Urban Auckland

CORRIDOR MANAGEMENT PLAN

1 16 18 20 20A 20B 22

2018-2028

NZ TRANSPORT AGENCY
WAKA KOTAHI

New Zealand Government

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Executive summary

The Auckland Urban corridor comprises the motorway network which primarily covers the urban and peri-urban area of the Auckland Region stretching from Puhoi in the north, just west of Waimauku in the north west, and Pokeno in the south.

SH1 is the spine of the Urban Auckland corridor running south from Puhoi via the North Shore, Auckland Harbour Bridge, Auckland City Centre, and Manukau to Bombay where it enters the Waikato region. The Western Ring Route is an alternative to the SH1 spine and comprises SH18 between the North Shore and Westgate, part of SH16, and SH20. SH16 runs from the Port of Auckland in the Auckland CBD west through Waterview and Henderson to Westgate on the Auckland motorway network where it then continues through Kumeu and Waimauku and onwards to Wellsford. SH20 runs from SH1 near Manukau in the south, to SH16 at Waterview in the north west, via the Waterview Tunnels. SH20A and SH20B intersect with SH20 providing access to Auckland Airport and the airport industrial area. SH22 in the south of the corridor, provides access to Pukekohe from SH1.

Auckland has an urban rail network that provides an alternative to road transport for daily commuters and fright. This is comprised of the North Island Main Trunk line from Britomart in Auckland Central to Pukekohe, as well as branch lines between Newmarket and Waitakere, Penrose and Onehunga, Puhinui and Manukau, and a loop east from Britomart through Glen Innes to Westfield.

The corridor is approximately 410 km long (3.6% of the state highway network). The total value of assets along the corridor is $3,488M (15.1% of the total national asset value).

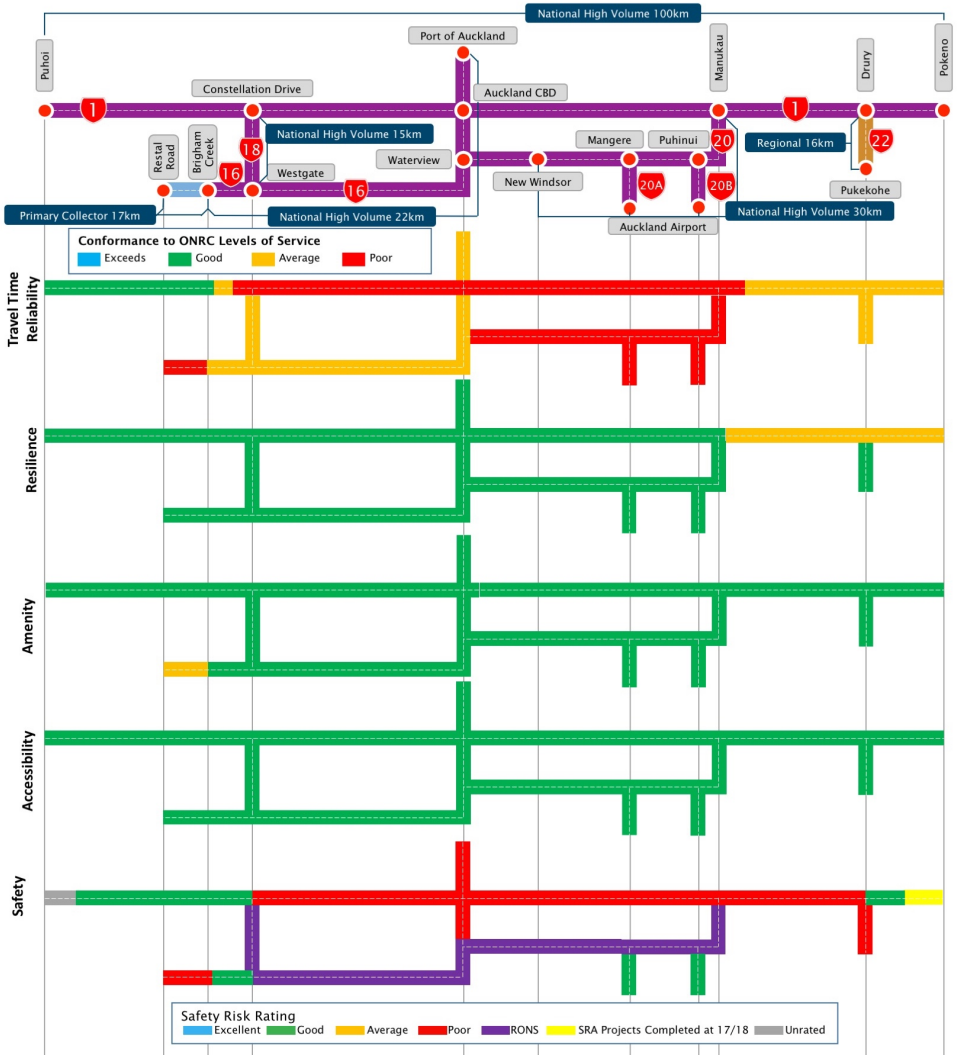
The Auckland Urban Corridor sits at the heart of the country's largest economic hub and most populated city. It is part of the Auckland transport system of roads, bus/rail networks, and walking/cycling connections that collectively provide access to, within, and across the region.

The corridor plays an important role not just within the Auckland urban area but across the Upper North Island as a whole. It provides the only State Highway access to Northland and as such plays a key role in providing connectivity to the rest of the North Island.

The corridor is geographically constrained, with Auckland located on an isthmus limiting alternative routes and resulting in high volumes of traffic being funnelled through a constrained land mass. The corridor is over-dependent on key pieces of infrastructure for its operation and vulnerable if critical assets suffer a catastrophic failure as there is insufficient network capacity to accommodate displaced network users. The Auckland Harbour Bridge (with more than 100,000 vehicles daily), is a critical piece of infrastructure significant to the transport network throughout the isthmus.

The corridor already experiences extended periods of significant congestion which contributes to a low level of service for freight customers and commuters. The resulting poor journey time predictability and reliability causes frustration for all users of the corridor.

Figure 1 - Performance of the corridor against ONRC outcomes



Customers expect a high level of service particularly on links to gateways and employment areas. With a high number of passenger transport, walking, and cycling alternatives available many of which run parallel to the corridor there is an opportunity to optimise public and private usage of the corridor.

Whilst customers accept a reasonable level of delay, availability of real-time and accurate travel information is a key demand. This helps to shape their travel decisions whether it be to travel via an alternative route, mode, or time.

Approximately 50 million tonnes of road freight originates in Auckland, 80% of which remains within the Auckland region (1% is moved to the north and the remaining 19% is moved south). It is critical to the region's economy that the network supports this high freight demand and allows businesses to reliably predict travel times. A 2013 study by the Transport Agency indicated that congestion on the State Highway network costs the economy approximately $250million per annum.

While huge gains have been made in public transport growth (commuter rail trips increased by 19.4 per cent in 2016 to 19 million trips) it cannot presently compete with the number of new cars on the roads. Vehicles travelled 13.4 billion kilometres on Auckland roads in 2015, up 1.2b from 12.2b kilometres in 2012 with a commensurate drop in travel speeds on the corridor. Motorway speeds have fallen from 64km/h to 55km/h at peak hours between 2014 and 2016.

Auckland requires an integrated transport network that enables people and goods to move freely and efficiently. The corridor is part of a network comprising motorways, roads and streets, public transport (ferries, buses and trains), footpaths and cycle-ways, ports and airports. To provide customers with the optimal choice we need to integrate all transport components using a single system approach.

The Auckland Plan identifies three required components to provide customers with greater choice, address current congestion problems, accommodate future business and population growth, and move to a single transport system:

- improve and complete the existing road and rail network
- encourage a shift towards public transport
- support environmental and health objectives through walking and cycling.

The corridor has limited alternative cross isthmus routes making it susceptible to significant delays in the event of incidents or weather events. Given the significance of the corridor to the region this can frequently have a knock-on effect on the wider transport system.

The corridor plays a key role across the whole of the Upper North Island providing the only State Highway access to Northland and the rest of New Zealand. The network also provides linkage to the nations key gateways of Auckland International Airport and the Port of Auckland.

Growth will add additional pressures to the network with the region expected to accommodate over 1million additional residents in the next 30 years. Future improvements will need to be in place in a timely manner to mitigate the likely impact of this. With much of this development focused on the extremities of the urban area, connectivity and providing viable alternatives to private car will be challenging to deliver. The motorway network will continue to change and expand as urban growth sees development west through Waimauku, and north towards Wellsford.

Walking the waterview tunnel

Introduction

Purpose

What is the corridor management plan?

This Corridor Management Plan describes the customer service delivery story for the Urban Auckland corridor, as measured against the One Road Network Classification performance framework. It is intended to describe the investment story, i.e. why invest in this corridor, in a context everyone can understand whether the activities are delivered through investment in the State Highways maintenance, operations, renewals and improvements programmes.

The corridor management plan considers a combination of:

- The **pressures** on the system that are resulting in increased demand or a reduction in levels of service
- The **current state** of the system and how it is performing
- The **response** the Agency is investing in to deliver the customer levels of service along the corridor.

It is important to note that this is a first-generation Corridor Management Plan, therefore, we expect it to be improved as we learn from this approach. It sets a firm foundation to improve from in the next 2-3 years, utilising a common framework and consistent data sets across the 30 corridors.

Why is it needed?

The corridor plan provides a link between the long-term planning outlook, the 10-year medium term investment programme and the 3-year land transport programmes for the next funding round.

Traditionally, the approach to investing in maintenance and renewals is to consider each asset activity in isolation, i.e. pavement, structures, drainage, and in isolation of capital expenditure. The Corridor Management Plan approach considers all assets within the corridor and takes a holistic view of the customer levels of service they provide throughout the corridor.

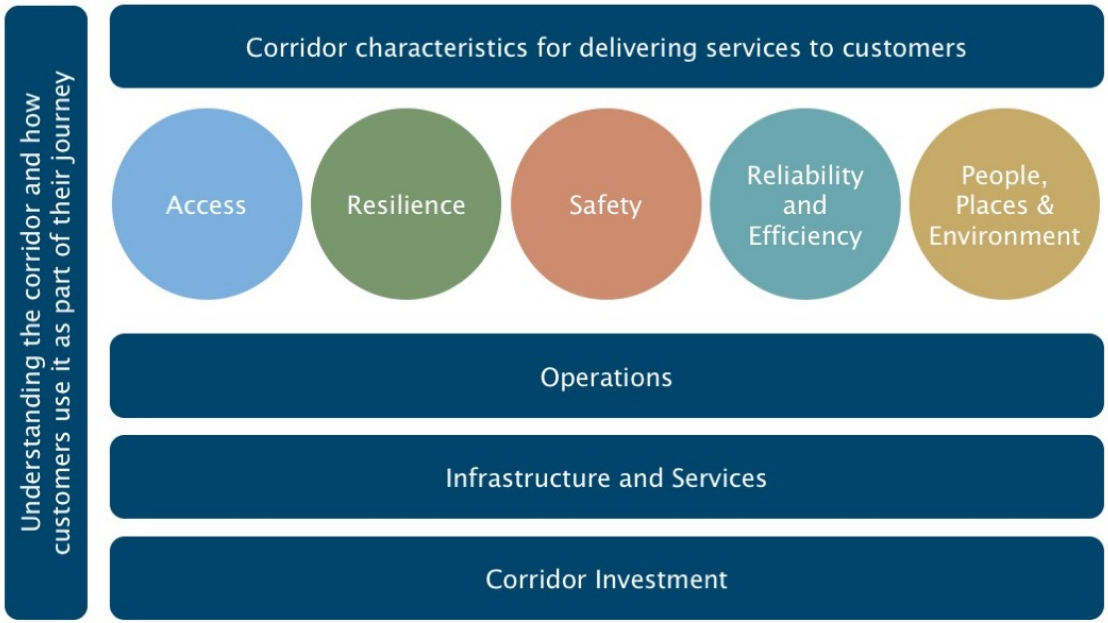
Planning is currently undertaken at the regional level, but typically significant journeys traverse more than one region. By considering the significant customer journeys and destinations, the corridor management plan is a vehicle to engage in regional and inter-regional conversations by focusing on the issues that are important and may extend beyond the state highways network.

How will we use it?

The Corridor Management Plan will provide the customer story and case for investment in maintenance, renewal and improvement on the corridor, based on targeting maintenance to achieve the appropriate customer levels of service within the context of providing value for money. The information presented in the corridor management plan helps to inform the business case for investment in State Highways for the subsequent triennial period.

In conjunction with the long-term view, the corridor management plan will provide for engagement with key stakeholders and partners to shape the future of the corridor. It responds to the needs of the users of the corridor to shape the future service levels.

Figure 2 - Corridor management plan framework



The corridor at a glance

Corridor overview

The Auckland Urban corridor comprises the motorway network which primarily covers the urban and peri-urban area of the Auckland Region stretching from Puhoi in the north, just west of Waimauku in the north west, and Pokeno in the south.

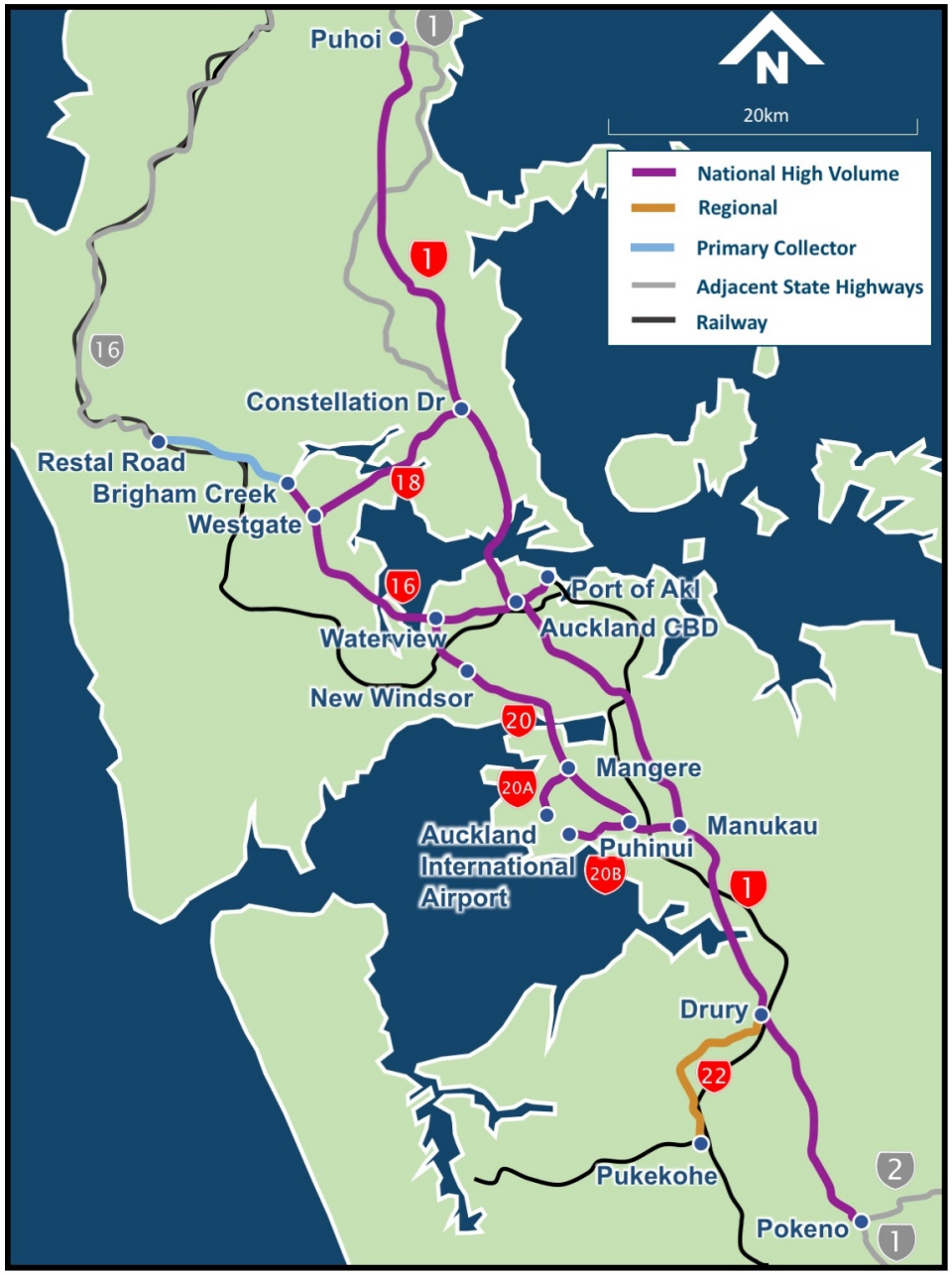
SH1 is the spine of the Urban Auckland corridor running south from Puhoi via the North Shore, Auckland City Centre, and Manukau to Bombay where it enters the Waikato region. The Western Ring Route is an alternative to the SH1 spine and comprises SH18 between the North Shore and Westgate, part of SH16, and SH20. SH16 runs from the Port of Auckland in the Auckland CBD west through Waterview and Henderson to Westgate on the Auckland motorway network where it then continues through Kumeu and Waimauku and onwards to Wellsford. SH20 runs from SH1 near Manukau in the south, to SH16 at Waterview in the north west, via the Waterview Tunnels. SH20A and SH20B intersect with SH20 providing access to Auckland Airport and the airport industrial area. SH22 in the south of the corridor, provides access to Pukekohe from SH1.

The corridor provides access to many of the suburbs in the city, with multiple connections to the wider Auckland road network. It forms part of the Auckland transport system that supports the connection of people to jobs and services. It also provides a connection to several key destinations across the city including Auckland International Airport and Ports of Auckland, and enables both regional and interregional trips to further destinations. In addition, it facilitates the movement of people and goods within the greater Upper North Island.

The corridor is geographically constrained, with Auckland located on an isthmus limiting alternative routes and resulting in high volumes of traffic being funnelled through a constrained land mass. The corridor is over-dependent on key pieces of infrastructure for its operation and vulnerable if critical assets suffer a catastrophic failure as there is insufficient network capacity to accommodate displaced network users. The Auckland Harbour Bridge (with more than 100,000 vehicles daily), is a critical piece of infrastructure significant to the transport network throughout the isthmus.

The motorway network will continue to change and expand as urban growth sees development west through Waimauku, and north towards Wellsford.

Figure 3 – Corridor overview



The regional economy

The Auckland region is the largest commercial and financial hub within New Zealand, and is home to a third of the country's population (approximately 1.4 million residents as per the 2013 Census). Several of the country's largest international gateways are in the region including the Port of Auckland and Auckland International Airport.

GDP in 2015 amounted to $88.3billion an increase of around 30% since 2010 and accounts for approximately 40% of the total GDP for the country (stats.govt.nz). Whilst the region is amongst the wealthiest in the country, some of the most socio-economically deprived areas in New Zealand can be found within the urban area. Manufacturing accounts for most employment in the Auckland region with 10.9% of those employed in the sector in 2013, followed closely by those in professional, scientific and technical services (10.6%).

The city centre acts as the main service sector hub focused around the shoreline of the Waitamata harbour. Outside of the central area, there are several large industrial areas including those around the Airport and the Onehunga foreshore which support a strong manufacturing economy in the region.

Approximately 50 million tonnes of road freight originates in Auckland, 80% of which remains within the Auckland region (1% is moved to the north and the remaining 19% is moved south). It is critical to the region's economy that the network supports this high freight demand.

The rail terminals in the Onehunga-Penrose area help load and unload around 4.6 million tonnes of rail freight each year, which is moved between Auckland, the rest of the New Zealand and the world. Much of this rail freight is moved by road for either the first or last leg of its journey, which means that efficient north to south and east to west road connections are vital for moving freight to where it is needed, when it is needed.

Ports also play an important role in New Zealand's freight economy. Their interconnectivity with the rest of the transport network is vital. Approximately one million containers are moved by Ports of Auckland every year. More than 90% of the sea cargo that comes into Ports of Auckland stays in Auckland.

Tourism also plays a significant role across the region. As the country's main international airport, many visitors to New Zealand first arrive in Auckland. From here many tourists explore the city as part of wider tours of the country or are increasingly basing themselves in the region to explore the coastline, city, and cultural attractions.

Newmarket viaduct

Understanding our customers

Key customers

The key customers utilising the corridor are diverse, and utilise a range of transport modes. Different customers have different needs, expectations, and personal circumstances for using the transport system. Therefore, what customers value from the transport network needs to be understood in the context of who they are.

Daily commuter

Commuting patterns are diverse and travel varies, particularly nearer the central area where public transport choice is greater and active modes are more viable. As the distance from the urban area increases more people commute by car. At the northern extremities of SH1 85% drive for their daily commute. A high proportion of commuting is to the central area, but also many town centres, business and industrial parks which are key employment centres. The education sector creates a large seasonal demand with travel times increasing by up to an average of 30 minutes in the AM Peak during term time.

Insights into daily commuter users:

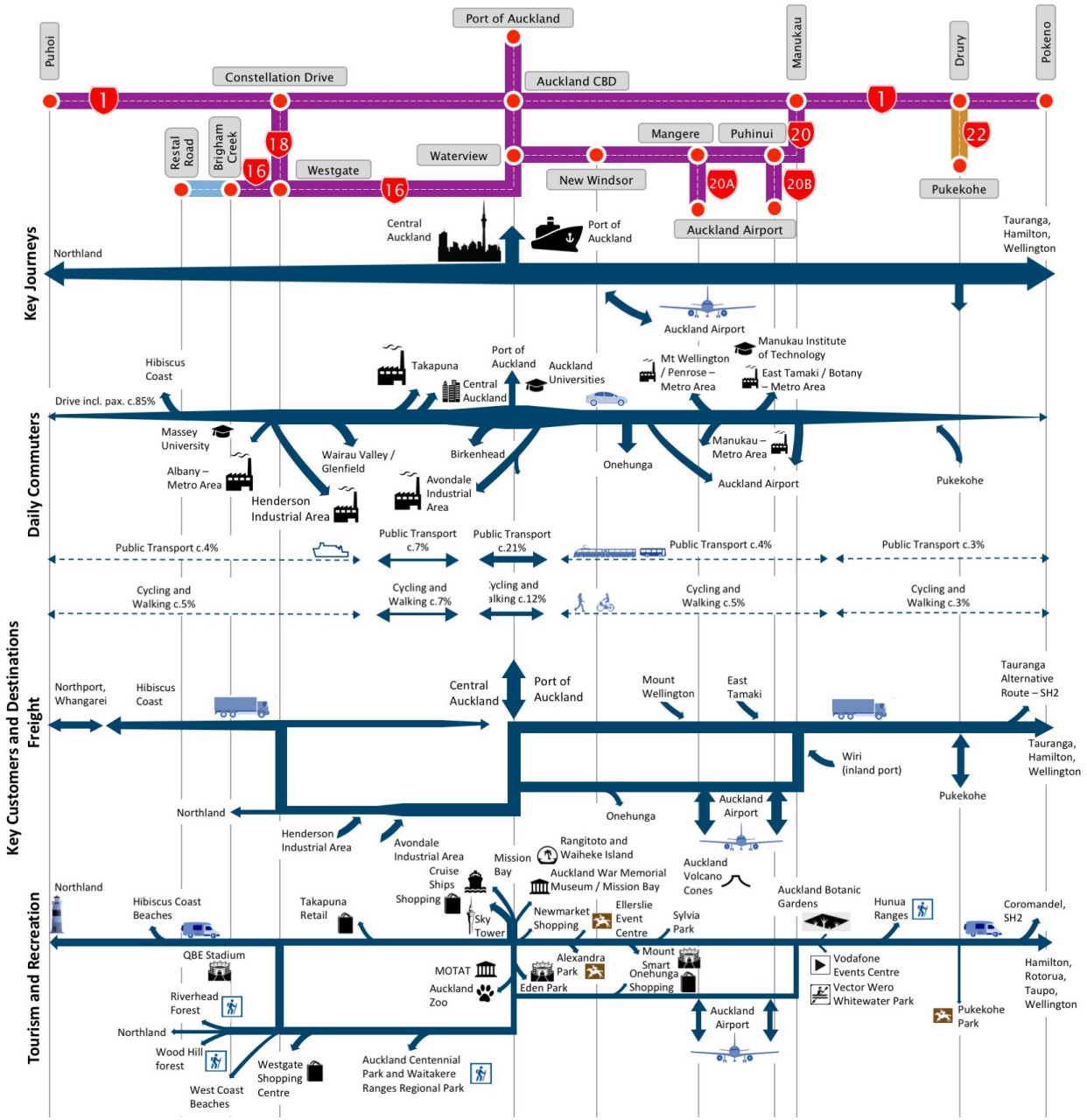
Road use: Commuters have some alternative options when accessing employment close to the inner city, with the state highway network and local roads available.

Road knowledge: Familiar with the main and alternative routes across the city. Public transport usage continues to increase as the bus and rail networks are improved. Cycling usage is also increasing, stimulated by delivery of major infrastructure such as Te Ara I Whiti - The Lightpath, a cycleway connecting Upper Queen Street to Victoria Street West.

Pain points: The Central Motorway Junction, on the approaches to Auckland Harbour Bridge, sections of SH1, and the network in and around Auckland Airport. The network is susceptible to congestion in the event of even small incidences such as vehicle breakdowns.

Daily Commuters expect: Predictable journey times during the peak periods with accurate and up to date travel information. A legible and consistent network with clear signing, logical points of access to/from the motorways, and real time information about network conditions. Good access to key destinations such as the port area, airport, and key business centres.

Figure 4 - Key customers, journeys, and destinations 1



Tourist and recreational users

As the largest city in New Zealand with many cultural and natural attractions, Auckland draws tourists from across New Zealand and internationally. It is the gateway to the country for many and Auckland is often the start or finish point for tourists. Many world class events are held in Auckland, and during these times demand for hotel accommodation can be high. There were 7.1 million guest nights recorded in 2015, the highest for any region in New Zealand.

Auckland is also the starting point for the Twin Coast Discovery Highway, a tourist route connecting the city with Northland via SH16.

Insights into tourist and recreational users are as follows:

Road use: Significant congestion during holiday periods, particularly during Christmas, New Year, and around public holiday weekends as Aucklanders head to the Coromandel and Northland in particular. General weekend traffic sees tourism and recreational customers travelling to retail destinations and out of Auckland for leisure. Regular "special events" at city entertainment sites such as Eden Park, the ASB Showgrounds, and Mount Smart Stadium create unique travel patterns and high demand around their location. A high number of international users are on the corridor which serves as the main route for tourists and recreational users accessing destinations in and around Auckland.

Road knowledge: The Auckland Urban corridor is primarily constructed to motorway standards, providing some degree of familiarity to international users, albeit some New Zealand roads and signage may be unfamiliar. For domestic visitors and tourists who are more familiar with lower volumes or rural road conditions, high speed motorway conditions can be intimidating, causing issues with wayfinding and lane choice resulting in less predictable driving behaviour.

Pain points: Traffic can be particularly busy especially around the city centre and on routes to coastlines, regional parks and key natural features. This is particularly prevalent during summer months and during long weekends.

Tourist and recreational users expect: Predictable and safe journeys together with clear signage, particularly on the more complex sections of the network such as within the Central Motorway Junction. Provision of real time information relating to diversions and traffic to help customers with route choice. There are currently only two service centres in each direction on SH1, which can result in long drives between rest periods, particularly at times of congestion. There are currently no service areas on SH20.

"The information that is available about congestion on the motorways is important to me"

Freight operators

Auckland State Highway network plays a key role in the economic performance for the whole Upper North Island, with the region also home to the Port of Auckland. Road based freight accounts for most freight movements within the region. The main industries served include manufacturing as well as some dairy farming in the rural parts of the region. Many freight movements are also part of the wider international supply chain from the key international gateways into the country.

"I value the reliability of my journey time – no surprise delays"

Insights into freight operators are as follows:

Road use: Both SH1 and the Western Ring Route SH20 are heavily used by freight operators. Travel time reliability is crucial for operators. Many local roads also act as key links between industrial areas and the State Highways which emphasise the importance of the overall transport system, eg Beach Road in the CBD, Neilson Ave in Onehunga, Highbrook Drive in East Tamaki, Rosedale Road in Avondale, and Great South Road in Takanini.

Road knowledge: Knowledge of the road network is extremely high. Freight operators are confident in routing through the corridor and are adaptable to changing traffic conditions.

Pain points: The State Highway network experiences daily congestion with some unpredictability in journey times. It is highly vulnerable to even relatively minor incidents that exacerbate problems in the peak periods and can lead to significant delays at other times.

Availability of land for marshalling and storage space at ports is constrained by the area available to them. This results in the implementation of demand management practices and the development of inland port options. Therefore, journey time predictability is critical for freight customers to enable them to reliably meet their allocated delivery windows.

Freight movements to and from the Port of Auckland result in large numbers of freight trucks travelling onto SH16 and through the Central Motorway Junction, creating conflicts with other road users. Within this area, many truck breakdowns occur because of the steep grade, and in response heavy haulage recovery is parked on this section during peak times on most weekdays.

High vehicles are not permitted on the Auckland Motorway network which has a height limit of 4.3m for most of the motorway network. The central location of the Port along Quay Street within the city centre can result in trucks encroaching on city centre locations that are unsuitable for large vehicles.

Freight operators expect: Continued availability of the corridor is vital. Provision of reliable travel time information both during and prior to reaching incidents on the network is also important. Operators would also welcome an increase in the number of suitable stopping and service points for vehicles within the corridor.

Population and employment

Customers frequently move between communities for employment, education, and to access service centres on a daily basis. The population of the Auckland region is approximately 1.4 million with around 90% living in the main urban area. In 2013, there were around 530,000 people in employment across the region.

Insights into population and employment areas:

Hibiscus Coast and Rodney: Population and employment in this rural part of the corridor is focused on the main towns close to SH1 including Puhoi, Orewa, and Whangaparaoa. Development identified within the Future Urban Land Supply Strategy (FULSS) indicates 27,000 homes and 13,000 jobs are to be delivered in this area. Currently around 145,000 people live and 34,500 are employed here.

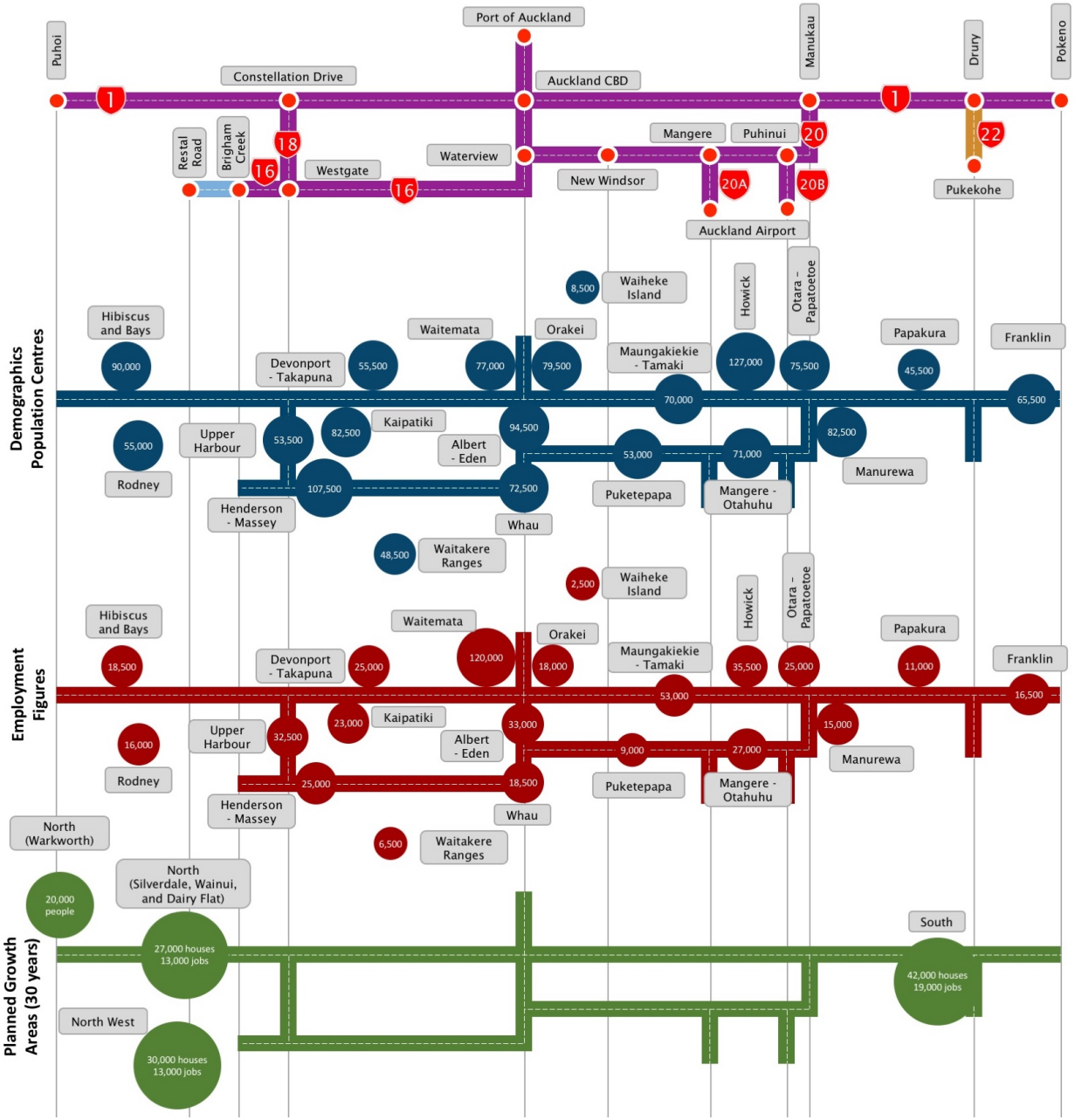
North Shore: Key centres on the North Shore include Albany, Takapuna, and Devonport. Several developments are proposed, particularly around the Albany mall and within Takapuna itself. Around 191,500 people live and 81,000 work in this area.

Western Suburbs: The Western Suburbs rely on SH16 and the western railway line to access the city centre and other parts of the Auckland urban area. Development is focused around key centres in Henderson, Kumeu, and the new centre at Westgate where currently around 228,500 people live and 50,000 are employed. Future development is expected to result in 30,000 new homes and 13,000 new jobs mainly focused on the Redhill, Whenuapai and Kumeu areas.

City Centre: The city centre is the key commercial hub for Auckland. It contains the main economic and service sectors of the CBD as well as neighbouring suburbs and the city's port. Village centres within suburbs are also key to the areas' vitality. An estimated 374,500 people live in this part of Auckland with 233,000 employed.

South Auckland: South Auckland is home to the city's airport and many large areas of industry. Residents and workers rely on SH1, SH20 and the southern railway line to access services and jobs. Main centres include Manukau, Takanini, Papakura, and Pukekohe. The FULSS identifies an additional 42,000 dwellings and 19,000 jobs in the area over the next 30 years mainly be focused on or near existing settlements in Takanini, Papakura, Drury and Pukekohe. Currently around 467,000 people live in this area with 130,000 employed.

Figure 5 - Key customers, journeys, and destinations 2



How we deliver services along the corridor

Transport partners

The land transport system comprises more than State Highways. To provide customers with a reliable and safe journey usually requires the use of two or more transport infrastructure provider's networks. As such we work with other network providers to provide a one network approach, and we work closely with the TLAs along the corridor shown in Figure 6.

Collaboration along the corridor

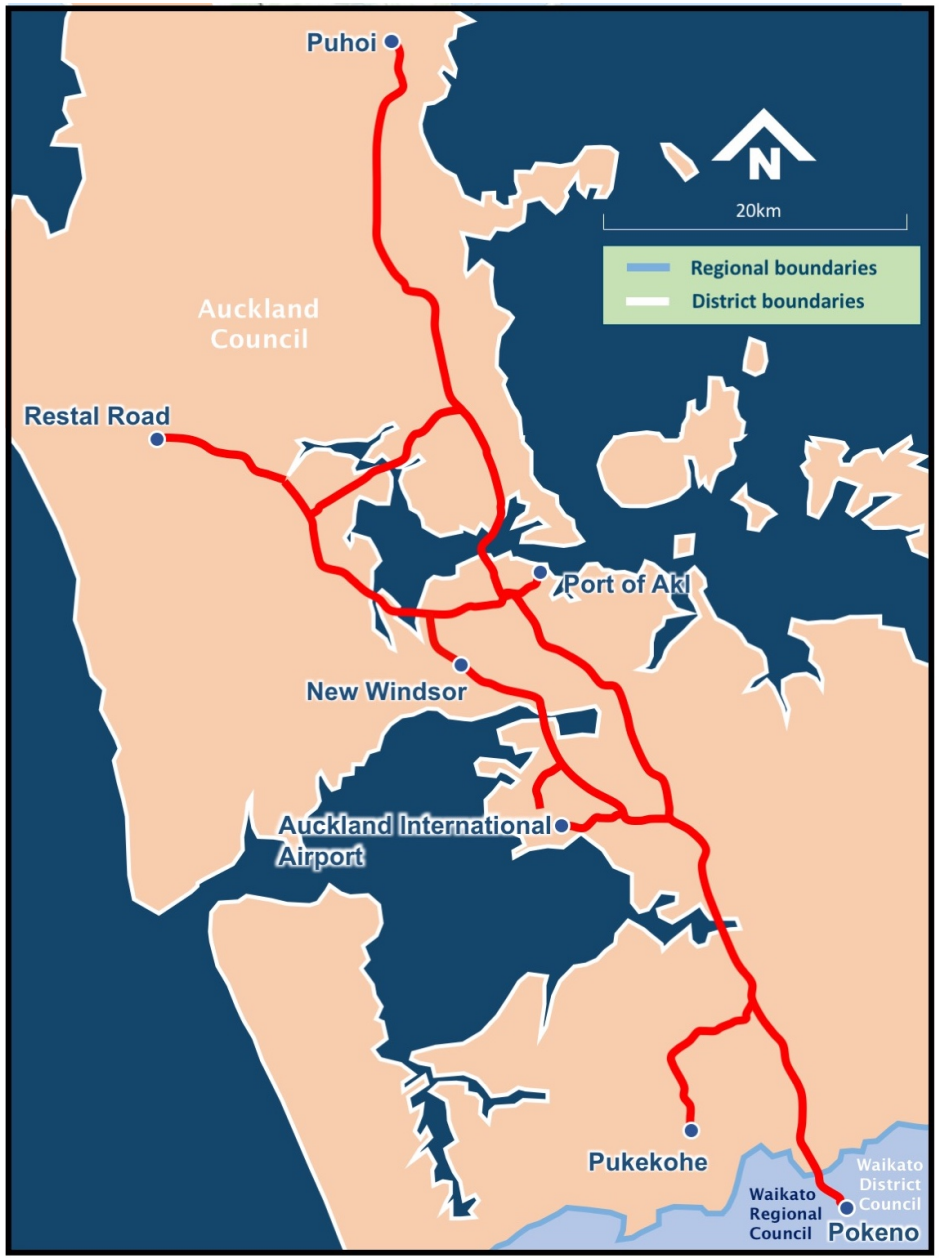
The Transport Agency collaborates with Auckland Transport and Auckland Council for many programmes across the wider Auckland network. This includes initiatives around Safety delivered by the 'Safe Roads Alliance' and funding and accommodating future growth projections through the 'Supporting Growth – Delivering transport networks' programme, and how Auckland's transport will meet these needs through the Auckland Transport Alignment Project, discussed further later in this report.

Accelerated Transport Programme

The Accelerated Transport Programme outlines the priority transport projects that will be funded across the region by the Interim Transport Levy over the next three years (2015-2018) of the 10-year budget (Long-term Plan). The money generated from the levy to help fund the programme will include projects across the region, with some listed below:

- Increasing walking and cycling funding across Auckland to $124 million leveraging additional central government funding
- Transport interchanges at Otahuhu (open), Manukau, and Te Atatu
- Pukekohe interchange and park and ride facilities
- New park and ride facilities at Papakura, Westgate, and Silverdale
- Public transport safety improvements for rail crossings
- 45 additional kilometres of bus lane.

Figure 6 - Map of associated local authorities



Auckland Urban Cycleways Programme

The overarching nationwide Urban Cycleways Programme was announced in August 2014, with the aim of making significant improvements to the cycling infrastructure in the main urban centres from 2015 to 2018. The Auckland Urban Cycleways Programme focusses on providing cycling as it will be a key contributor to improving travel options and increasing reliability across the transport network. With a focus on liveability and sustainability, Auckland Transport, Auckland Council, and NZTA are working together to create a future where anyone can feel comfortable riding a bike.

Community Safety Forum

The Community Safety Forum (which comprises of members from the local community and stakeholders) is responsible for considering and recommending via a report to the Regional Development and Operations Committee, developing region-wide policies and planning on community safety, providing leadership on the forum functions, advocating on behalf of Auckland on matters relating to community safety, and engaging with local boards on community safety issues.

Safe Roads Alliance

Made up of the NZ Transport Agency and infrastructure consultancies Beca, Bloxam, Burnett & Olliver (BBO) and Northern Civil Consulting (NCC), Safe Roads will work with stakeholders to deliver timely and tangible improvements to New Zealand roads, helping to reduce deaths and serious injuries. Safe Roads has been established to deliver a programme of road and roadside safety improvements to the State Highway Network over six years.

Auckland Transport Alignment Project (ATAP)

Planning, funding and developing Auckland's transport system is one of central and local government's biggest transport challenges. It is essential that transport solutions are tackled head on, in order to secure the success of the region, and of New Zealand as a whole.

Through the Auckland Transport Alignment Project (ATAP), the Government and Auckland Council agreed to work together to identify an aligned strategic approach for the development of Auckland's transport system that delivers the best possible outcomes for Auckland and New Zealand.

A joint project involving Auckland Council, the Ministry of Transport, Auckland Transport, the NZ Transport Agency, the Treasury and the State Services Commission, the ATAP final report has recommended an aligned strategic approach, including an indicative package of transport investment, for the next 30 years.

Collaborative delivery of services

Four organisations are responsible for delivering services along the corridor as below.

Auckland Motorway Alliance (AMA)

Historically, the maintenance and operation of the Auckland motorway network was provided through 60 separate contracts. The NZ Transport Agency established the AMA to bring responsibility for maintenance into one organisation, due to the complexity of the network, range of asset types, and need for high level collaboration with Auckland Transport. On 1 October 2008, the AMA began a 10-year agreement to operate and maintain the Auckland motorway network. The AMA is an Alliance led by the NZ Transport Agency with Fulton Hogan, Opus, Beca, Resolve Group, and Armitage Systems Ltd. The AMA is responsible for the maintenance and operation of the Auckland motorway network and SH22. The work includes renewals but not large capital projects or planning issues.

Auckland Transport Operations Centre (ATOC)

ATOC Smales was officially established on 1 July 2011 as a joint venture between the NZTA and AT. The Partnering Agreement between the two parties outlines the goals and objectives of ATOC Smales as being:

> *To operate one transport system that delivers a satisfying experience to our customers by providing an integrated approach to moving people, goods and services safely and efficiently throughout the Auckland and upper North Island region.*

It further requires ATOC *'to enable customers to make smarter and more informed choices about the way they travel, achieving the most from Auckland's transport services and infrastructure and keeping Auckland moving by a single network approach'.*

ATOC is governed by a Joint Management Board and is fully reliant on the two partner organisations for all funding, operational and business support.

Auckland Harbour Bridge Alliance (AHBA)

The bridge is operated and maintained by the Auckland Harbour Bridge Alliance (AHBA), a partnership between the NZ Transport Agency as the asset owner, Total Bridge Services a joint venture between Opus, TBS Farnsworth, and Fulton Hogan), and Beca.

Auckland/Northland Network Outcomes Contract

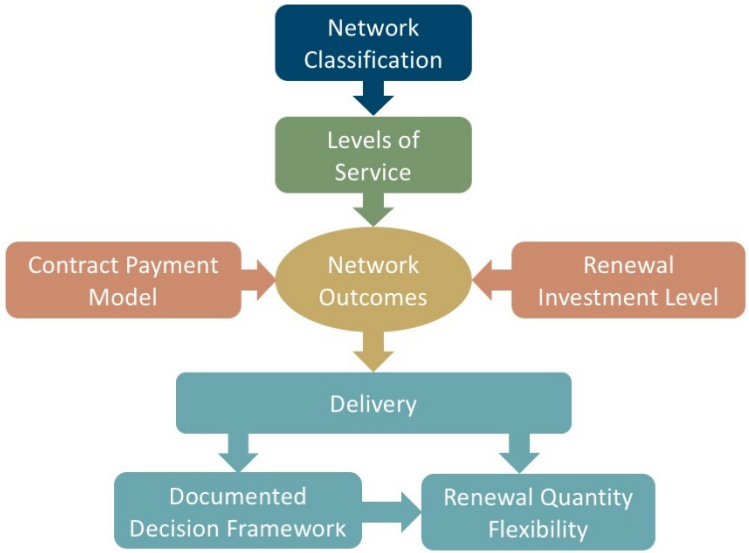
Network Outcome Contracts (NOC) are aimed at improving the effectiveness of service delivery for maintenance and operations of the state highway network. Elements of previous procurement methodologies (PSMC, Hybrid and Traditional models) have been integrated into the NOC contract model which delivers services through a primary supplier incorporating both professional services and physical works for all key maintenance activities.

To support this a central Governance and Management Group represents the interests of the Maintenance and Operations teams in the delivery of the NOCs. This group resolves issues, looks at opportunities for improvement, recommends changes to the national contact documentation, and ensures a consistent application, understanding and implementation of the NOC delivery model.

The core scope of work typically includes, but is not limited to maintenance, operations and renewals. The core scope of work typically excludes transport planning, ITS maintenance and management, capital works, emergency works reinstatement, Traffic Operation Centre activities, bridge and other structures management and repairs.

The contract process for the NOC's is shown below:

Figure 7 - NOC process



The Auckland/Northland NOC (MN3927) is undertaken by Fulton Hogan Construction Ltd. The contract commenced on 1 July 2015 for a 7-year period with the option based on performance for a further 2 years. It applies to the SH16 section of the corridor from the junction of SH16 and Brigham Creek Road.

The contract is supported by the following specialist maintenance contracts and supply arrangements:

- **Traffic signal maintenance – Auckland north:** Traffic signal services for Auckland North to Warkworth are supplied according to a Memorandum of Understanding (MOU) with Auckland Transport Operations Centre (ATOC). This arrangement brings a co-ordinated and consistent One-Network approach to signal maintenance and renewals on both local roads and state highways across the densely-trafficked Auckland spine network.
- **Street lighting:** Contracts for street lighting power supply are held with three providers (Genesis, Contact, and Meridian) with their maintenance liability to the fuse. Power lines and poles (often shared for street lighting) are maintained by Top Energy and Northpower.
- **Regional bridge and structures:** Undertaken by Opus (PA3987) commencing on 1 July 2015 for a 3-year period with the potential for two single year extensions (3+1+1). Some routine structural maintenance sits within the NOC contract, with more specialised work put to the market as required.

Drivers for change

The Transport Agency's long term strategic view identifies a number of key journeys and metro areas. These are considered either crucial for the continuing economic prosperity of the country, or in need of special attention with transport often considered a key enabler of economic revival. The key journeys, programmes to support growth within the corridor, and the long-term view of these are briefly described below.

Supporting growth – Delivering transport networks

Auckland will be home to an additional 1 million people over the next 30 years. Whilst most this development will be accommodated within the existing urban area, up to 30% will be situated in greenfield areas. The 'Future Urban Land Supply Strategy' (FULSS), adopted by Auckland Council in 2015, outlines the location and sequencing of this growth.

'Supporting growth – Delivering Transport Networks' (formerly known as Transport for Future Urban Growth) is the collaborative approach between the NZ Transport Agency, Auckland Transport, and Auckland Council to develop the transport network plan needed to support these future urban areas. The provision of accessible public transport services is vital to encouraging modal shift, and as such, collaboration between agencies is crucial to create a consistent approach for this to be achieved.

Development will be focused around four growth areas across the region of which three are within the Auckland Urban Corridor. The forecast growth in these four areas is as follows:

- North (Silverdale, Wainui and Dairy Flat) – 27,000 houses, 13,000 jobs;
- North (Warkworth) – 20,000 people;
- North West (Kumeu/Huapai, Red Hills, Whenuapai) – 30,000 houses, 13,000 jobs; and
- South (Takanini, Papakura, Drury, Pukekohe) – 42,000 houses, 19,000 jobs.

Key journeys

Key journeys influence the development of the transport network as it adapts to meet new demands from increasing journey numbers and the changing travel patterns of users.

Auckland to Whangarei

Whangarei is the largest city in Northland and is a focal point for onward travel to tourist and freight destinations across the region. SH1 provides a lifeline to the Northland region, connecting to the rest of the country.

Identified benefits of investment for this key journey are focused on delivering a reduction in deaths and serious injuries and providing a predictable journey time for customers.

Auckland Metro area

The motorway network within the urban area provides regional and interregional connections for residents, workers, and freight. It also plays a key role in linking the city's major centres and ports. The private car continues to be the main mode of choice for the increasing population, with growth in this mode far outweighing that of other modes. This places an ever increasing demand on the corridor.

Investment is likely to focus on building resilience, addressing pain points, and improved journey time reliability. This needs to be combined with investment into public transport and active travel modes, providing viable alternatives to the private car and promoting modal shift, helping reduce increasing demand on the corridor and surrounding network.

Auckland to Hamilton and Tauranga

Hamilton, as New Zealand's fourth largest city, provides both business and social connections with Auckland. The greater Waikato region is also home to a number of primary industries including dairy and farming which rely on this key journey corridor as part of the wider supply chain. Tauranga is home to New Zealand's largest port in terms of total cargo volume.

Provision of an efficient road network between these areas will continue to support New Zealand businesses and residents. As such, investment is focused on delivering an efficient freight supply chain.

Understanding customer levels of service on the corridor

Current levels of service performance

The One Network Road Classification (ONRC) is a framework that categorises roads throughout the country depending on what purpose they serve. Importantly it will also help New Zealand to plan, invest in, maintain, and operate the road network in a more strategic, consistent, and affordable way throughout the country.

Over time all roads in a particular category should offer an increasingly consistent and fit for purpose customer level of service (CLoS) for road users. With the knowledge of current levels of service we can better target investment to meet future intended service levels.

Overall, customers will be provided with the right level of road transport infrastructure where it is needed, determined by a robust, impartial, nationally consistent tool – the ONRC.

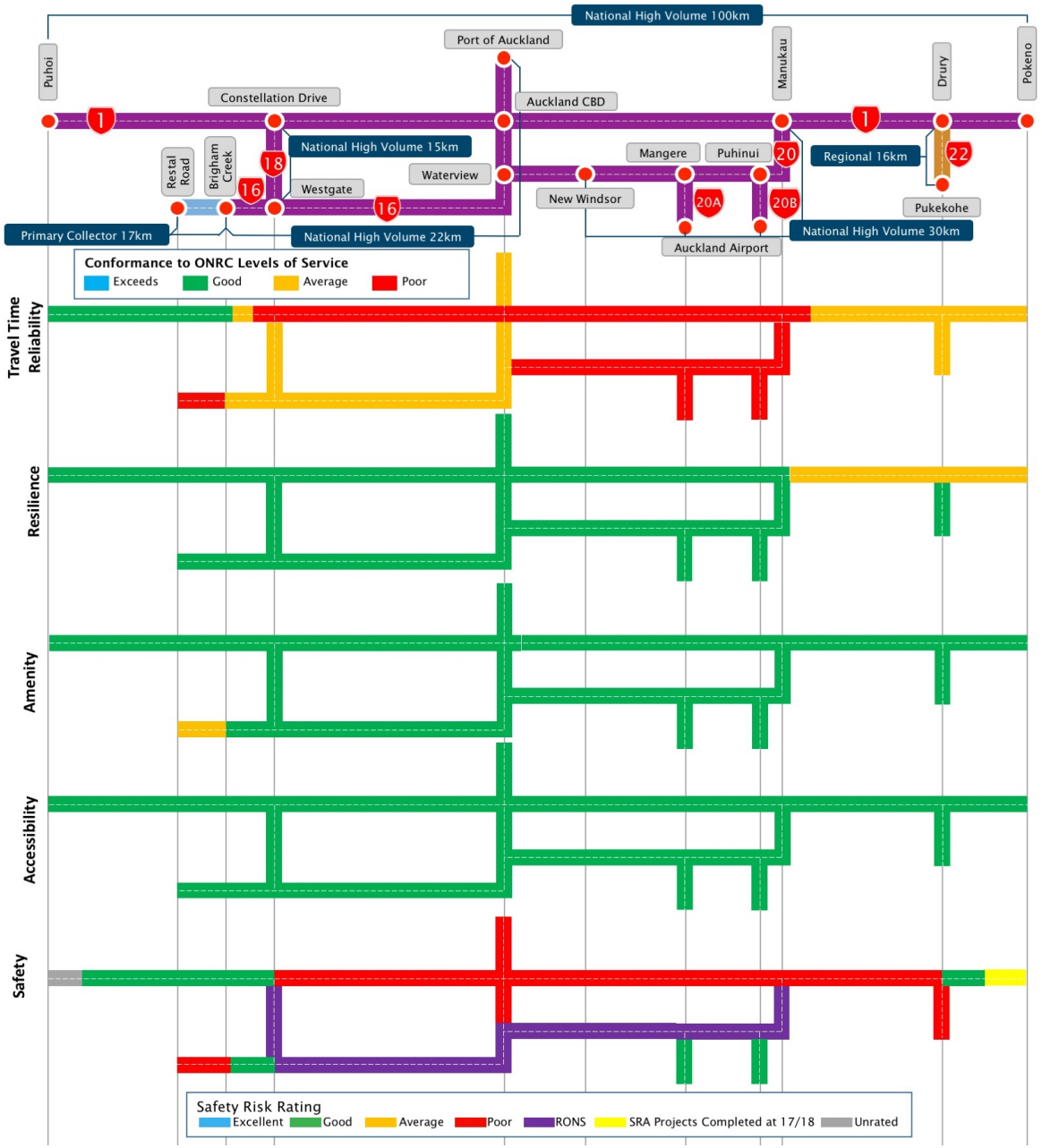
Road classification

The network is classified as a National High-volume route throughout the majority of the corridor. This is reflective of the high traffic volumes and link to key destinations such as ports and airports. The network also plays a key role in moving people and goods between the Auckland and Northland regions to the rest of the country.

SH22 is classified as a Regional route from SH1 to just north of Pukekohe.

Overleaf provides additional context to explain the current levels of service along the corridor based on the road classification.

Figure 8 - Current ONRC customer levels of service performance



Summary of current performance

Figure 8 shows how the Urban Auckland corridor is performing against the ONRC Levels of Service, as they relate to each of the three current classifications.

Levels of service performance has been determined by workshop participants in the development of this corridor plan and is therefore not solely based upon consolidated evidence from the ONRC technical measures.

A simple four-point assessment has been utilised as follows:

Exceeds	The level of service provided by the section of corridor for the activity under consideration exceeds what is required for a highway of that classification
Good	The section of corridor generally meets the LOS requirements for the activity and ONRC
Average	The section of corridor meets some but not all of the LOS requirements for the activity and ONRC classification
Poor	The section of corridor generally fails the LOS requirements for the activity and ONRC classification, or there is a significant gap in the LOS for some aspects of the activity.

Travel time reliability

Travel time reliability is generally poor across the corridor particularly on sections of the northern, southern, and southwestern motorways. This is most prevalent during peak period times and during holiday periods. SH16 and SH18 have average journey time variability but conditions can be particularly unreliable during the AM and PM peak periods.

Increasing traffic volumes on the corridor have resulted in a greater distribution of travel times by road users, with the AM peak period considered to occur from 06:00 to 10:00, and the PM peak period from 15:00 to 19:00.

Resilience

The corridor has good levels of resilience where there are multiple alternative routes both on the State Highway and local road network. However, in the event of an incident, it is not always the case that the alternative routes have the capacity to deal with the high volumes of diverted traffic and significant local congestion can occur. This is particularly the case on the approaches to or on the Auckland Harbour Bridge. Additionally, the corridor is susceptible to congestion in the event of smaller short-term incidents particularly during peak periods.

Sections of SH1 south of SH20 have average resilience due to the lack of viable alternatives, with a potential over reliance on Great South Road as an alternative route.

The corridor crosses over or is within close proximity of other key infrastructure, such as water pipelines, electricity lines, and rail lines. Collaboration between agencies is required in the event of incidents or problems to avoid undue disruption.

Amenity

Amenity across the corridor is rated good throughout, except for the Primary Collector portion of SH16 west of Brigham Creek. This is predominantly due to the quality of the road pavement surface and high maintenance regime on the motorway network representative of a National High-volume road.

Service centre provision is limited with only two facilities across the corridor on the northern and southern sections of SH1. However, there are numerous other facilities close to the corridor either at interchanges or within a short distance.

Accessibility

The corridor shows general conformity with what is expected of a National High Volume, Regional, and Primary Collector route respectively. Whilst there are issues relating to desirable spacing between and geometry of some motorway intersections all are highly engineered and grade separated. Whilst the corridor can accommodate 50Max vehicles, a 4.3m height restriction applies on the majority of the corridor. The box girder extensions (“clip-ons”) on the Auckland Harbour Bridge are subject to a maximum permitted vehicle weight of 44 tonnes.

Safety

The whole Urban Auckland corridor is KiwiRAP rated as 4-star, except for SH22 and a small section of SH16. Safety in general is poor on approaches to the Central Motorway Junction. There are a high number of intersections within this section which are below the Austroads standard of 2km spacing, this results in high incidences of weaving and some poor driver behaviour.

A significant portion of the corridor is rated high collective risk. This includes from Constellation Drive to Auckland CBD on SH1. Pressures on the corridor include poor sightlines and geometry impacting on the safety performance of the corridor.

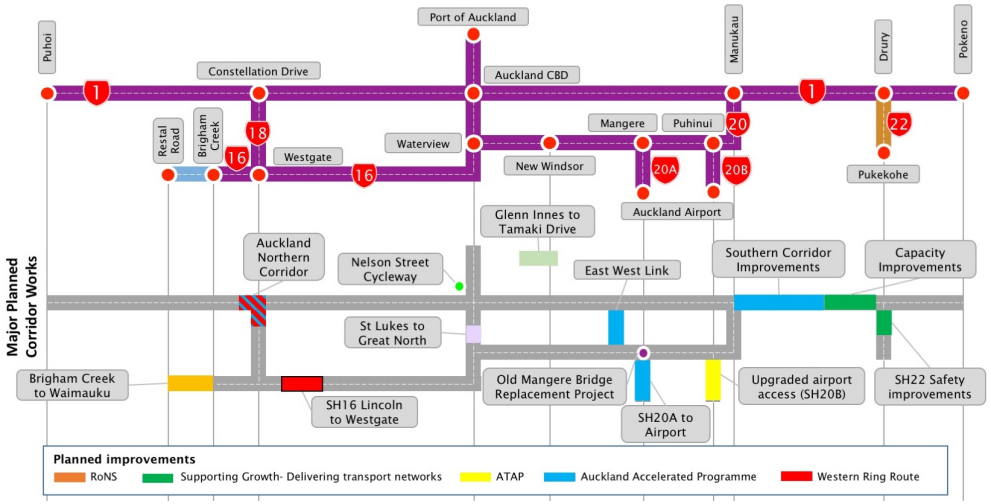
Improving the customer experience

In responding to Customer Levels of Service it is important to acknowledge that significant improvements to the corridor are planned or underway. The Auckland Urban Corridor has several schemes proposed or recently completed. These include the Waterview Tunnels, Auckland Accelerated projects, Roads of National Significance, and Additional Waitemata Harbour Crossing as well as the emerging programme associated with future growth such as the Auckland Transport Alignment Programme and Supporting Growth. Figure 9 shows the planned improvements in the corridor. Some planned improvements feature in more than one strategy due to overlapping objectives.

When completed, the planned improvements on the corridor will result in capacity, intersection, public transport, and walking and cycling enhancements across the network. Major schemes including Northern Corridor Improvements will provide alternatives for users, building resilience across the isthmus. Access to future development sites as well as key infrastructure such as Auckland Airport are also planned or under construction.

The planned improvements on the corridor should provide more reliable and predictable journey times for users. However, due to the consistently high levels of demand on the network, journey times will not necessarily be quicker.

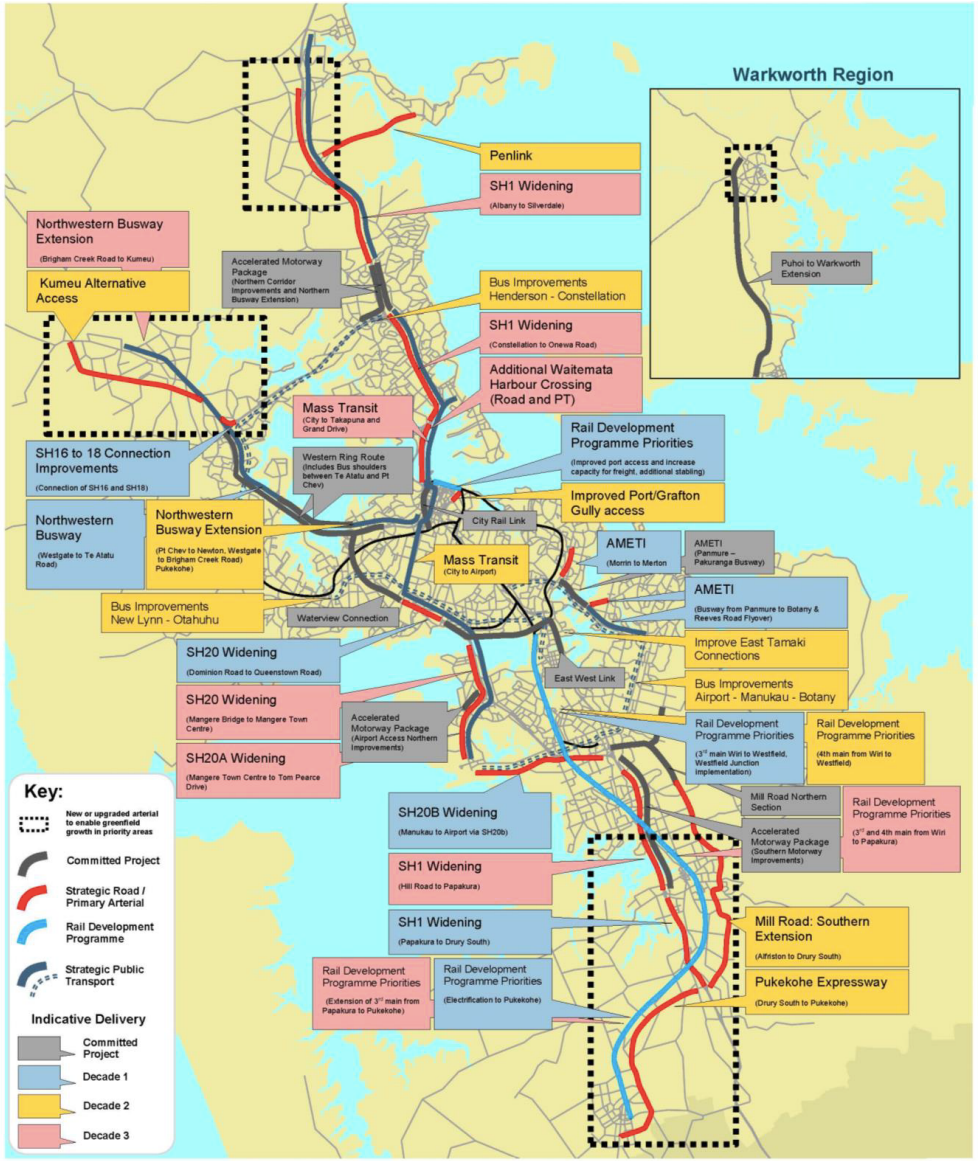
Figure 9 – Significant corridor planned improvements



ATAP

The major proposed investments that form part of the ATAP programme are shown in Figure 10, broken down by decade for the next 30 years.

Figure 10 - ATAP programme of major investments by decade



Access

Carriageway configuration

The carriageway configuration ranges from 2 to 5 lane sections. The Harbour Bridge has a moveable barrier system which provides 5/3 configuration southbound in the AM peak and vice versa in the PM peak period.

SH20A provides four lane divided access to the airport with an at-grade interchange at Kirkbride Road and Montgomerie Road. SH20A is currently being upgraded to provide grade separation of the Kirkbride Road intersection and full motorway status to the airport boundary with the closure of Montgomerie Road. SH20B, SH22 are both two lane single carriageway roads.

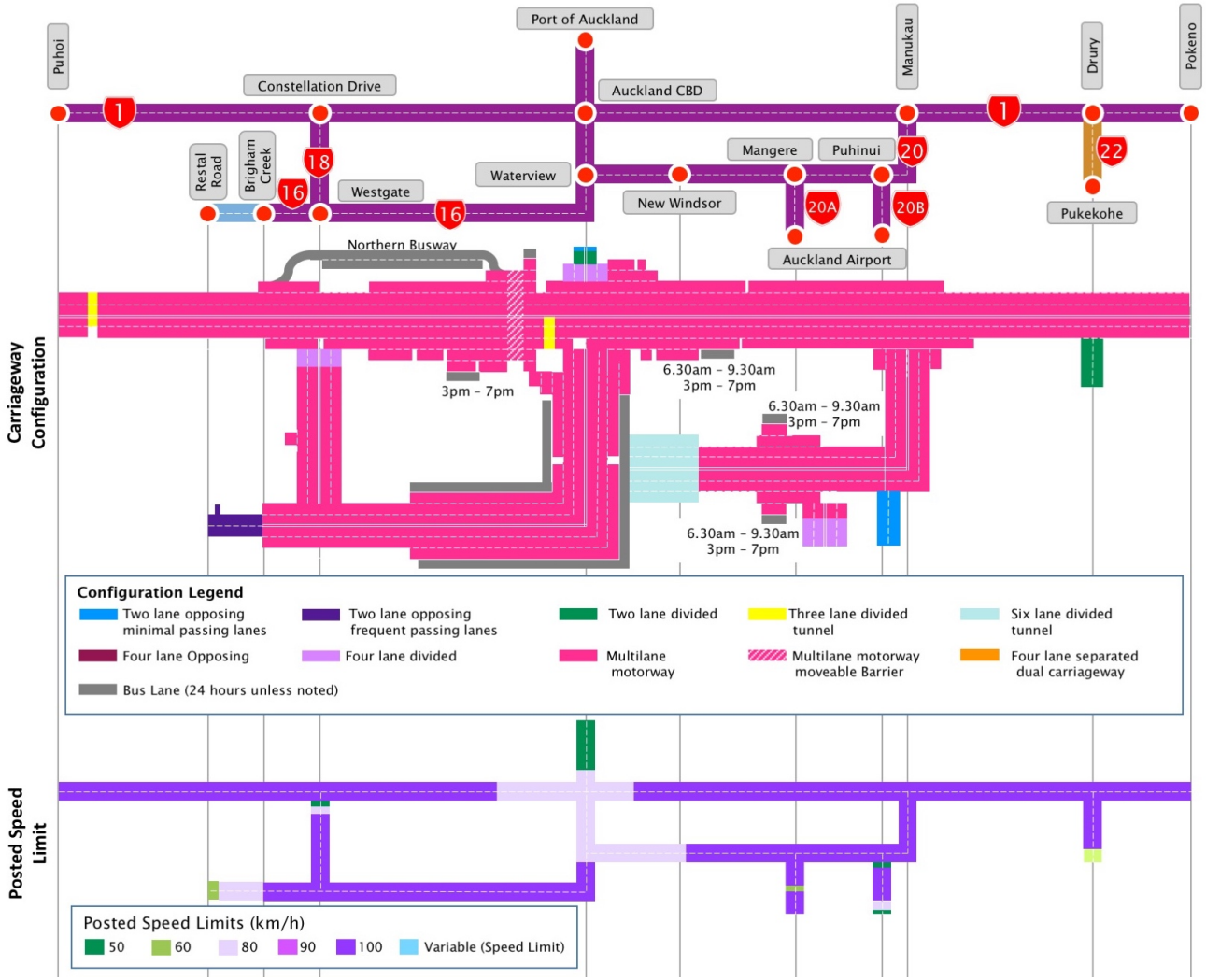
On the approach to the Port of Auckland, SH16 reduces from motorway standard to two lane single carriageway at The Strand. At its western extreme, the road reduces to two lane divided and two lane opposing from Westgate onwards.

Speed limits

The corridor generally has a 100km/h speed limit on motorway sections reducing to 80km/h within the Waterview Tunnel and on approaches to the Central Motorway Junction through to the northern side of the Auckland Harbour Bridge. The 80km/h sections are in response to high traffic volumes and safety concerns associated with multiple intersections and decision points in these areas. SH16 on approach to the port area reduces to 50km/h where the road becomes single carriageway. Speed limits on SH22 vary between 50 and 100km/h on its approach to Pukekohe.

Reviewing speed limits is important to ensure that levels of safety are high, with changing traffic volumes and new projects influencing driver behaviour on the network.

Figure 11 - Corridor characteristics 1



On/Off ramp configurations

The Auckland Urban Corridor has many grade-separated intersections providing motorway to motorway and local road connections.

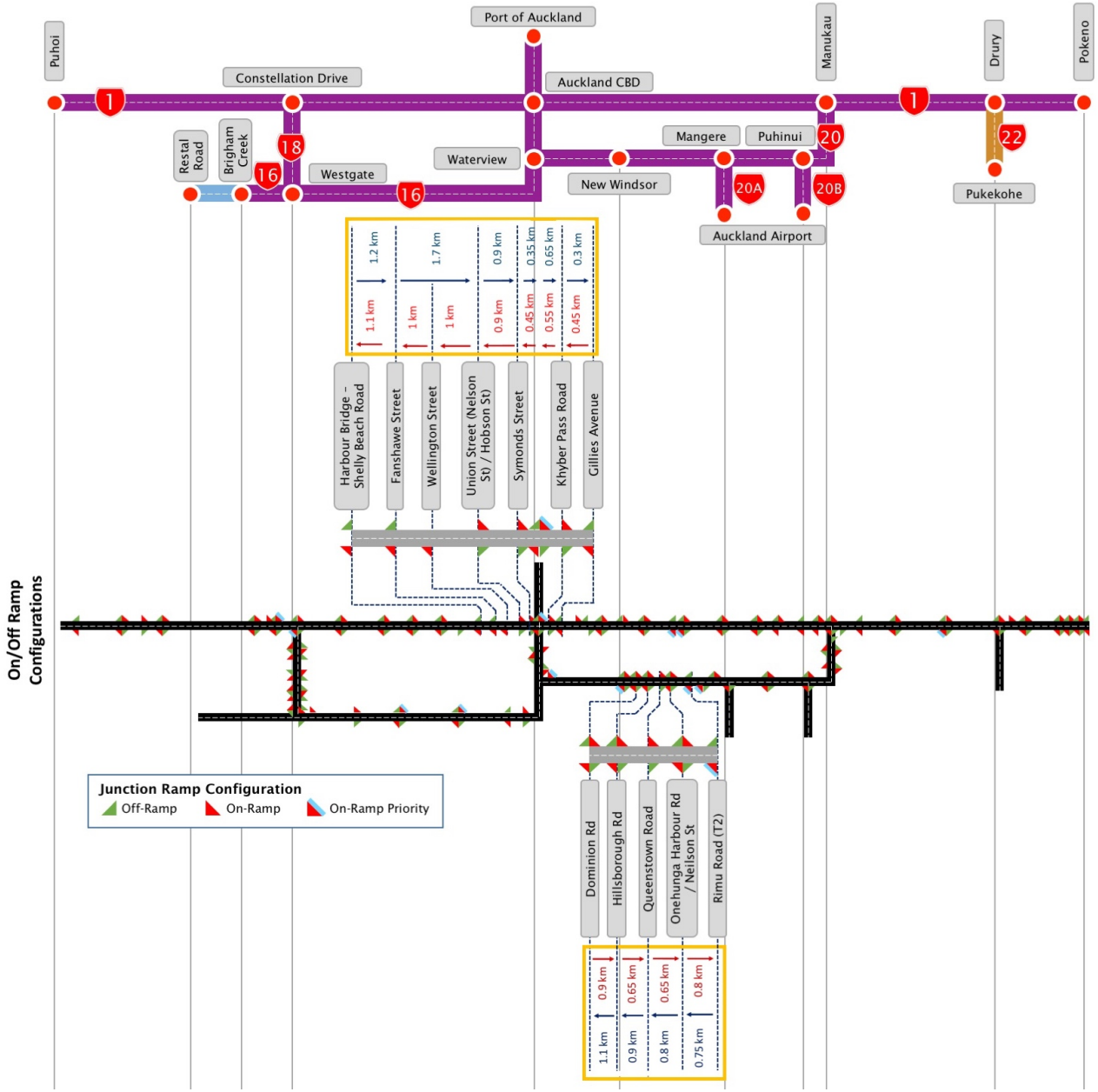
Intersection spacing along the corridor is relatively frequent and well below recommended intersection spacing for a high speed motorway network. This undermines the roading hierarchy with the motorway network frequently fulfilling an arterial network function in addition to its national strategic role. This duel role slows users of the network on longer and interregional journeys, as the merging of multiple traffic streams disrupts efficiencies on the highway network.

The density and configuration of intersections can create confusion for unfamiliar drivers leading to hesitation and uncertainty for some road users and consequently safety concerns. Impatient drivers can act recklessly, trying to navigate around slower drivers and performing dangerous manoeuvres to avoid congestion.

The highest concentration of intersections, highlighted in Figure 12, is within the Central Motorway Junction (CMJ) section of SH1 extending through the Southern suburbs of the city. Within the CMJ alone (between the southern side of the Auckland Harbour Bridge and Gilles Avenue) a total of seven full and limited intersections are accommodated within approximately 4km.

There is also a high concentration of intersections on SH20 (between the Dominion Road exit and the Onehunga Harbour Rd / Neilson Street exit) with four full and limited intersection within approximately 4km. Although the density of intersections is not as great as that seen around the CMJ, this section of the corridor currently experiences a high number of incidents, with the pressure of the additional traffic using the Waterview Tunnel potentially exacerbating the risk of confusion and hesitation for drivers.

Figure 12 - Corridor characteristics 2



Cycle lanes and pedestrian infrastructure

The state highway corridor is increasingly becoming a key part of Auckland's active transport network. Several shared walking/cycle links have been provided alongside the motorway including the Northwestern Cycleway and the SH20 Cycleway. The NZ Transport Agency has been responsible for the construction of some of Auckland's cycleways. These are then passed to Auckland Transport who take responsibility for their maintenance and operation.

Dedicated schemes such as Te Ara I Whiti- the Lightpath and Westgate Bridge mitigate the severance impacts of the corridor on communities as well as provide alternative modal choice for customers. All capital improvements in the corridor consider the role of walking and cycling and provide enhanced walking and cycling infrastructure as appropriate.

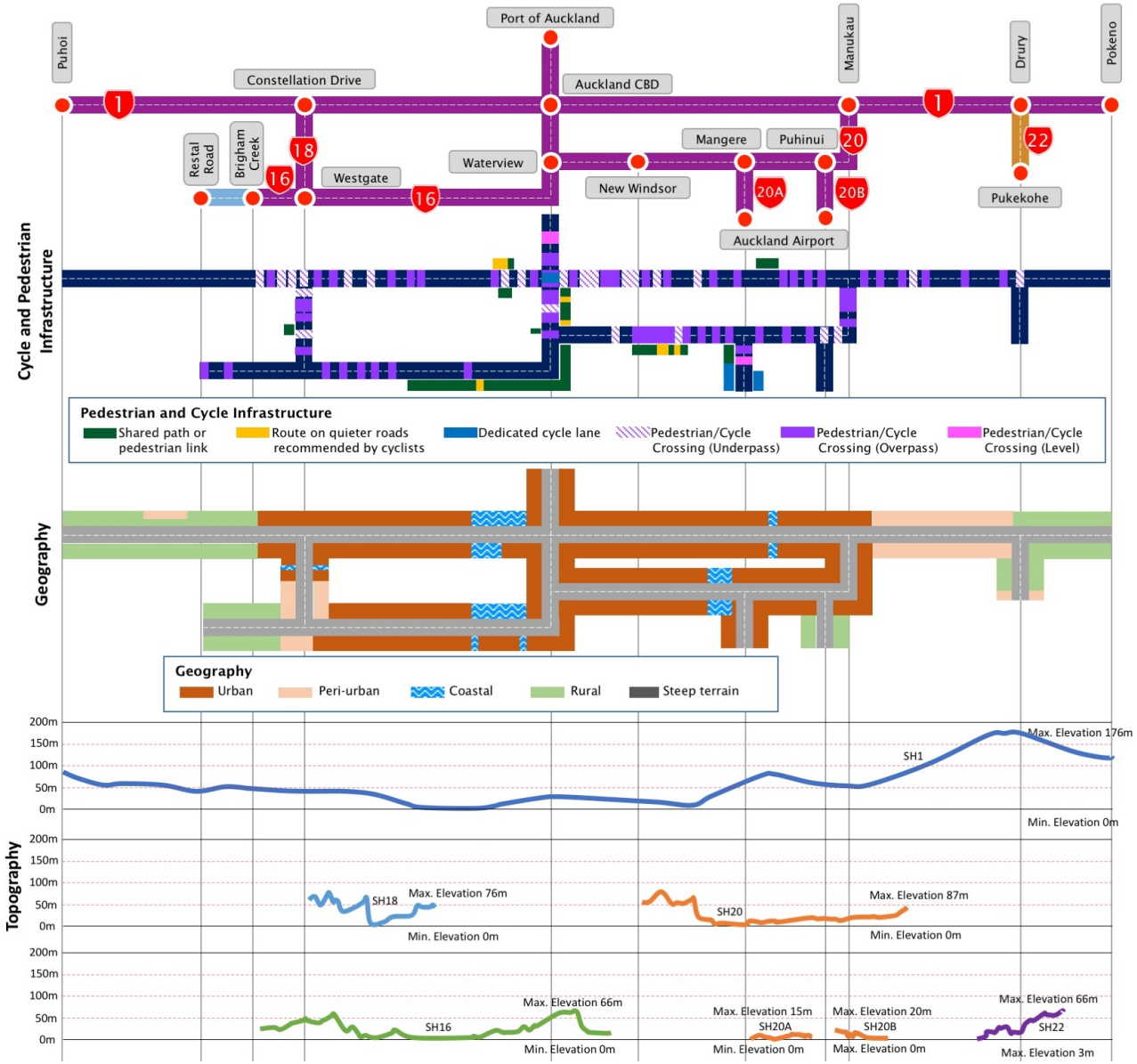
The permeability of the network is much greater in the densely populated urban areas. However, distances may still be long to reach a crossing point. To the north of the corridor, where bridges may have space for a pedestrian to cross, there is no connecting pedestrian or cycle infrastructure on the side of the road to access the bridge.

Topography/geography

The corridor is predominately urban and peri-urban in nature. Traversing the narrowest part of New Zealand's mainland, the water and coastal features play an important role. The most significant topographical feature in the corridor is the steep terrain of the Bombay Hills.

Traversing the narrowest part of New Zealand's mainland, between Otahuhu Creek and the Mangere Inlet, water and coastal features play an important role in the shaping of the built environment and the corridor itself.

Figure 13 - Corridor characteristics 3

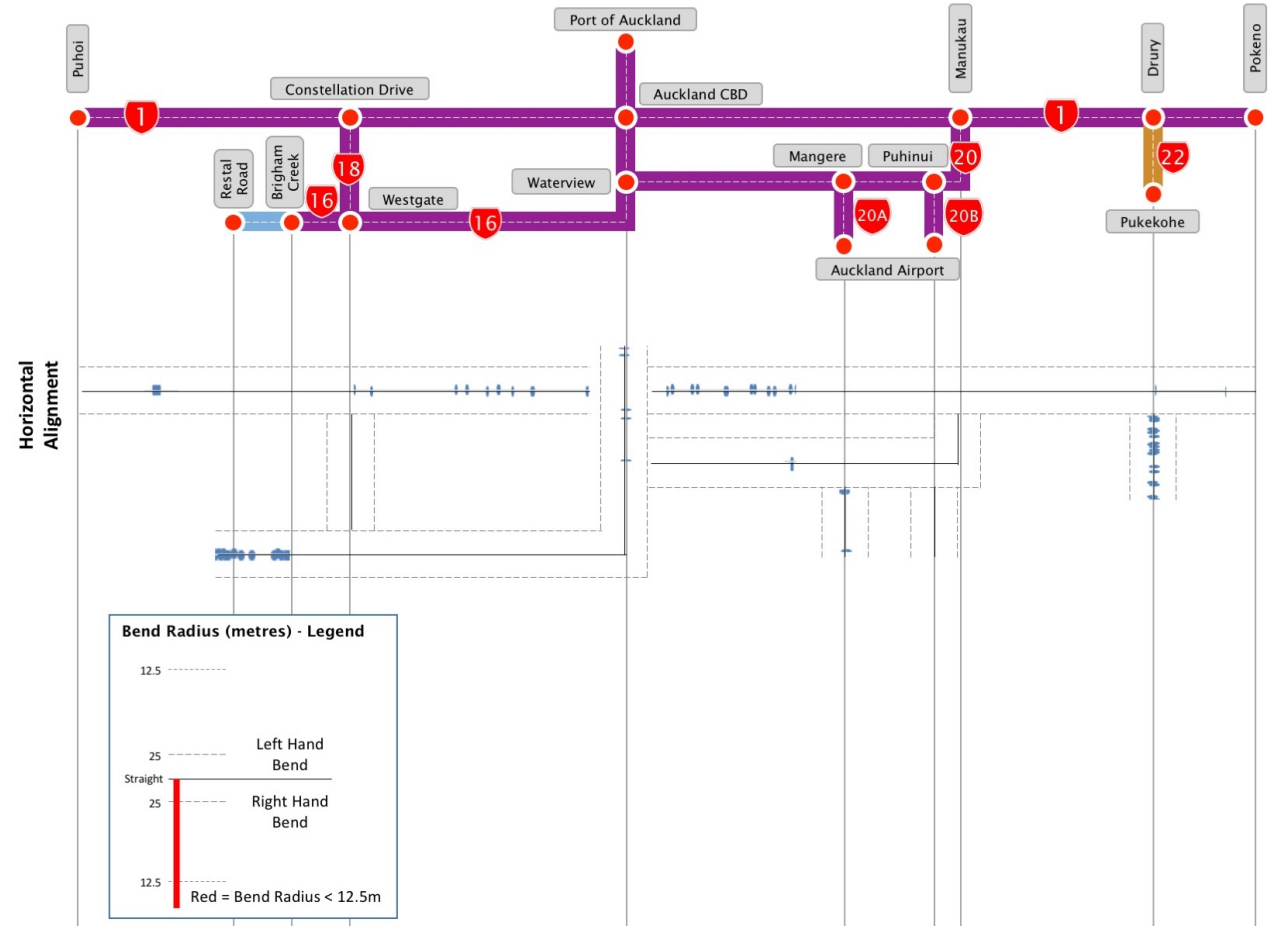


Horizontal alignment

The infographic shows the location and extent of the out of context curves along the corridor. The height of the bar is an indication of the severity of the curve calculated as $\frac{1}{radius^2}$, meaning the taller the bar, the smaller the radius of the curve. Note: Unlike other infographics, the horizontal alignment infographics are drawn in proportion to the length along the corridor. As such they are not shown in context with the intermediate points which have been excluded.

The Auckland Motorway network by its nature does not contain any curves which present a challenging driving experience. Sections with a higher concentration of curves occur on the lower classification sections of SH16 northwest of Brigham Creek, and SH22 between Drury and Pukekohe.

Figure 14 – Horizontal Alignment



SH16 Causeway upgrade

Volumes

The Auckland Urban corridor contains the highest traffic volumes of any roads in New Zealand. These are focused on approaches into Auckland City on the Southern Motorway.

Figure 15 illustrates the average hourly traffic volumes per lane during the AM peak (07:00-10:00), Inter-peak (11:00-16:00), and PM peak (16:00-19:00) periods.

Traffic volumes are high on most approaches into the city and the Central Motorway Junction. There are also sections of high volumes on approaches to Manakau on SH1, south towards Auckland Harbour Bridge and on SH20. In general, rural sections of the corridor have low traffic volumes in comparison.

Increasingly traffic volumes and associated congestion is becoming more prevalent during the inter-peak period particularly in suburban areas and industrial sites such as Mount Wellington and Wairau.

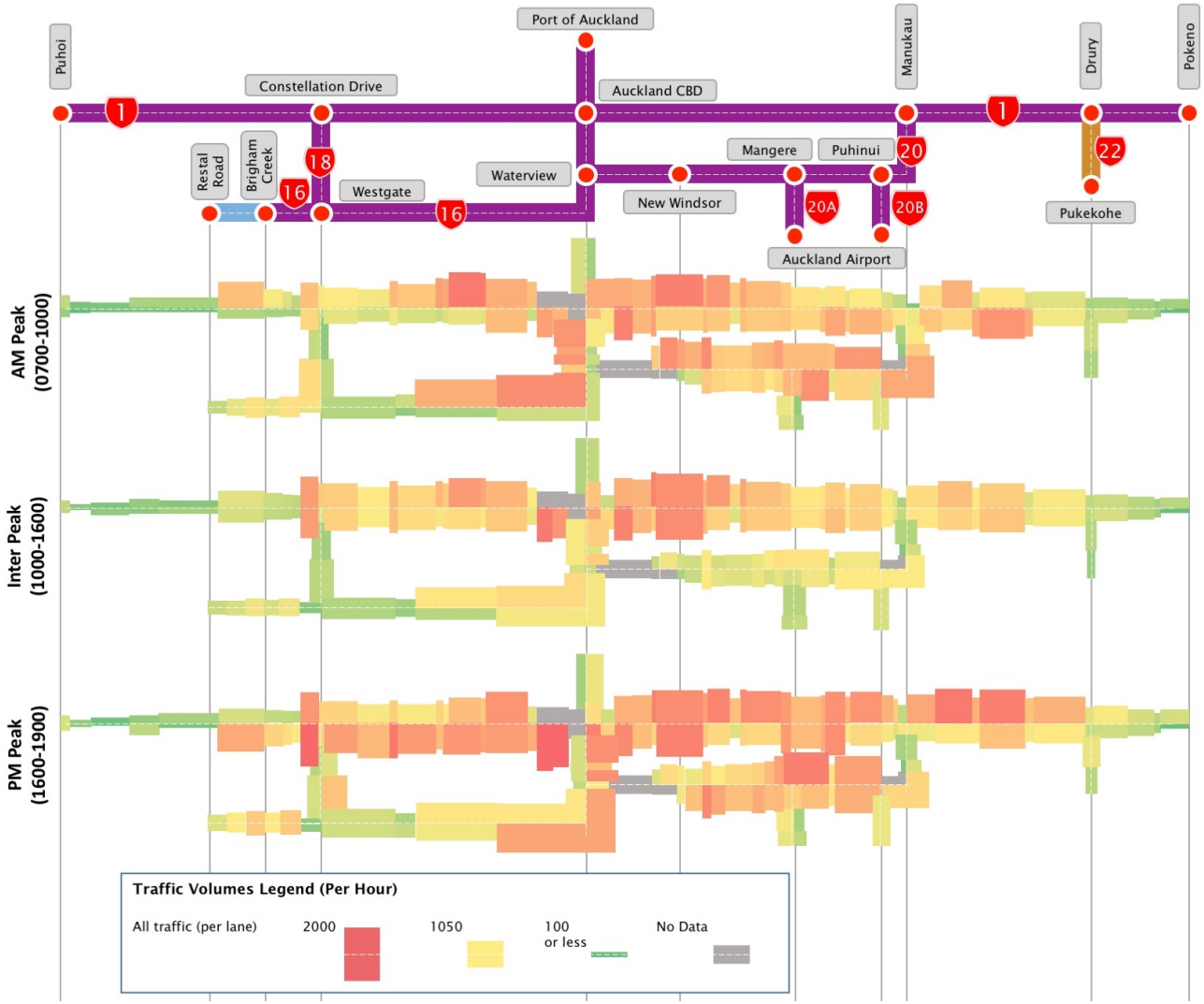
On SH1 south of the CMJ, consistently high levels of demand are seen throughout the day. Tidal traffic volumes can be observed, with levels towards the CBD showing a slight decrease, and flows away from the CBD increasing during the PM peak period.

SH16 demonstrates high traffic volumes with a tidal nature, with high volumes travelling towards the CBD in the AM peak period, and high volumes travelling away from the CBD in the PM peak period.

SH20 sees much higher levels of demand during the AM and PM peak hours, with the PM peak period showing highest level of demand.

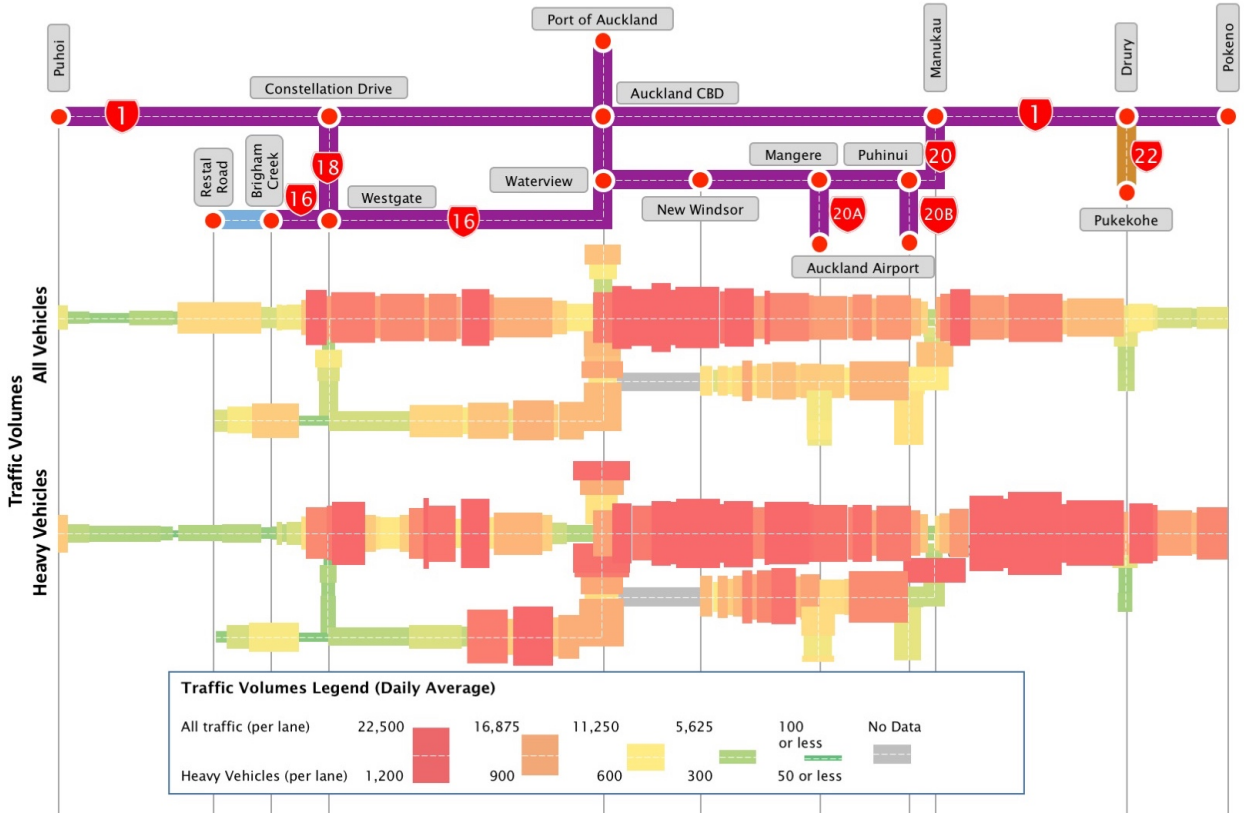
In general peak spreading is more prevalent in the evening peak period compared to that in the morning.

Figure 15 - Corridor capacity 1



St Lukes to Great North Rd project is jointly funded with Auckland Transport & NZ Transport Agency

Figure 16 - Corridor capacity 2



HPMV routes

A continuous HPMV route through the corridor is provided via SH1, SH18 and either SH1 via the Southern motorway or SH20 through the Waterview Tunnels. The Waterview Tunnel is restricted, with no dangerous goods allowed through the tunnel.

The Auckland Harbour Bridge is suitable for HPMV's, however, the box girder extensions ("clip-ons") have a maximum permitted vehicle weight of 44 tonnes.

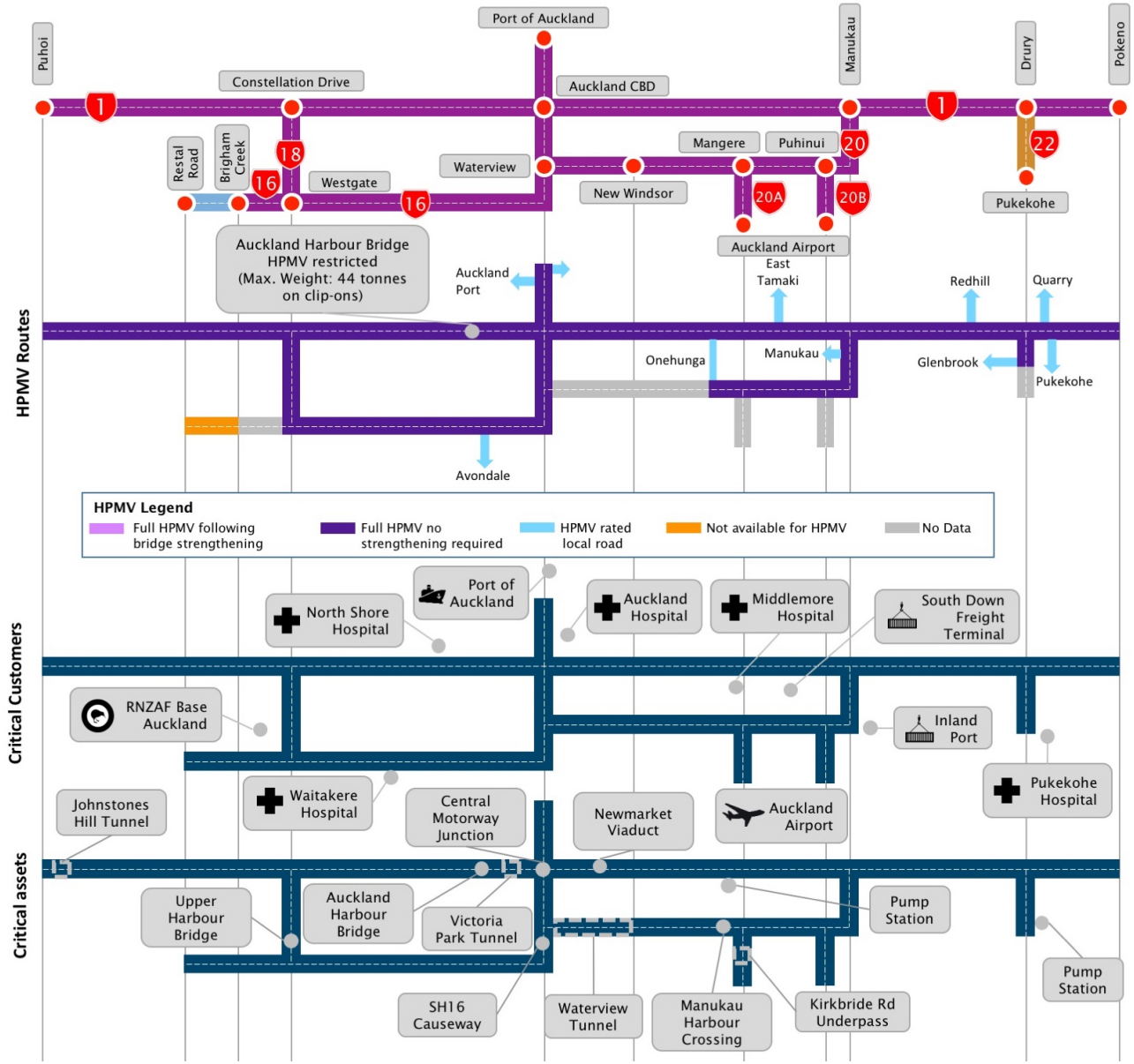
A number of local roads provide a connection to key industrial and commercial sites across the region.

Critical customers and assets

There are a number of critical customers and assets on or near the Urban Auckland Corridor vulnerable to any short or long-term interruptions including several hospitals, the freight terminals at the Port and South Auckland, Auckland Airport and RNZAF Base Auckland in Whenuapai.

There are also a number of critical infrastructure assets along the corridor that require an enhanced maintenance focus. Failure of these assets would significantly disrupt services along the corridor if they were to fail. These include the Auckland Harbour Bridge, Newmarket Viaduct and the Victoria Park and Waterview Tunnels.

Figure 17 - Corridor capacity 3



Pressures

The pressures on the corridor that are resulting in increased demand or a reduction in levels of service for Access are the following:

- **Urban growth:** Current large scale urban growth is resulting in increased demand on the motorway network, particularly at the extremities of the urban area. This is exacerbated by the limitation of existing public transport networks. Planned growth in future urban areas will also place pressure on the motorway network, particularly SH16 and SH22 which are single lane carriageways.
- **Carriageway / Junction configuration:** Changes in carriageway configuration create choke points on the network which impact journey times. Particular issues occur near the Sylvia Park / Mount Wellington intersection which can experience extensive congestion during both the peak and interpeak periods. Furthermore, the concentration of on/off ramp configurations can confuse drivers and result in hesitant and dangerous driver behaviour, with less patient drivers performing dangerous manoeuvres to advance faster in congestion.
- **Physical constraints:** Present on the corridor are physical constraints which can limit HPMV movements. These are mainly in the form of bridges which limit the heights of vehicles on sections of the corridor. There are particular constraints on SH1 with ongoing concerns regarding weight restrictions on Auckland Harbour Bridge.
- **Provision for active modes:** Cycling is proving an increasingly attractive mode of transport, especially within the Central Auckland area, with the state highway network creating a barrier to movement, in some areas, for cyclists. The growth in popularity of electric bicycles creates new pressures for the network as cycling becomes more viable for longer journeys.

Future considerations

Future considerations relating to corridor pressures, intervention triggers and appropriate levels of investment related to Access are as follows:

- **Mitigate choke points:** Continued investment to reduce the number of choke points on the motorway network. This can include improved network management and operations coupled with targeted capital investment. Identify and mitigate choke points as part of a whole of network approach, with the provision of additional lanes where necessary to accommodate traffic volumes.
- **Provision for growth:** Provision of an integrated strategic transport network designed to cope with the future growth areas identified and the resultant increase in trips expected. Recognition that greater pressure on the corridor and intersections will occur around these growth areas. Infrastructure provision will be needed to mitigate unacceptable levels of traffic congestion.
- **Review of on/off ramp configuration:** Review the concentration of on-off ramps onto the state highway network to identify ways to reduce driver confusion where multiple facilities exist. Campaigns to reduce aggressive driver behaviour at these locations and across the state highway network will help to make a safer driving environment for all road users.
- **Integration of cycling and walking infrastructure**: With cycling and walking facilities often delivered as part of major projects there is a need to ensure these improvements integrate with the wider Auckland cycling and walking network. Collaboration with Auckland Transport and other stakeholders will help ensure such facilitates are part of a wider network plan to deliver a connected network. Reviewing and monitoring growth areas will help with the response to the continued provision of such infrastructure where needed.
- **Separated walking and cycling facilities:** The potential of electric bikes to reach high speeds can be a cause of conflict between cyclists, pedestrians and other road users, and cycling becomes more viable for longer journeys. Where ‘off-line’ facilities are provided as part of motorway enhancements consideration of separated pedestrian and cycling facilities might improve safety. Rural parts of the network, pedestrian and cycling facilities should be considered.
- **Improve pedestrian permeability:** Providing safe passage across the network for pedestrians improves accessibility, connecting people to their homes, places of work and play and provides alternative travel choices to the private motor vehicles. Working with Auckland Council and Auckland Transport to ensure pedestrian connectivity across the network as part of ongoing development will reduce the reliance on vehicle journeys.

Resilience

The Corridor provides local connection within the Auckland urban area as well as interregional movements throughout the Upper North Island. It provides key linkages for residents and businesses alike and provides access to key transport and freight nodes such as Auckland Airport and the Port of Auckland. Whilst short and appropriate alternative routes are available these can often be congested particularly on the local road network.

Vulnerabilities

The corridor is susceptible to surface water and estuary flooding particularly during extreme weather events. This includes on approaches to Auckland Harbour Bridge and Curlew Bay. Several locations are also susceptible to disruption due to wandering domestic animals which can lead to significant delays for customers. The corridor crosses, or is within close proximity to, other critical infrastructure, creating vulnerabilities in the event of failure or major maintenance requirements.

Alternative routes and diversion lengths

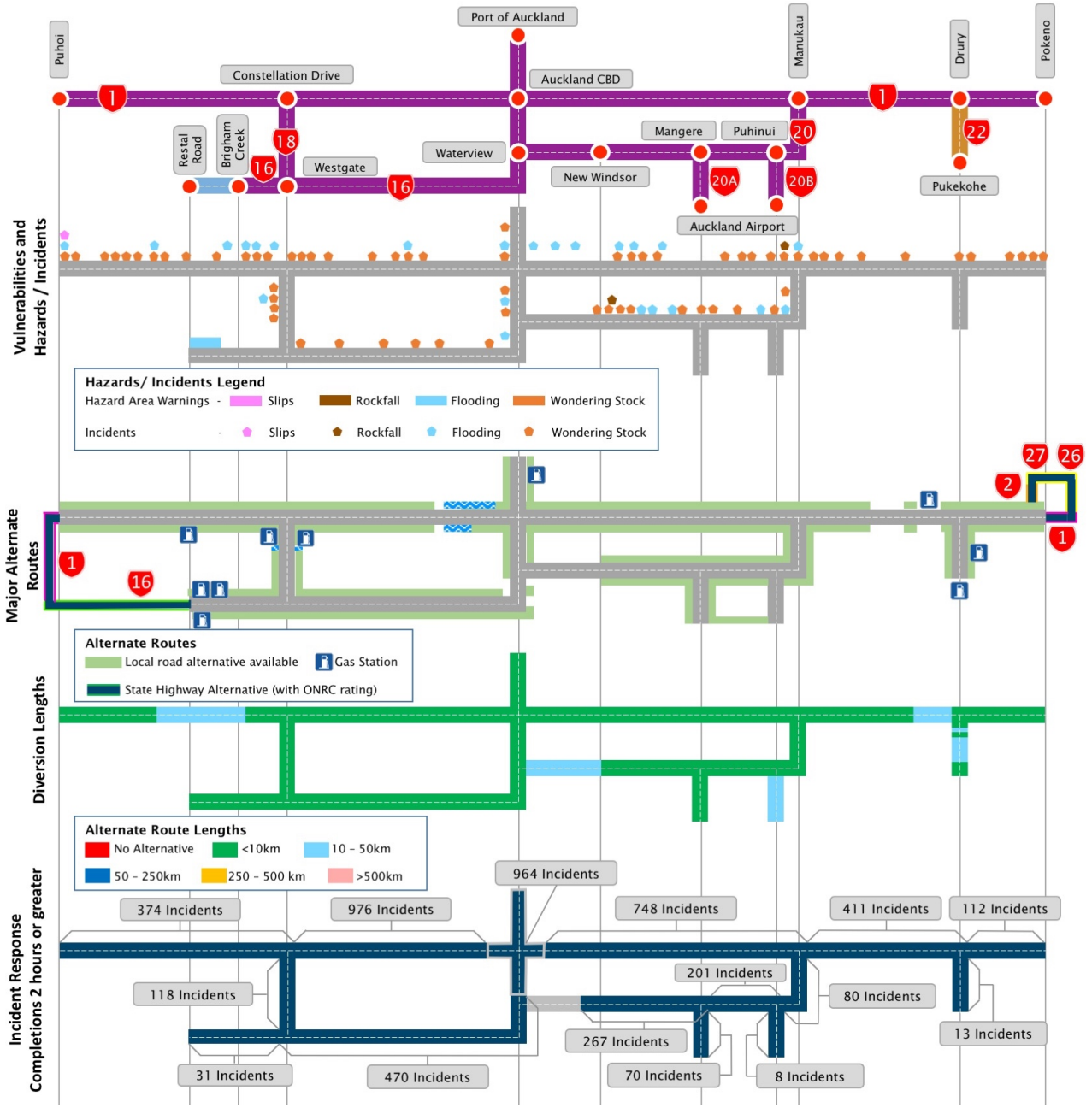
With the completion of the Waterview Tunnels, the Western Ring Route via SH120, SH16, and SH18 acts as a near fully motorway standard diversion route for SH1. This is also the main HPMV route across the city.

A number of local roads also act as diversions, particularly those that run parallel to existing motorways and between SH1 and SH20. There are fewer alternative routes on the Southern Motorway.

Corridor incidence

The incidents on the corridor with a response completion of 2 hours or greater during 2016 are shown on Figure 18. Higher numbers of incidence are shown from Constellation Drive to Manukau, and on SH20, and SH16. This correlates to the higher number of vehicles travelling on these sections of the corridor. Accident causes vary from driver behaviour to weather hazards.

Figure 18 – Resilience



Pressures

The pressures on the corridor that are resulting in increased demand or a reduction in levels of service for Resilience are as follows:

- **Lack of viable alternatives:** In parts of the corridor, particularly SH16 north west of Westgate, SH22, and SH1 south of Papakura there are limited viable alternatives to cater for the traffic volumes. While there are alternative routes to these sections of the corridor, the alternatives are unlikely to be able to accommodate the traffic volumes. This is particularly the case for SH1 south, with Great South Road as the only alternative to the motorway.
- **Impact of minor incidents is significant:** Minor incidents can have a major impact on congestion on the transport system resulting in longer than anticipated delays. This is particularly significant during peak times when there is a substantial volume of traffic on the network.
- **Major and fatal incidents:** Due to the nature of major and fatal incidents, the impact upon the highway network can be significant. In the event of a fatal incident, the road is closed for a police investigation causing major disruption. As the main route within the Auckland Urban area, closures have a major impact on the local road network, many of which act as diversion routes. These can become increasingly congested when there are incidents and result in gridlock across the whole urban road network.
- **Maintenance restrictions:** Restrictions are in place for programmed renewal work on the state highway network, with no planned lane closures permitted between 6am and 10pm. This limits the progress of work, and working at night can create a hazard to workers. For unplanned events the roads are closed as required.
- **Surface water flooding issues:** Some parts of the network experience surface water flooding particularly during major weather events. This can result in major delays or road closures.
- **Wandering domestic animals:** There are several locations within the corridor which are susceptible to wandering animals which causes a hazard for drivers, and can cause substantial delays to the traffic.

Future considerations

The future considerations relating to corridor pressures, intervention triggers and appropriate levels of investment related to Resilience are as follows:

- **Appropriate diversions:** Ensuring appropriate diversion routes are available and signed accordingly is vital to informing customers of the most efficient route. With the recent implementation of signage for the Western Ring Route, continued adequate and coherent signage across viable alternatives should be considered. Working with Auckland Transport to establish an appropriate Network Operating Framework (NOF) to seek to devise suitable alternatives on the local network as part of the whole network approach will help to achieve this.
- **Relationships:** Work with other statutory bodies to reduce the impact of incidences on the motorway network. Liaise with AMA, Auckland Transport, Police and other emergency services to respond to incidences in a timely manner. Improve customer information during events by working closely with the Auckland Transport Operations Centre (ATOC).
- **Alternative modes:** Continue to promote public transport and active modes as a viable alternative to the private car. Work collaboratively with Auckland Transport to promote public transport modes across the motorway network. This could include the provision of bus priority on off ramps as well as bus shoulders, improved access to Park and Ride sites, and secure facilities at bus and train stations for bicycle storage to enable a longer multi-modal journey.
- **Access to fuel stations and electric charging stations:** An increased accessibility of fuel and services on the corridor will reduce trips off the corridor to access these services, thereby reducing pressure on interchanges. Easily accessible electric charging points will become increasingly necessary to facilitate the growth of electric vehicles. The development of a strategy for fuel stops across the Urban Auckland network, and taking into consideration the extension of the SH1 motorway network north to Warkworth could reduce interchange movements in some locations.
- **Improve corridor resilience:** Natural hazards pose a constant threat and need to be considered in future projects as appropriate. Continue to maintain a high quality asset to ensure greater resilience, longevity, and extended maintenance intervals. Collaborate with Auckland Council about Catchment Management Plans and Flooding risks.
- **Alternative routes:** Working collaboratively with Auckland Council and Auckland Transport to develop the Supporting Growth strategic network will improve network resilience, particularly in the south with the development of the Mill Road corridor and Pukekohe expressway as alternative routes.

Reliability and efficiency

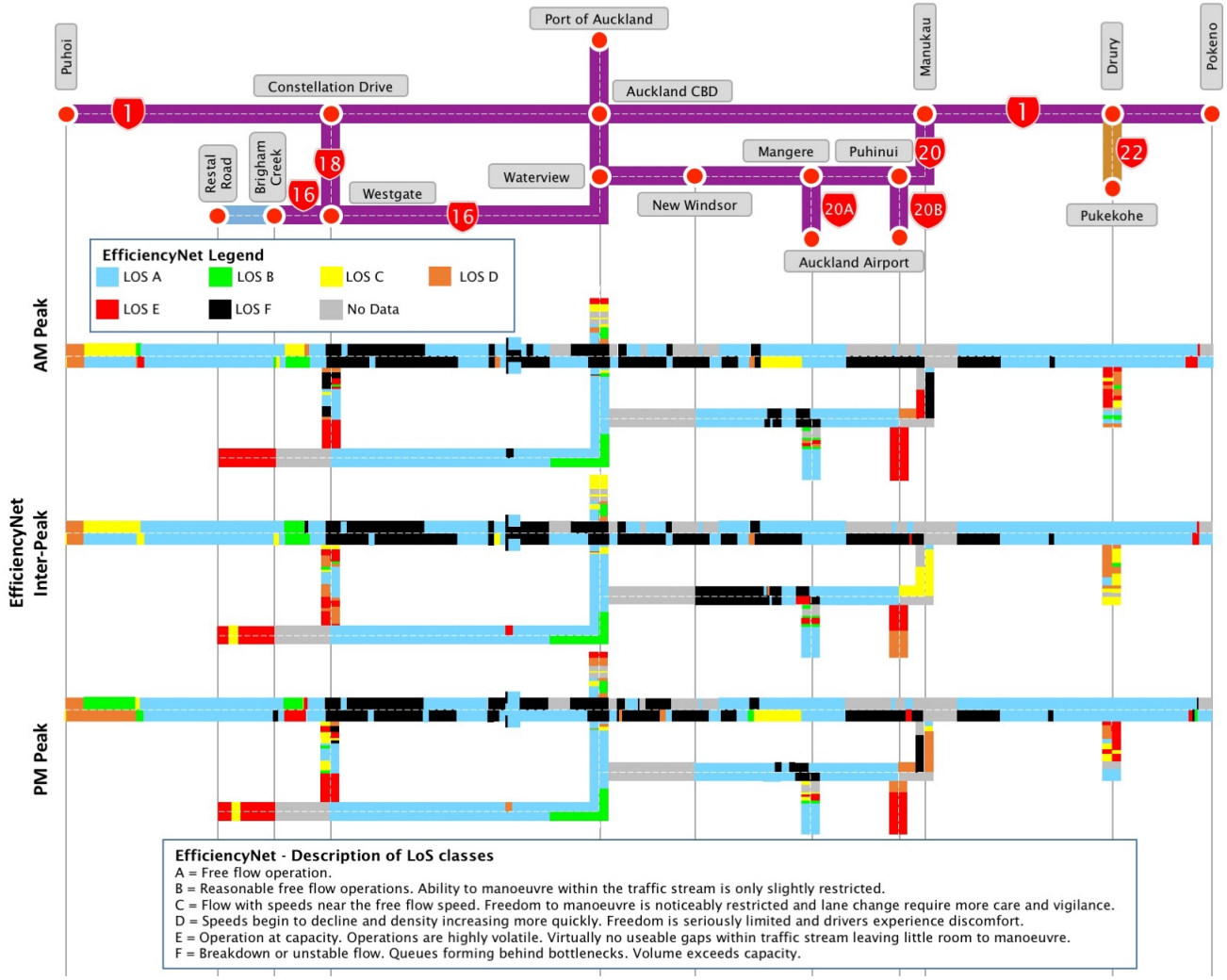
Efficiency

The corridor has a variable level of service. Some sections of the motorway network see a dramatic drop in their level of service such as the Northern Motorway between Constellation Drive and the CBD, all approaches to the Auckland Harbour Bridge, Central Motorway Junction on SH1, and northbound sections at the Southern Motorway. The level of service also drops substantially on SH20 during the inter-peak between the Manukau Harbour Crossing and Maioro Street.

During peak periods congestion can be unpredictable, affected by incidences on the network, major events in the city, and holiday periods, all creating spikes in the level of demand.

The lack of efficiency on the network is a result of the demand on the network exceeding the capacity that is available. As shown, several sections of corridor exceed capacity, resulting a much lower level of service being provided to the customer.

Figure 19 - Reliability and efficiency 1



Variability

Variability is very high through the central section of the network including SH16 and SH1 between SH18 and SH20. This is reflective of the unpredictability of the network through the central motorway junction. Generally, other sections perform well for variability.

Commercial vehicle average speed

Average speeds for commercial vehicles are generally high across the network peaking at speeds in excess of 85 km/h on the section of SH1 north of Albany and SH20. Average speed reduces in the urban section of the corridor. This is in line with the increase in traffic volumes and congestion along this section.

It is evident that freight operators have adjusted their behaviour in response to congestion patterns on the corridor. Freight operators tend to move freight outside of peak hours to avoid longer and more costly operations. Therefore, commercial vehicle average speed may be improved by operation in these hours.

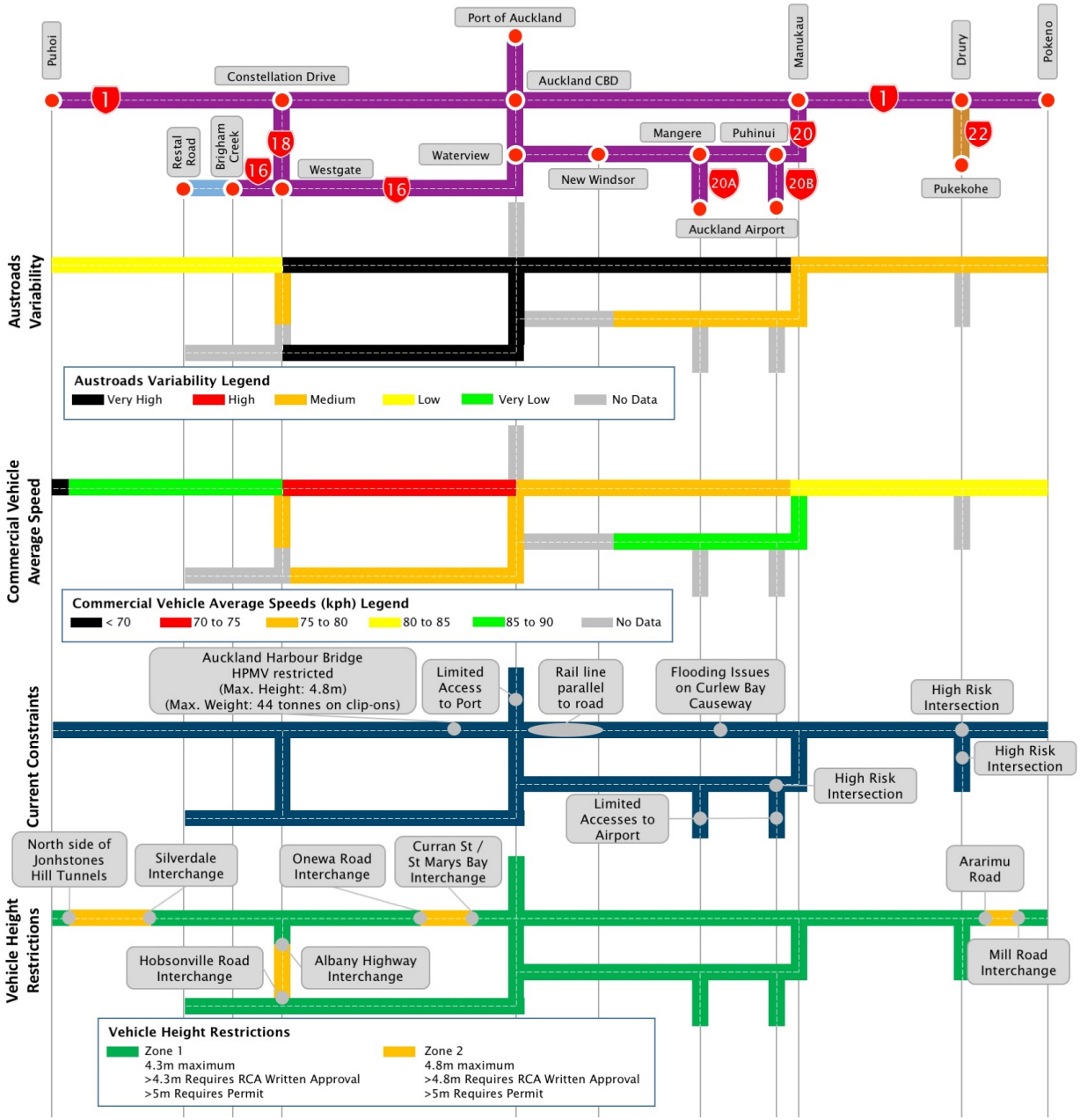
Current constraints

The major current constraints on the network affecting journey reliability and efficiency are shown in Figure 20. These predominantly relate to low bridges on part of the State Highway network.

Vehicle height restrictions

The corridor is subject to height restrictions due to overhead bridges and other infrastructure. Regardless, many bridge strikes occur on the corridor, creating a hazard for road users. Most the corridor is subject to a 4.3m maximum height restriction, with certain sections permitting 4.8m vehicles. All vehicles over 5m require a permit throughout the corridor.

Figure 20 - Reliability and efficiency 2



Pressures

The pressures on the corridor that are resulting in increased demand or a reduction in levels of service for **Reliability and Efficiency** are as following:

- **Corridor capacity:** Many sections of the corridor are at or near capacity particularly during the peak periods, but increasingly during the inter-peak period. This is delivering a poor level of service for customers. Pressure will be exacerbated by ongoing urban development in existing and future urban areas and a lack of alternative transport options in some areas.
- **Poor journey time reliability:** Journey time reliability is poor, particularly within the city centre section of the corridor. This is compounded by changes in conditions such as weather, school hours, and activity on adjacent land uses together with road incidences such as breakdowns and crashes.
- **Commercial vehicle efficiency impacts:** Efficiency of commercial vehicles is impacted by the start/stop flow currently experienced on sections of the corridor. Whilst the option to operate at less congested times is possible, this is not a viable option for all industries. Long term transport issues can result in relocation and economic loss to communities.
- **Bridge strikes:** Bridge strikes are common and cause significant disruption. They can lead to the closure of the highway network depending on the severity of the incident, potentially resulting in the closure of the road affected. Overweight trucks continue to drive over restricted assets such as the box girder extensions on Auckland Harbour Bridge, which causes greater damage and weakens the structure.
- **Tidal impact:** High tides at Shoal Bay can impact highway travel times particularly between Tank Farm Culvert and Esmonde Road interchange.

Future considerations

The future considerations relating to corridor pressures, intervention triggers and appropriate levels of investment related to **Reliability and Efficiency** are as follows:

- **Public transport and active mode provision:** Continue to promote and provide for public transport and active travel modes to create an attractive and viable alternative to private cars. Provision of more bus priority measures will help ensure a more reliable service that is more attractive to customers. Incorporation of bus lanes/ bus ways and other priority measures into future development of the corridor will improve corridor capacity.
- **Increased use of ITS:** Consider increased use of ITS systems to manage flows and make best use of the existing asset. Explore opportunities to convey information to customers both before and during journeys to improve journey optimisation.
- **Investment in high quality assets:** High quality assets with longer operational lives reduce maintenance frequency thereby minimising the impact of maintenance on customer journeys.
- **Over-height vehicle detection and warning:** Continue to invest in over-height protection systems to prevent strikes, combined with detection and warning systems to alert drivers of both over-height and over-weight vehicles. This will help in the prevention of strikes and the associated costly delays and infrastructure repairs. Ongoing engagement with the heavy vehicle industry will continue to inform drivers of height restrictions and the need for loads to be measured before travel. Inclusion of load height measurement into load security checks before transport may reduce the incidence of bridge strike.
- **Severe Weather:** Improve forecasting of extremes of tidal and rainfall events to give improved notice of likely risks and effects on network reliability and efficiency.

Safety

Collective risk

Collective risk is rated medium-high or high along the corridor. There are significant high risk sections along the corridor, including SH1 from Constellation Drive to halfway between Auckland CBD and Manukau. SH20 has a large high-risk section between New Windsor and Manukau. SH22 to Pukekohe is rated high for collective risk.

Personal risk

The majority of the corridor is rated low personal risk, including the entirety of SH1, SH16, SH18, SH20 and SH20A and S20B. SH22 is rated medium-low personal risk.

Star rating

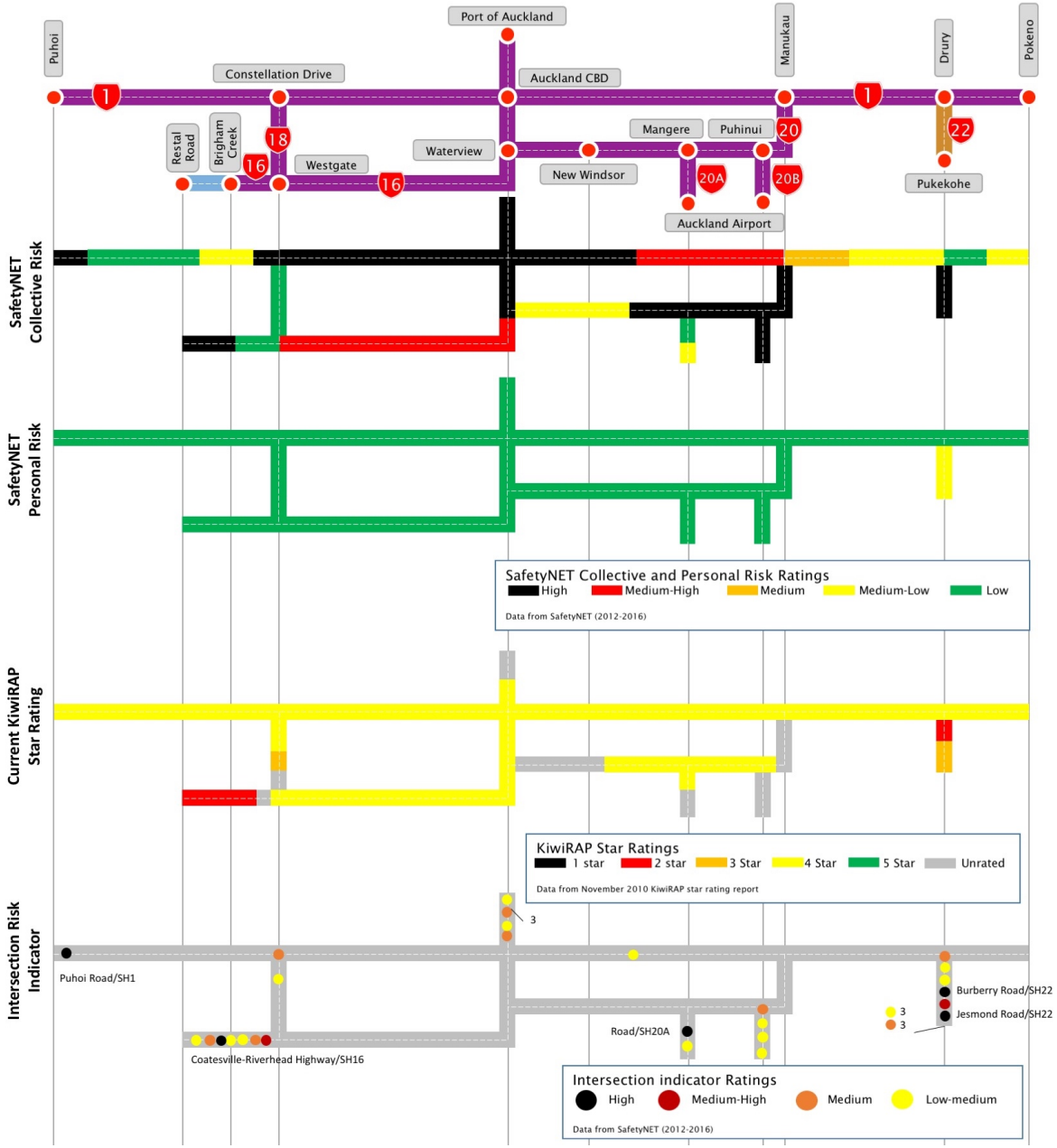
Star rating along the corridor is mostly 4-star. There is a section of SH16, from Kumeu to Brigham Creek which is rated 2-star. There are large sections of the corridor unrated for KiwiRAP star ratings.

The entire corridor apart from SH22 is a National High-Volume Road, with a target KiwiRAP 4-star standard.

Intersection risk indicators

There are five high-risk intersections along the corridor, two on SH22, and one each on SH1, SH16 and Sh20A. Intersections with low-medium, medium, and medium-high risk intersections are located around busy urban areas.

Figure 21 - Safety



Pressures

The pressures on the corridor that are resulting in increased demand or a reduction in levels of service for Safety are as follows:

- **Transition of standards:** The transition from Motorway standards and speeds at off ramps and local roads can create confusion. Customers are slow to transition from motorway speeds when exiting motorways. This is particularly prevalent on rural parts of the corridor such as SH16 at Brigham Creek and SH22 as well as the 50km/h urban section of SH16 towards the Port of Auckland.
- **Excess speeds and poor geometry of SH22:** As a rural highway, SH22 has issues resulting from poor sightlines and geometry, resulting in a poor safety record.
- **Mix of agricultural activities with traffic on SH22:** Due to the proportion of agricultural vehicles used along the corridor, together with a lack of pull off places or slow vehicle bays, drivers may be surprised by sudden low moving vehicles, or stock movement along the corridor, particularly in winding areas where visibility is restricted.
- **Aquaplane risk:** The presence of surface water during high intensity rainfall can cause aquaplaning, unless travel speeds are lowered.

Auckland's expanding cycling and walking network – the Upper Queen Street, Grafton Gully and Beach Road link

Future considerations

The future considerations relating to corridor pressures, intervention triggers and appropriate levels of investment related to Safety are as follows:

- **Clear speed notification and signage:** Investigate options to provide speed triggered VMS signs at key off-ramps and sections where speed is identified as an issue.
- **Safety improvements:** Continue to work closely with the Road Safety Alliance to identify opportunities to improve safety on SH22 and SH16 and other hotspots.
- **Speed limits monitoring and review:** Proposed 110 km/hr speed limit on some sections of the corridor may pose higher collective risk to road users.
- **Real Time VMS:** Improve VMS notification to advise of excess surface water during high intensity events.

People, places and environment

Natural environment

The corridor is defined by the Bombay Hills to the south, the narrow isthmus between the Manukau and Waitemata Harbours, the rising hill country north of Orewa, and the Waitakere Ranges and rural landscape to the west. With geographic connections to the Pahurehure Inlet (Manukau Harbour) in the south and Hauraki Gulf to the north and east via harbours and waterways, interfaces include the upper Tamaki River (at Curlew bay), Waitemata Harbour and Shoal Bay north and west of the CBD, upper Lucas Creek, Upper Otanerua, Waiwera River, and Puhoi River.

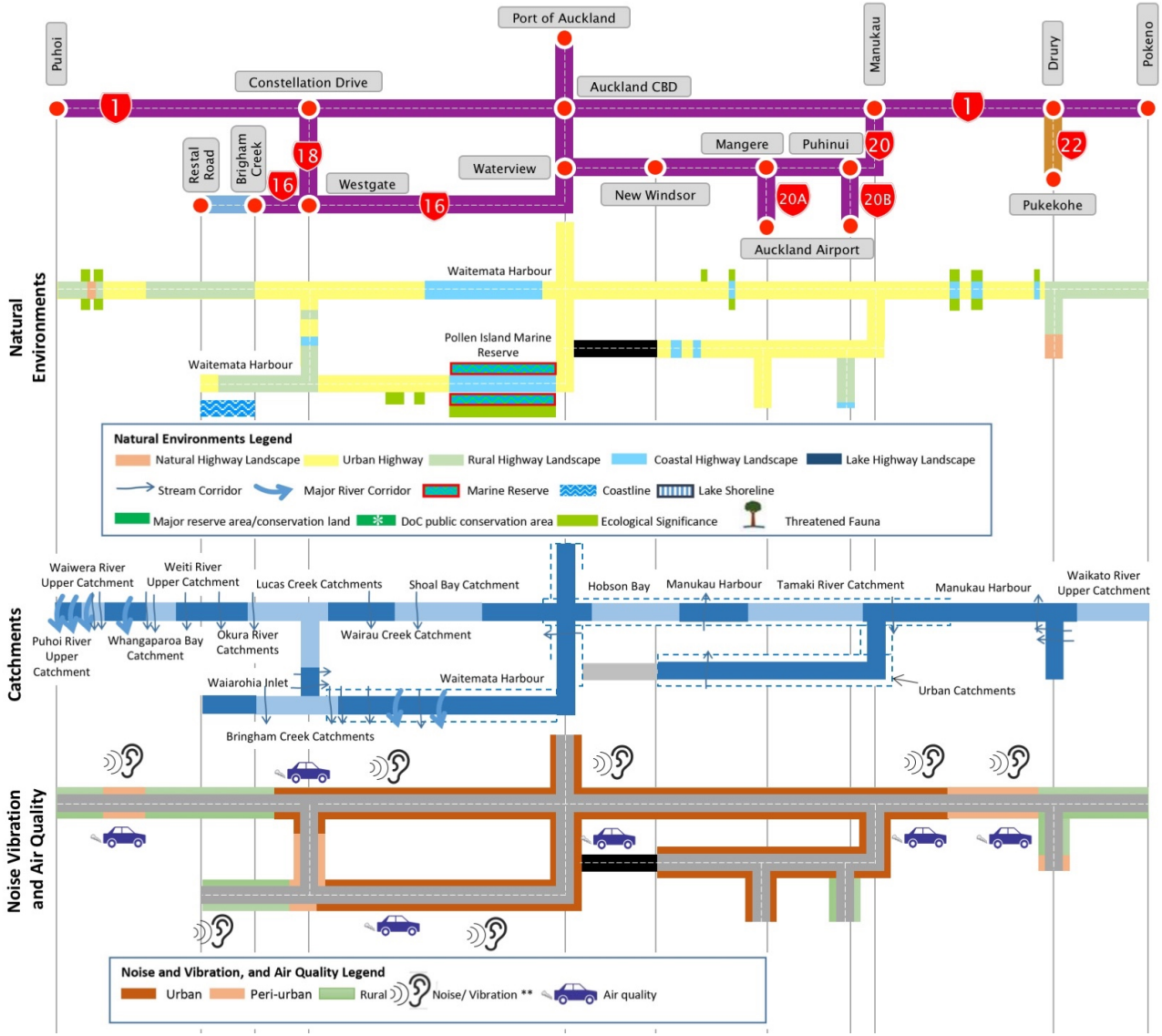
The corridor is characterised by its predominately urban nature, with peri-urban and rural environments in the southern, northern, and north western extremes. A number of sites of ecological significance also border the corridor including Motu Manawa – Pollen Island Marine Reserve (SH16), Lava forest (CMJ), Smiths Bush, Upper Lucas Creek catchment, and the Northern Gateway gumland forest remnant.

Stormwater within most of the motorway is actively captured and treated, however there are sections of the highway – both urban and rural, with no stormwater management.

Noise, vibration and air quality

A number of properties and sensitive receptors are located close to the motorway network through the corridor. Areas of particular note include Forrest Hill on the North Shore, the Central Ellerslie area, Papatoetoe, and Papakura. Noise and vibration mitigation has been utilised along parts of the corridor and is monitored periodically. New highway sections have implemented noise and vibration mitigation.

Figure 22 – People, places and environment 1



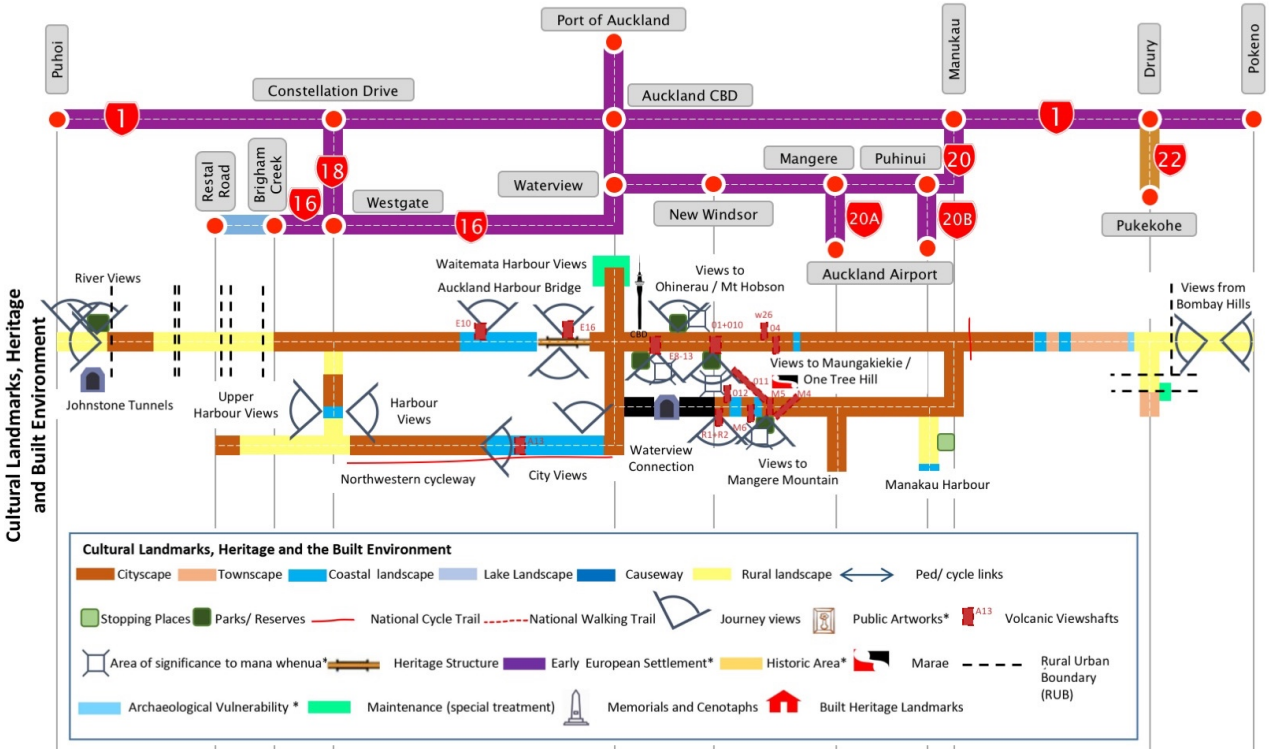
Cultural landmarks, heritage and built environment

The motorway corridor is part of the cities everyday landscape and experienced by commuters (cars, buses, cyclists and pedestrians), tourists, and commercial operators.

Large volumes of traffic and a residential and public realm interface with the city and suburbs, contributing to the amenity and quality of the corridor environment. Surrounding structures and landscape are a key part of how the corridor is planned, designed, implemented, operated, and maintained.

The Auckland urban area has a large concentration of culture and natural features including volcanic cones, built heritage sites, and coastal landscapes.

Figure 23 – People, places and environment 2



Pressures

The pressures on the corridor that are resulting in increased demand or a reduction in levels of service for **People, Places and Environment** are as follows:

- **Biodiversity and biosecurity:** Work in this area, including pest plant removal, is a major investment along the corridor. This work is prioritised along the urban areas and focussed on urban Customer Level of Service which has led to rural areas having less tailored maintenance to address biodiversity, for example north of Orewa.
- **Stormwater assets and management:** Technology has improved maintenance treatment and efficiency, increasing disposal costs. Overall the resources required to operate and maintain existing assets is increasing, as well as the requirement to meet environmental standards. The wide range of differing systems across the network exacerbates this. There are also parts of the corridor with no stormwater management and development of these sections will increase maintenance.
- **Aging infrastructure:** Aged infrastructure requiring upgrade or renewal triggers approvals and environmental compliance costs. For example, culvert renewals would likely need to address fish passage and potentially increased capacity.
- **Growing population:** Given the urban context and growing population, much of the corridor is in close proximity to residential receivers. As such, noise and vibration issues will continue to be highlighted by the communities along the corridor.
- **Special infrastructure management:** There is special noise, vibration and air quality infrastructure, such as tunnel ventilation systems which have high maintenance requirements to ensure they are effectively managing human health risks.
- **Contribution to the built environment:** A greater expectation from the community and Council on the highway network in understanding how it contributes to the built environment, amenity, and quality of communities.
- **Preservation of heritage sites:** A great expectation from Heritage New Zealand, Department of Conservation, and others on how historic and natural heritage features are managed both within maintenance programmes, and project development and delivery.
- **Commercial signage management:** Managing the pressure of commercial and retail signage along highway boundaries and potential cluttering this can cause, as well as the reverse sensitivity from future projects.
- **Consent Management:** There are multiple resource consents applying along the corridor requiring management. Conditions may vary according to the era of the works and consent regime that applied at the time.

Future considerations

The future considerations relating to corridor pressures, intervention triggers and appropriate levels of investment related to **People, Places and Environment** are as follows:

- **Biosecurity response:** Working with Council and DoC (where appropriate) and developing a corridor wide strategy to improve biosecurity considerations in maintenance activities will provide greater consistency in management practices such as the use of chemicals, plant-pest management and the level of services and amenity (for mowing).
- **Managing stormwater with the environment:** Aligning stormwater management with the receiving environment characteristics with Auckland Council to ensure that the level of treatment is aligned with the catchment management outcomes sought.
- **Improved biodiversity outcomes through strategy development:** Working with other agencies such as DoC and Auckland Council to determine where the greatest benefit can be gained through investment in planting, fish passages, and wildlife corridors for example may focus expenditure.
- **Increase scope of corridor works:** Treat any asset renewal or improvement as an opportunity to support the corridor amenity, built form, quality urban design, and landscape outcomes. This can support a sense of place, improve customer journeys, and help to achieve Auckland liveability visions.

Storm surge on Northern Motorway at Shoal Bay

Understanding the infrastructure assets

The following sections contain information about the condition and performance of the state highway assets within the corridor. This information is necessarily complex and therefore challenging to communicate simply. Every effort has been made to explain the base data inputs and what the information is describing in as simple terms as possible, however full comprehension does require some technical knowledge of the terms used.

Corridor asset base

The state highway system is a significant national asset, made up of 11,412 km of roads and associated assets. This corridor contributes approximately 410 km of road network which reflects 3.6% nationally. The total value of the assets along the corridor is $3,488M (excluding ITS, and, heritage and green assets).

The corridor assets have been divided into eight groups as shown in Figure 24 which directly support the access, reliability and efficiency, safety, resilience and people, places and environment outcomes on the network.

Asset condition and performance summary

The infographic shows the summary score the entire corridor achieves for each of the eight measures used in this document to assess the condition and performance of the assets. These measures are assessed in more detail along the corridor in the following sections of the document.

Figure 24 – Corridor asset base

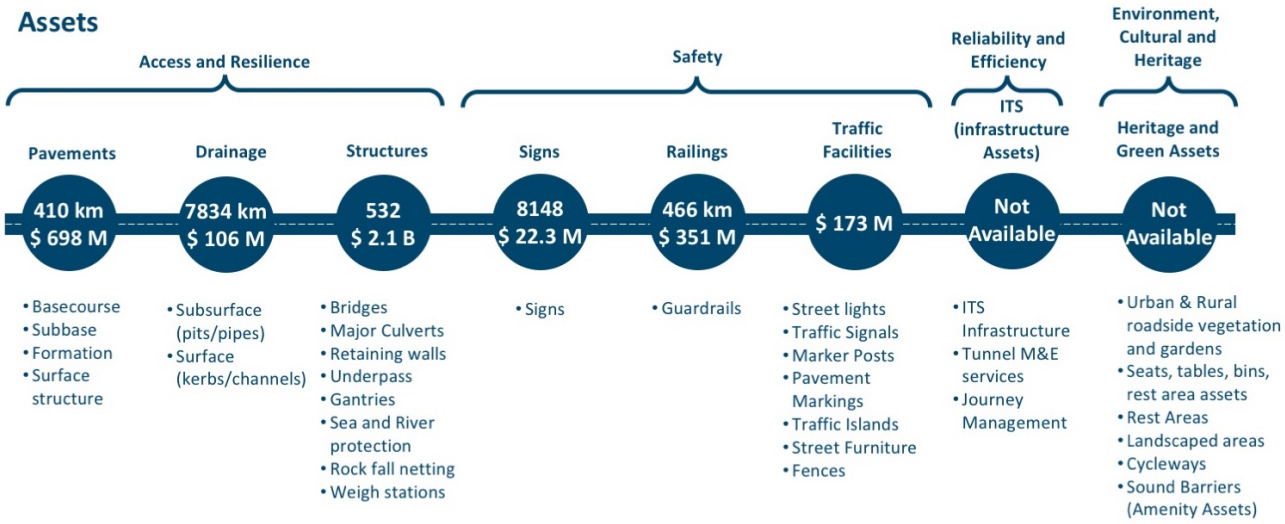
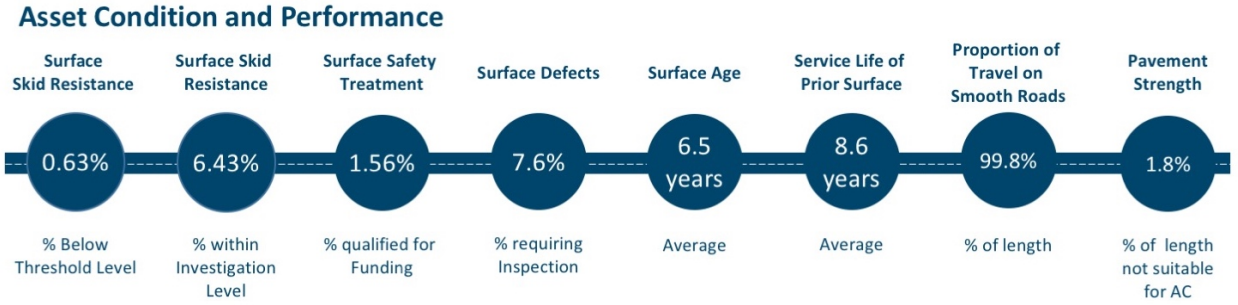


Figure 25 – Summary asset condition and performance



Asset condition and performance

Surface skid resistance

The infographic shows the proportion of the Route Section, as a percentage, that falls within the two levels of either threshold limit or investigation level. The change in Surface Skid Resistance infographic shows the change in the levels from the 2014 survey to the 2016 survey, as either an improvement or degradation.

The information is derived from inspection data that records a value every 10m in each direction. Each 10m length is rated as to whether it is within one of the bands: below threshold limit; within investigation limits; or above Investigation limits. The proportion is then the number of 10m lengths in that section as a percentage of all 10m lengths in that section.

Two sections of SH16/19 and SH22/0 show significant levels of surface skid resistance below the threshold limit. Both these sections are in rural environs and have relatively low traffic compared to the remainder of the corridor. These two sections also show significant levels of surface skid resistance within the investigation limits.

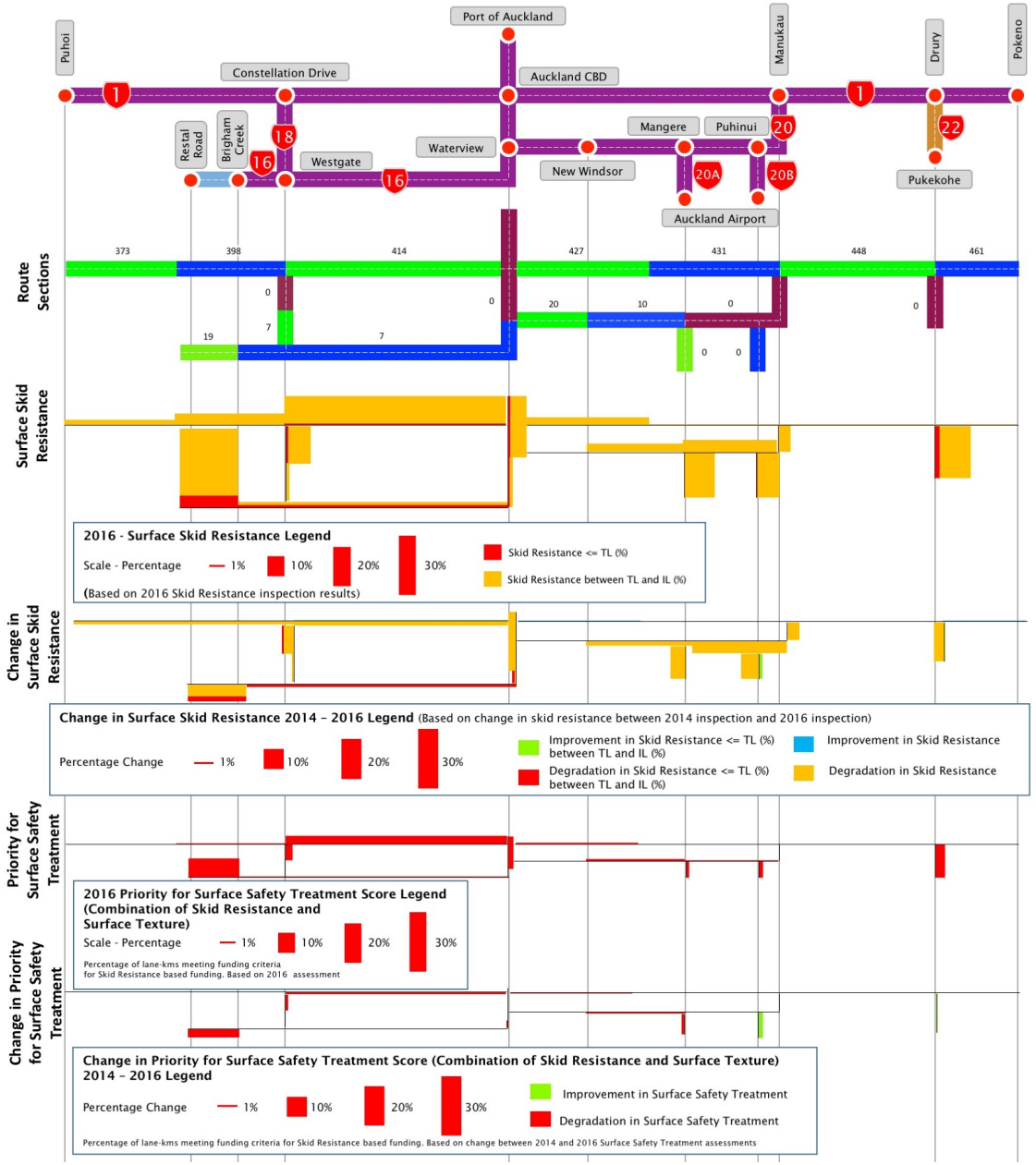
Priority for surface safety treatment

The infographics show the proportion of the Route Section that has a Priority for Surface Safety Treatment (Skid Assessment Length) that would qualify for funding, i.e. a score >140. The second infographic shows the change in these levels from the 2014 survey to the 2016 survey, as either an improvement or degradation.

Taken from inspection data that is normally recorded every 100m in each direction. Each 100m assessment length is rated and if it achieves a score over 140 it qualifies for funding. The proportion is then the length of route section that qualifies for funding as a percentage of the total length of that section.

A low percentage (1.56%) of the corridor achieved Skid Assessment Length that qualifies for funding. This equates to only 9.4 lane-km of the 803 total lane-km of the corridor. While insignificant the sections with the highest priority for surface safety treatment qualifying for funding are SH1N/414, SH16/19 and SH22/0. SH16/19 showed the largest increase in priority over the last 3 years.

Figure 26 – Asset condition 1



Surface defects

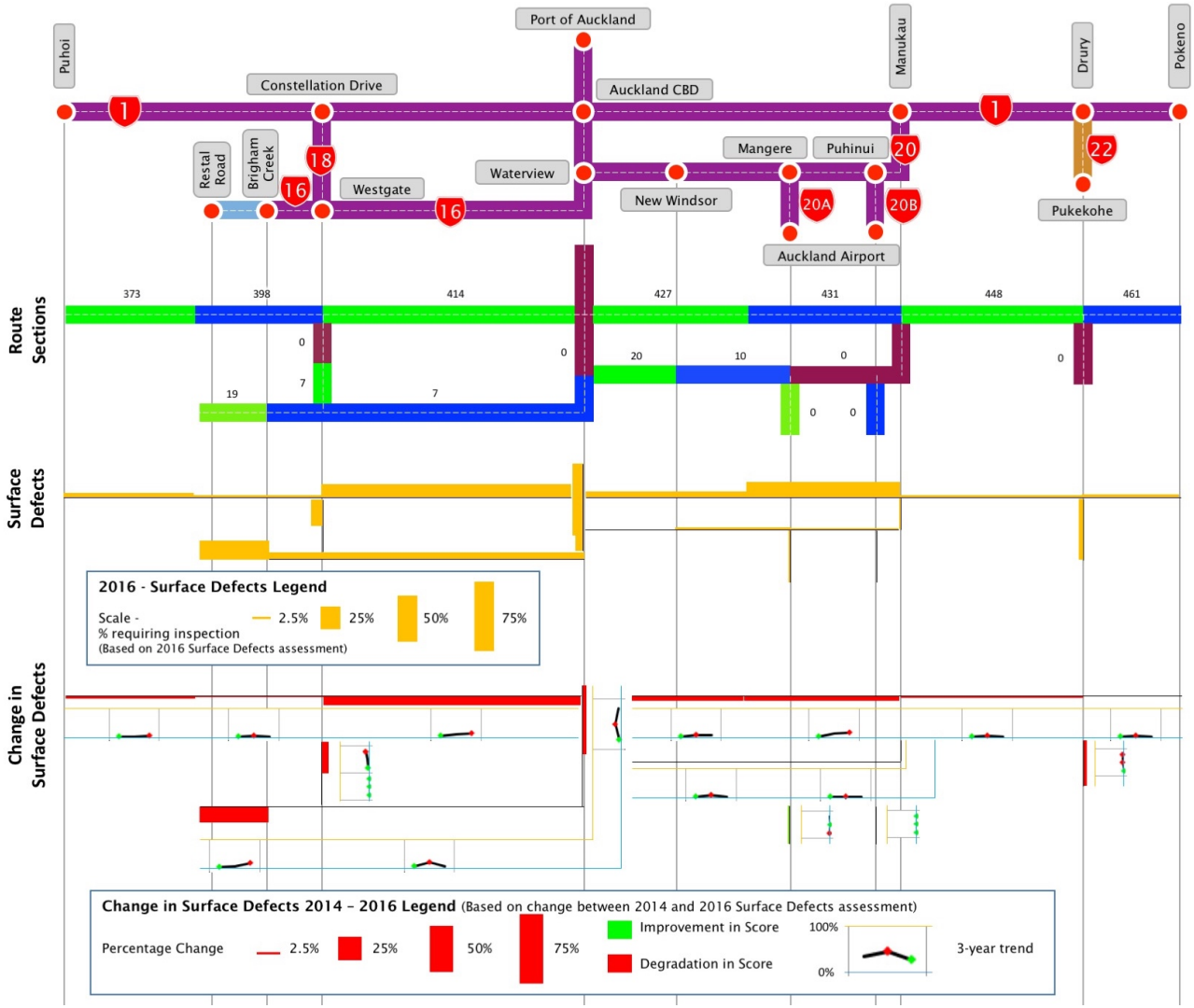
The infographics show the proportion of the Route Section that has a Surface Defects (100m Priority) score that would signal the need for further investigation, i.e. a score >20. The second infographic shows the change in these levels from the 2014 survey to the 2016 survey, as either an improvement or degradation, as well as the three-year trend.

The Surface Defects score is made up of a number of measures which all contribute to the overall score including: roughness, rutting, shoving, flushing, and design life. Any 100m section achieving a score over a total of 20 rates as flagged for inspection. The proportion is then the length of corridor that is flagged for inspection as a percentage of the total length of that section.

Overall, 7.4% of the corridor achieves a score above which inspection is required, making this the best performing corridor nationwide. Sections with significant lengths of surface requiring inspection include: SH1N/414, SH1N431 and SH16/19. These sections also show a significant level of degradation in score over the last three years.

It should be noted that the infographics shown do not include the results obtained for on and off ramps, only the main carriageway. As ramps are often under more stress it is expected that the results for surface defects on ramps would indicate a condition worse than the associated carriageway in most cases.

Figure 27 – Asset condition 2



Surface age

The infographic shows the weighted average age of road surface, and the proportions of surface age that fall within the three age bands.

The base data is all the seal lengths and their age from RAMM. Then a weighted average is then calculated. Overall, all sections add up to 100%. The proportion is the length of corridor in a particular age band as a percentage of the total length of that section.

The sections of corridor with the oldest age profile are SH16/7 between Waterview and Brigham Creek, and SH18/0 between Constellation Drive and Greenhithe.

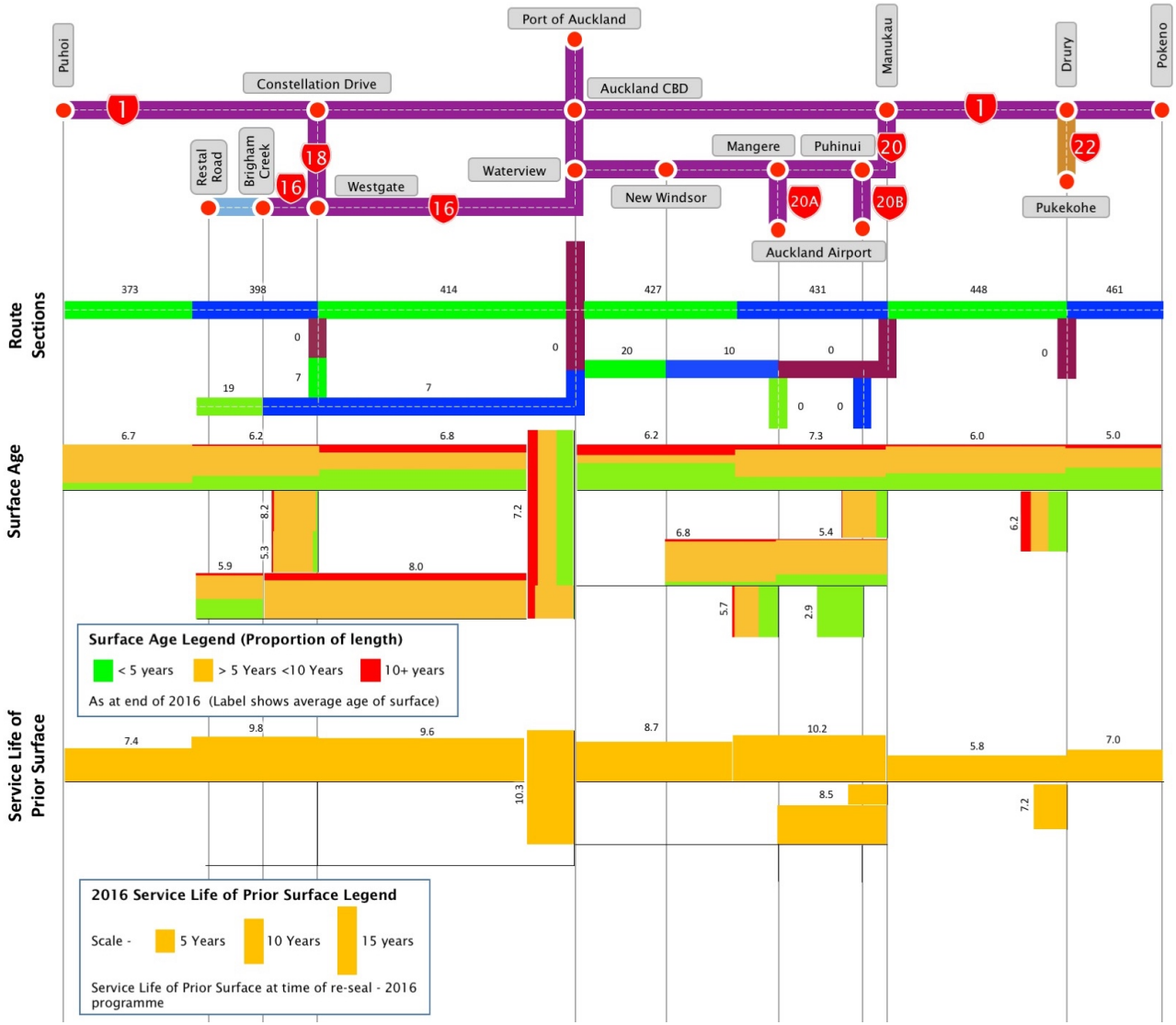
It should be noted that significant portions of SH16/0 have been resurfaced since the data for this infographic was obtained.

Service life of prior surface

The infographic shows the weighted average age achieved for the sections of road surface that were resurfaced in the last financial year (2015-16). The infographic only shows sections where re-surfacing work was undertaken in the 2015/16 season. The value is derived from the weighted average age of the sections of seal that were overlaid by a new first coat seal. This is a standard ONRC measure.

Overall the re-surfaced sections achieved an average service life of 8.6 years, with sections 16/0 between Port of Auckland and Waterview and SH1N/431 between Newmarket and Manukau achieving a service life in excess of 10 years.

Figure 28 – Asset condition 3

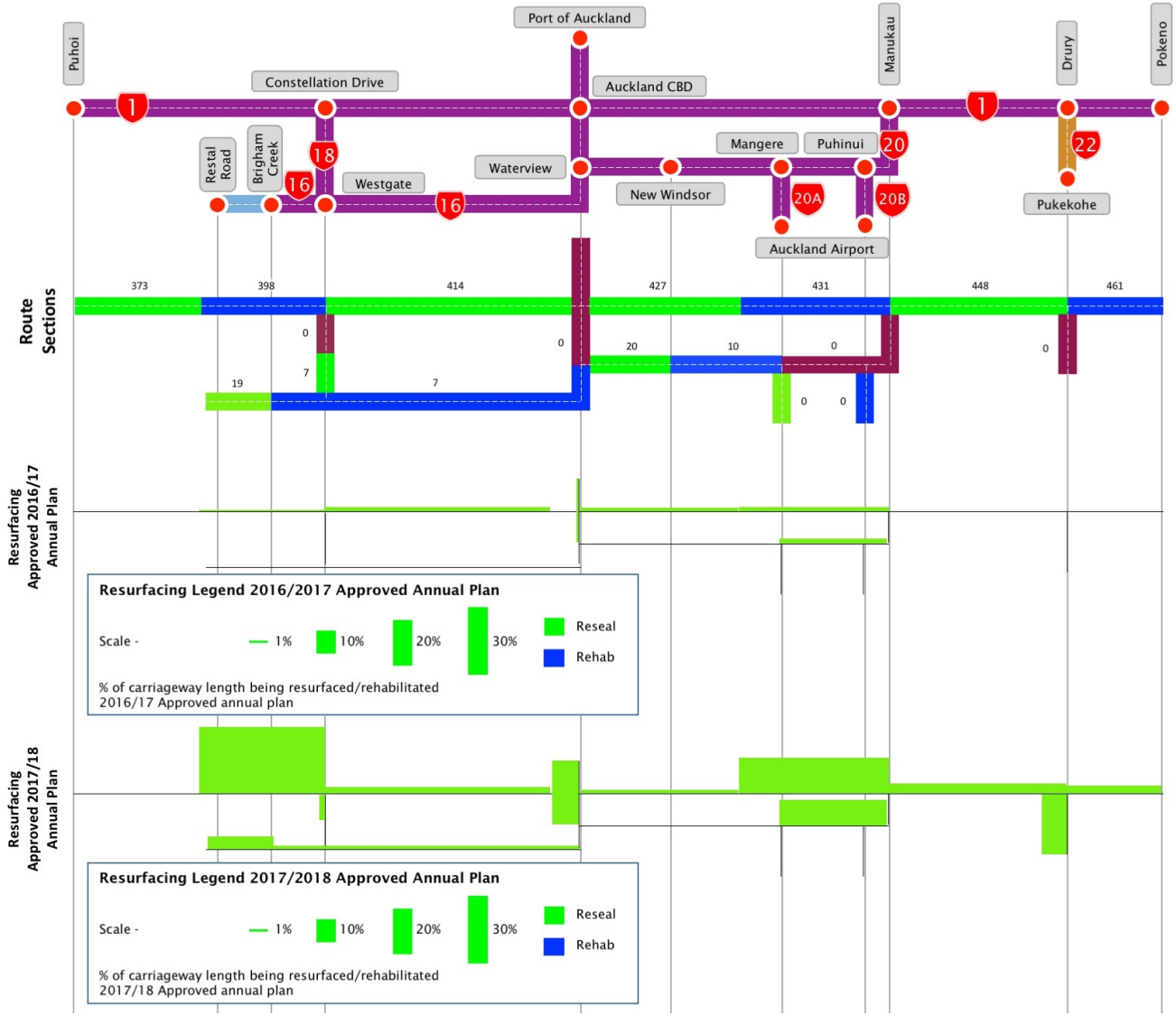


Resurfacing

The infographics show the proportion of Route Sections planned for resurfacing in the 2016/17 and 2017/18 approved annual plans, confirmed through the RAPT tour, as an indication of the response to the surface condition described previously, and current surface condition.

The major resurfacing works are planned for sections SH01N/398 between Silverdale and Constellation Drive, and, SH01N/431 between Newmarket and Manukau.

Figure 29 – Asset condition 4



Proportion of travel on smooth roads

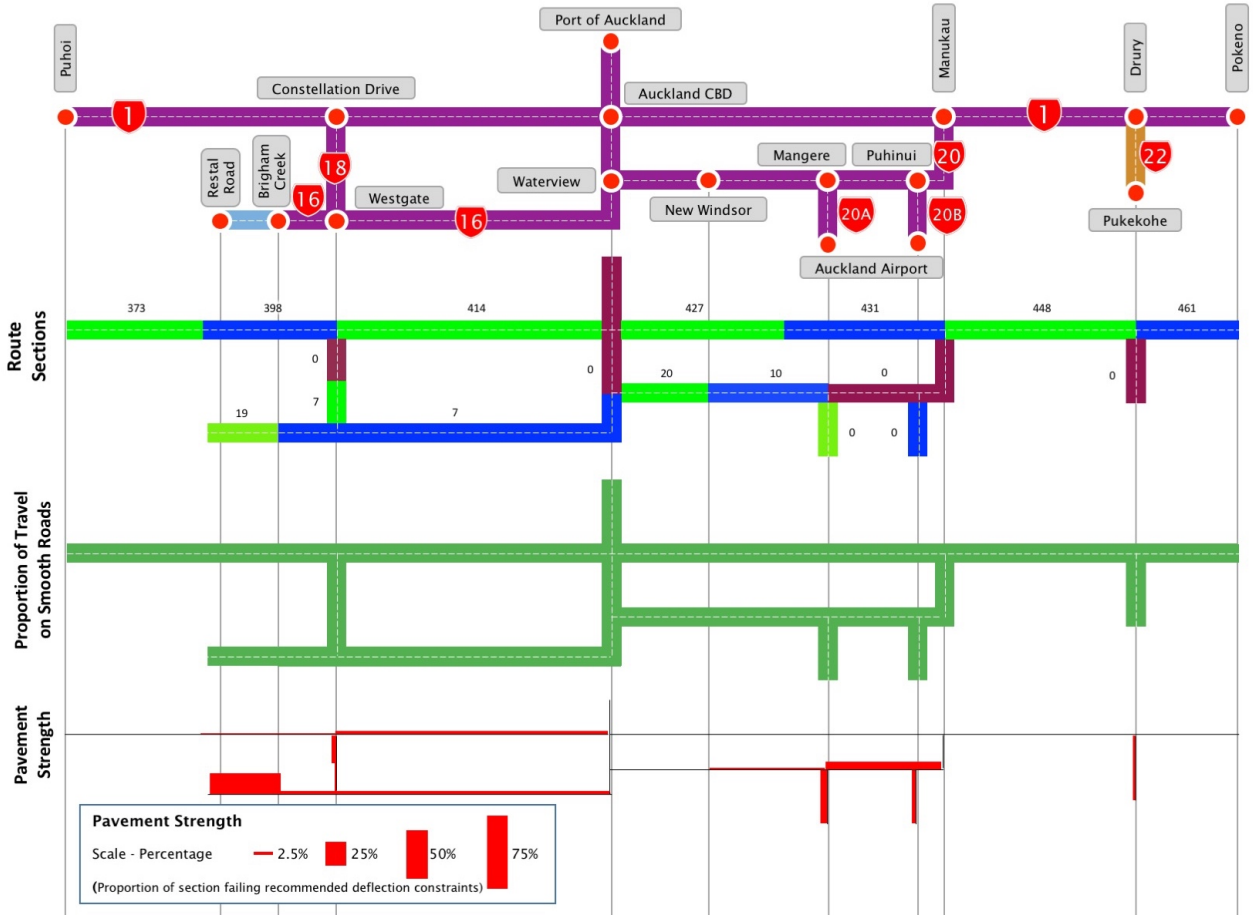
The infographic shows whether the route section passes the ONRC standard for Proportion of Travel on Smooth Roads (Smooth Travel Exposure). 97% is the ONRC target for proportion of travel on smooth roads. The infographic simply shows whether the route section achieves this level or not.

Pavement strength

Recommended deflection constraints for thin asphaltic surfaces is used as a measure of pavement strength. The infographic shows the proportion of the Route Section that fails to achieve the recommended deflection constraint for the classification of road, based on lane-km.

The sections of corridor with the highest proportion of pavement failing to meet the deflection constraints occur at SH16/19 northwest of Brigham Creek.

Figure 30 – Asset condition 5



Asset condition and performance pressures

The pressures on the corridor that are resulting in increased demand or a reduction in levels of service for **Asset Condition and Performance** are as follows:

- **Short working window:** The work window to do rehabs is not long enough to allow for the laying of a thickness of AC required for a 25-year design life. Approach then is a trade-off between surface treatment to obtain a viable pavement and the time available to undertake work.
- **Night works:** The only possible window to undertake work is at night, so apart from emergency response all maintenance works are done as night works only.
- **Overlays and minimum heights:** Barrier heights that cannot be easily raised, and other structures that rely on minimum height clearances, mean that the option to keep building layers is not available without compromising minimum heights for barriers and clearance heights for overhead structures.
- **Epoxy modified OGPA:** Epoxy modified OGPA is being used on some sections to achieve a longer surfacing life and make network more available (less closures for resurfacing).
- **Street lighting:** Replacement of traditional sodium vapour lamps with LEDs should result in reducing the number of closures to undertake lamp replacements.
- **Drainage:** Climate changes include more intense rain events, which is a pressure on the capacity of the stormwater assets and widening the impact of flooding on the corridor
- **Incident response:** The Auckland motorway network is vital to the economy of Auckland and New Zealand. Keeping the motorways operational requires a rapid and effective response to issues in real-time.
- **Over height vehicles**: Over height vehicles having bridge strikes have the potential to cause catastrophic failure of structures and the resulting major disruption to the network.
- **Age of infrastructure:** design standards have improved over time and the older parts of the corridor are more vulnerable than the newer sections, such as embankment and culvert designs.

Asset condition and performance future considerations

The future considerations relating to corridor pressures, intervention triggers and appropriate levels of investment related to **Asset Condition and Performance** are as follows:

- **New surface treatments:** Consider the use of products that use a very stiff binder which allows for thinner layers of AC, and longer achievable surface lives.
- **Line marking and autonomous vehicles:** With the move away from painted lane markings, that have a relatively short life on high volume highways, to raised markers, may have a detrimental impact on the emerging technology being used in semi-autonomous and in future autonomous vehicles. Will need to keep a watch on technological change and uptake and respond accordingly. Auckland will need to be an early adopter of the technology because of the large number of trips undertaken that include the motorway network.
- **Intensification of heavy vehicles:** As consequence of urban growth the nature of traffic will change with more heavy vehicles including buses as more commuters transition to public transport.
- **All day peak:** Due to urban growth, the classic morning and afternoon peaks are expanding to the point where there is an all-day peak. Capital expansion projects within the urban constrained environment are not keeping up with the increase in traffic volumes. Need to consider changing the nature of the network to remove roadside assets that require regular maintenance requiring lane closure, such as grass berms and medians.
- **Culvert Criticality:** Large culverts need to be criticality rated with inclusion of current condition data.

Investing in the corridor

The **Customer Levels of Service** shapes our response to our investment in maintenance, renewals and improvements. The NZ Transport Agency must consider the impact we have on our customers, the environment, communities, iwi, and the NZ economy in everything we do.

Decisions must be evidence based, informed and transparent with investment targeted to the right treatment, in the right place, at the right time while considering a range of competing priorities for investment. This requires analysis of various alternatives and options and expertise in applying appropriate judgement in collaboration with our service delivery partners.

Right treatment, right place, right time

A range of factors have been considered to determine the best point at which to intervene with maintenance and/or renewal treatments and improvements along the corridor.

Intervention works will be programmed to ensure:

- The right treatment,
- At the right place, and,
- At the right time.

Interventions will:

- Be based on minimising whole of life, whole of system costs and be underpinned by facts derived from enhanced asset information and modelling
- Define the most appropriate approach to asset maintenance, inspection and renewal, supported by reliability, availability, maintainability and safety specifications
- Use a risk-based approach to determining intervention requirements to specified levels of reliability
- Use resilience requirements to a specified range of weather conditions, considering climate change
- Define how sustainable development requirements are to be addressed

Summary investment

The proposed investment in the corridor is as follows:

Table 1- Summary corridor investment ($000)

Outcome	Expenditure Category	2018-2021	2021-2024	2024-2028
Access and Resilience	Maintenance & Operations	$82,835	$91,730	$127,430
	Renewals	$95,914	$117,928	$128,103
	Improvements	$9,300	$63,000	$250,000
Reliability and Efficiency	Maintenance & Operations	$70,763	$75,901	$110,153
	Renewals	$7,997	$14,659	$13,390
	Improvements	$2,120,107	$1,283,165	$4,779,371
Safety	Maintenance & Operations	$50,730	$55,675	$86,537
	Renewals	$39,540	$40,198	$48,545
	Improvements	$81,092	$35,100	$77
People, places and Environment	Maintenance & Operations	$29,371	$31,257	$47,266
	Renewals	$5,505	$6,190	$8,637
	Improvements	$65,220	$0	$0
	Total	**$2,658,374**	**$1,814,801**	**$5,599,510**

Figure 31 – Corridor investment

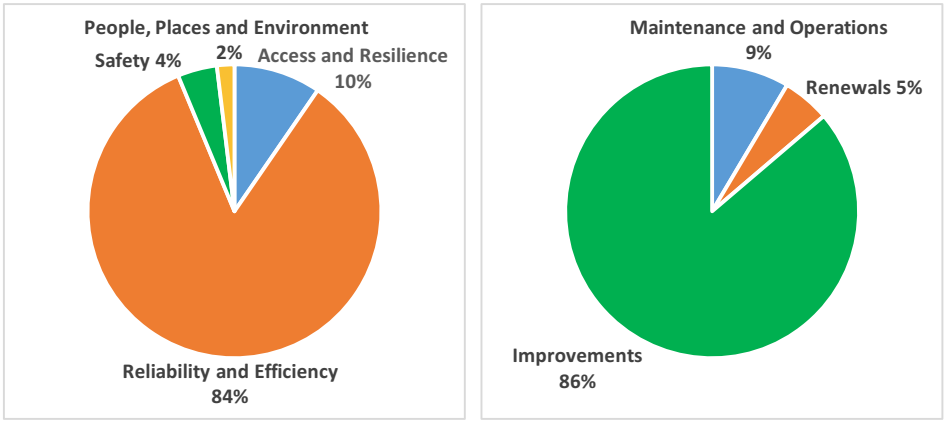


Table 2 - Summary investment by work category ($000)

Outcome	Work Category		2018-2021	2021-2024	2024-2027
Access and Resilience	111	Sealed Pavement Maintenance	$4,819	$5,515	$8,715
	112	Unsealed Roads	$25	$29	$43
	113	Drainage Maintenance	$1,207	$1,412	$2,127
	114	Structures Maintenance	$44,918	$50,160	$65,128
	121	Environmental Maintenance	$5,048	$5,877	$8,256
	122	Traffic Services Maintenance	$101	$402	$605
	124	Cycle Path Maintenance	$69	$78	$117
	151	Network & Asset Management	$21,397	$22,696	$34,087
	161	Property	$5,252	$5,560	$8,351
	211	Unsealed Road Metalling	$73	$81	$122
	212	Sealed Road Resurfacing (excl. surface skid resistance)	$51,865	$69,210	$52,463
	213	Drainage Renewals	$5,741	$6,110	$8,444
	214	Pavement Rehabilitation	$18,308	$22,443	$33,455
	215	Structures Component Replacements	$18,213	$18,321	$30,954
	222	Traffic Services Renewals	$1,715	$1,764	$2,665
	321 - 341	Improvements	$9,300	$63,000	$250,000
Reliability and Efficiency	121	Environmental Maintenance	$12,960	$13,801	$19,871
	123	Operational Traffic Management	$46,699	$50,907	$73,493
	151	Network & Asset Management	$10,141	$10,183	$15,274
	161	Property	$963	$1,009	$1,516
	221	Environmental Renewals	$7,997	$14,659	$13,390
	321 - 341	Improvements	$2,120,107	$1,283,165	$4,779,371
Safety	111	Sealed Pavement Maintenance	$5,080	$5,656	$8,924
Safety	112	Unsealed Roads	$24	$27	$40
	113	Drainage Maintenance	$3,788	$4,033	$6,073
	114	Structures Maintenance	$3,382	$3,913	$6,198
	121	Environmental Maintenance	$427	$732	$1,099
	122	Traffic Services Maintenance	$13,125	$13,827	$20,928
	124	Cycle Path Maintenance	$10	$13	$20
	151	Network & Asset Management	$22,646	$25,038	$39,597
	161	Property	$2,248	$2,436	$3,658
	212	Surface Skid Resistance	$4,422	$5,168	$7,762
	214	Pavement Rehabilitation	$3,185	$6,105	$7,081
	215	Structures Component Replacements	$9,872	$8,017	$8,839
	222	Traffic Services Renewals	$22,061	$20,907	$24,862
	321 - 341	Improvements	$81,092	$35,100	$77
People, places and Environment	111	Sealed Pavement Maintenance	$467	$492	$749
	121	Environmental Maintenance	$26,064	$27,766	$42,013
	151	Network & Asset Management	$2,279	$2,407	$3,614
	161	Property	$562	$592	$890
	221	Environmental Renewals	$5,505	$6,190	$8,637
	321 - 341	Improvements	$65,220	$0	$0
		Total	**$2,658,374**	**$1,814,801**	**$5,599,510**

In future, the Puhoi to Warkworth PPP will manage the new RONS based on a fixed lump sum fee for the first 25 years of its existence from 2021. The new highway when completed will form part of this corridor, as ultimate responsibility for it will vest with the Auckland Motorway Alliance.

Investing in access and resilience

Operations and maintenance

The main areas of investment to provide and preserve access and resilience are drainage maintenance, sealed road surfacing and structural component replacements and vegetation control. An adjusted focus toward reactive maintenance has proven inefficient because of the cost and impact of accessing the corridor.

Maintenance hot spots

The following maintenance 'hotspots' require additional monitoring or cause an increased maintenance burden along the corridor:

- **Climate change** is having the effect of causing more frequent and higher severity weather events. This is increasing the need to be proactive in preparing for these events when they occur, and the clean-up required following severe storm events. As such a number of sites along the corridor are susceptible to flooding or storm surge of harbours.
- **Bridge strikes:** Proactive action is taken through detectors to attempt to prevent strikes. Response plans are in place to respond quickly if these do occur. Working with Ports to address over-height issues at source. Also partnering with National Recovery Alliance to provide heavy vehicle towing services when required.

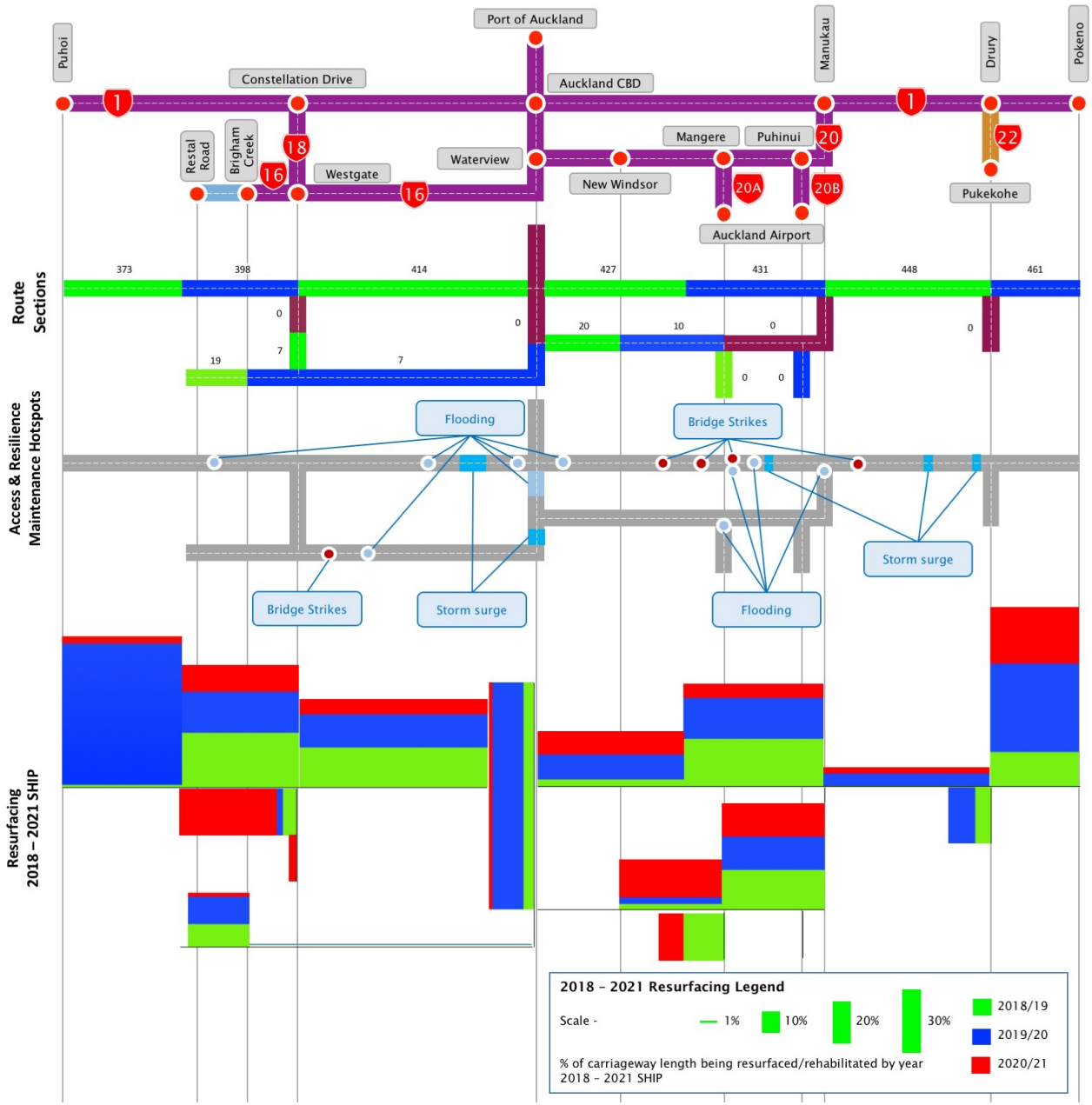
Renewals

Resurfacing

The infographic shows the proportion of route section by carriageway length planned for resurfacing within the period 2018/19 to 2020/21, the three-year span of the SHIP. This is also broken down in to the individual years to indicate the timing of expenditure over the three-year period.

Significant investment in resurfacing is planned for sections: SH1N/373 north of Silverdale, SH1N/461 south of Drury, and SH16/7 between Waterview and Brigham Creek.

Figure 32 – Access and resilience investment



Structure renewal

The renewal investment infographic shows the planned bridge replacements along the corridor. Two bridges are planned for replacement due to asset condition, at a total estimated cost of $4.3M.

Improvements

Planned

There are no currently planned access and resilience related improvements underway on this corridor.

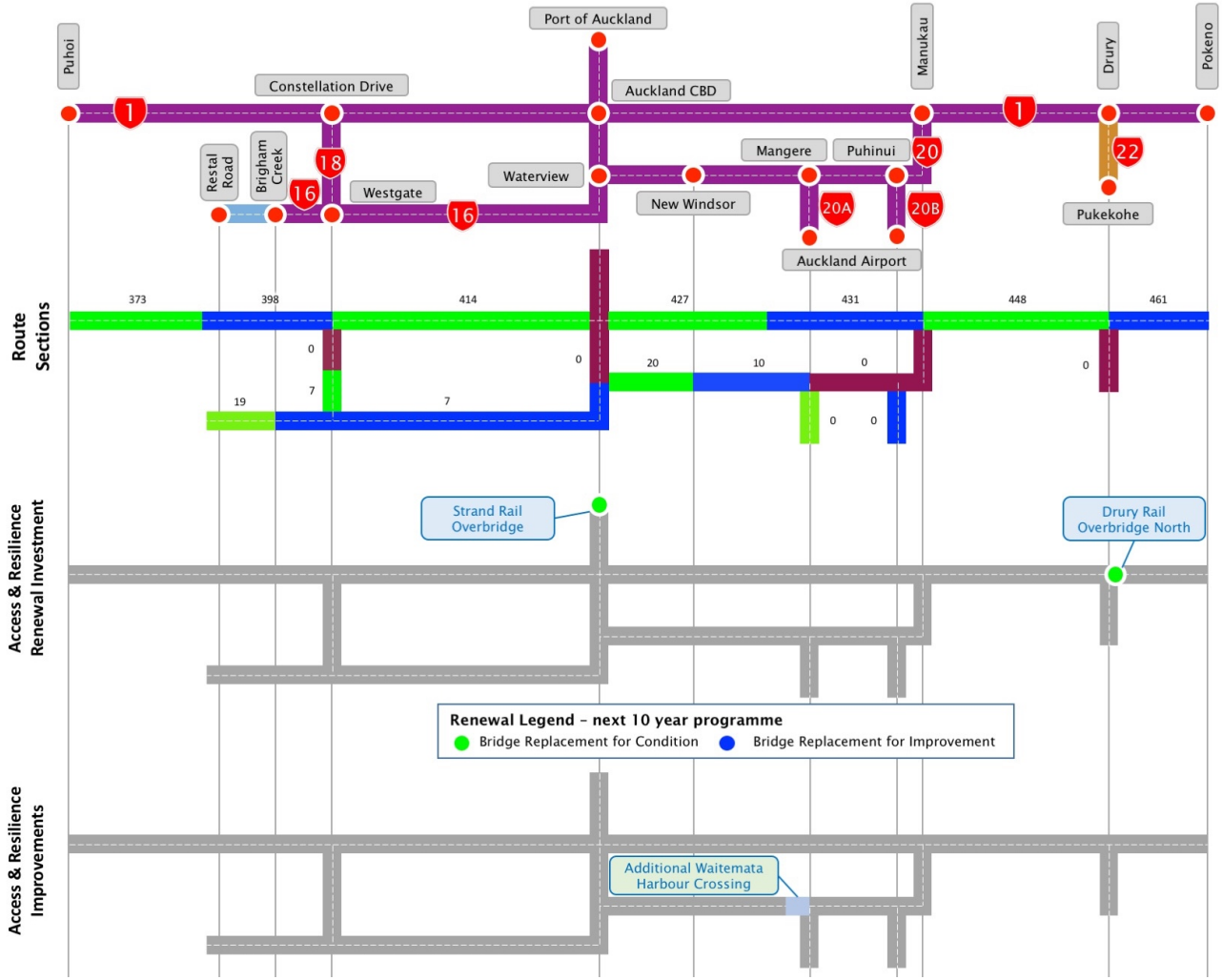
Draft Regional Programme considered for SHIP

The following table shows the list of projects being considered through the Draft Regional Land Transport Programme though the SHIP, and cover the next 10 years.

Table 3- Draft regional programme considered for SHIP

Project	Funding Status	Description
Additional Waitemata Harbour Crossing		This project aims to future-proof an additional road & rail transport crossing across the Waitemata Harbour with connections to inner city and Northwestern & Southern Motorways.

Figure 33 – Access and resilience investment 2



Investing in reliability and efficiency

Operations and maintenance

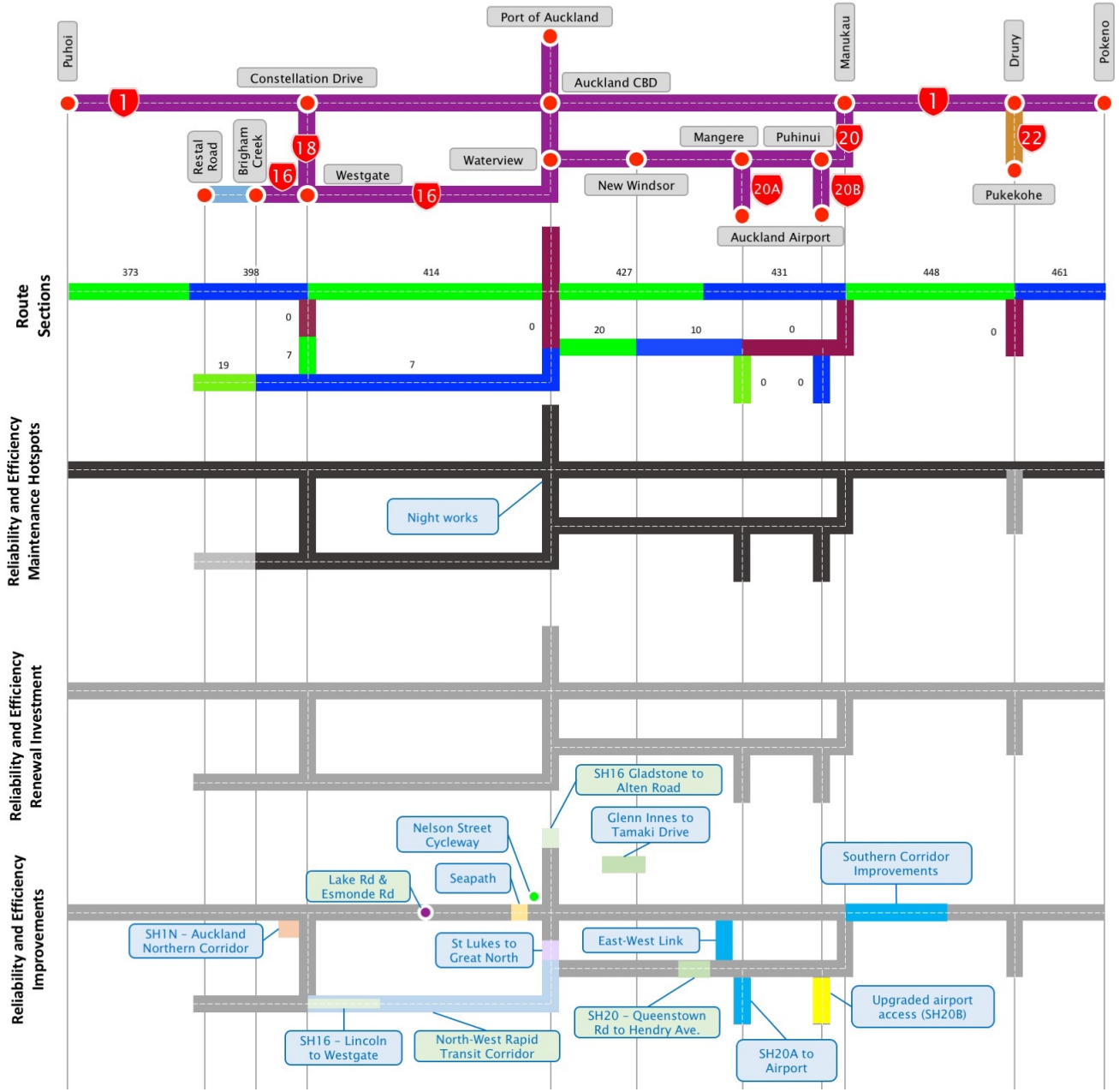
The main areas of investment to provide and preserve reliability and efficiency are environmental maintenance through keeping potential obstructions clear of the highway, wayfinding signage, and operational traffic management.

Maintenance hot spots

The following maintenance 'hotspots' require additional monitoring or cause an increased maintenance burden along the corridor:

- **Night works:** Due to the critical nature of the majority of the corridor, and the need to ensure minimal disruption, night works are almost exclusively used for planned works.
- **SH16:** SH16 is outside of management of AMA, but has outgrown itself and is highly sensitive to incidents and delays.

Figure 34 – Reliability and efficiency investment



Renewals

There are no, reliability and efficiency related renewals planned for the corridor.

Improvements

Planned

The following projects are planned and underway. Details of the project progress can be found on the Transport Agency website at: https://www.nzta.govt.nz/projects/

SH20A – SH20 to Airport

Description: SH20A is the primary route to and from Auckland Airport and forms a strategic link between the Western Ring Route (SH20 and SH16), the Airport Business District and the greater Auckland area.

SH1N – Southern Corridor Improvements

Description: The Southern Corridor Improvements Project covers the stretch of Southern Motorway (SH1) from the SH20/SH1 connection at Manukau down to Papakura in the south. The Project includes additional lanes in both directions, upgraded Takanini Interchange and a 4.5km shared use pedestrian / cycle path.

SH16 – Lincoln to Westgate

Description: The SH16 Lincoln to Westgate project will improve the Northwestern Motorway between Lincoln Road and Westgate to support the expected growth in the western suburbs and increased traffic using the Western Ring Route. It is the final project to be completed as part of the SH16 Northwestern Upgrades.

Nelson Street Cycleway

Description: The Nelson Street Cycleway will link Upper Queen Street to Quay Street via the disused Nelson Street off-ramp. The proposed cycle route will also cater for walkers and connect to the Northwestern and Grafton Gully cycleways, providing easier and safer access to and from the city centre.

Seapath

Description: SeaPath is a proposed 3km walking and cycling path between Akoranga/Esmonde Rd in Takapuna and Northcote Point on the North Shore. It will provide safe and direct connections to local communities, destinations and recreational areas on the lower North Shore.

Glen Innes to Tamaki Drive Shared Path

Description: The project will provide a new shared path for walking and cycling between Glen Innes and Tamaki Drive. The 7km route will enable people to walk, run or cycle from the eastern suburbs to the city centre.

SH1N – Auckland Northern Corridor

Description: This project will provide better links for Northern Motorway (SH1) travellers in Auckland and improve transport options on the North Shore for freight, cars, pedestrians and cyclists. It includes a new motorway connection between SH1 and SH18, opening up access to the Western Ring Route and airport.

New – East West Link

Description: As the engine room of New Zealand's industrial and manufacturing economy, the Onehunga-Penrose area is a key piece in the country's transport network. Many of the largest distribution and logistics facilities are based in the area because it is close to state highways, the rail network, the airport and the port. The area employs approximately 68,000 people and contributes $4.6 billion a year to Auckland's economy.

Gloucester Park Eastwest link

Draft Regional Programme considered for SHIP

The following table shows the list of projects being considered through the Draft Regional Programme for SHIP, and cover the next 10 years.

Table 4- Draft regional programme considered for SHIP

Project	Funding Status	Description
SH20 / Queenstown Road / Hendry Avenue		Investigate missing link between Queenstown Road and Hillsborough Road.
SH16 Gladstone to Alten Road		Investigate options for missing link Grafton Cycle way to Gladstone.
Northern Connections		The only area that remains in question is with delivery of the NCI and corresponding cycle infrastructure, how this then connects and is best utilised.
Airport to City Centre Mass Transit		Investigate staged transition of mass transit between Auckland Airport and Auckland City Centre, from bus based to light rail.
Improving short and medium term Airport Access.		Improving short and medium term airport access DBC.
Network Optimisation (post Western Ring Route)		Network Optimisation work on the WRR (post opening) as required to deliver improved trip reliability.
SH1 North of Albany PT Reliability improvements.		To look at low cost options for buses - e.g. Shoulder running etc ahead of the longer-term bus way extension.
North-West Rapid Transit Corridor		To protect a route for passenger transport between Pt.Chevlier and Westgate in order to deliver an integrated, safe, responsive and sustainable public transport solution
Lake Rd & Esmonde Rd (AT joint initiative)		As part of Auckland Transport's Lake Road CMP options, it is assumed that some improvements will need to be undertaken at Esmonde Road.

Southern Corridor

Investing in safety

Operations and maintenance

Safer Journeys Goal 2016 to 2020 is to reduce the likelihood of crashes occurring and to minimise the consequences. The main areas of investment into ensuring safer journeys include: specialist pavement treatments, audio-tactile markings and high levels of observation and traffic management such as advance and variable messaging signage, safety barriers, variable speed limits.

Safety to public and road workers is important. The network is high speed/high volume and requires Level 3 temporary traffic management for any works.

Maintenance hot spots

The following maintenance 'hotspots' require additional monitoring or cause an increased maintenance burden along the corridor:

- **Surface Water:** vehicle speeds when there is surface water present, either rainfall or coastal surge.
- **Barrier maintenance** across the corridor to ensure continuous efficacy of safety assets.
- **Bridge protection:** This includes over height screening, and throw screens to prevent litter and rocks being thrown onto carriageway below.

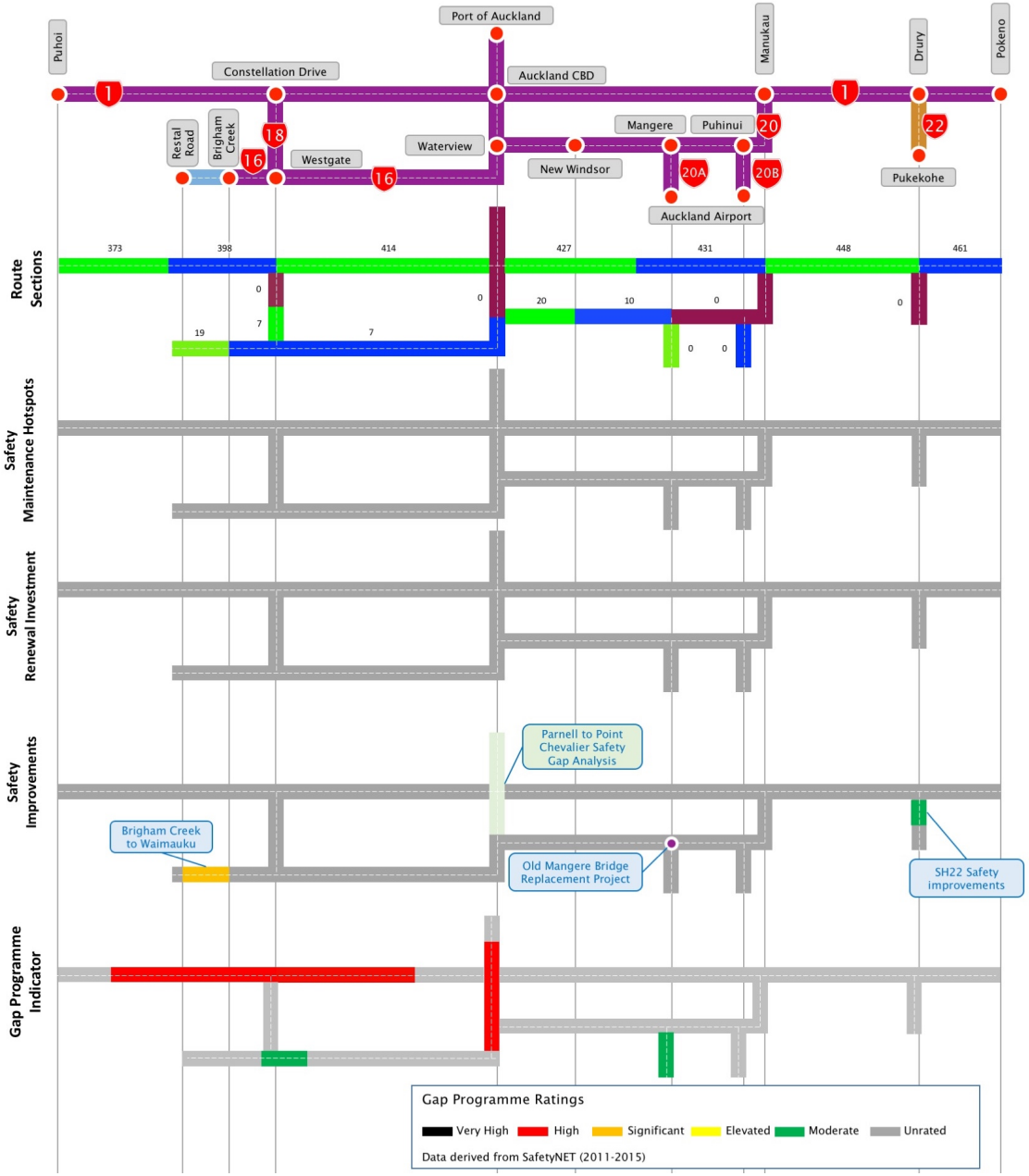
Gap programme indicators

The potential for reducing fatal and serious injuries across the corridor has been assessed under the Gap programme. The Gap programme looks at the collective risk rating, likely level of intervention and the potential reduction in death and serious injury that may be achieved to determine a possible treatment approach. For instance, a road segment rated 'Very High' could potentially achieve a 50-70% reduction in fatal and serious injuries with the application of high cost improvements. Alternatively, if the risk level is 'Elevated' a 10-20% reduction may be realised through targeted low cost, high coverage treatment improvements.

There is a high potential for reducing fatal and serious injuries between Puhoi and Auckland CBD on SH1, and on SH16 between Waterview and the Port of Auckland. These sections of corridor would benefit from comprehensive high cost improvements. There is a moderate potential for fatal and serious injury savings on SH20A and the section at the intersection of SH16/SH18 where targeted low cost, high coverage, improvements are warranted.

The unrated segments are either areas where potential crash savings are low or are being addressed under other existing programmes.

Figure 35 – Safety investment



Vegetation management

The infographic shows the sections of corridor that have roadside or central median grass or plantings that require traffic management while undertaking vegetation management to ensure safe working distances, and consequently impacting on mobility.

Renewals

There are no safety related renewals planned for the corridor.

Improvements

The following projects are planned and underway. Details of the project progress can be found on the Transport Agency website at: https://www.nzta.govt.nz/projects/

Planned

SH22 – Drury to Paerata Safety Improvements

Description: This project will improve road safety on State Highway 22 between the Drury turn off from SH1 and Paerata township. When these changes have been implemented, we estimate there will be 7-22 fewer deaths and serious injuries on this stretch of the highway over the next decade.

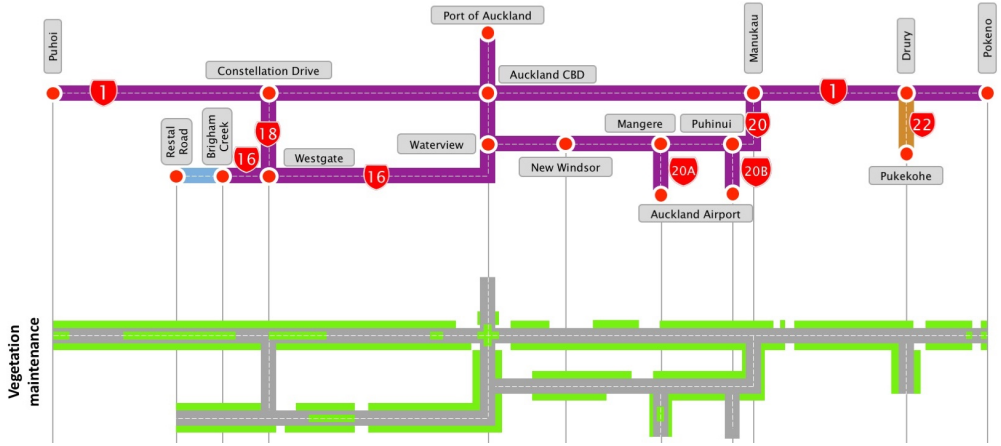
SH16 – Brigham Creek to Waimauku

Description: The project will improve safety within the project extents, helping to reduce serious crashes resulting in death and serious injuries. The project will also improve efficiency, ahead of other major infrastructure build projects being progressed in the longer term.

Old Mangere Bridge replacement project

Description: The NZ Transport Agency and Auckland Council are replacing the Old Mangere Bridge to provide the community with a safe, high quality walking and cycling connection between the Onehunga and Mangere Bridge communities.

Figure 36 - Vegetation management



Draft regional programme considered for SHIP

The following table shows the list of projects being considered through the Draft Regional Programme for SHIP, and cover the next 10 years.

Table 5- Draft regional programme considered for SHIP

Project	Funding Status	Description
Accelerated LED upgrades		The Transport Agency is attempting to align the implementation of LED upgrades with local authorities through the recently announced decision to provide FAR of up to 85% for the LED upgrades.
Weigh Right and Weigh in Motion		Weigh Right National - Auckland. To increase the incentive for heavy vehicle commercial operators to comply with load limits, and to increase the effectiveness of our network and operation of weight enforcement sites.
SH16 – Parnell to Pt Chevalier – Safety Gap Analysis		Safety Gap Analysis work undertaken across the country to determine the safety improvements that would be necessary.

Investing in people, places and environment

Operations and maintenance

The main areas of investment into people, places and environment are: pavement rehabilitation to ensure a high proportion of travel on smooth roads, control of litter, provision of rest areas and stopping points, landscaped areas maintenance, and, environmental compliance.

Litter is being addressed on a regional basis. The alliance is working with Auckland Council through the Auckland Regional Litter Prevention Group.

Also working with Auckland Council on pest plant control and removal.

Visual quality and amenity of journey is important to network users.

Maintenance hot spots

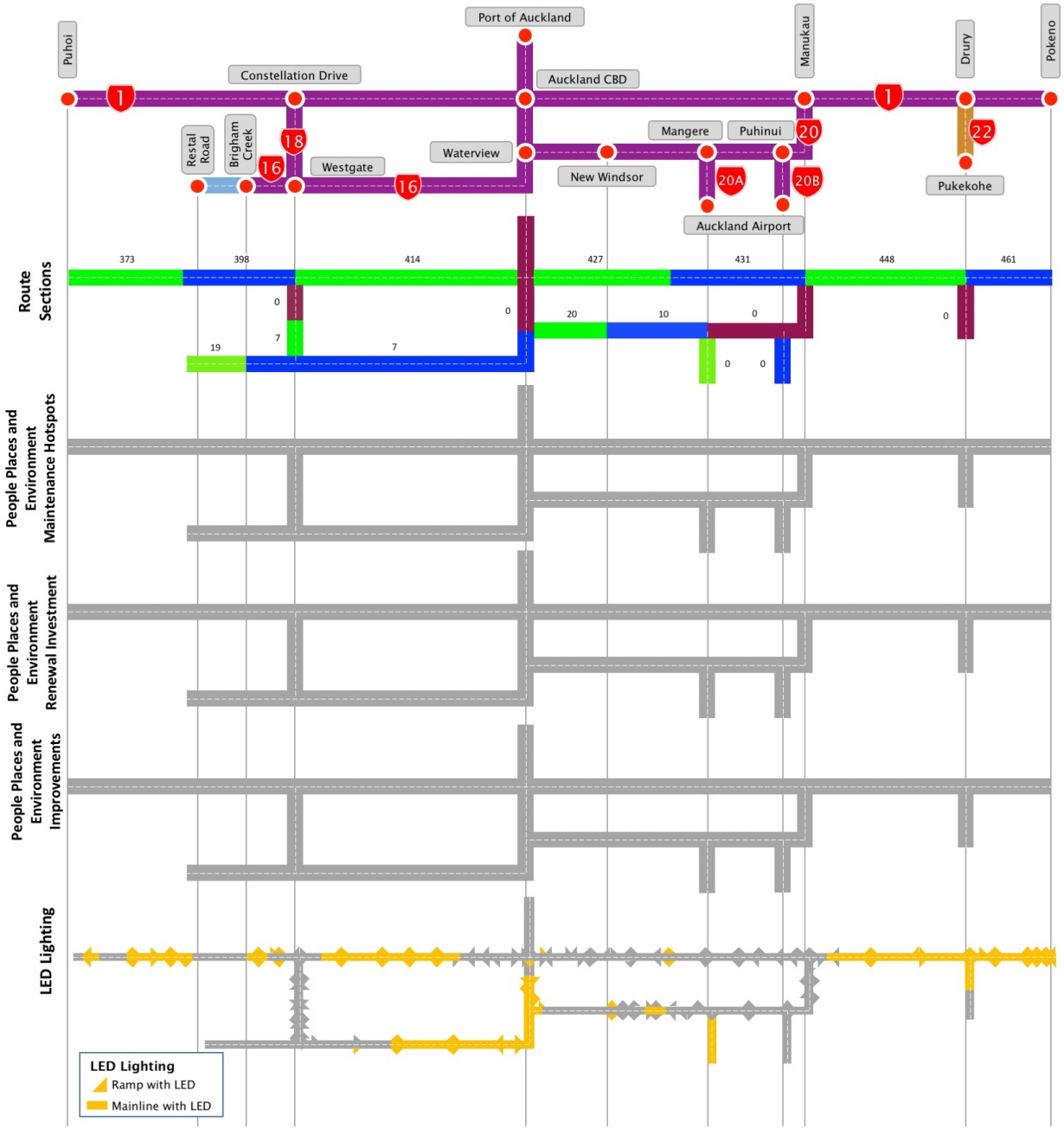
The following maintenance 'hotspots' require additional monitoring or cause an increased maintenance burden along the corridor:

- Graffiti, litter, vegetation control, urban art maintenance.
- Consented elements of projects in terms of noise and water quality management. When renewing assets this needs to be considered.
- **Noise during night works** is an issue for activities such a vegetation control that cannot be undertaken during the day. In general noise is an issue for all activities and more noise barriers are being erected which is creating a maintenance burden.

LED Lighting

The infographic shows the progress in converting the streetlighting for the motorway network to LED luminaires.

Figure 37 – People, places and environment investment



Renewals

There are no people, places and environment related renewals planned for the corridor.

Improvements

There are no currently planned people, places and environment related improvements underway on this corridor.

South bound spaghetti junction

Investment pressures

Access and resilience

The following concerns excerpt pressure on the investment in **Access and resilience** on the corridor.

- **Surface renewal bow wave:** A significant forecasted bow wave of **surfacing renewal** from 2017/18 to 2022/23, due to the coinciding anniversary of past capital projects, plus the confidence to stretch and maximise the surfacing life, and the Transport Agency taking the risk of surface skid resistance failure for these years. The scope of resurfacing is significantly above previous plant and material resourcing levels for the years 21/22 and 22/23, and could also mean significant disruptions to the network due to the number of simultaneous night time closures and detours required.
- **Pavement Deterioration:** Accelerated pavement deterioration is resulting in unexpected additional forward works requirements. Epoxy modified OGPA is being used on some sections to achieve a longer surfacing life and make network more available (less closures for resurfacing).
- **Interface with Capital projects:** Poor interfaces with Capital Projects, resulting in poor *during* and *post* construction operational performance, and poor value for money whole of life costs.
- **Third Party Access:** the need for third parties to access the corridor and the associated network controls and planning; such as utility operators with a water main crossing the corridor. Access to the network has to be tightly managed. Cycling is proving an increasingly attractive mode of transport, especially within the Central Auckland area, with the state highway network creating a barrier to movement, in some areas, for cyclists. The growth in popularity of electric bicycles creates new pressures for the network as cycling becomes more viable for longer journeys.
- **Drainage:** Climate change appears to be causing more intense rain events, which is widening the impact of flooding on the network.

Reliability and efficiency

The following concerns excerpt pressure on the investment in **Reliability and efficiency** on the corridor.

- **Network congestion** and poor network resilience results in significant economic loss, social disruption and loss of both the AMA and the wider Transport Agency image and reputation. Minor incidents can have a major impact on congestion on the transport system resulting in longer than anticipated delays. This is particularly significant during peak times when there is a substantial volume of traffic on the network.
- **ONRC Mobility** is the key driver for determining the operational approach There is a drive to find smarter ways to do things that reduce the impact of maintenance such as only requiring a shoulder closure instead of a lane closure.
- **Disruption by works:** Significant investment in the corridor is coming that will mean increased disruption to the travelling public as works are undertaken. An attempt will be made to spread the work out as much as possible to minimise disruption.
- **Maintenance window reducing:** The working window to undertake works without significant disruption to customers is shrinking. This is driving an approach where as much work as possible is planned to be undertaken during network planned closures.
- **Asset Complexity:** Increasing asset complexity with greater operational and compliance requirements at a high maintenance cost, such as Victoria Park Tunnel (VPT), Johnstones Hill Tunnel (JHT) and now also Waterview Tunnel.
- **ITS Assets:** ITS assets are critical, but the wide range of assets are susceptible to the harsher Auckland environment with high humidity and saline exposure resulting in shorter lives and often failure without warning.
- **Capital Defects:** deficiencies or defects from capital projects create a significant drain on maintenance operations when they cannot be covered by the completed project or departed contractor.
- **Incident response:** The Auckland motorway network is vital to the economy of Auckland and New Zealand. Keeping the motorways operational requires a rapid and effective response to issues in real-time.

Safety

The following concerns excerpt pressure on the investment in **Safety** on the corridor.

- **Health and safety:** There are significant risks associated with operational activities in a high speed and high-volume corridor that could result in a fatality of, or serious injury to, workers or members of the public.
- **Major and fatal incidents:** Due to the nature of major and fatal incidents, the impact upon the highway network can be significant. In the event of a fatal incident, the road is closed for a police investigation causing major disruption. As the main route within the Auckland Urban area, closures have a major impact on the local road network, many of which act as diversion routes. These can become increasingly congested when there are incidents and result in gridlock across the whole urban road network. There's a risk that 2016/17 increase of road fatality and serious injuries on the Auckland South portion of the corridor against a historical downtrend does not regress to the mean, and continues to trend up.
- **Mix of agricultural activities with traffic on SH22:** Due to the proportion of agricultural vehicles used along the corridor, together with a lack of pull off places or slow vehicle bays, drivers may be surprised by sudden low moving vehicles, or stock movement along the corridor, particularly in winding areas where visibility is restricted.

People, places and environment

The following concerns excerpt pressure on the investment in People, places and environment on the corridor.

- **ITS Assets** are critical to operation of the corridor, but susceptible to the prevalent humid and saline environment. These failures are often without warning requiring early replacement.
- **Environmental compliance:** monitoring and management of multiple consent conditions across the corridor, especially noise and stormwater management.
- **Special infrastructure management:** There is special noise, vibration and air quality infrastructure, such as tunnel ventilation systems which have high maintenance requirements to ensure they are effectively managing human health risks.
- **Contribution to the built environment:** A greater expectation from the community and Council on the highway network in understanding how it contributes to the built environment, amenity, and quality of communities.
- **Preservation of heritage sites:** A great expectation from Heritage New Zealand, Department of Conservation, and others on how historic and natural heritage features are managed both within maintenance programmes, and project development and delivery.

Investment future considerations

Consideration of investment in the corridor in future should take account of the following:

- **Mitigate choke points:** Continued investment to reduce the number of choke points on the motorway network. This can include improved network management and operations coupled with targeted capital investment. Identify and mitigate choke points as part of a whole of network approach, with the provision of additional lanes where necessary to accommodate traffic volumes.
- **Provision for growth:** Provision of an integrated strategic transport network designed to cope with the future growth areas identified and the resultant increase in trips expected. Recognition that greater pressure on the corridor and intersections will occur around these growth areas. Infrastructure provision will be needed to mitigate unacceptable levels of traffic congestion.
- **Alternative modes:** Continue to promote public transport and active modes as a viable alternative to the private car. Work collaboratively with Auckland Transport to promote public transport modes across the motorway network. This could include the provision of bus priority on off ramps as well as bus shoulders, improved access to Park and Ride sites, and secure facilities at bus and train stations for bicycle storage to enable a longer multi-modal journey.
- **Aggregate supply:** The supply of quality aggregate in the Auckland region is diminishing. This will necessitate the need to source aggregate from further afield.
- **Capital Defects: U**nexpected or unforeseen defects from capital projects create a substantial drain on operations and maintenance when identified beyond the point of project completion. There are a number of works due for completion 2016/17 and 2017/18. High quality assets with longer operational lives reduce maintenance frequency thereby minimising the impact of maintenance on customer journeys.
- **Network Access:** Access to the network has to be tightly managed, need to consider how to effectively provide and co-ordinate corridor access.
- **Programme Co-ordination:** Corridor renewal programmes need to be well co-ordinated across all parties to minimise costs and maximise access opportunities; including consideration of obsolescence and capacity of all features within the boundaries of the corridor.
- **AMA Boundary:** Consider whether to extend AMA boundary as lead or lag infrastructure, such as for SH16.
- **Designing for Whole of Life:** Ensure that future retrofits, renewals and capital works are designed for the whole of the life of the assets present, such as barrier heights with successive pavement overlays.
- **Biosecurity response:** Working with Council and DoC (where appropriate) and developing a corridor wide strategy to improve biosecurity considerations in maintenance activities will provide greater consistency in management practices such as the use of chemicals, plant-pest management and the level of services and amenity (for mowing).
- **Managing stormwater with the environment:** Aligning stormwater management with the receiving environment characteristics with Auckland Council to ensure that the level of treatment is aligned with the catchment management outcomes sought.
- **Increase scope of corridor works:** Treat any asset renewal or improvement as an opportunity to support the corridor amenity, built form, quality urban design, and landscape outcomes. This can support a sense of place, improve customer journeys, and help to achieve Auckland liveability visions.

Appendix A – Information sources

Section	Infographic	Information Source	Date
Introduction	Corridor Overview Map	The Road Efficiency Group https://www.nzta.govt.nz/roads-and-rail/road-efficiency-group/onrc/	2013
Understanding our Customers			
Key Customers	Key journeys	Network Manager and Regional Staff	2016
	Daily commuters	Network Manager and Regional Staff	2016
	Freight	Network Manager and Regional Staff	2016
	Tourism and recreation	Network Manager and Regional Staff	2016
	Demographics and population centres	MBIE Regional Economic Activity Report Web Tool http://www.mbie.govt.nz/info-services/business/business-growth-agenda/regions	2015
Understanding Customer Levels of Service on the Corridor			
Customer Levels of Service	Corridor classifications	The Road Efficiency Group ONRC -right-road-right-value-right-time-combined-poster.pdf https://www.nzta.govt.nz/roads-and-rail/road-efficiency-group/onrc/	2015
Current Levels of Service Performance	Current ONRC Levels of Service Performance	Network Manager and Regional Staff	2016
Improving the Customer Experience	Significant planned improvements	Network Manager and Regional Staff NZTA Projects web page: https://www.nzta.govt.nz/projects/ NZTA Safe Roads web page: https://www.nzta.govt.nz/safety/our-vision-vision-of-a-safe-road-system/safe-roads/ Submitted Regional SHIP programmes	2017

Section	Infographic	Information Source	Date
Access	ONRC classification	The Road Efficiency Group https://www.nzta.govt.nz/roads-and-rail/road-efficiency-group/onrc/	2013
	Carriageway configuration	Network Manager and Regional Staff Corridor drive-over Highway information Sheets	2016
	Posted speed limit	NZTA – MapHub Speed Limits on NZ Road Network	2016
	Topography	Elevations derived from Google Earth™	2016
	Geography	Network Manager and Regional Staff Corridor drive-over	2016
	Traffic volumes – heavy vehicles	RAMM Carriageway Table – December Traffic Estimates	2015
	Traffic volumes – all vehicles	RAMM Carriageway Table – December Traffic Estimates	2015
	HPMV routes	NZTA – MapHub High Productivity Freight Network	2016
	Critical Customers	Network Manager and Regional Staff	2016
	Critical Assets	Network Manager and Regional Staff	2016
Resilience	Vulnerabilities	NZTA – MapHub Hazard Incidents and Area Warnings	2016
	Major Alternate Routes	Network Manager and Regional Staff Desktop analysis Corridor drive-over	2016
	Diversion Lengths	NZTA StateHighways.pptx Diversion Routes	Unknown
	Closures	NZTA 2011-2015_Treis_incidents_by_region.xlsx	2015
Reliability and efficiency	Efficiency	NZTA – MapHub EfficiencyNet	2016

Section	Infographic	Information Source	Date
	Variability	NZTA / Beca Dwg No. GIS-3391515-500-4 Network Performance - Attachments.pdf March 2012 eRUC Commercial Vehicle Data – State Highway Austroads Variability Assessment	2012
	Commercial Vehicle Average Speed	NZTA / Beca Dwg No. GIS-3391515-500-5 Network Performance - Attachments.pdf March 2012 eRUC Commercial Vehicle Data – State Highway Average Speeds	2012
	Current Constraints	Network Manager and Regional Staff Corridor drive-over	2016
Safety	KiwiRAP Collective Risk	https://nzta.abley.com/SafetyNET_2017 SafetyNET	2016
	KiwiRAP Personal Risk	https://nzta.abley.com/SafetyNET_2017/ SafetyNET	2016
	KiwiRAP Star Rating	http://www.kiwirap.org.nz From 2010 KiwiRAP star rating report.	2010
	Intersection Risk Indicator	https://nzta.abley.com/SafetyNET_2017/ SafetyNET	2016
	Gap Programme Rating	https://nzta.abley.com/SafetyNET_2017/ SafetyNET	2015
Environment Culture and Heritage	Natural Environment	NZTA - Environment and Urban Design Team	2016
	People and Place: Journeys	NZTA - Environment and Urban Design Team	2016
	People and Place: Landmarks and Heritage Places	NZTA - Environment and Urban Design Team	2016
	Noise and Vibration	NZTA - Environment and Urban Design Team	2016
	Drainage Catchments	NZTA - Environment and Urban Design Team	2016
Understanding the Infrastructure Assets			

Section	Infographic	Information Source	Date
Overview	Corridor Asset Base	NZTA_ 2017 Values by Corridor.xlsx complied by Opus International Consultants from RAMM and other asset information sources	
	Asset Condition and Performance	Summarised from the data sets described below	
Asset condition and performance	Surface Skid Resistance	SCRIM data derived from RAMM by NZTA Data Quality and Access team	2016
	Surface Safety Treatment	SAL data derived from RAMM by NZTA Data Quality and Access team	2016
	Surface Defects	100m Priority data derived from RAMM by NZTA Data Quality and Access team	2016
	Surface Age	Surface Age data derived from RAMM by NZTA Data Quality and Access team	2016
	Service life of Prior Surface	Surface Age data derived from RAMM by NZTA Data Quality and Access team	2016
	Resurfacing	Resurface data derived from forward works programme	2016
	Proportion of Travel on Smooth Roads	STE data derived from RAMM by NZTA Data Quality and Access team	2016
	Pavement Strength	Deflection data derived from RAMM by NZTA Data Quality and Access team	2016
Investing in the Corridor			
Summary Investment	Summary Corridor Investment	2028-21 SHIP programme funding requests 2017/18 Annual Plans	2017
	Summary investment by work category	2028-21 SHIP programme funding requests 2017/18 Annual Plans	2017
Investing in access and resilience			
Investing in access and resilience	Maintenance Hot Spots	Network Manager and Regional Staff	2017
	Resurfacing 2018 - 2021	Resurface data derived from forward works programme	
	Renewal Investment	National Bridge Replacement Programme National bridge replacement programme 2017 LCMP data.xlsx	

Section	Infographic	Information Source	Date
	Improvements	Network Manager and Regional Staff NZTA Projects web page: https://www.nzta.govt.nz/projects/ Submitted Regional SHIP programmes	
Investing in reliability and efficiency	Maintenance Hot Spots	Network Manager and Regional Staff	2017
	Renewal Investment		
	Improvements	Network Manager and Regional Staff NZTA Projects web page: https://www.nzta.govt.nz/projects/ Submitted Regional SHIP programmes	
Investing in safety	Maintenance Hot Spots	Network Manager and Regional Staff	2017
	Renewal Investment		
	Improvements	Network Manager and Regional Staff NZTA Projects web page: https://www.nzta.govt.nz/projects/ NZTA Safe Roads web page: https://www.nzta.govt.nz/safety/our-vision-vision-of-a-safe-road-system/safe-roads/ Submitted Regional SHIP programmes	
Investing in people places and environment	Maintenance Hot Spots	Network Manager and Regional Staff	2017
	Renewal Investment		
	Improvements	Network Manager and Regional Staff NZTA Projects web page: https://www.nzta.govt.nz/projects/ Submitted Regional SHIP programmes	

If you have any further queries, call our contact centre on 0800 699 000 or write to us:

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WAKA KOTAHI

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