Auckland Transport Alignment Project

Freight Report

Contents

Preface

This is one of a series of research reports that were prepared as inputs to the Auckland Transport Alignment Project (ATAP). It is one of a number of sources of information that have been considered as part of the project, and which have collectively contributed to the development of the recommended strategic approach. The content of the report may not be fully reflected in the recommended strategic approach, and does not necessarily reflect the views of the individuals involved in ATAP, or the organisations they represent. The material contained in this report should not be construed in any way as policy adopted by any of the ATAP parties.

1.0 Executive Summary

This paper brings together what is known about freight performance in Auckland, discusses trends impacting the freight task and identifies a methodology for assessing freight delay. It largely concentrates on road freight as the primary freight mode in Auckland.

Auckland Freight Task

This investigation has confirmed the significance and importance of the Auckland region in the national freight task with currently around 25% of New Zealand's freight originating or terminating within the region, accounting for 28% of road transport related GDP in 2012. Looking ahead, forecasts from the Ministry of Transport (MoT) expect New Zealand freight volumes to grow by 58% by 2042 with a near doubling of existing flows experienced in Auckland. While rail and coastal shipping mode shares are expected to grow, in absolute terms road transport will continue to carry the vast majority of freight.

Road Freight Congestion

The belief that Auckland's congestion is having a negative impact on freight has been confirmed in recent meetings with the road freight industry where evidence of decreasing service offerings over time due to increasing congestion, both in terms of frequency and geography, was provided.

While general network wide congestion was noted by industry representatives, the areas of particular concern correlated, as would be expected, to access to and from major production or distribution hubs; namely access to Port of Auckland via the Strand, motorway access to and from Wiri, Onehunga / Southdown, Highbrook / East Tamaki and the Airport via 20A / 20B.

Looking forward, freight carriers expect congestion issues to spread south. This is tied to the development and/or intensification of industrial land at Manukau / Wiri followed by Takanini and in due course Drury. They also noted the size and scale of greenfield growth areas in terms of how freight will access the areas and the impact of the development and intensification that these routes will have on general traffic – for example the reliance on SH16 to serve the Kumeu / Huapai area.

Whilst there is uncertainty as to the impact of larger international ships visiting New Zealand and the subsequent role of rail as a shuttle to the inland ports and regions, road freight to and from Ports of Auckland Limited (PoAL) is expected to continue to increase. A review of available data has confirmed that approximately 80% of freight originating from PoAL travels via the motorway network, validating to some extent the Regional Freight Network.

Finally, industry representatives identified the lack of co-ordination and integration between PoAL and Port of Tauranga and their associated inland facilities. This was cited as contributing to double handling and back tracking.

Assessing Freight Demand

While both Auckland Transport (AT) and the New Zealand Transport Agency (NZTA) have monitoring programmes for their networks, there is no specific monitoring of freight. The lack of maintained representative data relating to freight movement and efficiency severely limits AT and NZTA's ability to plan for or improve the performance of freight movements. Ownership of freight function is shared across multiple parts of NZTA and AT with limited specific budget allocated for improving freight efficiency.

No assessment has been completed to determine if rail can accommodate the projected freight task on existing infrastructure and how this might change as demand for passenger rail increases. With growing demand for both freight and passenger transit it is likely that there will be a need to separate rail freight and transit, or expect freight to transfer from rail to road. The lack of freight data and a model hinders the determination of the date at which this separation / change of mode is required. A major driver will be the completion of the City Rail Link, expected in 2023, which will allow more passenger trains to operate on the network.

To understand the cost to the economy of delay and congestion impacting the freight fleet we need to understand both the cost of freight travel time and freight transport demand. The Economic Evaluation Manual (EEM) provides values for the former which have been reviewed against relevant international literature to confirm if they are appropriate or conservative. The latter item, namely an understanding of freight transport demand, is currently a significant gap.

To provide the Auckland Transport Alignment Project (ATAP) with an approach for testing and understanding the impacts of various transport infrastructure packages, a review of various datasets and methodologies was completed. There are numerous data sets that provide evidence of current freight movements, either in terms of volume, route choice or journey time. However, whilst these data sets all provide components of the quantified 'freight' demand, individually they don't provide a full picture of the pattern of current movements. They also fail to provide the future assessment that is required because they are 'observed' data.

Our assessment identifies an approach that compares output from the Auckland Regional Transport (ART) model with a range of datasets including eRUC (electronic Road User Charging), Bluetooth and classified vehicle counts. This methodology develops a base matrix of freight demand and of average journey times between areas of the Auckland network from the available observed data sets. This data can then be compared with the data in the ART model to provide an 'adjustment' matrix that can be used as a comparator for forecast changes.

It is considered unlikely that the above approach can be completed in time to align and provide insight to the ATAP project. It is also noted that NZTA has recently commissioned research looking at real-time monitoring of freight movements in Auckland (*TAR 15/24 Use of technology to measure and improve urban freight movements*) which is anticipated to be completed in 2017.

Key Findings

The findings of this report are not particularly new. Comparison with the Auckland Regional Council (ARC) Freight Strategy (2006) and the Upper North Island Strategic Alliance's Critical Issues (2013) shows little advancement on a number of common issues. This is in part due to a lack of organisational capability and focus on the freight task. Historically the Auckland Regional Transport Authority had a key focus on public transport, and local councils an emphasis on roads from an engineering perspective. As such there was and continues to be limited strategic planning relating to the freight task at the regional level.

Another key aspect that has previously held back understanding of the freight task has been the broad and diverse spectrum of the task and its participants which has made gathering of reliable and comprehensive data challenging. In recent years there have been significant advances in the industry's ability to gather data on freight traffic. While still not perfect or entirely complete in terms of coverage of the freight sector, this step change provides a vital enabler for transport agencies to plan for freight. As such, investing in data capture, monitoring and ultimately development of multi-modal freight demand and distribution tools, such as models, to assist strategic planning should be considered.

Recommendations

The majority of the recommendations identified in this report require investment beyond ATAP. Actions for immediate consideration in ATAP are:

- From the Round 2 Package Evaluation – Consider how the inclusion or omission of the AWHC and other significant strategic freight network improvements impact freight congestion and distribution.
- While recognising that eRUC data only represents a proportion of freight traffic, use regional eRUC data to verify current assumptions of the Strategic Freight Network. One approach would be to assess what areas the package is affecting and compare these with freight congestion data e.g. AT's freight monitoring and eRUC heat maps. Unitary Plan zoning maps would assist in identifying current and future commercial areas.

Recommendations that should be considered beyond the current ATAP scope:

- Address knowledge and data deficiencies
    - Develop and apply an adjusted freight matrix to assess future freight demand and enable quantification of delay and congestion costs.
    - Establish a consolidated accessible freight dataset for the Auckland region.
    - Develop a multi-modal regional freight model(s) to assist in the management and planning of freight movement and distribution.
    - Develop strategic freight planning capability. Engage further with PoAL, Port of Tauranga and KiwiRail to develop an enhanced understanding of capabilities, operations and future aspirations.
    - Develop organisational focus and capability in the freight sector to enable and enhance strategic planning of this significant transport sector.
    - Develop a stronger collaborative working relationship between public sector (NZTA and AT) and the freight sector beyond the regulatory relationship.

2.0 Background

2.1 Introduction

Efficient freight services by rail, large trucks and smaller delivery vehicles are important to Auckland, helping to keep the prices of goods and services down and ensuring prompt reliable service. Freight efficiency is also important to New Zealand as Auckland is the main import port. The higher cost of moving goods also restricts the competitiveness of manufacturers based in the region, resulting in constrained employment in the sector.

Auckland's congestion was thought to have a negative impact on freight and this has been confirmed in recent meetings with the freight industry where evidence of decreasing service offerings over time due to increasing congestion, both in terms of frequency and geography, was provided.

2.2 Scope

This paper brings together what is known about freight performance in Auckland, discusses trends impacting the freight task and identifies a methodology for evaluation of freight delay. The freight transport task covers a broad spectrum – this report primarily focuses on the heavy vehicle portion of this spectrum, with some limited discussion on the role of rail freight in Auckland. A significant gap in scope is consideration of the Light Commercial Vehicle and "man in van" business and commercial traffic sector which forms of a large part of the Auckland freight task. As became evident through the development of this report, there is a general lack of data and understanding of the freight task, and this sub-sector is typically proxied as being represented by general traffic when considered at a regional level. It would be useful to understand if these trips are concentrated in specific areas.
This workstream deliverable partially overlaps with both the Arterial Roads and the Rail Workstream reports.

2.3 Purpose

The focus of this workstream has been to develop an understanding of the current and future freight challenge in Auckland and the importance of freight in Auckland and New Zealand's productivity.

The findings, where applicable, will then be used to assist the development, testing and assessment of interventions and scenarios in the second and third stages of ATAP.

The approach to this task has been as follows:

a. Review published data in relation to Auckland and New Zealand freight research
b. Investigate readily available datasets to develop an understanding of freight demands and distribution.

2.4 Consultation and Engagement

A review of existing traffic data and monitoring sources was conducted and included meetings with the relevant teams at the Auckland Motorway Alliance (AMA) and AT. A workshop was also held with representatives from National Road Carriers (NRC) to assist with understanding key road freight issues and challenges.

It is recognised that a full freight supply chain view would require a much broader and triangulated consultation involving the likes of exporters, the port companies, KiwiRail and Air New Zealand. However due to the time constraints and the primary focus of this paper being on heavy vehicle freight on the Auckland network, external engagement was limited to NRC.

2.5 Structure

This working paper is presented as follows:

- Part A contains a thorough literature review of the existing and future freight network in Auckland and New Zealand as a whole.
    - Section 2 discusses the existing situation for freight on a nationwide level and then focuses on freight in Auckland
    - Section 3 looks at the factors which will influence the future freight task
    - Section 4 summarises the predicted future situation for freight. This includes the key challenges and opportunities.

- Part B explains the methods for quantifying freight delay in New Zealand.
    - Section 5 presents an approach for quantifying freight travel time
    - Section 6 presents an approach for forecasting future freight demand
    - Section 6 presents the conclusions and recommendations.

Part A - Characteristics of the Existing and Future Freight Network

3.0 Existing Situation

3.1 Economic Contribution of Freight

The Westpac Transport Industry Insight (2015) noted that the transport, logistics and distribution sector (including road, rail and shipping) produced around 5.4% of New Zealand's GDP in 2014, or $12.5 billion. This is in line with Australian and European Union GDP shares. Road transport (including freight and passenger services) employs the largest share of workers in the transport, logistics, and distribution sector, with 41,000 full time employees employed in 2014, generating $4.3 billion in GDP nationally. Auckland produced around $1.2 billion in road transport value in 2014, or 28% of the total sector.

The MoT and Lincoln University 2015 strategic study *Economic Development and Transport* noted the impact of transport on the location of economic activity (e.g. the Auckland port and the freight links to its hinterland). It discussed the importance of reducing the costs (including transport costs) of doing business and improving access to maintain relative competitiveness. It is noted that, while freight is no longer growing as fast as GDP, in part reflecting the increased share of service industries in the economy, the volume of freight moved within Auckland and New Zealand continues to grow at a substantial rate.

3.2 Freight Task

The Westpac Transport Industry Insight (2015) notes that the largest share of road transport value is added in Auckland, which accounts for around 28% of the national total.
A study in 2012 showed that 16.2% (by weight) of all freight movements around New Zealand were within Auckland (MoT, 2014a). Around 4.5% of nationwide freight movements were from destinations outside of Auckland to destinations within Auckland. Similarly, around 4.5% of nationwide freight movements were from Auckland to destinations outside of Auckland. Therefore around 25% of New Zealand's freight has an origin or destination of Auckland.

A further study conducted by Beca (2015) aimed to look at the current movements of freight from the PoAL. A cordon drawn around the Auckland Isthmus concluded that 20% of nationwide trips began or terminated within this cordon area, which is very similar to the conclusion reached by MoT (2014a).
Data from the MoT (2016) indicates that approximately 95% of freight originating from Auckland is transported by road to other regions. Rail makes up 4.6% and coastal shipping less than 1%.

As shown below, a significant proportion of Auckland's freight task is internal with just under 40% of estimated freight volumes being intra-regional.

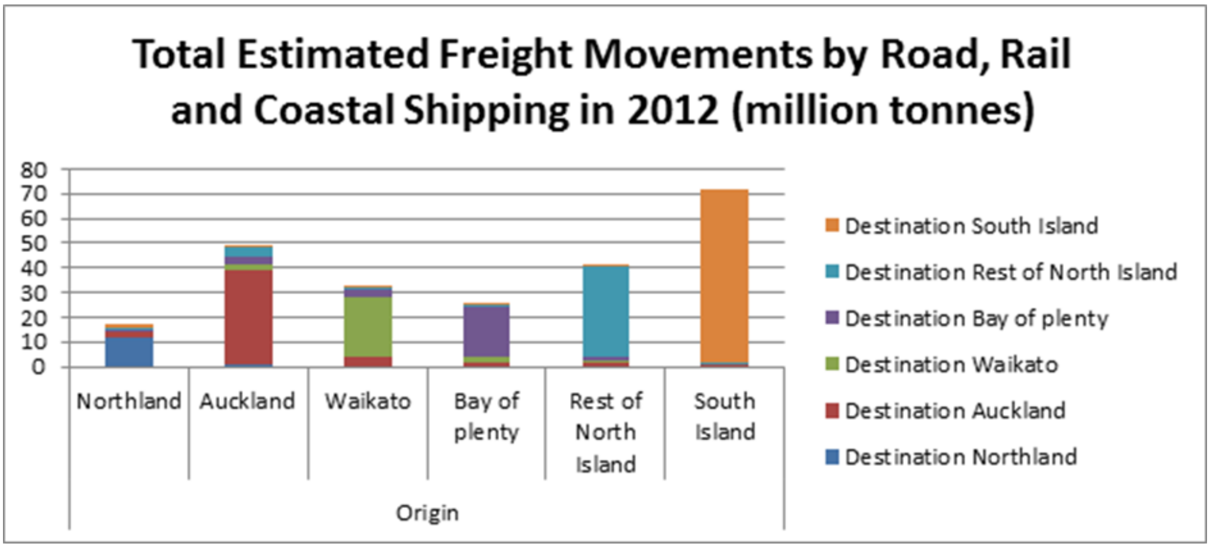


Figure 1: Freight movements by region for road, rail and coastal shipping in 2012 (MoT, 2016)

3.3 Regional Freight Network

The principle of a Regional Freight Network (RFN) based on the State Highway network and key regional arterials has existed in various forms for a number of years. Limited consultation with the freight sector has been undertaken to confirm the completeness of the routes covered. Anecdotal evidence from the workshop held with NRC is that the principles underpinning the network are sound as the network focuses on the “movement” orientated corridors in the region, the significant freight-generating hubs (manufacturing and distribution) and the metropolitan centres (receiving environments). The network is shown at Appendix B.

AT monitors Level of Service KPI’s on a broader network which includes more of the arterial network than the RFN, but input data driving this dashboard is general traffic and this is not considered against Heavy Commercial Vehicle (HCV) volumes. This means the specific importance of each route to freight movement is not known or assessed. An example of this dashboard is included at Appendix C.

Supporting Evidence for the RFN - The Port Demand and Route Preference Study

The Port Demand and Route Preference Study completed in 2015 for the MoT used a sample of 122,000 vehicle trip movements from March 2015. These have been linked to census area units if a trip starts or finishes on the studied ports. The cordon for this study was the Auckland Isthmus and, as can be seen from the key findings, broadly supports the RFN.

Ports of Auckland

- The key sources of port freight traffic were as expected being the major freight hubs in the region; namely the Airport area, Onehunga, Penrose, Mt Wellington and Highbrook.
- 20% of trips started or finished within the Auckland Isthmus.
- Of those trips crossing the Isthmus cordon 20% travelled north or west – the remainder south.
- 80% of the Isthmus cordon crossing trips used the state highway with Great South Road the most significant local road.
- There is a bias for trips heading south from PoAL to use the Southern Motorway or Great South Road and for PoAL inbound trips to use SH20.

MetroPort

- Primary sources of MetroPort traffic are the industrial belt (Onehunga to Highbrook) and the Airport area.
- 80% of traffic crossed into the Auckland Isthmus on a state highway, with Great South Road taking over 50% of the non-state highway traffic.
- A noticeable asymmetry with a bias for south bound vehicles to use SH20 Mangere Harbour Crossing and return north bound on Great South Road or SH1 Southern Motorway. The significant cause for this is attributed to the lack of signals at the MetroPort gate.

Establishing the potential for this approach to be broadened to other major and minor freight nodes in the Auckland region could be explored as a cost effective way of developing a freight matrix for ATAP. This is discussed in more detail in section 6.

The RFN is essentially a form of classification or description – that is, a means of noting which roads are particularly important to freight and have a relatively high proportion of trucks in their traffic mix and are therefore significant contributors to national productivity. So far they have not been a basis for different policies compared with other roads. As noted above, the network focuses on the “movement” orientated corridors.

3.4 Current Network Pinch Points

When asked about specific locations of major freight congestion and delay on the current network, NRC representatives tended to speak of general congestion across the network and in particular the scale and duration of peak period congestion and how this impacted their scheduling.

While the benefits of encouraging public transport, active modes and increased vehicle occupancy were generally acknowledged, it was noted that the impact to freight of reassigning road space to these uses did not from the NRC’s perspective seem to be well considered. For example, the impact of dedicated bus lanes on key arterials results in a loss of general traffic lanes in peak periods. Conversely the potential for freight to use bus and other special vehicles lanes was raised as an opportunity to be explored. This has strong overlap with the Arterial Roads Workstream.

On further interrogation, locations of particular concern correlated, as would be expected, to access to and from major production or distribution hubs; namely the access to Port of Auckland via the Strand, motorway access to and from Wiri, Onehunga / Southdown, Highbrook / East Tamaki and the Airport via 20A / 20B. Projects addressing congestion and capacity, both for general traffic and freight have been identified as part of the Package Development Workstream. It is recommended that each of the projects is reviewed with respect to its contribution to addressing freight congestion.

Known capacity constraints such as Warkworth, the SH20/1 southbound merge at Manukau and the State Highway lane reductions at Mt Wellington and Takanini due to bridge widths were also noted. Priority freight lanes or ramps to and from the motorway at the above locations were noted as desirable.

At a local and very practical level, the quality of loading zones (both on and off-road) and the influence of development control rules on this were raised by NRC representatives. Developers, enabled by the rules, have long prioritised car parking over suitably sized loading zones resulting in inefficient deliveries. For example, a loading zone that enables access and unloading of an A or B Train will reduce the overall number of trips to a location if the same load is to be delivered by a medium goods vehicle. Similarly a loading area that enables optimal access to vehicles reduces time spent in the yard and would increase productivity.

3.5 The Use of Rail in Auckland

Rail does not usually suit operations within urban areas because of double handling costs (often trucks have to be used at one or both ends of the journey). The primary freight market served by rail in the Auckland region is the import / export of containerised cargo with perhaps the most important rail operation within Auckland being shuttle trains between the port and the freight precincts. Double handling costs are usually avoided because the trains go directly from sidings at the port to sidings in freight terminals. As noted above, road congestion deters some freight companies from using trucks for this journey.

Other significant rail freight operations in Auckland involve trains connecting Auckland with other regions, especially to/from the Port of Tauranga and on the main trunk south towards Wellington. Nationally this function is substantial in terms of access and volume, taking the equivalent of around 1000+, 50 tonne truck combinations per day.
Refer to the ATAP Rail Workstream for further detail on the use and anticipated future of rail in the Auckland context.

3.6 Monitoring & Data Sources

A review of existing traffic data and monitoring sources was conducted and included meetings with the relevant teams at the Auckland Motorway Alliance (AMA) and AT. A Workshop was also held with representatives from National Road Carriers (NRC) to assist with understanding key freight issues and challenges.

The key findings of this investigation are that, while both AT and NZTA have monitoring programmes for their networks, there is no specific monitoring of freight. The lack of maintained representative data relating to freight movement and efficiency severely limits AT and NZTA's ability to plan for or improve the performance of freight movements. Ownership of freight functions isn't clear within the organisations, with no budget allocation for improving freight efficiency. Similarly there isn't any specific tool available for the forecasting of future freight traffic demand and distribution.

While there are numerous data sets and sources ranging from fixed inductance loops through to in-vehicle journey tracking software such as SNITCH or TOMTOM; no single dataset is considered a complete picture of the freight sector – with the particular gap being an understanding of journey purpose and length. Many causes of this are issues common to the freight sector, especially the commercial sensitivity of information and breadth of contributing organisations. While eRUC, SNITCH and TOMTOM data are a marked improvement from traditional floating car surveys, the sample size and coverage of various vehicle classes is unclear.

AT have validated SNITCH data against floating car surveys and are satisfied that the data is statistically significant and representative of light and medium goods vehicles, but less certain for Heavy Commercial Vehicles (HCV's) – especially where gradients are significant. Commercial sensitivity and or privacy concerns are cited by both vehicle tracking service providers and freight haulage firms. If this barrier could be removed the consolidation of the various datasets – both physical and technology based – would be expected to provide a rich picture of the wider freight distribution and demand in Auckland.

As such, it is recommended that a consolidated freight data set is developed and maintained for the Auckland region. This would enable establishment of baseline travel patterns and the development and enabling of performance indicators. The sharing of this data within the industry could result in the optimisation of trips, in terms of both timing and consolidation of journeys between operators, and improved productivity.

Proactive engagement with the freight sector to discuss data availability and the potential data uses would be needed. The aim would be to develop an approach that is a compromise - with the potential benefits to the freight sector through greater understanding of the issues at an aggregate level exceeding any potential commercial sensitivity from the provision of that data by individual operators.

Both the AMA and AT agreed that in lieu of freight-specific matrices and data, general traffic congestion is considered an appropriate proxy for freight delay.

3.7 Organisational Focus

There is a lack of organisational capability and focus on the freight task. Historically the Auckland Regional Transport Authority had a key focus on public transport, and local councils an emphasis on roads from an engineering perspective. As such there was and continues to be limited strategic planning relating to the freight task, especially at the regional level.

One such example is the Auckland Regional Council's Freight Strategy (ARC, 2006) which identified a number of recommendations and tasks to support strategic planning of the Auckland freight task. Comparing the findings with that study with the Upper North Island Strategic Alliance discussed below shows little progress on many aspects over the past ten years.

3.8 Upper North Island Strategic Alliance

The Upper North Island Strategic Alliance (UNISA) is made up of the various councils in Northland, Auckland, Waikato and Bay of Plenty. This group is collaborating with AT, KiwiRail and NZTA on initiatives to reduce the cost of doing business in New Zealand, through an Upper North Island lens.

As part of this work the following have been identified as the seven critical issues, at an upper North Island scale, that are limiting economic productivity and New Zealand's ability to reduce the cost to do business. These issues are explained in

Table 1.

Table 1: Seven Critical Issues limiting the North Island's Freight Productivity (NZTA, 2013)

No.	Critical Issue
1	**Strategic Road and Rail Network Constraints** There are a number of constraints on the upper North Island strategic freight road and rail network that are limiting our ability to enhance economic performance and reduce the cost to do business in New Zealand.
2	**Delivery of the High Productivity Motor Vehicle (HPMV) programme** There is a need to develop a more coordinated approach to the implementation and communication of the upper North Island HPMV programme. Freight operators require a fast and seamless permitting process, appropriate rules and enforcement, consistent coordination between agencies and regular communication on the status of routes ('whole of journey' network approach).
3	**Utilisation of industrial land** There is a need to understand the likely supply and demand for industrial land (amount, type and location) across the upper North Island so that land and public investment can be provided and staged at appropriate times.
4	**Lack of strategic, integrated land use and transport planning and investment** There is a lack of a comprehensive, integrated approach to current and future land use and land transport (road and rail) planning and investment at an upper North Island scale. A more strategic approach would increase certainty for industry and public sector agencies and support effective industry, local government and central government planning and investment.
5	**Lack of shared and accurate data** A lack of shared and accurate data (e.g. freight volume and value for both road and rail) means it is difficult for public agencies to make well-informed, collective decisions about land use and transport planning and investment that will increase efficiencies for business and public investment.
6	**Need to understand costs of freight supply chains for critical industries in the upper North Island** There is a need to better understand the costs of the freight supply chain for the upper North Island's key economic industries in order to support development / alignment of initiatives by industry and the public sector to reduce the cost to do business.
7	**Challenging local government and central government funding structures** The current range of central and local government funding structures and requirements (i.e. legislation, policy and application) are hindering 'smart investment' decisions due to their multitude and complexity.

The majority of these, particularly those focused on the transport element of the freight task, are confirmed as knowledge gaps or areas for further investigation by this work stream report. Similarly the Auckland-specific road and rail constraints relating to Critical Issue 1 are consistent with the locations identified in this study.

The relevant pages from the Upper North Island Freight Story – Shared Evidence Base (April 2013) are provided in Appendix D.

4.0 Factors Influencing the Future Freight Task

4.1 Trans-Pacific Partnership

The Trans-Pacific Partnership is predicted to accelerate growth in the freight industry. The freight industry is expected to grow in New Zealand by 58% by 2042, which is approximately 2% per annum assuming a linear increase (MoT, 2014a). The freight flows are predicted to increase in all regions across the country with increases of almost double the existing flow by 2042 in Auckland and Canterbury.

4.2 Congestion

Congestion is an increasingly serious problem for freight movements in Auckland. Attempts have been made to improve the issue, such as special lanes for commercial vehicles on the motorway onramps, however total delay times across the network due to congestion are increasing. Along with increasing travel time, travel unpredictability is also creating significant supply chain cost. There is currently limited understanding of the extent of this cost and how to reduce travel variability for freight.

4.3 Dead mileage

Underutilised or empty movements are reducing the productivity of freight operators. The clear imbalance between where imports are consumed and exports are generated is one cause of this problem. While Auckland is the dominant region for consuming imports, exports are principally produced in rural regions further south. This means that the transport system often requires the relocation of equipment, such as containers, from Auckland to other parts of the country (Beca, 2015).

Another prominent factor is the imbalance between the population in the North and South Island and between cities. This results in fewer goods being required in one location than another and consequently the movement of partially filled containers or trucks.

4.4 Larger Ships

Container ships have been growing in size since they first began use in the 1950s, with the 5,000 twenty-foot equivalent unit TEU class of ships that are now visiting New Zealand in increasing numbers having been in use since the late 1980s. The main factor driving this increase in larger ships visiting New Zealand is the post 2009 overcapacity in the Northern hemisphere which has made it more economical to send larger ships to the Southern hemisphere.

4.5 Logistical Services

Logistical services such as forwarding services, distribution centres and online inventory management are being utilized to help manage stock levels, reduce delivery costs and ensure that sufficient stock is held at all points in the distribution chain (MoT, 2014a). These logistical services utilise large trucks to move consolidated loads to distribution centres. Smaller vehicles are then used to deliver reduced loads to the urban area.
Although third party logistic services are being used in New Zealand, they are not as prominent as in overseas markets. New Zealand's large exporters have previously organized

their own transportation systems. The shift towards third party services is now becoming more noticeable with companies such as Fonterra and Carter Holt Harvey recently establishing independent businesses to look after their transportation requirements (MoT, 2014a).

4.6 Information Management and Scheduling

The freight sector is becoming more efficient in road transport as new technology enables more extensive information regarding traffic flows to be made available (MoT, 2014a). A greater proportion of movements are now being scheduled for off-peak periods, resulting in greater productivity, however after hours running has probably reached or is near its limits. There is limited scope for businesses to move freight after hours, due to staff availability at receiving sites, driver fatigue and the additional costs associated with having 24/7 operations.

Freight companies will continue to improve their efficiency as new technology becomes available to ensure that they remain competitive. A study of the road freight industry in Australia stated that Electronic Data Interchange (EDI) technology is becoming increasingly important (IBISWorld, 2011). These systems allow for communication within a company and more accurate information about the location of vehicles. As noted earlier, if the commercial concerns regarding aggregating and sharing this data could be overcome, the ability to understand traffic movements of the freight sector would take a great leap forward.

4.7 Online Services

The development of online communication and shopping services is changing the freight fleet composition.

Email and web based / cloud computing applications are causing a sharp decline in the number of document deliveries. Postal services are continuing to operate, however there is a shift from the traditional documents to parcels (Westpac, 2015). This will see a rise in the number of courier vans which are replacing the traditional postmen. In regards to the number of full time workers in the postal services sector, the decline in document deliveries has seen a reduction from 21,800 employees in the year 2000 to 7,000 in 2014.

The composition of trucks for shipping of retail goods is changing as online shopping becomes more prominent (MoT, 2014a). Traditionally containers of goods would be shipped to distribution centres, which would then be transported by large trucks to retail stores. The retail store is now being removed from the chain and replaced by a direct delivery from the distribution centre to the consumer’s house. This presents a need for a larger number of small vans as opposed to a smaller number of large trucks. The same effect is occurring because of increasing pressure for just-in-time deliveries and manufacturers hold smaller inventories.

4.8 Regulation Changes

The rules governing the maximum weights and dimensions of heavy goods vehicles were amended in 2010 with the introduction of the concept of the High Productivity Motor Vehicle (HPMV). These vehicles can operate on specified routes at weights of up to 62 tonnes, depending on the number of axles on the vehicle and the capacity of bridges on the route. This allowed a greater freight task to be carried in one load which reduced the number of trucks and drivers required.

The use of HPMV's had been limited to specific routes because of the potential for damage to pavements and structures on some parts of the network. To address pavement wear concerns and bridge axle loading restrictions, the concept of a 50MAX HPMV was introduced in 2013. The 50MAX HPMV is a longer vehicle and has an extra axle which means that the truck's load is spread further resulting in the same amount of wear on the road surface as the conventional 44 tonne trucks. These vehicles are now able to drive on almost the entire State Highway network and on many local roads.

The introduction of HPMV's has seen an increase in the value added per worker as a result of larger tonnage vehicles being permitted. Many truck firms are switching to them as older trucks wear out. This may also increase the competitiveness of road transport against rail and coastal.

The NRC group were supportive of these changes but believe another incremental step change would come from an increase in truck lengths to 25m from the current maximum of 20-23m (depending on configuration). This would enable more flexibility in the possible container size configurations that can be carried in one trip. However, trials have found that despite the productivity benefits, these vehicles had problems tracking due to New Zealand's relatively tight road geometry.

4.9 Connected and Autonomous Vehicles (CAVs)

The potential for improvements arising from the digital revolution such as vehicle autonomy and platooning are seen by NRC representatives as having very limited impact in New Zealand in the short to mid-term. Several companies have conducted significant investigations and trialling of world leading innovations but to date have not (or at least are not willing to publicly discuss) invested in these. One innovation example cited was the driver assist provided by Volvo which had been trialled but found to currently be of limited value in the New Zealand road environment.

Many technology initiatives were seen as being of greater benefit to driving environments overseas such as motorways and freeways in Europe, Australia and the United States where distances are often longer, off-ramps less frequent and the topography less demanding.

5.0 Auckland's Freight Future – Key Challenges and Opportunities

5.1 Future Network Pinch Points

In considering where future problem locations might occur, the general consensus from NRC was an expectation of southward migration tied to the development and/or intensification of industrial land at Manukau / Wiri followed by Takanini and in due course Drury.

The quality of access to the proposed greenfield growth areas identified in the Unitary Plan and Future Urban Land Supply Strategy were also noted both from a construction and eventual servicing perspective. This was both about how freight will access the areas and the impact that the development and intensification of these routes will have on general traffic – for example the reliance on SH16 to serve the Kumeu / Huapai area.

Participants recognised the significance of good ground conditions as being an indicator of the potential for uptake of industrial land – seeing continued development of the Airport precinct and future development of the Drury South industrial park as likely prospects due to the ease of development of distribution and warehousing facilities.

There was strong support for Ara Tūhono – Pūhoi to Warkworth, East West Connections and the Waterview Connection. The opening of the Waterview tunnel will provide an alternative route for freight that would previously have had to cross the Harbour Bridge. Beca (2015) made a rough estimate that 15% of freight traffic currently crossing the Harbour Bridge would be diverted to the Western Ring Route once the Waterview Tunnel is opened. This figure is expected to increase to 30% with the opening of the East-West Connection.
NRC representatives anticipate an increase in congestion issues south of Manukau on completion of the Western Ring Route and SH20A/B upgrades (rerouting from PoAL to Wiri/Manukau) however the Southern Corridor Improvements project is expected to address this to some extent.

5.2 Growth by Mode

Future predictions for freight movement are for an increase across all of the modes of transport mentioned in Table 2 and Table 3 by 2042. The forecast increase in freight in tonne-kms over the next 30 years is consistent (48%) across rail, coastal shipping and road (16%, 13% and 71% respective current share of total freight tonne-kms). However, there is uncertainty around projects over such a long period, because of unknown economic, social and technical developments.

Table 2: Forecast Growth in Freight in New Zealand by Mode 2012-2042 in million tonnes (MoT, 2014a)

Year	Rail	Coastal Shipping	Road	Total
2012	16.1	4.2	216.0	236.3
2042	24.3	7.60	341.0	372.9
Growth to 2042	51%	81%	58%	58%

Table 3: Forecast Growth in Freight in New Zealand by Mode 2012-2042 in billion tonne-kms (MoT, 2014a)

Year	Rail	Coastal Shipping	Road	Total
2012	4.1	3.5	18.6	26.3
2042	5.9	5.1	27.6	38.8
Growth to 2042	44%	46%	48%	48%

It should be noted that no assessment has been completed to determine if rail can accommodate this task on existing infrastructure, particularly in Auckland where the network is shared with passenger trains.

5.3 The Role of Rail

The use of rail is expected to continue increasing gradually as companies look for more efficient and productive ways to transport freight domestically. Evidence from the Port of Tauranga[1] showed that where a new uncongested road route is available there is the potential for existing rail movements to be replaced by additional road movements. Freight movements are much more sensitive to the cost of travel. Mode and route choice react rapidly to changes in relative cost.

This was a view supported by the NRC workshop attendees who were sceptical when asked about the potential for rail to deliver more of the freight task, with the consensus being that rail had a role to play but that it would remain of limited significance in Auckland. The reasons given for this were numerous but in summary appear to be driven by:

1. a lack of responsiveness to scheduling and distribution requirements, and
2. reliability issues arising from the state and capability of assets (both tracks and rolling stock).

Auckland is a shared network catering for both passenger and freight demands. The ability to cater for additional services (both passenger and freight) will be limited without further investment. Refer to the ATAP Rail workstream for more detailed information.

5.4 Coastal Shipping

The largest increase in freight in tonnes is expected to occur in the coastal shipping industry, with a predicted increase of 81%. Coastal shipping was only briefly discussed with NRC but, due to the duration and speed of journeys, it was not seen as having significant potential in contribution to Auckland’s freight task.

5.5 Consequences of Larger Ships

The increase in ship sizes require ports to upgrade their services to cater for larger ships. These upgrades include inland port development, deeper channels and larger quay cranes.

[1] Following the completion of the second harbour bridge and the removal of tolls for the crossing there was a marked increase in the HCV movements across the Harbour Link. Investigations showed that the growth was related to the replacement of rail based transfers of empty containers to road based.

Only some of New Zealand's ports will be able to make the required upgrades due to monetary and spatial constraints. Companies with larger ships may choose to make fewer New Zealand port calls. Thus the number of international container ports in New Zealand may decrease. This could lead to an increase in freight costs and increase in competition as the average distance that freight must travel domestically to reach its final destination increases. There is expected to be port consolidation and alliances as the ports become more competitive (MoT, 2014b).

The pattern of freight movement is expected to become more tidal with a higher quantity of trucks required to unload shipping freight while these vessels are in port, followed by a lull while the port waits for the next large vessel to arrive. Overall there are cost pressures working in opposite directions: larger ships that offer lower costs per tonne kilometre and higher landside freight costs. The net impacts on different New Zealand ports is not known, but it is expected that Auckland and Tauranga will retain or even increase their importance, with consequences for truck and train movements in the Auckland region. This is evident from current trends towards consolidation of shipments in the Upper North Island, and in particular at the South Auckland inland ports.

A capacity analysis performed by MoT (2014b) found that the current transport network generally had sufficient capacity to cater for larger vessels. However insufficient capacity was noted to occur on the road and rail routes around the ports of Auckland and Tauranga. These areas will require upgrading to provide sufficient capacity and travel time reliability for the time sensitive requirements of large vessels.

5.6 Freight Scheduling

It is believed that a greater proportion of freight movements will have to occur at night in response to Auckland's congestion. Representatives from NRC believed that this is already taking place, with freight scheduling prioritising movements in the inter peak and at night. However, there are labour supply issues and consent conditions associated with night working and current literature suggests that this approach is only used in the transportation of containers from ports to intermediate holding areas.

5.7 Logistical Services

Growth in the logistical services industry is expected to steadily increase for the foreseeable future but at a slower pace than in the past ten years. The reduction in positive growth rate is due to two main factors; China becoming more developed and therefore requiring less imported goods, and a large number of international trade barriers that have already been removed (Westpac, 2015).

Part B - Quantifying Freight Delay

The ATAP terms of reference require a methodology that can:

1. Understand the current freight delay cost;
2. Forecast future freight delay cost; and
3. Test the effectiveness of investments on key freight routes.
4.

To understand the freight cost (current or future), two pieces of information are needed:

1. An estimate of the cost ($ per unit) of freight travel time;
2. The quantum of freight transport demand.
3.

The following sections first consider elements contributing to the cost of freight travel time before outlining a methodology for assessing and forecasting freight transport demand.

6.0 Valuing Freight Travel Time

6.1 Components of freight travel time cost

Gillett (2001) noted that there are three components of the supply chain which impact the value of freight travel time. These are listed below:

- Direct costs – The cost directly associated with moving goods from one location to another, and can include costs such as fuel, driver wages, and the cost of the truck.
- Direct inventory costs – The cost associated with inventory, e.g. warehousing costs and the cost of holding additional inventory as a result of higher travel times.
- Obsolescence costs - A subset of inventory costs. Obsolescence costs are the costs associated with the risk of inventory depreciating while in transit.

Gillett (2001) also noted that obsolescence costs would be the most relevant component for accounting for the value of the commodity. In a separate study aimed at investigating freight delay costs for railroads, Lovett (2014) noted that it is common practice in North America for goods suppliers to charge railroad companies a negotiated penalty for late delivery, representing lost revenues or increased costs. These discount rates range from 15% a day for perishable goods to 5% a day for bulk goods.

6.2 Values of direct freight travel time

Utilising values from NZTA's Economic Evaluation Manual (EEM) reveals a combined driver, passenger and freight travel time for a weekday Urban Arterial traffic mix of $61.10 per hour in 2015 dollars. This excludes vehicle operating costs. The calculation is included in Appendix E.

A comparable Australian figure of $77.18 (2015 NZ$) was generated from the 'Austroads – Guide to Project Evaluation Part 4: Project Evaluation Data'. It should be noted that the value of 'commuting' and 'other' driver costs were kept in the same proportion to the values provided by the EEM. The major factor leading to the higher cost per hour is that the freight time component is valued highly in Austroads. The calculation is included in Appendix E.

Internationally estimated costs per hour of freight travel time vary considerably, through the different basis of estimation (resource cost versus 'willingness to pay'). Table 4 shows an estimated cost per hour of travel time between $55.29 and $128.97 (2015 NZD$). It is recognised by the Federal Highway Administration FHWA that the valuation of travel time is an unsettled aspect of benefit-cost analysis, hence the range of costs.

Table 4: Cost per hour of freight travel time from overseas studies.

Location	Author	Cost Per Hour (2015 adjusted $NZD)
USA (FHWA)	FHWA (2008)	$55.29
Texas (Texas A&M Transport Institute - TTI)	Urban Mobility Report (2015)	$128.97
Australia	Austroads (2012)	$77.18
USA	American Transportation Research Institution (ATRI) (2014)	$89.83

*The 10 year average NZD$-USD$ exchange rate of 0.73NZD$ per USD$ has been used for currency conversion

The NZTA EEM's value of freight travel time of $61.10 is below the average of the range provided by the four international studies shown in Table 4. It is noted that New Zealand costs are not directly comparable to international costs due to differences in cost of living, legislative environments, fleet composition, and a host of local factors. The next section has a comparison to remove some of these differences.

6.3 Valuation of New Zealand freight travel times

To remove some of the local cost factors from the comparison, scale factors have been developed between freight travel time costs and general traffic costs. This is intended to remove variations due to international income differences, inflation, GDP, and legislative environments. However, legislative requirements specific to the freight industry and differences in fleet composition cannot be removed.

Table 5 adjusts values of time for inflation for the studies above and calculates the scale factor between freight travel time valuations and general traffic costs. Due to the coarse nature and small sample size, this is an indicative study only and would need additional international evidence to provide additional confidence.

Table 5: Hourly value of freight travel time for New Zealand and international studies after adjusting values into a New Zealand context.

All costs are in 2015 $NZD	Hourly Value of Time (Composite)	Value of Freight Travel Time	Scale Factor
NZTA EEM (2014)	$32.49	$61.10	1.9
FHWA (2008)	$17.80	$55.29	3.1
Urban Mobility Scorecard (TTI, 2015)	$24.21	$128.97	5.3
Austroads (2012)	$28.85	$77.18	2.7
ATRI Study (2014)	$29.78	$89.83	3.0

The EEM scale factor value at 1.9 is the lowest of international estimates. If the highest of the international scale factors of 5.3 was utilised on the EEM value of time, the value of freight travel time would be approximately $170 per hour. The scale factors and ranges could be used to develop sensitivity tests in freight valuation assessments. However, it is noted that the composite value of time from the EEM is higher than all the overseas data and higher by some 30% than the TTI data. As such, this $170 could be considered to be the upper end extrapolation of all the data sets reviewed.

Methodologies aimed at developing an Auckland-specific freight value of time were investigated but ultimately discarded. Valuation of freight travel time using land use areas and commodity production with mass balancing were considered (and were used in a similar study for Southland), however mass balancing would not be an appropriate technique for Auckland.

6.4 Basic delay and the value of reliability

Lovett (2014) noted that holding costs are primarily affected by the variability of delivery rather than absolute travel time. Under ordinary circumstances where there is no serious time constraint, travel time reliability is valued at 80-100% of the value of time. In the presence of a significant non-flexible arrival or departure constraint, travel time reliability is valued at up to three times the basic value of time. A separate FHWA study notes that, depending on the product carried, unexpected delays can increase the value of travel time by 50% to 250%.

The NZTA EEM (Appendix A4.5) utilises a value of 90% as the value of reliability. This is based on a typical urban mix (NZTA, 2014). Cars utilise a value of 80% and commercial vehicles utilise a value of 120%. The EEM does not calculate reliability benefits based on travel time reduction (captured as travel time savings), but on the reduction in journey time variability (for which journeys with highly congested links exceeding capacity are likely to have more than the average travel time reductions).

Kruger (2013) addressed the value of reducing freight time volatility. The Swedish government guidelines for cost-benefit analysis recommend factoring travel time reductions by a value of two. This is intended to reflect the likely improvement in reliability, where their researchers derived values of reliability at approximately 90% of the value of travel time. This study also referenced studies from Denmark and the Netherlands which found that the value of reliability for freight was between 90% and 130% of travel time value.

It should be noted that the type of goods being transferred will result in a wide variance in the value of reliability. At the lower end of the reliability value are goods that are non-perishable and are intended for storage for a period far in excess of any variability. An example of this is warehousing and distribution of non-perishable goods where the reliability element of the costs relates to the number of vehicles required to move a given quantity of goods daily. With uncertain journey times an operator may need to run an additional vehicle to provide the capacity. At the other end of the spectrum is the movement of perishable goods to the port for export, where storage space is constrained precluding early arrival, and failure to arrive in time means that goods miss an export sailing and lose the majority of their value.

In summary, the majority of studies value the reliability of freight travel time at between 80% and 130% of travel time value, and using a value of 90% of travel time for reliability appears reasonable on aggregate. As a future aspiration, it would be beneficial to acquire data and consider methodologies for considering different reliability rates for particular sub-sets of freight vehicles or between specific origin and destination pairs where land uses lead to higher or lower sensitivity for journey time reliability.

7.0 An Approach to Assessing Freight Demand

7.1 Overview

The quantification for freight movements is generally of a lower quality than private vehicle movements in urban transport models. There are several reasons for this, including:

- Freight movements are a relatively small minority of vehicle movements during the peak periods;
- First order economic benefits for private vehicle congestion are an order of magnitude higher than freight related benefits;
- Data for individual journeys (private vehicles) is readily available from data sets including the census and household travel surveys; and
- Design is often focussed on alleviating a peak hour congestion issue which requires a solution to address a pattern of demands driven predominately by private commuter movements.

To be able to provide the ATAP Freight workstream with adequate tools for quantitative assessment of freight movement there is need to understand the following:

- Number of freight vehicles travelling on the network;
- The routes used by the freight vehicles;
- The delay experienced by those freight vehicles;
- The likely changes in journey time as a result of potential future network and demand changes.

The key consideration for this workstream is not just the ability to quantify the network today, but more importantly to forecast future conditions and be able to provide comparable quantification of the benefits (or disbenefits) to freight from potential interventions. As a result, a methodology that is aligned to a forecasting tool was considered essential.

7.2 The Role of the Auckland Regional Transport Model

NZTA and AT have heavily invested in a hierarchy of models over many years. Whilst these models are likely to evolve in the medium to long term future, for the purposes of this workstream it was considered that the existing strategic transport models, most notably the Auckland Regional Transport (ART) model, should be used to provide the data for the effects of forecast changes. Whilst the ART model has very limited freight data as input, the use of the model for the assessment of other ATAP workstream interventions means that there are logical and practical efficiencies that arise from using this tool as a consistent means for forecasts.

However, whilst this approach offers consistency, it is understood that there are significant shortcomings in the direct application of the ART model to freight movements. It is important to understand that this is not a particular failing of the current model, only that the specific focussed application of the tool when applied to freight movements is outside the purpose for which the model was initially developed.

7.3 Available Datasets

There are numerous data sets that provide evidence of current freight movements, either in terms of volume, route choice or journey time. These include classified 'loop' counts that provide quantification of volume at specific points in the network, Bluetooth monitoring that can imply journey time for goods vehicles discrete from cars over longer distances, and collated GPS data sets including TOMTOM and eRUC that provide journey time and route data. Whilst these data sets all provide components of the quantified 'freight' demand, individually they don't provide a full picture of the pattern of current movements, and as they are 'observed' data they don't provide the future assessment that is required.

However as all are long term sources of data there is a robustness that they provide that can inform an annualised long term assessment of freight demands, noting that in the case of several key freight categories, the movements vary through seasonal changes. These fluctuations are not just in agricultural exports, but also apply to construction related movements – so the use of data related to a single month would not represent the total freight picture.

7.4 Proposed Approach

The proposed way forward is to develop a base matrix of freight demand and of average journey times between areas of the Auckland network from the available observed data sets. This data will then be compared with the data in the ART model to provide an 'adjustment' matrix that will be used as a comparator for forecast changes. This technique is commonly used in transport modelling when seeking to develop a calibrated model with forecast demands being provided by a higher level strategic model. This differs in application here because the relative level of data pertaining to freight in the ART model is significantly lower than the observed data that we have available. As such, the approach is considered viable for the high level assessment and for comparing candidate schemes, but a greater degree of rigour is recommended to provide the evidence base for the assessment of individual schemes prior to implementation.

Specifically, it is suggested that the eRUC data be used as the platform for the assessment of the freight movements. This data set provides a sample of the freight movements on the network. The proportion of movements has increased over recent years, and analysis undertaken by others has suggested that the dataset does not contain any significant bias within freight movements. However, the proportions of HCVs that are recorded are still relatively low, and critically eRUC data in itself does not quantify that proportion. Where the eRUC data does provide valuable information is in its ability to provide long term (monthly and annual) data on route choice and journey time. We are therefore proposing to overlay the ART model zones onto the eRUC database and match the origin and destinations of all eRUC recorded journeys in Auckland. As well as the demand volume, the journey time and journey time variability can be extracted from the eRUC data set.

7.5 Scaling and Calibration

The ‘demand’ matrix will only be a minor proportion of freight movements. In order to develop a ‘full’ demand matrix we also propose to produce link counts from the eRUC data that match a sample of the classified loop counts across the Auckland network. These loop counts are considered to produce highly accurate (within 5%) rates and we would then use these observed rates to factor up the demand matrix. The specific methodology for this is to be defined once the data is supplied, but may consist of a uniform growth of the matrix using the average of the observed counts. Conversely, if there is a greater degree in the observed versus eRUC volumes along different key routes, then sector-based Furness and / or matrix estimation can be undertaken.

The Bluetooth data for available routes for several different time periods will be compared to the ART model and the eRUC data to provide models that link journey time to journey time variability for different network conditions.

It is also noted that eRUC vehicle classes do not immediately equate to those used by the Transport Agency’s Project Evaluation Manual (PEM). Assessment of complementary datasets would be required to better understand the composition of the eRUC data and how this might need to be factored for use in establishing a regional freight matrix.

7.6 Approach Summary

Combining all of these discrete data sets then produces the following methodology for the quantified assessment of the economic value of freight in different conditions:

1. Code base and forecast networks into the ART model
2. Output matrices of the travel time between OD pairs from ART
3. Create matrix of change in OD journey time between all the OD pairs in base and future ART models
4. Apply change matrix to observed (eRUC based) journey time.
5. Apply journey time variability model to calculate increase / reduction of reliability for OD pairs
6. Multiply inflated (eRUC and loop count based) demand matrix to quantify the total direct economic cost of freight travel (product of volume and efficiency).

There is the potential to apply a further level of sophistication to this model which would look at second order effects of changed freight efficiencies in relation to agglomeration, and third order benefits as a result of potential national and international competitiveness. However, whilst having significant economic value effects on the region, these are significant extrapolations from the data and so carry a high risk.

The above methodology relies on the use of the eRUC derived data. This data is owned by the NZTA and currently held by Beca.

We have considered the use of alternate data sources however an assessment showed that the eRUC data would provide the most robust and cost effective data source. Alternatives to matrix development could be used if the eRUC is not available in a timely manner or is not considered cost effective. These alternatives include OD surveys and fully synthesised methods (from observed link counts) factored from employment land use.

It should be noted that, due to the tight delivery programme of ATAP, this work would need to extend beyond the completion of ATAP.

8.0 Conclusions & Recommendations

This investigation into freight in Auckland has confirmed the significance and importance of the region in the national freight task. Forecasts from the MoT expect the New Zealand freight industry to grow by 58 % by 2042 with a near doubling of existing flows experienced in Auckland. While rail and coastal shipping mode shares are expected to grow, in absolute terms road transport will continue to carry the vast majority of freight.

8.1 Road Freight Congestion

The belief that Auckland's congestion is having a negative impact on freight has been confirmed in recent meetings with the freight industry where evidence of decreasing service offerings over time, both in terms of frequency and geography, due to increasing congestion, was provided. As would be expected, areas of particular concern correlated to access to and from major production or distribution hubs.

Looking forward, freight carriers expect congestion issues to spread south. This is tied to the development and/or intensification of industrial land at Manukau / Wiri followed by Takanini and in due course Drury. They also noted the potential impact that development and intensification of proposed greenfield developments will have on freight generation and access.

Whilst there is uncertainty as to the impact of larger international ships visiting New Zealand and the subsequent role of rail as a shuttle to the inland ports and regions, road freight to and from PoAL is expected to continue to increase. A review of available data has confirmed that approximately 80% of freight originating from PoAL travels via the motorway network, validating to some extent the Regional Freight Network.

8.2 Assessing Freight Demand

To understand the cost to the economy of delay and congestion impacting the freight fleet now and in the future, both the cost of freight travel time and freight transport demand need to be understood. While we have values for the former, the latter item, namely an understanding of freight transport demand, is currently a significant gap.

Our assessment identifies an approach to assess freight transport demand that compares output from the ART model with a range of datasets including eRUC, Bluetooth and classified vehicle counts. This approach develops a base matrix of freight demand and of average journey times between areas of the Auckland network from the available observed data sets. This data would then be compared with the data in the ART model to provide an 'adjustment' matrix that could be used as a comparator for forecast changes.

8.3 Key Findings

The findings of this report are not particularly new. Comparison with the Auckland Regional Council (ARC) Freight Strategy (2006) and the Upper North Island Strategic Alliance's Critical Issues (2013) shows little advancement on a number of common issues.
This is in part due to a lack of organisational capability and focus on the freight task.

Historically the Auckland Regional Transport Authority had a key focus on public transport, and local councils an emphasis on roads from an engineering perspective. As such there was and continues to be limited strategic planning relating to the freight task at the regional level.
Another key aspect that has previously held back understanding of the freight task has been the broad and diverse spectrum of the task and its participants which has made gathering of reliable and comprehensive data challenging. In recent years there have been significant advances in the industry's ability to gather data on freight traffic. While still not a perfect or entirely complete coverage of the freight sector, this step change provides a vital enabler for transport agencies to plan for freight. As such, investing in data capture, monitoring and ultimately development of multi-modal freight demand and distribution tools, such as models, to assist strategic planning should be considered.

8.4 Recommendations

The majority of the recommendations identified in this report require investment beyond ATAP. Actions for immediate consideration in ATAP are:

- From the Round 2 Package Evaluation – Consider how the inclusion or omission of the AWHC and other significant strategic freight network improvements impact freight congestion and distribution.
- While recognising that eRUC data only represents a proportion of freight traffic, use regional eRUC data to verify current assumptions of the Strategic Freight Network. One approach would be to assess which areas the package is affecting and compare these with freight congestion data e.g. AT's freight monitoring and eRUC heat maps. Unitary Plan zoning maps would assist in identifying current and future commercial areas.

Recommendations that should be considered beyond the current ATAP scope:

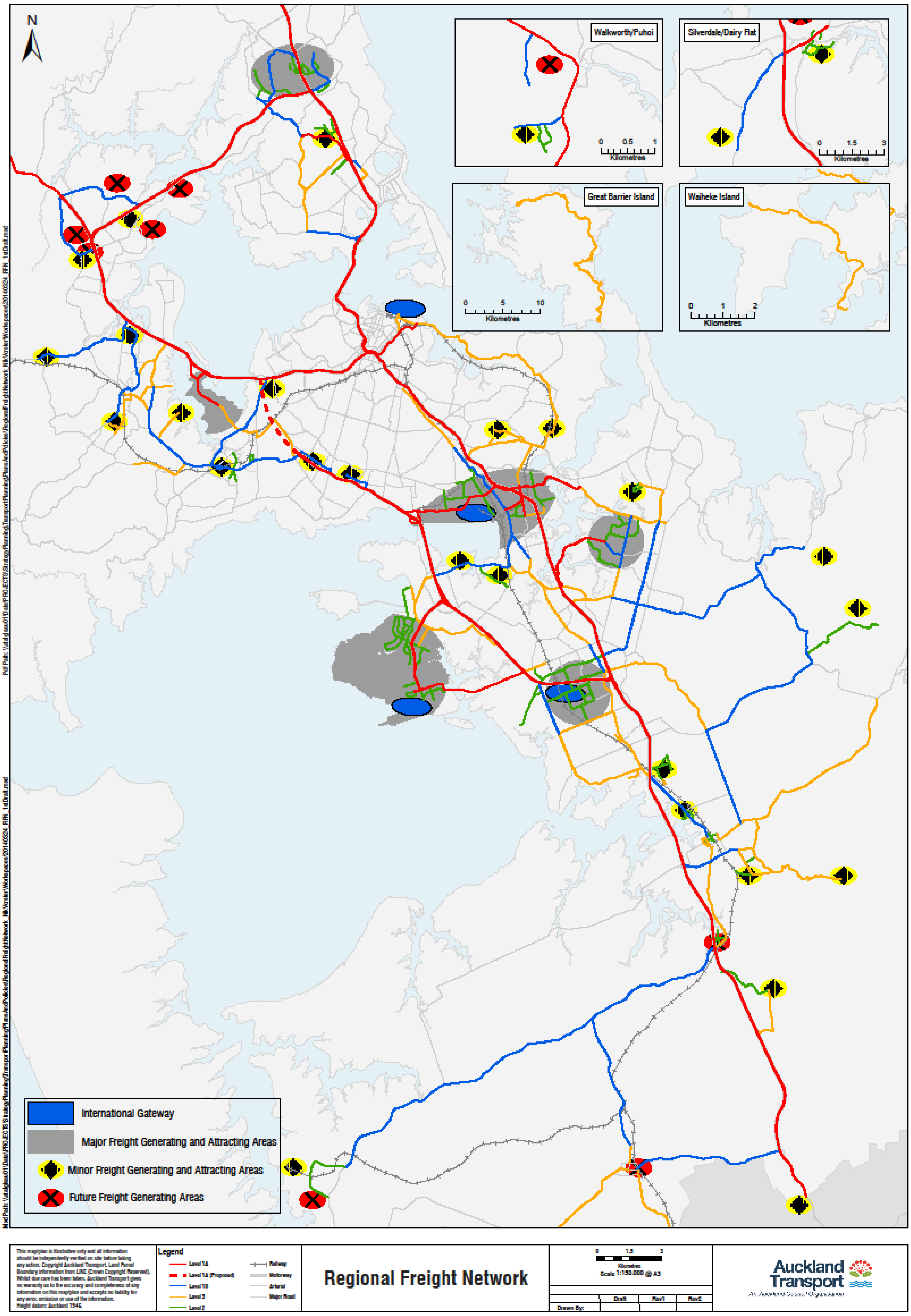
- Address knowledge and data deficiencies
    - Develop and apply an adjusted freight matrix to assess future freight demand and enable quantification of delay and congestion costs.
    - Establish a consolidated accessible freight dataset for the Auckland region.
    - Develop a multi-modal regional freight model(s) to assist in the management and planning of freight movement and distribution.
- Develop strategic freight planning capability
    - Engage further with PoAL, Port of Tauranga and KiwiRail to develop an enhanced understanding of capabilities, operations and future aspirations.
    - Develop organisational focus and capability in the freight sector to enable and enhance strategic planning of this significant transport sector.

Appendix A

As part of the review to identify locally available data and international studies on the topic, a number of papers have been reviewed as listed below:

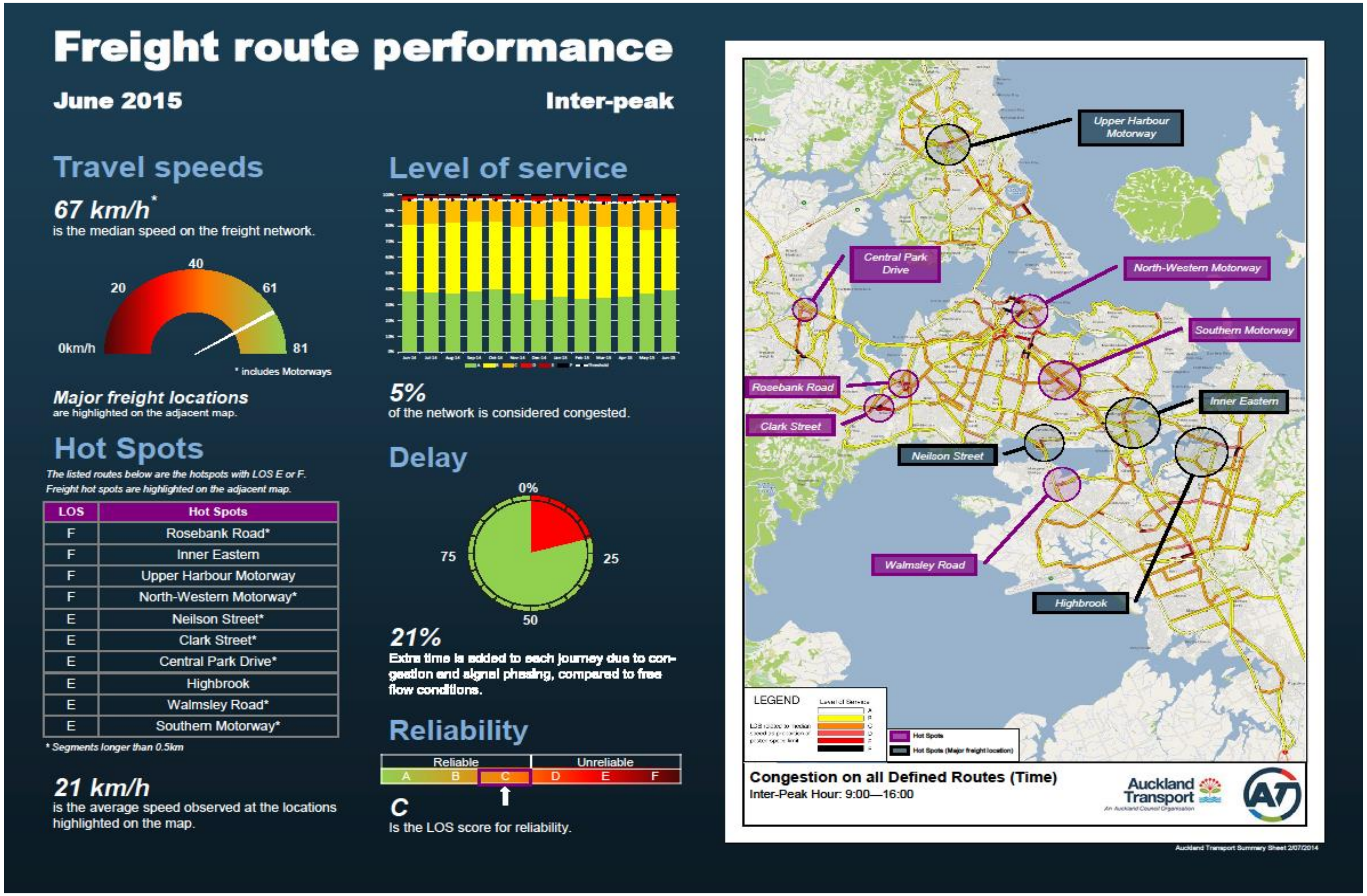
- 2015 Urban Mobility Scorecard, The Texas A&M Transportation Institute (TTI), 2015
- Auckland Regional Freight Strategy, Auckland Regional Council (ARC), 2006.
- Beca Freight Studies 2015, Beca, 2015.
- Determining freight train delay costs on railroad lines in North America, A. Lovett, 2014.
- Economic Evaluation Manual, New Zealand Transport Agency (NZTA), 2014.
- Freight Information Gathering System, Ministry of Transport (MoT), 2016.
- Freight Story 2008, Federal Highway Administration (FHWA), 2008.
- Future Freight Scenarios study, Ministry of Transport (MoT), 2014b.
- Guide to Project Evaluation Part 4: Project Evaluation data, Austroads, 2012.
- Industry Insights- Transport, logistics and distribution, Westpac, 2015.
- Level of Service Metrics, Austroads, 2015.
- Monetizing truck freight and the cost of delay for major truck routes in Georgia by J. Gillett, 2011.
- National Freight Demand Study, Ministry of Transport (MoT), 2014a.
- NCHRP Synthesis 298 – Truck Trip Generation Data, Transportation Research Board, 2001.
- Road Freight Transport in Australia, IBISWorld, 2011.
- The impact of freight delay to economic productivity, Florida Department of Transport (FDOT),
- 2014.
- Traffic Counts, Abley Transportation Consultants, 2016.
- Upper North Island Freight Story, New Zealand Transport Agency (NZTA) 2013.
- Value of Freight Time Variability Reductions, Kruger, 2013.

Appendix B



Click on image to enlarge

Appendix C



Click on image to enlarge

Appendix D

REF #	NAME OF CORRIDOR	NAME OF CONSTRAINT	MONITORING REFERENCE ID (Freight flows model)	STRATEGIC LINK National Network i.e. State Highway classification / RLTS classification	KEY ISSUE with constraint in reducing the cost to do business	VOLUME Average Annual Daily Traffic (AADT) through constraint 2011 data	VOLUME % Heavy Vehicles within AADT through constraint	VALUE of product carried through constraint 2011 (2007$mil)	CORRIDOR LEVEL STRATEGIC RESPONSES What is the range of strategic interventions that could be considered? Includes short (0-5yrs), medium (6-10 yrs) and long –term (>10 yrs). Committed investments or current processes noted where known	BENEFITS POTENTIAL to be realised through a upper North Island collaborative approach	AREAS FOR UPPER NORTH ISLAND COLLABORATION To assist in resolving the constraint
Auckland – Road											
ARD1	Auckland North - South State Highway Corridor	**Auckland Harbour Crossing**	01N00424 01N10424 01N20424 (Centre span + 2 X clip ons)	SH1 National Strategic Route Classification	Congestion and travel time reliability. Need to manage growth in heavy vehicles in medium-term. Restrictions on use by HPMVs.	158,220 (2011)	5,850 (5.0%)	$75,458	**Short term:** • Alternative Western Ring Route (Waterview and SH16 committed) • SH1 Corridor Optimisation - signal optimisation, ramp metering, freight priority lanes • Removal of pinch points on the strategic road network to improve throughput • Auckland Harbour Bridge heavy freight vehicle management • Travel demand management programmes – public transport service improvements, increasing vehicle occupancy, parking management • Additional Harbour Crossing Route protection **Medium term:** • Complete removal of pinch points on the strategic road network • Auckland Harbour Bridge heavy freight vehicle management **Long term:** • Construction of additional Auckland harbour crossing • Travel demand management – road pricing	**High**	
ARD2	Auckland North - South State Highway Corridor	**General North - South route (SH1)** Ports of Auckland to SH2	01N00463	• SH1 National Strategic Route Classification. • Part of a HPMV Investment Route	Congestion and travel time reliability including HPMV structural constraints.	128,165 (2011 at Green Lane I/C)	7,180 (5.6%)	$70,874			
ARD3	Auckland Urban State Highway Links	**Airport Access (SH20A & SH20B)**	20A00003	SH20 National Strategic Route Classification.	Congestion and travel time reliability.	61,600 (2011, SH20A & SH20B)	3,600 (5.7%)	$14,436 (SH20A)	**Short term:** • Improved road access to the port - Grafton Gully investigation (underway) **Medium term:** • Upgrade of road access to the port **Long term:** • Upgrade SH20A to motorway standard (includes grade separation) • Upgrade SH20B to expressway • 6 lane SH20 from Mangere to Puhinui • Travel demand management – road pricing	**High**	
ARD4	Auckland Urban State Highway Links	**Port Access (SH16)**	01600001	SH16 National Strategic Route Classification Part of a HPMV Investment route	Congestion and travel time reliability.	42,790 (2011)	3,125 (7.3%)	$30,873			

Upper North Island Freight Story – Shared Evidence Base (April 2013) 15

Click on image to enlarge

Appendix E

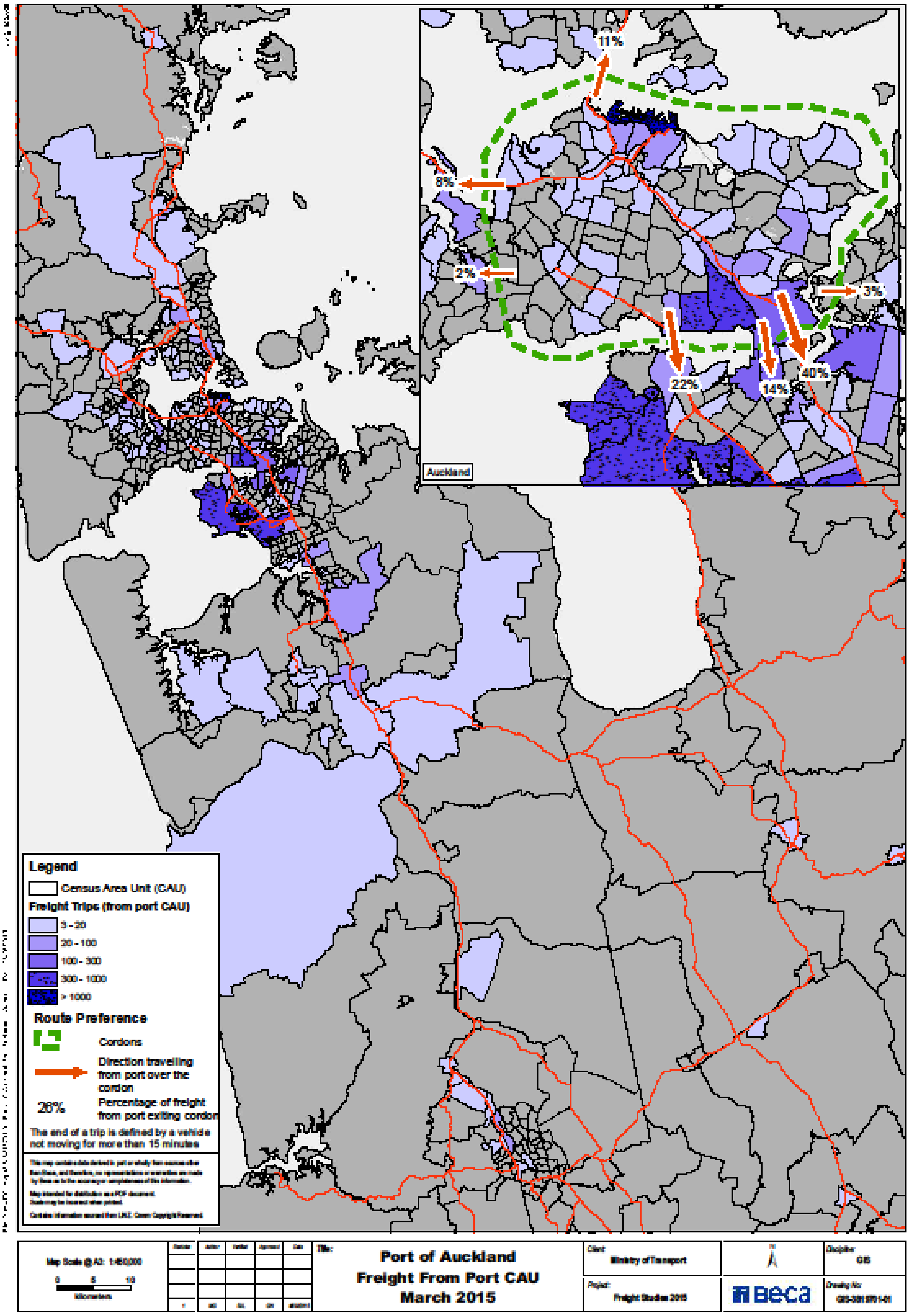
Cost of freight $/hr breakdown (EEM)

Type	Value
Occupancy	1.2
Percentage of work trips by MCV/HCV (%)	
Work	90
Commute	5
Other	5
Update factor to convert from 2002 value to 2015	1.44
Human Capital Cost ($/hr 2002)	
Driver – Work	20.10
Commute	7.8
Other	6.9
Passenger – Work	20.10
Commute	5.85
Other	5.2
Freight cost ($/hr 2002)	
MCV	6.1
HCVI	17.1
HCVII	28.1
Percentage weighting of commercial vehicles (%):	
MCV	25
HCVI	25
HCVII	50

	Calculation	Total ($/hr)
Driver Value	(0.9 * 1 * 20.10) + (0.05 * 1 * 7.8) + (0.05 * 1 * 6.9)	18.83
Passenger Value	(0.9 * 0.2 * 20.10) + (0.05 * 0.2 * 5.85) + (0.05 * 0.2 * 5.2)	3.73
Freight Cost MCV HCVI HCVII	 0.25*6.1 0.25*17.1 0.50*28.1	 1.53 4.28 14.05
Total cost per hour ($/hr 2002)		42.42
Total cost per hour ($/hr 2015)	**42.4 * 1.44**	**61.10**

Click on image to enlarge

Appendix F



Click on image to enlarge