continue with the painting and refurbishment of their existing fleet that will be used to deliver services in the new PTOM contracts. A number of these buses in the new Metlink colours have re-entered service and can now be seen around Wellington streets.

4.2 Rail operations

4.2.1 Wairarapa line performance

A report on an independent investigation by SNC-Lavalin into rolling stock issues on the Wairarapa Line has been finalised and is reported separately to this meeting.

Significant progress is being made with increasing the capacity on the busiest Wairarapa train services, by lengthening trains from eight to nine cars. Metlink is expecting that an in-service trial will commence in June 2018, and that the existing stopping pattern for this service will remain. However, the number of doors opened at Waterloo will be restricted, due to the platform length.

4.2.2 Park and Ride terms and conditions

The Park and Ride terms and conditions endorsed at the last Sustainable Transport Committee are being posted across the Region's Park and Ride facilities during June 2018. The Terms and Conditions are being posted at the largest car parks first.

During the last Committee meeting, concerns were raised to ensure that the Metlink Park and Ride terms and conditions are legally enforceable by GWRC, given the various entities involved. Section 9 of the Terms and Conditions, explains the entities involved in the enforcement of the Terms and Conditions:

***We** and **us** and **our** mean:*

- *Greater Wellington Rail Limited (**GWRL**) as the lessee and / or owner of the car park land including GWRL's employees, agents, independent contractors and contracted service providers to GWRL, and*

- *Greater Wellington Regional Council (**GWRC**) trading as Metlink and as the manager appointed by GWRL including GWRC's employees, agents, independent contractors and contracted service providers to GWRC.*

4.2.3 Ava Bridge

The main bridge span was unable to be lifted into place during Queen's Birthday weekend, as planned, due to manufacturing delays. Unfortunately, another rail line closure (necessary to lift the span into place) is not scheduled until late August, so the bridge re-opening is now expected soon thereafter.

4.3 Sustainable Transport

The NZ Transport Agency/Accident Compensation Corporation national cycle skills education programme, called Bike Ready, has been holding training to ensure compliance across the country of trained assessors with the national standards. Our two lead trainers have been participating in this. The GWRC programme, Pedal Ready, will undertake a six-month transition to move to the new branding name, including new uniforms.

Staff attended the national Mobility OS conference in May where NZ Transport Agency's Mobility as a Service platform was featured. NZ Transport Agency has launched two apps for different regions, with differing transport issues and users. 'Ridemate' is being trialled in Auckland Airport and 'Choice' in Queenstown. NZ Transport Agency is looking to create a business case for rolling these platforms out to other regions, and is aiming to assist regions to assess their readiness for using such a platform. Work is on-going with NZ Transport Agency to assess how the national multi-modal platform, Smart Travel, could be integrated into both Ridemate and Choice.

GWRC officers have been working with the Ministry of Education and the Office of the Privacy Commissioner to iron out any concerns with the re-build of an online mechanism for capturing travel to school data.

5. Responses to public participation

9 May 2018

Marian Horan, Karen Serjeantson, Meaghan Serjeantson, Marie Smith, Ada Donaldson, Tom Halliburton, and Chris Hare, gave a presentation to the Committee on the changes to the number 14 bus route.

The Hataitai community's concern has been students who travel to and from schools in Kilbirnie and Rongotai. GWRC Councillors have been in contact with Hataitai community representatives, and kept them informed that there are still travel options available for their children. From start of term three there

will be two school bus trips in the morning, and two school bus trips in the afternoon going through Hataitai, plus public bus services.

School bus route 782 – From Wellington Station to Scots College, via Roseneath, Hataitai, Evans Bay Parade, Kilbirnie bus hub, and Rongotai Rd. This route runs in the ***morning and afternoon***

School bus route 765 – From Karori to Rongotai College, via Bus Tunnel, Hataitai, Evans Bay Parade, and Kilbirnie bus hub. This route runs in the ***morning***.

School bus route 754 – From travels from Rongotai College to Wellington Station, via Kilbirnie bus hub, Kilbirnie Cres, Hataitai, and onwards through the Bus Tunnel. This route runs in the ***afternoon***.

The high-frequency **public bus route 2** also runs through Hataitai every ten minutes, on its journey between Karori and Seatoun. Route 2 uses the bus tunnel, and travels to Seatoun via Hataitai, Kilbirnie Crescent, Kilbirnie bus hub, and Rongotai Road. For students living further into Hataitai and Roseneath who choose to use the public bus option rather than the school bus option will need to make a transfer between buses at Hataitai Village, onto the new route 14. This transfer will be at no extra fare cost.

The Hataitai Residents Association included information about the upcoming changes in its May newsletter. Awareness-raising letters have been sent to schools regarding the upcoming changes. More detailed information with maps and timetables will be going out in the coming weeks.

6. The decision-making process and significance

No decision is being sought in this report.

6.1 Engagement

Engagement on this matter is not necessary.

7. Recommendations

That the Committee:

1. ***Receives*** *the report.*

2. ***Notes*** *the content of the report.*

Report approved by:	Report approved by:
Wayne Hastie General Manager, Public Transport	**Luke Troy** General Manager, Strategy

Exclusion of the public — Report 18.252

That the Committee:

Excludes the public from the following part of the proceedings of this meeting namely, the procurement of ferry services under PTOM.

The general subject of each matter to be considered while the public is excluded, the reasons for passing this resolution in relation to each matter and the specific grounds under section 48(1) of the Local Government Official Information and Meetings Act 1987 (the Act) for the passing of this resolution are as follows:

General subject of each matter to be considered:	***Reason for passing this resolution in relation to each matter***	***Ground under section 48(1) for the passing of this resolution***
Procurement of ferry services under PTOM	*Information contained in this report relates to future ferry service procurement and contracting in the Wellington Region. Release of this information would be likely to prejudice or disadvantage the ability of Greater Wellington Regional Council (GWRC) to carry on negotiations, and affect the probity of the ferry services procurement process. GWRC has not been able to identify a public interest favouring disclosure of this particular information in public proceedings of the meeting that would override the need to withhold the information.*	*That the public conduct of the whole or the relevant part of the proceedings of the meeting would be likely to result in the disclosure of information for which good reason for withholding would exist under section 7(2)(i) of the Act (i.e. to carry out negotiations without prejudice).*

This resolution is made in reliance on section 48(1) of the Local Government Official Information and Meetings Act 1987 and the particular interest or interests protected by section 6 or section 7 of that Act which would be prejudiced by the holding of the whole or the relevant part of the proceedings of the meeting in public are as specified above.