



## Report pursuant to s42A Resource Management Act 1991

<b>In the matter of:</b>	A Notice of Requirement to construct and operate a new intermodal rail and freight hub on land between Palmerston North and Bunnythorpe
<b>And:</b>	A hearing by Palmerston North City Council pursuant to s100A
<b>Requiring Authority:</b>	KiwiRail Holdings Ltd
<b>Hearing date:</b>	9 August 2021

S42A Technical Evidence: Railway Track design, construction and operation

By: Michael Than

# 1 Executive Summary

1. Based on the information provided by KiwiRail, I agree that the existing Tremaine Avenue railyard site is at capacity and cannot be expanded to handle future projected freight demands.
2. I agree that the proposed site for the Freight Hub at Railway Road appears likely to accommodate the current operational needs of KiwiRail's existing freight task in the region. Based on the information provided, the concept design and layout of the proposed Freight Hub appears likely to improve the train operation and through-put of container operation.
3. Some elements of the Freight Hub's proposed design and layout are likely to efficiently accommodate future growth in freight transport by rail. The increased freight storage capacity, being one example. However, a detailed simulation of all activities within the proposed Freight Hub would better demonstrate and justify the scope and scale of the yard required to meet the forecasted future capacity.
4. There is sufficient information on the Freight Hub's proposed design, but not enough information about how the Freight Hub will operate internally or integrate with the wider KiwiRail network. For example, it is not currently clear from a practical, operational perspective how the Freight Hub will accommodate 1500m long trains or how these will be operated and accommodated within the wider KiwiRail rail network.
5. Although the information provided by Kiwirail outlines safety considerations, it is not clear that specific Safety in Design ("**SiD**") processes have been recorded – for example, SiD workshops, lists of hazards, or risk assessments. These SiD processes are a requirement of current KiwiRail design procedures and principles.<sup>1</sup> I recommend that Kiwirail implement SiD procedures to detailed design. The SiD procedures have the potential to influence the operational design and layout of the Freight Hub.

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<sup>1</sup> G-ST-AL-9131 – KiwiRail General standard Safety in design.

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## 2 Introduction

6. My name is Michael Than. I hold a Master of Engineering-Railway Infrastructure from the Queensland University of Technology, and Bachelor of Science in Civil Engineering from Lunds University of Technology. I am a chartered member of Engineering New Zealand and a registered professional engineer with the Engineering Council in the United Kingdom.
7. I am a Rail Engineer with 20+ years of experience in planning, designing, constructing, maintaining and operating railway infrastructure.
8. I have worked on numerous rail infrastructure projects around the world and in New Zealand, including intermodal freight, rail hubs and yard design. I planned and designed the intermodal hub in Karlshamn, Sweden, from concept to construction stage, and was very recently involved in renewal work for the Hillside Rail Yard in Dunedin. My responsibilities included leading the rail team to provide the concept design of yard tracks and planning how the trains will operate in the proposed yard. I have also led the track design work within in the Link Alliance, which is designing and building the City Rail Link in Auckland.
9. I have prepared this evidence on behalf of the determining authority, Palmerston North City Council, in relation to the Notice of Requirement ("**NoR**") for the KiwiRail Regional Freight Hub ("**the Freight Hub**") lodged by KiwiRail Holdings Ltd ("**KiwiRail**"). I understand that my evidence will accompany the planning report being prepared by the determining authority under section 42A of the Resource Management Act 1991 (the "**Act**").

### 2.1 Expert Witnesses – Code Of Conduct

10. I confirm that I have read the Code of Conduct for Expert Witnesses in the Environment Court Practice Note 2014 and that I agree to comply with it. I confirm that I have considered all the material facts that I am aware of that might alter or detract from the opinions that I express, and that except where I state I am relying on information provided by another party, the content of this evidence is within my area of expertise.

## **3 Background and Scope of Evidence**

### **3.1 Background**

11. KiwiRail is seeking to designate approximately 177.7 hectares of land between Palmerston North Airport and Bunnythorpe for a new Regional Freight Hub.
12. The Freight Hub will consist of a centralised hub incorporating tracks, marshalling yards, maintenance and servicing facilities, a train control and operation centre, freight handling and storage facilities (including for logs and bulk liquids), provision of access, including road and intersection upgrades where required, and specific mitigation works including noise walls/bunds, stormwater management devices and landscaping. In addition, the North Island Main Trunk rail line will be relocated to sit within the new designation area and directly adjacent to the Regional Freight Hub. The activities that take place at KiwiRail's Tremaine Avenue freight yard (apart from the passenger terminal and the network communications centre) will be relocated to the new site to form part of the new Regional Freight Hub.

### **3.2 Scope of evidence**

13. The scope of my evidence is confined to commentary on the existing rail environment, and identification of issues relating to the design, construction and operations of the proposed rail hub.

### **3.3 Reports and material considered**

14. As part of preparing this statement of evidence, I have read the following reports and documents:
  - a. Intermodal freight hub Master Plan – Palmerston North Report, April 2020;
  - b. Concept plan (sketch), 20 October 2020;
  - c. Updated Rail Yard Concept Plan, 12 February 2021;
  - d. Notice of Requirement and Assessment of Environmental effects, October 2020;
  - e. KiwiRail Regional Freight Hub Section 92 Response - Economic Development Impact February 2021 Prepared by Richard Paling;

- f. KiwiRail Regional Freight Hub – Design, Construction and operation, October 2020;
- g. KiwiRail Holdings – Palmerston North Regional Freight Hub - S92 Requests and Responses – Design, Construction and Operation, 15 February 2021;
- h. KiwiRail Regional Freight Hub – Notice of Requirement - Response to Further information request pursuant to section 92 of the Resource Management Act 1991 – Issues raised by submitters, 28 May 2021;
- i. KiwiRail Design Management, General Principle: G-PR-AL-9025 Issue 1.0, Chapter 6;
- j. KiwiRail Safety in design standards: G-ST-AL-9131.

### **3.4 Site visit**

- 15. I undertook a site visit on the 29<sup>th</sup> of September 2020 and am familiar with the surrounding environment.

## **4 Palmerston North Rail network – in and around**

- 16. Palmerston North's is strategically located, with through roads for the North Island Main Trunk ("NIMT"), a connection to the Palmerston North-Gisborne Line and the connection to the Marton-New Plymouth Line. From Palmerston North southbound to Wellington, the railway caters for both passenger and freight trains. The railway around Palmerston North is essential as part of the broader transportation network, catering for passenger, freight and tourist services.

### **4.1 Existing Passenger rail services**

- 17. The passenger rail service, known as The Capital Connection, connects Palmerston North to Wellington with a weekday commuter train operated by KiwiRail, which runs a single peak direction service in each weekday peak. This carried approximately 134,000 passengers in the 2019 financial year and is increasingly operating at capacity on some days of the week. The Capital Connection serves a large catchment northwest of the Wellington region and south of the Horizons region and connects residents to employment,

educational and other opportunities and services that are not available elsewhere on the corridor. The service also stops at Shannon, Levin and Otaki. The Capital Connection parallels State Highway 1 for much of its length. State Highway 1 carries large traffic volumes and is geographically constrained, making it vulnerable to congestion and resilience events.

18. Besides the Capital Connection commuter service, KiwiRail's tourist train, the Northern Explorer runs on the North Island Main Trunk (NIMT) between Auckland and Wellington twice a week with a stop in Palmerston North.<sup>2</sup>
19. Investment in longer-distance rail passenger rolling stock, reliability, capacity, frequency and journey time improvements is foreshadowed and supported by Wellington Regional Council and Horizons transport plans and supported by spatial planning and regional economic development programmes in both regions. Regional Land Transport Plans ("RLTPs") are particularly relevant as they provide the strategic context and investment programme for land transport (including public transport) in each region. Both Wellington Regional Council and Horizons' RLTPs prioritise investment in longer distance commuter rail.
20. Horizons Regional Council has reaffirmed<sup>3</sup> that rail has been under-utilised for many years and acknowledges the shift of mode from road to rail, for both freight and passengers, will strengthen the resilience of the wider regional land transport network.

## 4.2 Existing Rail Freight services

21. For 76%<sup>4</sup> of all commodities coming into the yard, the Palmerston North Rail Yard is an intermediate location where the freight is briefly held before being redistributed to trucks or other trains. The remaining 24% of commodities is equally made up of freight originating from Palmerston North or reaching its final destination in Palmerston North. The dynamics of these freight servicing patterns are an important determinant of the proposed design and layout of the new yard.

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<sup>2</sup> Horizons regional council, Regional Land Transport Plan (RLTP) 2021-2031, (2018 Draft)

<sup>3</sup> Horizons regional council, Regional Land Transport Plan (RLTP) 2021-2031, (2018 Draft)

<sup>4</sup> KiwiRail Intermodal Freight Hub Masterplan – Palmerston North Report - Appendix D (April 2020)

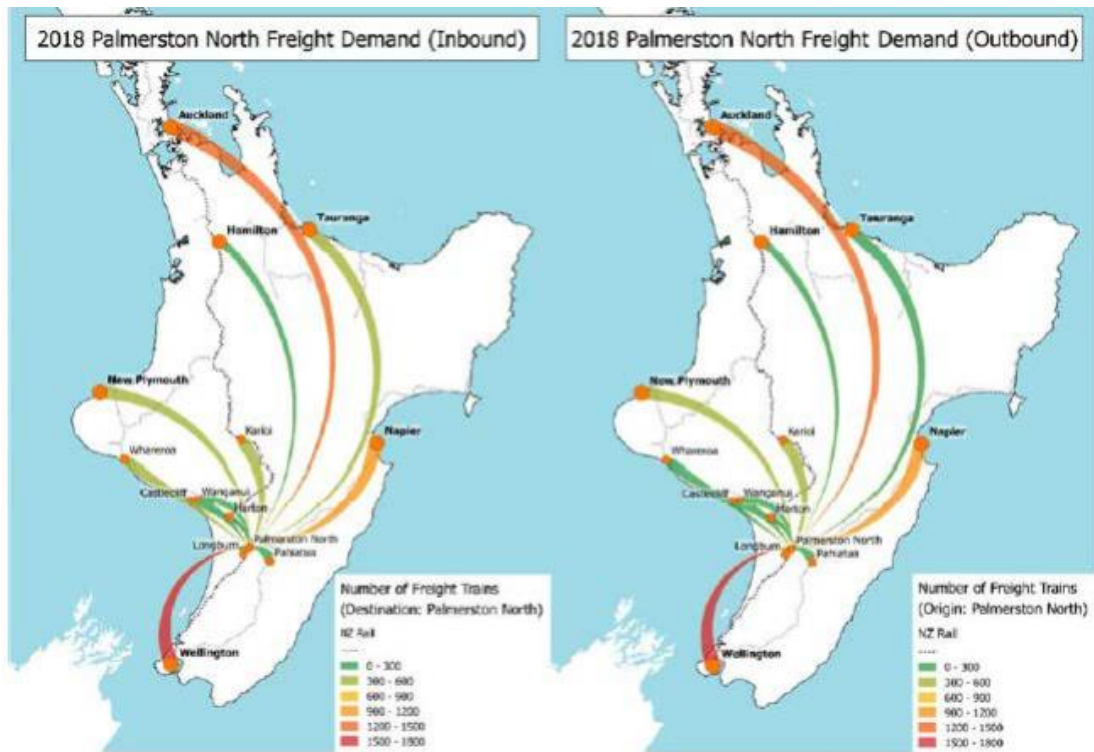


Figure 1: Freight movements and train counts to and from the existing Palmerston North terminal

22. As depicted in Figure 1, it is clear that Wellington is the primary southern location for outbound and inbound freight to and from Palmerston North. Further significant volumes originate and depart for Auckland to the north, Napier to the east and New Plymouth to the west. The distribution of freight in all directions provides a significant indication of the importance of the Freight Hub's proposed location NIMT, the access to the Palmerston North – Gisborne Line to the east and Marton – New Plymouth Line to the west.
23. Maximum train length is important from a design perspective, i.e. footprint of the layout, and the hub operation from the point of view of the required loops and tracks. Based on KiwiRail's third section 92A response, the current maximum train length on NIMT for trains north of Palmerston North is 900m, the maximum train length operated in 2019-2020 at Palmerston North was 895m, and 13 trains in each direction were over 800m long. In the same response, Kiwirail notes that the new ferries will have rail capacity slightly over 800m, which is less than the current 900m maximum. In conclusion, the Freight Hub's ability to accommodate longer trails may be of limited usefulness south of Palmerston North, although it may be theoretically possible to still run them to Wellington.



### 4.3 Existing Palmerston North Train Station and Yard

24. Kiwirail's current Palmerston North rail yard is located on Tremaine Avenue. This railyard has been described as "a major junction" to "serve trains to and from the north, south, west, and east: Auckland, Hamilton, and Tauranga; Karioi (pulp mill); Longburn, Wellington and the South Island; Whanganui, Hawera, and New Plymouth; Napier Hastings and Pahiatua."<sup>5</sup>
25. In 1964,<sup>6</sup> Palmerston North was not well developed, and the current location of Palmerston North Freight Yard was at the outskirts of the city. Over time, residential areas and the city centre have developed and now surround the Tremaine Avenue railyard. Kiwirail's Palmerston North Regional Economic Growth Hub Business case report stated that the buildings are near their serviceable limits, and some are not well equipped for current and future requirements.
26. The existing KiwiRail land in Palmerston North is about 40 hectares in area and includes the Tremaine Avenue yard. The existing hub contains the following facilities:<sup>7</sup>
  - a. Network Services Depot
  - b. Marshalling Yard including arrival/departure tracks
  - c. Container terminal
  - d. Wagon and Locomotive storage tracks
  - e. Maintenance facilities for wagon and locomotives.
27. The majority of train traffic to Palmerston North is inbound from the north, and most of the switching occurs at the north end of the marshalling yard. In the container terminal yard, top-lifters transfer containers from rail to truck, and from truck to rail.
28. Maintenance on wagons and locomotives is an essential function of the yard, necessary to keep the fleet of rolling stock operated in the lower region of the North Island operational. The maintenance team at Palmerston North maintains both diesel and electric locomotives, wagons and rail network

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<sup>5</sup> KiwiRail Masterplan Appendix B-Economic Development impact (2019)

<sup>6</sup> KiwiRail Palmerston North Regional Economic Growth Hub, Business case, (August 2018)

<sup>7</sup> KiwiRail Intermodal Freight Hub Masterplan – Palmerston North Report, Section 3.

equipment. The maintenance area is primarily located in the north-eastern part of the yard, with the facilities located in separate buildings and work/storage areas. The Palmerston North yard's maintenance function is strategically important. In addition to the locomotives, wagons and rail equipment being maintained and repaired here, they are also cleaned in the yard.

29. Also located at the Palmerston North yard are several leased facilities with rail services to each. A log loading siding is in the yard close to the Milson Line bridge. The siding consists of two loading tracks, approximately 250m in length and log storage.

#### **4.4 Existing yard limitations**

30. One of the main constraints for future growth are the residential areas surrounding the location of the current yard.<sup>8</sup> From a bird's-eye view of the area the yard is somewhat saucer-shaped, with main tracks leading into series of turnouts in ladder system which in can break up, divert and/or classify trains into its intended destination.
31. In the centre of the site is a paved grid for short term placement of containers and outside that, on either side, is an area for manoeuvring the large top-lift hoists that are used to move the containers. Outside that again are two tracks, one on each side, where the rail wagons are placed for loading and unloading. The track on the west of the site can hold 21 wagons, about 355m, and that on the east 15 wagons, 255m, a total of 610m. As a result, the site cannot take an existing maximum length train from the north of 900m.
32. As the current yard cannot accommodate a full continuous length of 900m, the trains need to be broken into a series of shorter sections. To make up and dispatch a train length of 900m, it requires a series of complicated coupling, de-coupling and switching works. The switching work imposes additional use of track-time, staffing and shunting locos and additionally delays through trains.
33. It is my understanding that the existing rail yard operation at Tremaine Avenue will be decommissioned and moved to the Rail Hub at the NEIZ site once it has been constructed and is in operation. It is unclear in the information provided

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<sup>8</sup> KiwiRail Intermodal Freight Hub Masterplan – Palmerston North Report, Section 3.1.

how or if the Tremaine rail yard tracks will be used once the new site is fully operational.

## 5 Proposed design of the Rail Hub

34. The concept design and layout for the Rail Hub is based on several key physical components. These have been presented and described in the KiwiRail Masterplan report, section 4.2. My consideration of these key components is as follows:
- a. Terminal operation: The number and type of tracks provided, switches, and crossings appear likely to accommodate and provide the same functional needs as currently in the Tremaine Avenue Freight Yard. The proposed design, in its entire constructed layout, has eight arrival and departure tracks. The 'split ladder track system', which facilitates trains being moved from one track to adjacent parallel tracks through a series of turnouts, can accommodate trains of up to 1500m in length, between the eight arrival and departure tracks. The eight tracks combined with the ladder system may provide classification (sorting) of trains and the opportunity to receive and dispatch trains to the required lengths.<sup>9</sup> The 12 marshalling tracks could operate as a classification yard where the process of receiving and breaking up in-bound trains and classifying or sorting of wagons can efficiently take place. Two 'bad order' tracks have been placed appropriately adjacent to the marshalling yard to switch out any mis-switched wagons if required.
  - b. Maintenance facilities: The facilities for maintenance activities, the number of tracks, and the type of tracks appear likely to accommodate and provide the current Tremaine Avenue Freight Yard needs. The maintenance facility includes maintenance for diesel, electric locos, wagon maintenance and vehicles for roadway work equipment.
  - c. Container Terminal: The storage of containers is centrally positioned with access for both trucks and rail. The design facilitates the loading and unloading activities and provides good flexibility for accessing the different transport modes. The storage area appears likely to

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<sup>9</sup> KiwiRail Rail Yard Concept Plan, Fig 142, dated 12 Feb 2021.

accommodate and provide the needs as in the Tremaine Avenue Freight Yard.

- d. Commercial services: Given the proposed site, the freight forwarder facilities, log loading facilities, bulk storage of liquid and solids appear likely to accommodate and replace existing operational needs.
35. To confirm, if the concept design, layout and area of the proposed hub meets the required scale and scope of forecasted future operations, a detailed simulation of all activities within the rail yard including locomotive and wagon preparation and maintenance, marshalling of trains, wagon stowage, locomotive stowage and passing traffic is required. A simulation can provide valuable insight on train and track configurations and utilisation, train movements internal/external to the yard, facility utilisation, stowage times within the yards, impacts on mainline services and hub operations.

## 5.1 Safety in Design (SiD)

36. Safety in Design: Occupational Health & Safety (OHS) is an important element of all legislative and societal frameworks in most countries. Legislation, government agencies and organisations are placing increasing emphasis on reducing OHS risks at the point where there is most opportunity for control. The opportunity for control of many issues arises at the design stage. The earlier in the design stage that issues can be mitigated, the lower the cost.

37. According to KiwiRail General Standard 9025:<sup>10</sup>

Designers are in a strong position to make work healthy and safe from the start of the design process, by making the right choices about the design as early as possible to enhance the safety of the project. Safety in Design integrates hazard identification and risk assessment methods early in the design process, in order to eliminate, isolate or minimise the risks of death, injury and ill health to those who will construct, operate, use, maintain, decommission or demolish an asset.

38. The NOR makes the following statement: 'The concept design layout was developed using the concept of Precision Scheduled Railroading (PSR) which has Safety as a one of the 5 core Principles – "safety in every aspect of Work".<sup>11</sup>

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<sup>10</sup> G-ST-AL-9131 – KiwiRail General standard Safety in design.

<sup>11</sup> KiwiRail Intermodal Freight Hub Master Plan – Palmerston North Report, Section 2.3.

However, there are no records provided of how SiD has been applied to the proposed solution.

39. There are elements of safety aspects mentioned in the provided material. However, the information presented, in my opinion, is not adequate to meet the current requirements of Safety in Design (SiD) principles. As described in the KiwiRail General Standard (referenced above), SiD is required. I am concerned with the lack of evidence of the following aspects:
- a. Risk management, output of the risk assessment, development of a Risk Register; and
  - b. Holding of a SiD workshop according to KiwiRail requirements, Hazard and Operability Study and analysis of what happens when designs are operated outside of the design intent.
40. As an external reviewer acting as expert witness, it is difficult to check and verify that the design has been conducted in line with safety legislation and industry practice.
41. The outcome of any such SiD review may also have implications for the design and layout of the proposed Freight Hub, so I recommend that it should occur at an early stage.

## **5.2 Site selection process, Multi Criteria Analysis / Assessment (MCA)**

42. Based on the provided information, the process of selecting a preferred site has been carried out through a site selection process involving site visits, workshops to determine a long list, and shortlisting of various options. Given the complexity and various project requirements, KiwiRail have chosen to identify a preferred site through a multi-criteria assessment (MCA). In general business practice, MCA is an accepted method consisting of tools to evaluate different options to improve decision-making. According to The Treasury,<sup>12</sup> 'MCA evaluates different options against a set of criteria. 'Effectiveness' is a criterion that is often used to assess whether an option meets the stated objectives.'

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<sup>12</sup> <https://www.treasury.govt.nz/information-and-services/regulation/information-releases/regulatory-review-programme/cost-benefit>.

43. The KiwiRail MCA process for selection of preferred site can be briefly summarised with the following key elements:
- Workshop 1 – Project induction Setting the criteria
  - Iwi Engagement
  - Workshop 2 – Long list assessment
  - Workshop 3 – Short list assessment
  - Weighting of the option
  - Outcomes, and recommendation of a preferred option
44. The work from KiwiRail to identify to recommend a proposed site for the future Regional Rail Hub seems to demonstrate a robust assessment given the complexity, various constraints and the vast number of criteria.

### **5.3 1500m long trains, yard design**

45. KiwiRail notes that accommodating trains up to 1500m long in the future is one of the justifications for the large footprint of the proposed rail hub. The rationale for this was presented in the KiwiRail report Design, Construction and Operation, which states:<sup>13</sup>

Increased traffic between Auckland/Hamilton and Palmerston North is to be accommodated by increasing train lengths by 65% to 1,500m.

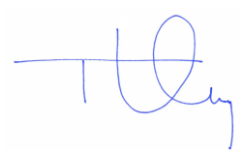
46. The technical parameters in section 2.1 of that report identify a design requirement to meet KiwiRail's operation standard, which must 'Provide for up to 1500m long trains between Palmerston North and Auckland'. It remains unclear precisely how or when this can be achieved from a national operations perspective.
47. From the information provided in the third section 92A response, it is understood that the given examples/enhancements/projects in the KiwiRail network have taken into account the requirement to accommodate train lengths of longer than 900m. The s 92A response provides several past and ongoing projects, focussed on achieving KiwiRail's company-wide objective

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<sup>13</sup> Regional Freight Hub – Design, Construction and Operation dated October 2020, Section 1.3.1.

to increase the capacity and resilience of the railway network, which included PGF funding for the Freight Hub. I understand that this project and the requirement for 1,500m trains falls within KiwiRail's stated operational objective of future-proofing its major infrastructure developments for growth.

48. While I recognise the general strategy to improve the resilience and capacity of the network and the key operational objectives, the network circumstances required in order to allow 1500m long trains are themselves uncertain at this stage, depending on unrelated investment and projects, and realised demand for freight traffic.
49. Further, based on the information provided it is not clear, in my opinion, how such trains will be operated and accommodated inside the yard from a practical operational perspective. A detailed simulation of the operation of the proposed rail hub, as discussed above, would help to demonstrate the intended operation of a 1500m train in and around the facility.
50. With that said, I also recognise that another future use of the Freight Hub may be as a classification yard (discussed briefly above), which in my opinion is arguably a more obviously feasible use, and which is itself a 'land-hungry' activity.



Michael Than

18 June 2021