

Auckland to Whangarei

CORRIDOR MANAGEMENT PLAN

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2018-2028



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Executive summary

The Auckland to Whangarei corridor comprises SH1 from Puhoi, (north of Johnstone’s Hill Tunnel through to the junction with SH14 (Maunu Road) in Whangarei. The corridor also includes SH16, the main alternative route between Auckland and Wellsford, from Restall Road north-east of Waimauku to its junction with SH1 at Wellsford. The short section of SH15 connecting SH1 to the port at Marsden Point is also included in the corridor.

The corridor is approximately 191 km long (1.7% of the state highway network). The total value of assets along the corridor is \$351 M (1.5% of the total national asset value).

The Auckland to Whangarei corridor is the main transport route connecting Northland to Auckland and the rest of New Zealand, and therefore is a key enabler of economic growth and inter-regional connectivity. Because of its unique geography, including the Kaipara Harbour in the west providing a natural barrier, there are no significant alternative routes between Whangarei and Wellsford.

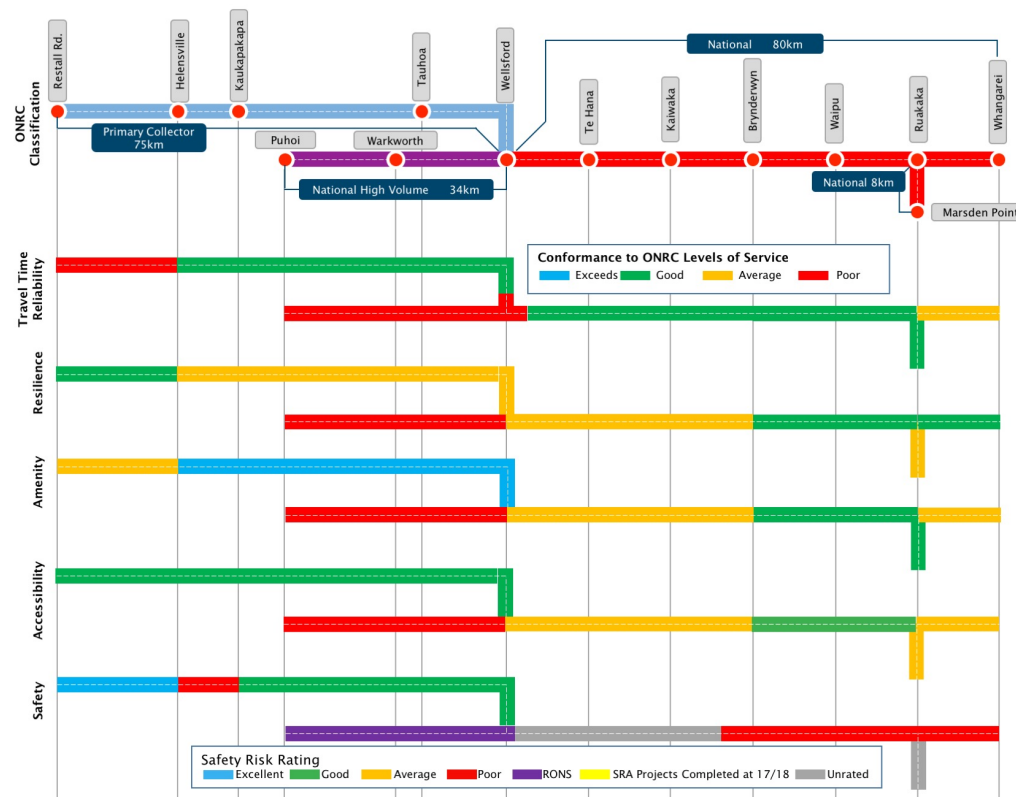
The corridor, in conjunction with the North Auckland Rail line, is critical to freight, both in terms of getting exports to port, but also for the distribution of imports arriving from overseas. Marsden Point, located on SH15, is a deep-water port and is the closest port to New Zealand’s international markets. It primarily handles high volume/lower value commodities such as crude oil, fertiliser, chemicals, wood chip and whole logs. The corridor also provides a vital link between Northland and the Port of Auckland, as well as Auckland Airport, which is important for exporting Northlands high value and time critical exports such as aquaculture.

Tourism contributed an estimated \$128 million to regional GDP in 2013 and the corridor plays a key role in supporting tourism growth as part of the Twin Coast discovery route. There are plans to develop and promote the route as part of a round-trip that incorporates the various visitor offerings and products on both coasts and up to Cape Rēinga.

Given the significance of the corridor to Northlands economic growth and prosperity the corridor needs to be reliable, resilient and safe. The region’s challenging topography, geology and high impact seasonal rainfall present particular challenges for the maintenance and operation of road and rail networks. Undertaking renewals and improvements while at the same time keeping the corridor open and available to users, especially on the high-volume sections of the corridor at either end, presents a maintenance challenge. A positive feature of the corridor is that it provides two alternative points of access to and from Auckland from Northland south of Wellsford, providing a higher level of resilience at its southern end.

Currently the section of State Highway 1 between Puhoi and Wellsford is performing poorly against all customer level of service outcomes, based on the One Network Road Classification (ONRC) measures as shown in Figure 1.

Figure 1 - Performance of the corridor against ONRC outcomes



The continued development of the Ara Tūhono - Pūhoi to Wellsford Road of National Significance (RONS) is a key initiative that will improve levels of service, saving up to 17 minutes in travel time between Auckland and Northland by 2026. Significantly, capital investment planned for the corridor over the next 10 years, will account for 89% of the total investment in the corridor over that period. This investment is primarily targeted at improving both the travel time reliability (54% of expenditure) and safety (37% of expenditure) of the corridor.

Envisaged investment in renewals is targeting poorer levels of skid resistance than desirable in the corridor, whilst a longer-term solution is explored which could include having to import higher quality aggregate from outside the region which will increase the cost of pavement surface renewals.

Introduction

Purpose

What is the corridor management plan?

This Corridor Management Plan describes the customer service delivery story for the Auckland to Whangarei 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.

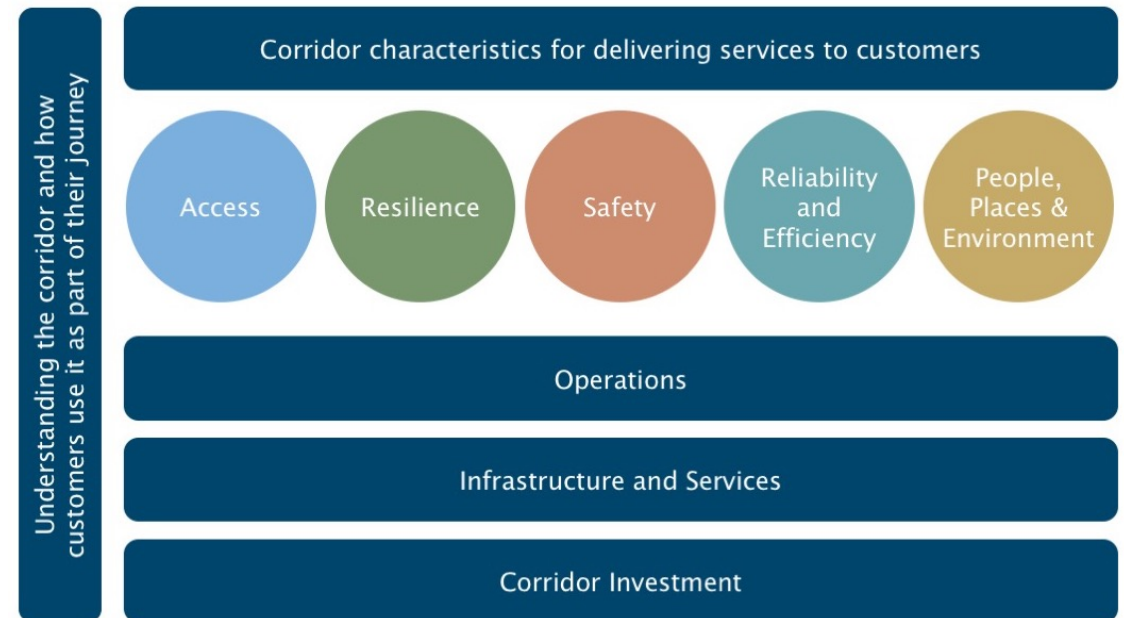
Planning is currently undertaken at the regional level, but typically significant journeys traverse more than one region. By considering the significant customer journeys and destinations, the corridor management plan is a vehicle to engage in regional and inter-regional conversations by focusing on 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 to Whangarei corridor comprises SH1 at Puhoi, (from where the Auckland Motorway Alliance responsibility ends) through to the junction with SH14 (Maunu Road) in Whangarei. The corridor also includes SH16, the main alternative route between Auckland and Wellsford, from Restall Road north-east of Waimauku, through Helensville and beside the southern end of Kaipara harbour, to its junction with SH1 at Wellsford. As this corridor is a major freight route, the short section of SH15 from SH1 to Marsden Point is also included in the corridor.

This corridor is the main transport route connecting Northland to Auckland and the rest of New Zealand, and therefore is the main economic enabler of the Northland region. Because of its unique geography, including the Kaipara Harbour in the west providing a natural barrier, there are no significant alternative routes between Whangarei and Wellsford. At the Auckland end, the corridor is a commuter link during week days, south of Wellsford on SH1, and Kaukapakapa on SH16.

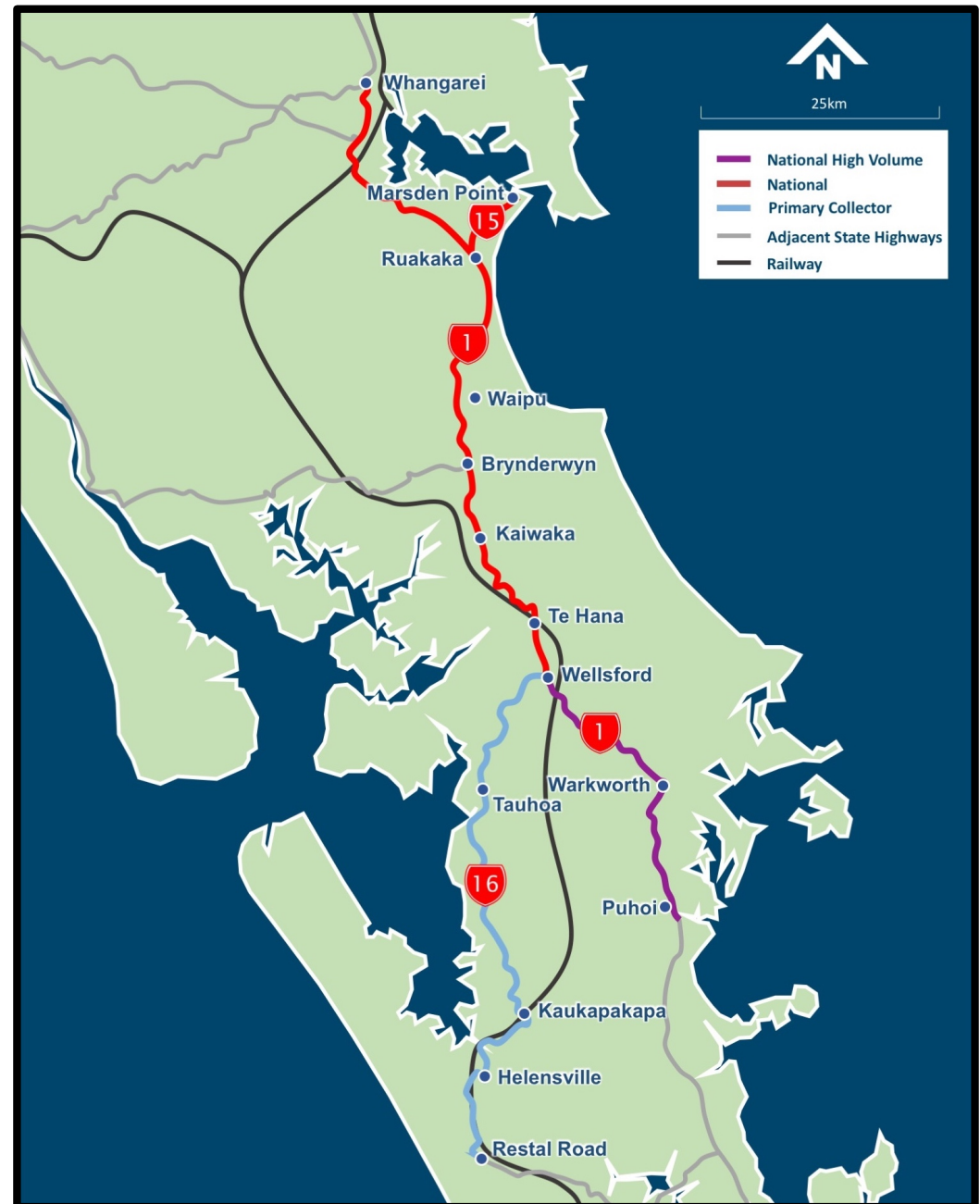
The regional economy

Auckland is New Zealand's largest city with over 1.5 million residents (34.2% of New Zealand's population), is the centre for commerce, and contributes 35.9% of NZ GDP. North Port at Whangarei (8.8M Tonnes) and Port of Auckland (7.2M Tonnes) are the second and third largest sea ports by tonnage in New Zealand, and as such the corridor forms a significant link in the supply chain.

Significant industry between Auckland and Whangarei includes forestry, dairy and aggregates. Auckland and Whangarei also have significant marine industries. New Zealand's only oil refinery is based at Marsden Point, with a pipeline of fuel direct to Auckland. Agriculture is an important part of growing the local economy with tourism and manuka honey continuing to grow.

Improved transport connections with Auckland would assist in bolstering the Northland Economy. Northland's relatively low population density and geographic remoteness have constrained growth of its place-based economy. The Tai Tokerau Northland Economic Action Plan identifies the opening up of transport corridors, especially with better connectivity to Auckland, as a key opportunity to the region realising its full economic potential. Transport infrastructure, in particular roading, is seen as a critical enabler to the confidence necessary for further investment in Northland region and supporting economic growth.

Figure 3 – Corridor overview



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

The sections of corridor: Wellsford to Puhoi; Kaukapakapa to Restall Road; and Ruakaka to Whangarei, provide a daily commuter link during weekdays. As there are minimal public transport options running along these corridor sections, use of personal vehicles is the predominant mode of commuter transport. With increasing urban growth in areas along the corridor, use of this corridor as a commuter route will continue to increase.

Insights into commuter users are as follows:

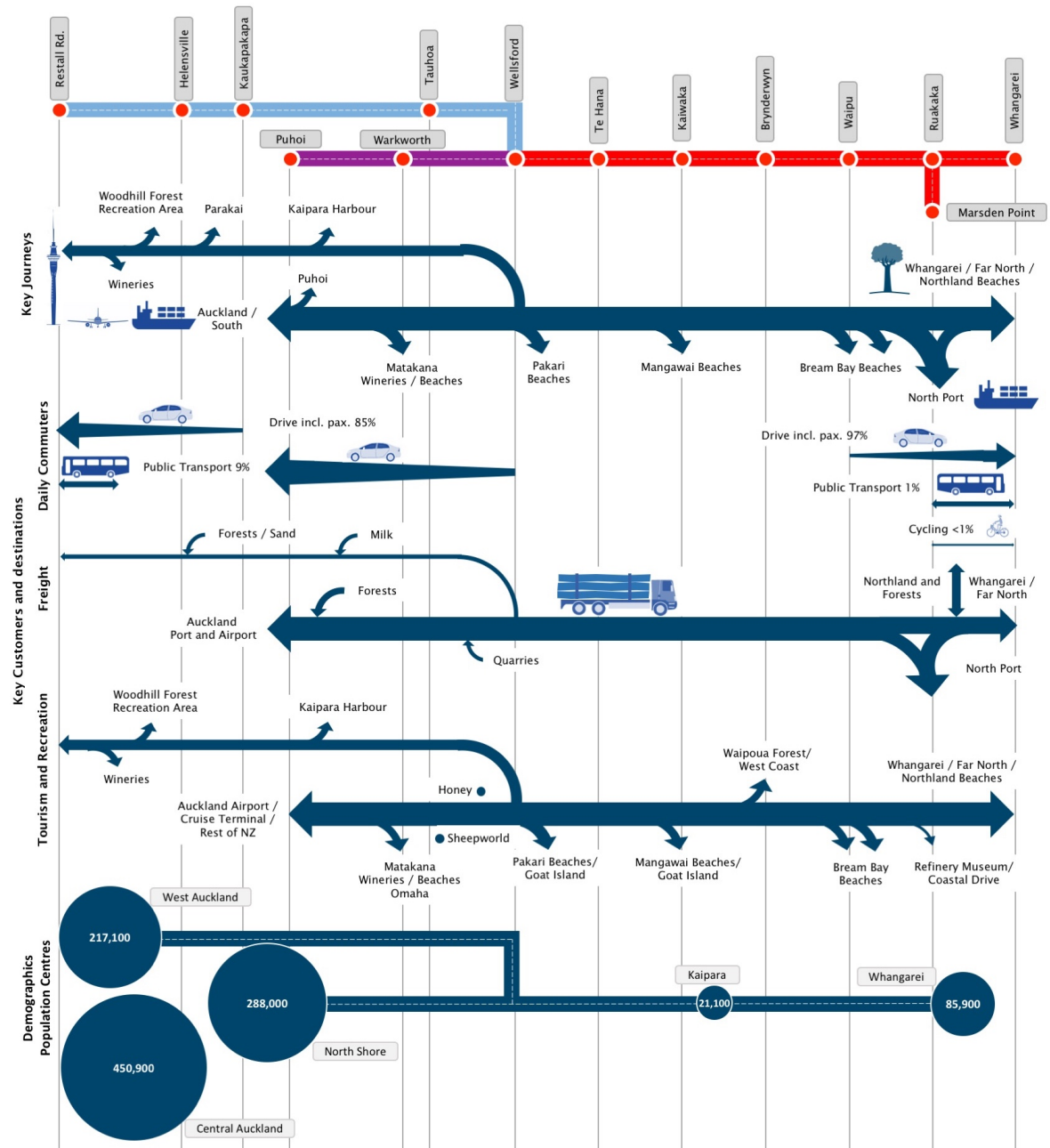
Road use: There are limited alternative transport modes so use of private vehicles is predominant. Public transport into Auckland can be accessed from locations closer into Auckland, outside this corridor.

Road knowledge: Commuters are familiar with their route and viable alternatives to avoid congestion when required. Journey times are relatively predictable considering time of day and day of week. Motorists need to adjust to changes along the corridor – from highly separated motorway and divided carriageway to unseparated narrower two-way traffic flows.

Pain points: Puhoi to Warkworth section regularly nears capacity at peak times. Limited public transport. Intersection of two highways amongst the concentrated township activity of Wellsford constrains traffic flow, especially in periods of high traffic volumes synonymous with summer weekend activity and Public Holidays.

Daily commuters expect: Predictable journeys at peak times, accurate and up to date information about traffic (peak and off peak), weather, road conditions and hazards, a more holistic approach to transport—investment in public transport to make it more reliable and accessible, at a reasonable cost and a focus on city traffic and congestion management on the weekends.

Figure 4 - Key customers, journeys, and destinations



Tourist and recreational users

As a tourist destination, Northland has many significant attractions including the Bay of Islands, Waipoua Forest, Ninety Mile Beach and Cape Reinga, and the many east coast beaches. Much of the tourist/recreational activity generating demand on the corridor is domestic based, with people accessing holiday homes, and weekend recreational users of facilities such as the Woodhill forest. As an overseas tourist destination, there are self-drive camper van tourists, with many overseas visitors to Northland also arriving and departing on cruise ships that anchor off Paihia in the Bay of Islands for the day. Significant sections of the corridor are part of the Twin Coast Discovery route, a significant scenic route promoted particularly to overseas tourists.

Insights into tourist and recreational users are as follows:

Road use: Recreational users every weekend to/from Northland or periodically for long weekends, especially in the spring/summer months. At times of particularly heavy congestion on SH1 from Puhoi to Wellsford, SH16 provides an alternative to manage throughput and is regularly promoted as such. Currently relatively low use made by overseas tourists of the corridor compared to other tourist destinations around NZ, the most significant numbers accessing the region in self-drive campers.

Road knowledge: High level of road knowledge as predominantly used by domestic recreational users. Most journeys of a comfortable length, although significant journeys undertaken to access far north beaches on Friday evening following a full week at work, causing risk from fatigue. International visitors have not experienced the roads and conditions and are focused on the landscape and the adventure (roads are a means to an end), overconfident on travel times, with no knowledge of places on the journey where the road narrows or becomes windy. Traffic volumes significantly increase during summer and Public Holiday periods.

Pain points: Weekend traffic can be particularly busy going to beaches and recreational areas, not knowing roads, conditions or on-road behaviours, sharing the road with other tourists/recreational users in the same situation. Increased journey time from cumulative effect of peak summer season traffic and, additional delays from reduced speed through road works sites.

Tourist and recreational users expect: Ease of getting around the country, including using complementary travel modes, good directional signage to destinations, distances, cities, places to stop for refreshments and toilet breaks when undertaking regional journeys.

“When people don’t have a choice of route they value early information to make informed decisions”

Freight operator

There is a major port located at each end of the corridor. Northport is a deep-water port at Marsden Point at the south-eastern end of SH15, with a flexible facility capable of handling large multipurpose vessels, primarily carrying high volume/lower value commodities such as crude oil, fertiliser, chemicals, wood chip and whole logs. Northport is multi-purpose and the closest port to New Zealand’s international markets. The Port of Auckland is perceived as closer to domestic markets handling a wider range of products and more scheduled services. High value and time critical exports such as cut flowers are also exported through Auckland Airport. The corridor is critical to freight, both in terms of getting exports to port, but also for the distribution of imports arriving from overseas.

Insights into freight operators are as follows:

Road use: Comfortably undertake the Whangarei to Auckland and return trip including loading/unloading and rest breaks within a shift. Schedule and time critical, inter-regional journeys, constant road use.

Road knowledge: Knowledge of road conditions is extremely high, verging on technical, confidence of managing difficult conditions is high, willing to take calculated risks to keep business going.

Pain points: Personnel management—schedules, health and safety, keeping trucks on the road (fleet upkeep) and making critical delivery times, roads and traffic conditions can be highly variable. Acceptable alternative routes for heavy vehicles are limited in some places along the corridor and have an adverse effect on delivery times and therefore on business. Travel time predictability is most important for perishable goods enroute to domestic and international markets.

There are plenty of opportunities for overtaking at regular intervals along SH1 from Puhoi to Whangarei. While the south side of Brynderwyn hill is a choke point in terms of average speed, the time to traverse this section is highly predictable.

Freight operators expect: Infrastructure that supports commercial activity—alternative routes that cater for freight trucks safely and consistently with consistent width and visibility, convenient places for trucks to stop and drivers to rest, and passing lanes for vehicles that want to overtake slower vehicles.

Information about road conditions that provides as much planning time as possible and enables considered decision-making and confidence that the advice is enabling business.

“My time is valuable, if there is a delay I want to know about it so I can change my plans”

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, the NZ Transport Agency works with other network providers to provide a one network approach.

The Transport Agency works closely with the local authorities and regional councils along the corridor shown in Figure 5.

Collaboration along the corridor

Currently, the Transport Agency is collaborating with the associated local authorities and Northland Inc. to revitalise the Twin Coast Discovery Scenic Route, of which a significant portion of the Auckland to Whangarei corridor is a part of.

Northern transport alliance

The three Northland District Councils - Kaipara, Whangarei and Far North, as well as the Northland Regional Council and the Transport Agency, formed the Northland Transportation Alliance (NTA) on 1 July 2016.

The aim of the alliance is to empower a One Network approach and make State Highways, regional, and local roads more resilient, more connected and safer for the communities of Northland as they get to work, school and play.

Traffic Operation Centres (TOC)

Traffic Operation Centres are the 'conduit' services in place nationwide to communicate activities/events on the transport network to the users of the SH network and wider stakeholders (e.g. emergency services and NOC suppliers providing emergency response), and monitor and report SH incident response in the online TREIS system. ATOC (Auckland) covers the entire corridor.

Figure 5 - Map of associated local authorities



Network Outcomes Contracts approach

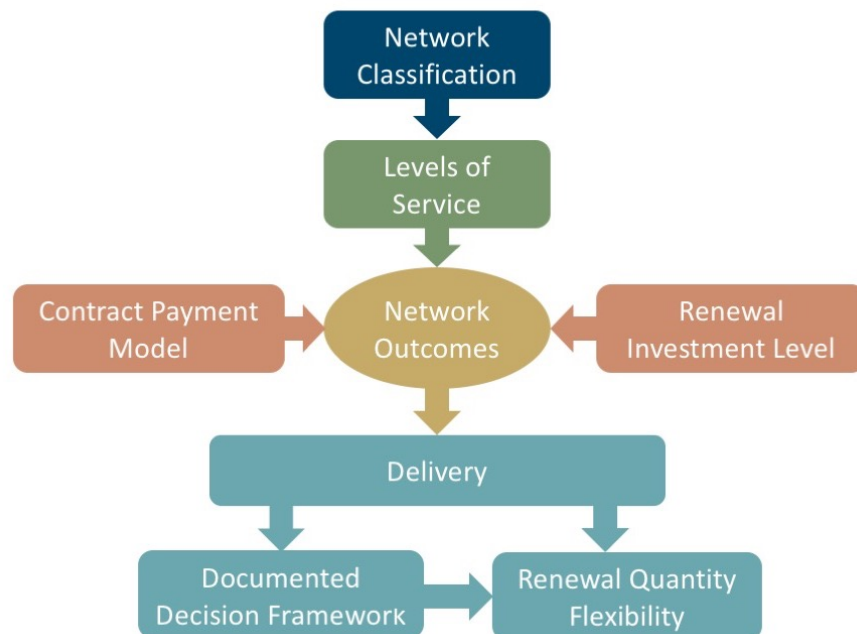
Network maintenance and operations is managed through the Network Outcome Contracts (NOC) aimed at improving the effectiveness of service delivery. By capturing the best elements of the three historic procurement methodologies (PSMC, Hybrid and Traditional models) the NOC contract model delivers services 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 contract 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 NOCs is shown in Figure 6 below:

Figure 6 – NOC process



Collaborative delivery of services

The Auckland to Whangarei corridor is fully contained within the area for the Auckland/Northland NOC contract.

Auckland/Northland Network Outcomes Contract

The Auckland/Northland NOC contract (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.

This 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.
- Traffic signal maintenance – Northland Region:** The Northland State Highway traffic signals operate in isolation of each other on, less sophisticated, “fixed-time” cycles (which makes them more independent than those on the Auckland North area). The maintenance of these signals, also supplied under a MOU, are managed and performed by Whangarei District Council, under the supervision of their Traffic Signal Engineer.
- Traffic monitoring sites (PN2969):** Traffic count data in Northland is collected by AgFirst under a contract that expired 31 September 2016. A new contract (PN4161) is currently out to the market with a proposed three-year term with two 2-year rights of renewal (3+2+2). Note, the NOC does not include a specific traffic counting programme, but it does require the contractor to maintain the highway assets associated with the counter locations and inform about works that may damage or alter the facility.
- 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 annually, as required.

Drivers for change

The Auckland to Whangarei corridor caters for variable and increasing levels and types of customers and this demand is expected to continue to grow into the future. The drivers for change associated with the corridor are briefly described below.

Auckland metro

Over the next 30 years, Auckland's population is expected to grow by 0.7 – 1 million people requiring 400,000 new homes and 277,00 new jobs. The use of bus and rail in rapid transit corridors has increased by 10% each year. We need to help facilitate the movement of more and more people travelling safely and reliably to work, study and play. Around 70% of this growth is expected to be accommodated within the existing urban area and 30% through greenfield development in identified future urban growth areas. The Warkworth future urban area is within this corridor.

Future focus (10 years+)

Influencing travel demand

This means ensuring land use decisions support an efficient transport network, maximising opportunities from new technology to increase vehicle occupancy and throughput, and progressively introducing a variable pricing system to encourage more efficient travel patterns and reduce long term need for investment.

Making better use of existing networks

We will better prioritise existing networks to get the most of what we already have and continue to improve efficiencies in maintaining, operating and renewing infrastructure. We will also accelerate the use of intelligent transport systems to provide real-time information and enable the benefits of emerging technologies.

Providing new infrastructure and services

Tailoring solutions to different circumstances and ensuring transport enables and supports growth to address Auckland's housing challenge. We will also strengthen strategic road, rail, and public transport networks to ensure sufficient capacity, resilience and efficiency.

Key journey - Auckland to Whangarei

The corridor is the main transport route connecting Northland to Auckland and the rest of New Zealand, and therefore is the main economic enabler of the region. Because of its unique geography there are no significant alternative routes between Whangarei and Wellsford.

There needs to be a reliable, resilient and safe link between Auckland and Northland network. The region's challenging topography, difficult geology and high impact seasonal rainfall present particular challenges for the maintenance and operation of road and rail networks. The continued development of the Ara Tūhono - Pūhoi to Wellsford Road of National Significance is a key initiative that will provide a safer and more resilient route for people and freight travelling from Auckland to Northland. By 2026 this investment will save up to 17 minutes in travel time between Auckland and Northland.

Northland regional economic development area

Northland is a small to medium sized economy with a prominent primary production and processing base which has been struggling to perform in comparison to other regions.

An MBIE-led growth study published in February 2015 estimated that there was potential to lift the economy of the region by 24%, or \$1.4bn, over the next 5-10 years. The study identified growth opportunities in key primary sectors of dairy, forestry, horticulture and aquaculture, and processing related to these industries. Tourism is an opportunity if the region can link cultural and natural advantages to reduce seasonality and keep visitors in the region longer.

One of the Upper North Island key journeys is the SH1 Whangarei to Auckland route. The economic development workstreams for the region are broadly consistent with outcomes for this journey, which are to increase safety and improve travel time reliability.

One of the key transport activities identified in the action plan is to improve logistics and infrastructure. This includes providing more efficient freight movements with more HPMV and 50Max capable roads.

The other key transport focus is tourism. In this regard, rejuvenating the Twin Coast Discovery Route, the 800km circular route of Northland, has been identified as an opportunity. This may include improvements to bridges, layovers and byways signage, improving the resilience of SH10, community and tourism engagement linking cultural and natural advantages, and developing a regional cycling strategy to help attract more visitors.

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 CLoS experienced by customers, 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

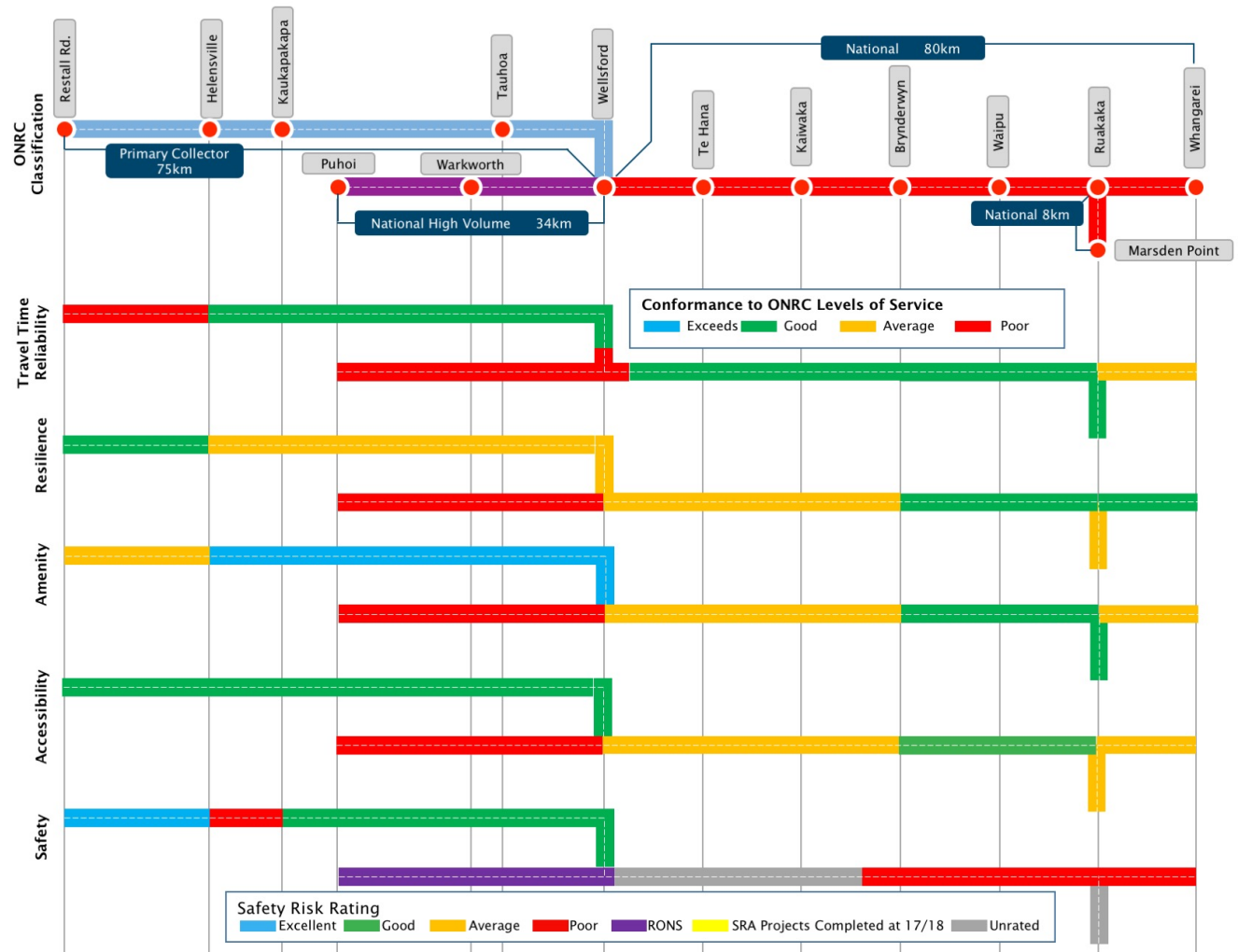
The length of SH1 corridor between Puhoi and Wellsford is National High Volume and provides a major route north from the Auckland CBD.

North of Wellsford this SH1 classification reduces to National in line with the reduced traffic volumes.

The more westerly corridor of SH16 is classified at the lower level of service as a Primary Collector providing recreational and commuter traffic access to the West Coast townships and an alternative route north.

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

Figure 7 - Current ONRC levels of service performance







Summary of current performance

Figure 6 shows how the Auckland to Whangarei corridor is currently performing against the ONRC Levels of Service expected for the relevant classification of each section.

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 along the corridor is generally good. The exceptions to this are between Warkworth and Auckland which is a significant commuter journey, where there is variable reliability in travel time during peak traffic periods. This is also experienced on the urban Whangarei section of SH1, although not to the same extent.

In other parts of the corridor, the steep winding section on the southern side of the Brynderwyn Hills causes traffic to slow down in both directions, however the effect on travel time reliability is negligible. The straight open sections north of Waipu through Ruakaka to Oakleigh support free flowing traffic.

Travel time reliability is generally high on SH16. Travel time reliability across the corridor on both SH1 and SH16 is affected during holiday season and summer weekends.

Resilience

The geography of the corridor, which is constrained on some sections by either the Kaipara Harbour or Pacific coast, means alternate routes are limited, especially for Heavy Vehicles. Blockages in certain sections of the network mean that Heavy Vehicles must park up until the corridor is re-opened. The low-lying areas of SH16 around Helensville through to Tauhoa are at risk from flooding. The Puhoi to Wellsford section of SH1 is at risk of slips and rockfalls, particularly through Dome Valley. The south side of Brynderwyn Hill is a high resilience risk for slips and rockfalls that could close the corridor for significant periods of time.

Amenity

The corridor has a high amenity value to tourists and locals with significant landmarks throughout its length. The views from the top of Brynderwyn Hill heading north across Bream Bay to Bream Head are exceptional. The corridor has high cultural and spiritual significance to Maori. Facilities for customers are provided through the smaller urban areas. Travel quality along the Puhoi to Wellsford section of the corridor is currently not what would be expected of a National high-volume highway. Generally, the corridor is compatible within the urban/rural context.

SH16 has an ONRC rating of Primary Collector which has a standard of amenity that exceeds its ONRC rating, with the exception for the high traffic volume section south of Helensville.

Accessibility

SH16 provides the appropriate level of accessibility in relation to its ONRC rating. The Puhoi to Wellsford section of corridor performs poorly for a National high-volume highway as there are frequent farm gate connections. Along this section there are also many key intersections or access points that provide no slip lanes or turning bays.

Traversing several small townships, the section of corridor north of Wellsford features shopfronts onto the highway. The urban Whangarei section and SH15 between Ruakaka and Marsden Point feature frequent direct driveway access to the corridor from adjacent properties.

Safety

SH1 between Puhoi to Whangarei is generally rated as medium-high to high collective risk rating. The collective risk for SH16 between Tauhoa and Restall Road is medium-high for most sections. The section of SH16 north of Helensville to Wellsford has a very high personal risk rating.

Significant sections of SH1 north of Wellsford are already at their target KiwiRAP star rating of 3, whereas none of the Puhoi to Wellsford section is at the 4-star target rating expected of a National High-Volume highway. Large sections of the corridor are rated KiwiRAP 2-star, denoting major deficiencies in some road features.

Improving the customer experience

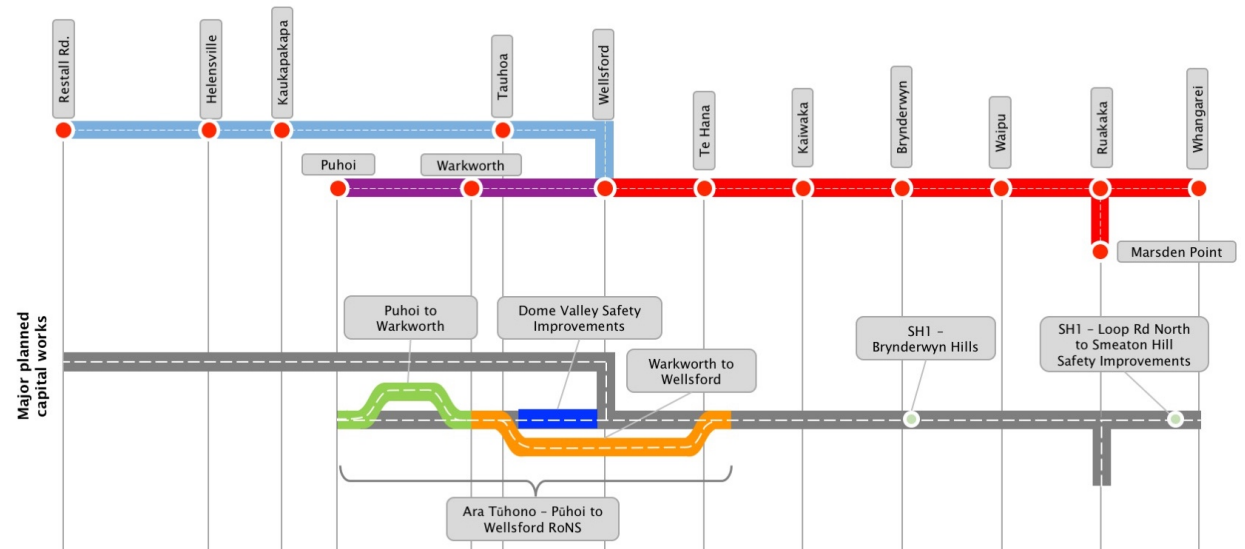
In responding to customer levels of service it is important to acknowledge that significant improvements to the SH1 part of the corridor are planned or underway as part of the Roads of National Significance, (RoNS) programme, including Puhoi to Warkworth, and Warkworth to Wellsford, both of which form parts of the Ara Tūhono Puhoi to Wellsford RoNS. In addition, safety improvements are planned or underway through Dome Valley, on the northern side of the Brynderwyn Hills, and between Loop Rd and Smeaton Hill.

When completed, the planned improvements on the corridor will result in significant improvements to the performance of the Corridor against the ONRC outcomes. In particular, the section of corridor from Puhoi north to Wellsford along SH1 will achieve full compliance with expected ONRC outcomes for all activities.

Currently there are issues with the rail services along the corridor in terms of the amount of freight that can be moved due to conflicts with urban commuter trains at the Auckland end, and infrastructure limitations such as Swanson tunnel that has size restrictions.

Planned improvements have been discussed in greater detail later in this document.

Figure 8 - Significant corridor planned improvements



Significant projects are underway on the corridor

Access

Carriageway configuration

The carriageway configuration is relatively consistent and appropriate to the context of each section of corridor.

The SH1 section between Puhoi and Whangarei provides regular overtaking opportunities for its entire length. Part of the northern side of the Brynderwyn Hills has a 2+1 configuration with a wire rope central median. This configuration will extend further once current safety improvements are completed.

SH15 and SH16 conversely provide little or no such opportunities.

Speed limits

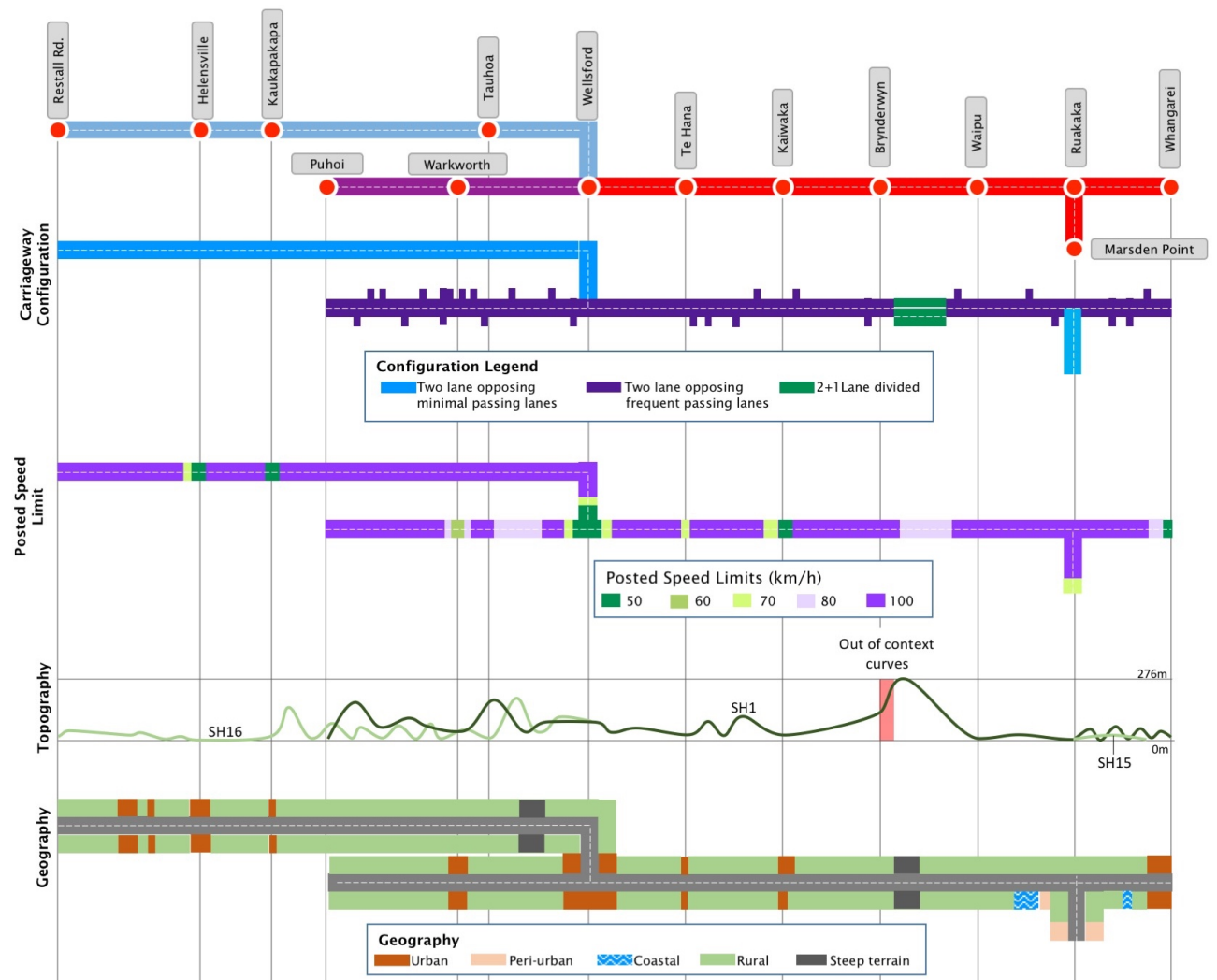
The corridor is generally 100km/h except for where reduction in speed limits is required within urban areas. Outside urban areas, there are 80km/h safer speed zones through the Dome Valley and the north side of the Brynderwyn Hills.

Topography/geography

The corridor generally traverses rolling hill country or coastal flats, being predominantly rural except for the few townships the corridor traverses, and the urban portion within Whangarei.

Dominating the topography of the SH1 part of corridor are the Brynderwyn Hills, the south side of which contains out of context curves and the requirement to drive at significantly slower speeds when both ascending and descending.

Figure 9 - Corridor characteristics

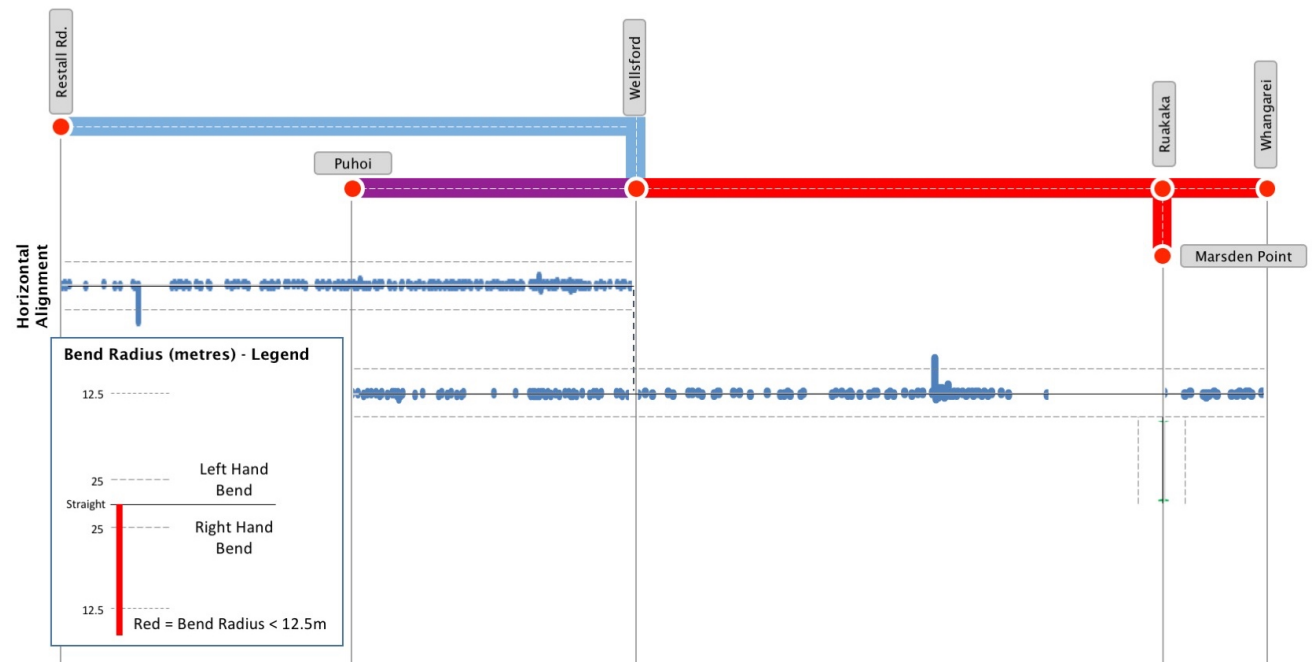


Horizontal alignment

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 corridor contains a regular occurrence of larger radius curves, except for the Ruakaka straights north of Waipu. Sharper bends with a radius below 25m occur at the Brynderwyn Hills and at the Parkhurst Road intersection in Helensville.

Figure 10 - Horizontal alignment



The south side of the Brynderwyn Hills can be challenging for unfamiliar drivers

Volumes

The section of corridor along SH1 between Puhoi and Whangarei supports significant overall traffic volumes per lane, increasing at the ends where the contribution of commuter traffic into urban areas is evident. SH16 has relatively low volumes except for a dramatic rise in volumes from Helensville south as the corridor nears Auckland.

The volume of heavy traffic along SH1 and down SH15 to Marsden Point is consistent with what would be expected of this corridor, as is the relatively low volume of heavy traffic along SH16 until the southern end past Kaukapakapa as significant industry and urban areas start to have an effect.

The effect of logging truck volumes coming from the northwest at Otaika and then through to SH15 is evident.

HPMV routes

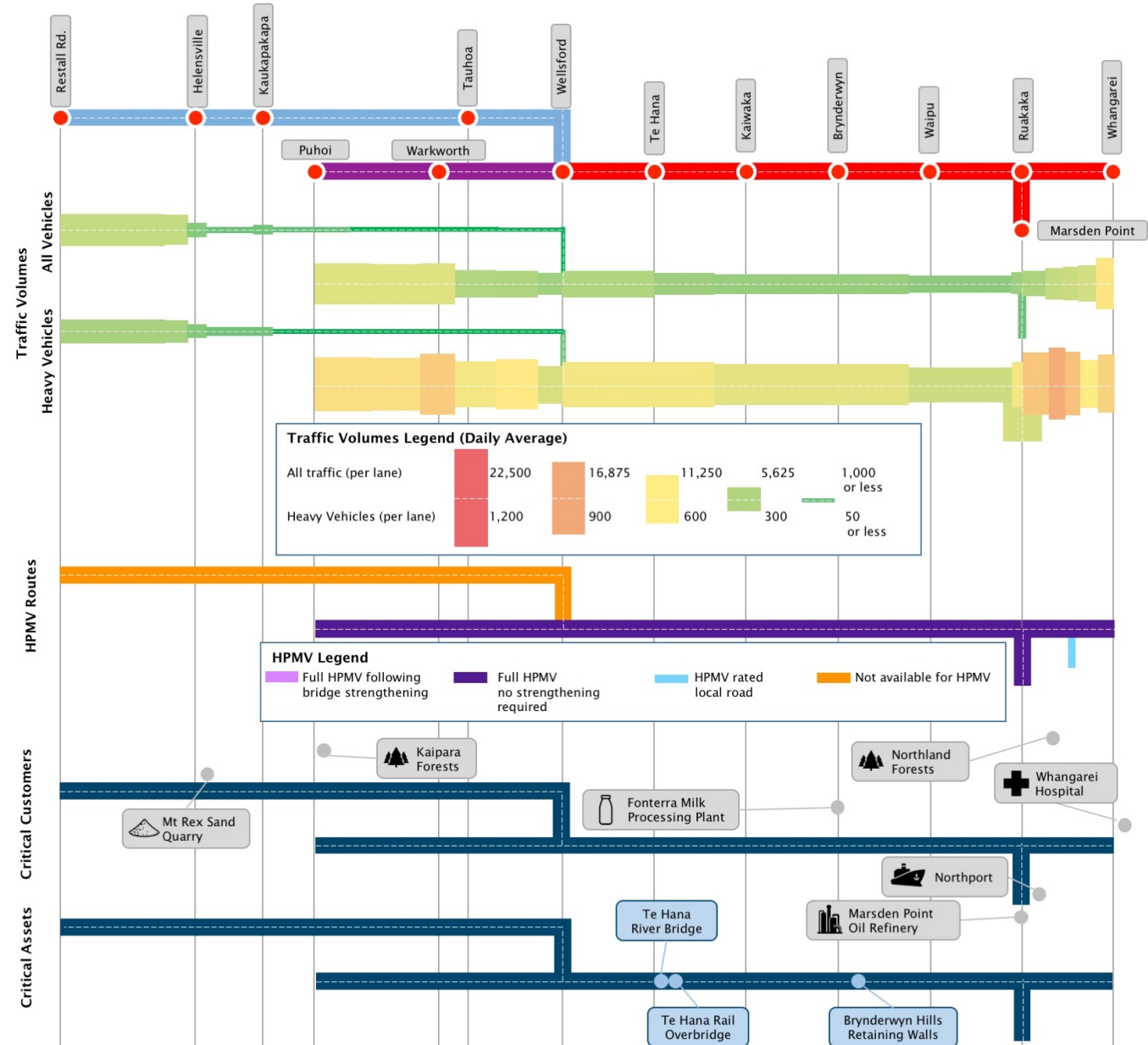
SH1 and SH15 to Marsden Point are both fully HPMV rated. Conversely, SH16 is not rated at any point within this corridor to carry HPMV traffic. Providing access to Golden Bay Cement, Portland Road running off SH1 at Otaika, is the only adjacent HPMV rated local road within the corridor.

Critical customers and assets

There are a number of critical customers adjacent or close to the corridor which rely on the corridor to be open 24/7 and are vulnerable to having short term interruptions which impact productivity. These include Fonterra being unable to pick up milk from large parts of the region, and patients that can't get to the hospital.

There are also critical assets along the route which need an enhanced maintenance focus to ensure they do not fail or significantly interrupt services along the network. For example, Bridges are not only a critical asset from a transport network perspective, but also provide carriage to other critical utilities infrastructure along the corridor which large parts of the community depend on.

Figure 11 - Corridor capacity



Pressures

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

- **Topography and landform:** The choke point of this corridor is where the landform is its narrowest, generally between Wellsford/Te Hana and Kaiwaka, where the topography and substantial river systems feeding into the Kaipara Harbour constrain alternate route opportunities (particularly to the west). Potential future eastern routes could compete with the growth and land use associated with the Maungawhai community and its environs.
- **Lack of HPMV alternative routes:** SH1 is fully HPMV capable, but options are immediately constrained once traffic is detoured away from SH1, to the extent that previous incidents have resulted in trucks parking up unable to access alternative routes. The Ara Tūhono Pūhoi to Wellsford Road of National Significance will provide limited relief to this pressure bypassing the Dome Valley. However, much of the corridor length will remain reliant on local roads for either full detour routes or to provide access to alternate highways.
- **Carriageway configuration on SH16:** The travel speed of HCV along SH16 are constrained in the northern sections due to its narrower width and slower alignment, making this a much less used and undesirable heavy vehicle route.
- **Urban growth and development in the North West of Auckland:** As urban growth continues, motorists are likely to seek alternate routes with a potential increased use of SH16 (particularly once works along SH20 are completed) and the connecting local roads (Peak Road as a way of bypassing Helensville, and Kahikatea Flat Road as connection between SH16 and SH1). The ONRC classification of some or all of SH16, as a Primary route, will need to be regularly monitored and revisited as appropriate.
- **Constraints on timing and logistics of maintenance activities:** Increasingly, as the corridor becomes more urbanised and traffic volumes increase, maintenance works are limited to night works. This can influence design decisions, management of Health and Safety, and material supply management, all of which may lead to ongoing asset maintenance implications. In addition, tight alignments such as through two lane narrow sections of SH1 Brynderwyns (and to lesser extent lower volume SH16/Windy Peak) require more considered scheduling and management of maintenance activities.

Future considerations

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

- **Appropriate levels of maintenance on existing sections of the corridor to be bypassed by RoNS:** The current and planned RoNS projects on the Corridor present an issue in regard to the appropriate level of maintenance investment in the sections of corridor that will ultimately be revoked to the relevant Local Authorities upon completion of the new routes. The issues revolve around how to manage the respective sections of the network in a safe and responsible manner without over investing in sections that will be substantially changed post revocation.
- **The influence of corridor access for maintenance activities on the proposed treatment:** Access for maintenance to some sections of the corridor requires a high level of planning and co-ordination, often at a higher establishment and implementation cost. In some cases, this requires full closure of an entire section – such as for some activities on the Brynderwyn Hills. The choice of treatment applied is increasingly dictated by the constraint of time on the network – how rapidly can we get in and out, how often we need to revisit, how quickly we can remediate, and how robust the treatment is.
- **Future levels of service:** Future proofing and maintaining appropriate levels of service for communities will be a key consideration for investment along this corridor as it continues to face changes in land use, travel behaviour, demand and mode share.
- **Increasing urban development along the corridor:** The corridor will require protecting from reverse sensitivity as growth continues, particularly where this creates higher expectations and a maintenance burden (such as noise reducing surfacing or noise attenuation treatment and constraints upon hours of work within the corridor.)
- **Alternative routes:** The absence of alternate routes along portions of this corridor mean that even minor maintenance (particularly unplanned) cannot be performed without some level of disruption to the smooth and efficient operation of the corridor.
- **Levels of service:** Increasingly operational constraints and Level of Service decisions may determine the type and nature of works applied to the corridor, not necessarily the conventional least cost outcomes.

Resilience

The corridor provides both major routes between Auckland and the north. With SH1 and SH16 having significant separation until they converge at Wellsford, it is unlikely both routes would be affected by closure at the same time, except for significant traffic incidents, or catastrophic natural disaster.

SH1 from Whangarei to Puhoi is the main transport connection between Northland and the rest of the country. The evidence shows that the corridor suffers regularly from unplanned incidents, which affects its resilience and availability.

Vulnerabilities

The low-lying areas of SH16 around the Kaipara Harbour coastline are particularly susceptible to flooding. Slips are an issue, particularly through the Dome Valley and in the Brynderwyn Hills area. The rail and river overbridges just north of Te Hana present a significant resilience risk should either or both bridges fail.

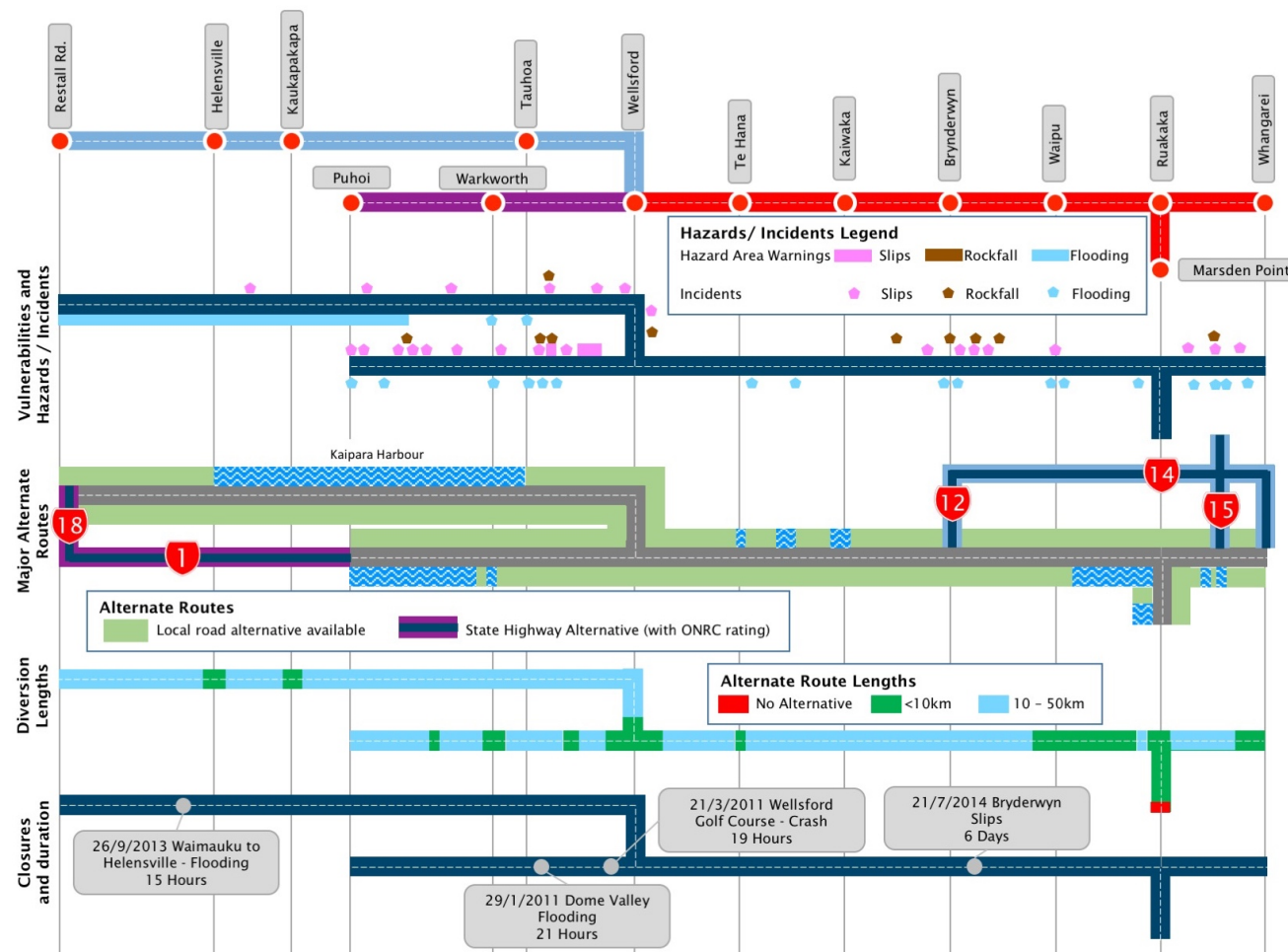
Alternative routes and diversion lengths

In the southern section of the corridor, SH1 Puhoi to Wellsford and SH16 provide the main alternative routes for each other, and SH16 is actively promoted during peak holiday periods. North of Wellsford, local roads provide most of the alternative routes, however there are restrictions on the ability to detour HPMV vehicles. Generally, the length of diversion routes is relatively short. As SH15 terminates at the boundary with NorthPort, the last short section of this part of the corridor has no alternative routes.

Closures and duration

This corridor can be subjected to both full and partial unplanned closures along its length. Major closures and their duration are shown in Figure 12.

Figure 12 – 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:

- **Slope stability:** Instability is common along much of this corridor resulting in random slips, debris and drop-outs, and identified long-term movement sites. These can often be cleared quickly, but the required response may vary from monitor and fill to more long-term structural repairs and disruption to some or all traffic.
- **Tight terrain and narrow alignments:** These characteristics, combined with heavy vehicle crash involvement, can delay re-opening of routes as specialised equipment may be required to remove crash debris, particularly through the Brynderwyn Hills.
- **Weather events, particularly flooding:** Natural events have an influence along much of this corridor, with alternate routes often worse affected. Low lying coastal margins such as along SH16 can be influenced by both rainfall, upstream watersheds and tidal affects. Climate change analysis indicates that this area will encounter increasing high intensity rainfall events, so these pressures can be expected to increase both in frequency and effect.
- **Vegetation management:** Dangerous trees are an ongoing maintenance item, and those within the highway corridor are risk assessed and prioritised for contractor removal. Vegetation management outside of the immediate corridor requires co-ordination with private property owners.
- **Limitations on communications and access:** Response times can be limited by both advice of an event (such as SH16, where mobile communication is less reliable), and site access (such as the need for wide spread flooding to subside). However, there are well prepared and tested response plans identifying responsible lead agencies and potential alternate routes to aid rapid response particularly to more frequent events such as traffic incidents.

Future considerations

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

- **Development of alternative routes:** The lack of good HCV alternative routes requires increased investment in mitigation to ensure the main corridor remains available. (Justification for higher level of service to facilitate resilience for all travel).
- **Maintenance management:** The maintenance response to resilience pressures is to ensure heightened readiness and prioritise known areas of weakness. Preventive works are programmed where practical (example – Satellite Station Road Intersection); proactive intervention is applied where there is advance warning of a potential incident and post incident recovery reactive works are prioritised to minimise disruption and rapidly re-enable the network. Risk of flooding on the Kaipara Harbour along SH16 section of corridor necessitates significant drainage maintenance in order to mitigate the resilience risk, and reduce the level of pavement maintenance and renewal.
- **Use of technology:** There are currently limited “eyes-on” opportunities along this corridor. An increase in ITS technology will be required as part of the resilience response to choke point areas such as between Wellsford and Brynderwyn Hills.



A resilient and accessible corridor is critical to keeping Northport operating 24/7

Reliability and efficiency

Efficiency

Generally, the corridor performs as expected, with reasonable efficiency along the open road sections and commuter volumes impacting AM and PM peaks in the Auckland and Whangarei urban environs. The section of SH1 Puhoi to Warkworth also has low levels of service during commuter peaks.

Low levels of service on SH16 north of Tauhoa are indicative of the nature of the geography at this point on the corridor. As expected, the south side of Brynderwyn Hills indicates a low level of service due to the need to slow down for both ascent and descent.

Variability

There is no variability data available for much of the corridor. However, the section of SH1 from Puhoi to Kaiwaka performs well in terms of variability except for the speed restricted section through Kaiwaka township. SH15 also indicates a low level of variability.

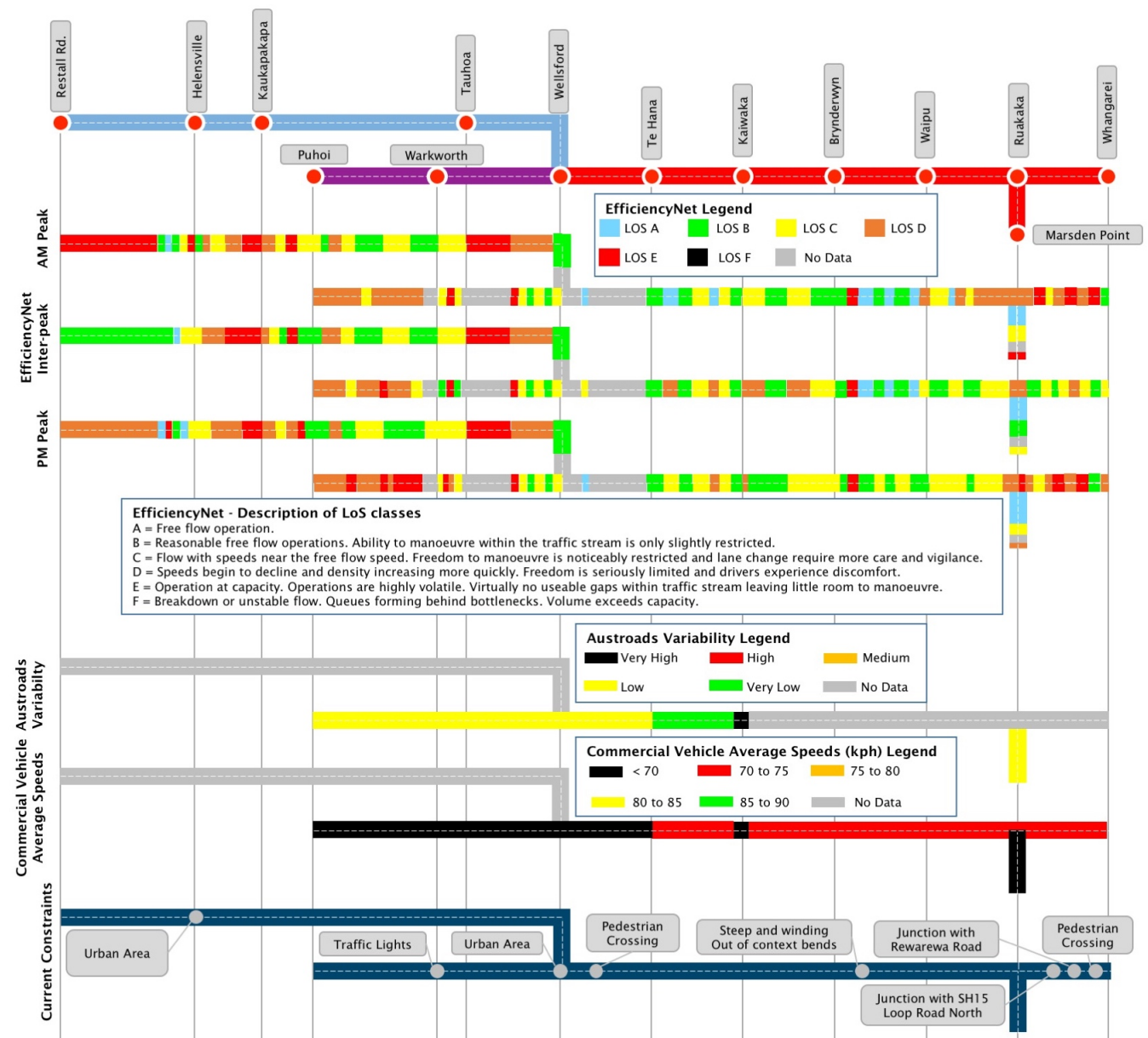
Commercial vehicle average speed

The SH1 and SH15 sections of the corridor generally perform poorly in terms of commercial vehicle average speeds.

Current constraints

The major current constraints on the network affecting journey reliability and efficiency are shown in Figure 13.

Figure 13 - Reliability and efficiency



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 follows:

- **Lack of data:** Efficiency data does not yet tell a story that is consistent with the anecdotal network observations along this corridor (either SH16 or SH1).
- **Seasonal peaks:** North of Wellsford the network generally operates reliably and efficiently, however increased recreational summer traffic demands along SH1 up to around Wellsford create a continuous flow of vehicles approaching the capacity of the route, making it very sensitive to rapid flow breakdown/congestion – inefficient/vulnerable/unreliable. (perfect storm).
- **Intersection efficiency:** Priority intersections are of limited efficiency once the main flow reaches its limits. Examples include SH16/SH1 where high density flow through Wellsford has flow on effect to SH16 with vehicles, particularly longer units, unable to easily access SH1 (no gaps in flow and excessive delay). Similarly, at the Otaika Valley Road (SH15/SH1) intersection, where long queues of southbound (right turn onto SH1) truck queues were observed.
- **Urban growth:** SH1 has priority through Wellsford, but there are a range of land uses and roadside activity that reduce the effectiveness of this flow as it moves through the 50km/h speed limited township. The interests of the local businesses and township are no longer compatible with the efficiency and effective operation of the State highway. The challenge is to maintain an effective balance between these competing interests until the completion of the RoNS, where the State Highway will follow a new alignment away from the township.

A signalised intersection at Warkworth results in significant queue lengths and again at peak times rapid flow breakdown – this area has been realigned multiple times and will become local road once this section of the RoNS is completed (projected to be 2022).

The southern end of SH16 is facing increasing pressure from growth (traffic and urban and recreational activities) as the residential boundary progresses west into the areas of Waimauku, Muriwai Beach and Helensville. Delays along the route increase as there are increased levels of intersection control and as traffic volumes move from free flow to continuous streams.

- **Limited transport choice:** Limited public transport options along SH16 will aggravate this as commuter peak demand increase with urban densification. There is a potential for greater use of local road connections between SH16 and SH1 as commuters access public transport options available at Albany/Silverdale/Orewa.

Future considerations

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

- **Timeliness of incident response:** Being able to respond quickly and efficiently to incidents on the network is important to maintaining reliable and efficient journeys for customers, this requires a higher level of response – both in identification and response.
- **Appropriate levels of investment in maintenance:** Where a route is to be revoked or replaced by an alternate route, it is expected that the existing level of service shall be maintained. Maintaining a reliable corridor approaching revocation of a route will require a level of investment consistent with that expectation.

As capital works and safety improvements come on stream there is a risk of additional maintenance burden from the cumulative costs, either from the unknown maintenance costs associated with new technologies, from replacement of sacrificial elements, or simply from under-estimation of operational costs.



Maintenance work is scheduled at night to minimise travel interruptions to customers

Safety

Collective risk

The corridor performs poorly for collective risk with the majority having a medium-high to high collective risk rating. Only the sections between Wellsford to Te Hana, Ruakaka to Marsden Point and the road around Glorit - Tauhoa having a medium risk rating. SH15A to Marsden has a medium risk rating for its entire length.

Personal risk

There is a high or medium-high rating for the entire corridor between Wellsford and Restall Road except for a section north of Kaukapakapa. Personal risk is low between Puhoi and Te Hana before varying between low and medium-high through to Whangarei.

SH15A has a medium personal risk rating along the whole length.

Star rating

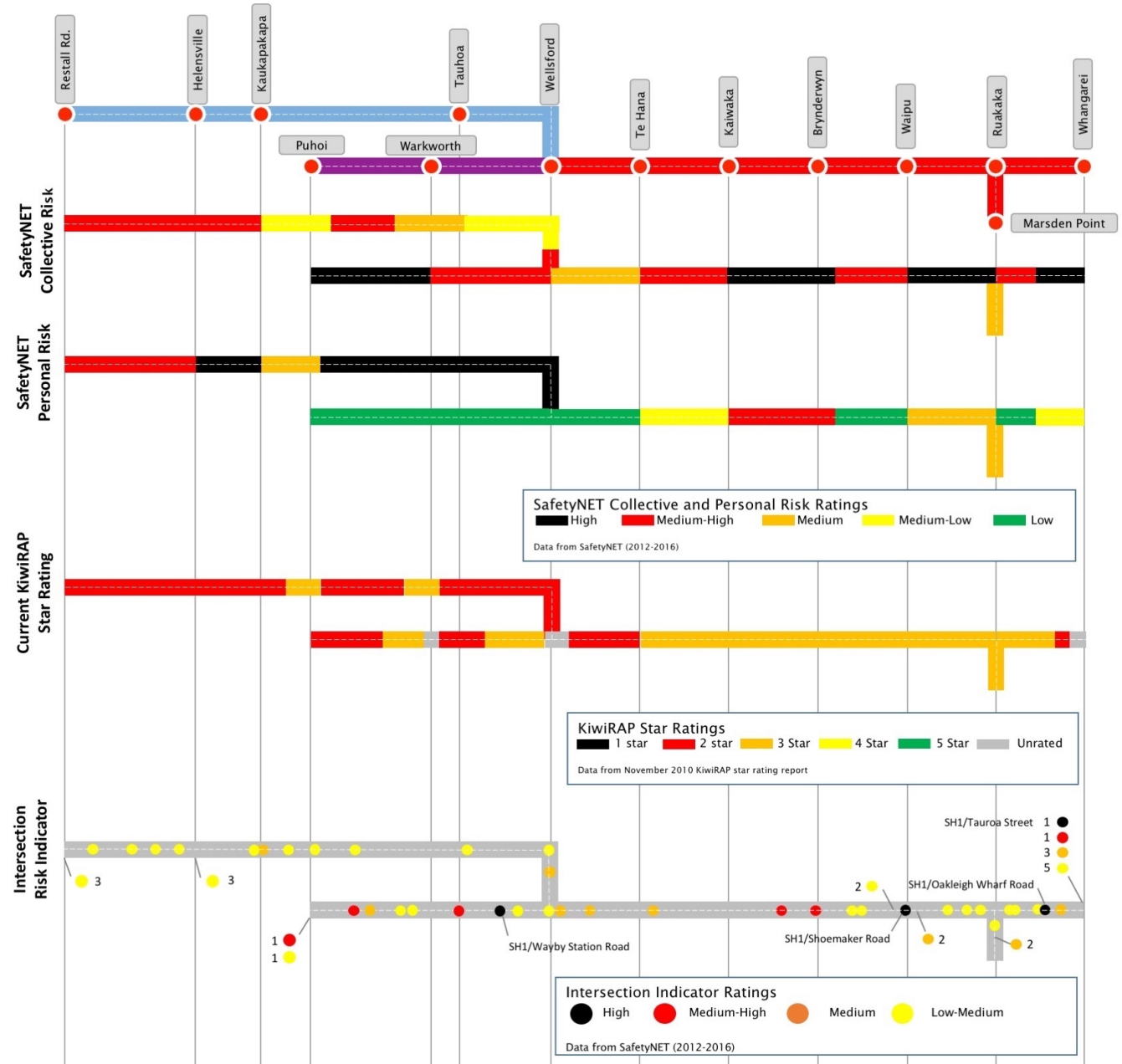
SH1 between Whangarei and Te Hana, including SH15, has generally a 3-star rating except where it approaches Whangarei where it has a 2-star rating.

From Te Hana to Puhoi, SH1 is predominantly 2-star rated apart from small sections around Warkworth, Wellsford and segments between Kaukapakapa and Tauhoa where it is 3-star. For the urban areas of Warkworth, Wellsford and Whangarei, no star rating has been given.

Intersection risk indicators

There are four high risk on SH1 (Tauroa Street, Oakleigh Wharf Road, Shoemaker Road and Wayby Station Road).

Figure 14 - 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:

- **Desire to increase safety:** SH16 between Helensville and Wellsford has the worst personal risk of this corridor (and of the Northland/Auckland region). It has relatively low traffic volumes with variable road standards and few major intersections through a relatively remote rural area. Crash severity can be expected to include serious and fatal injuries with emergency services response times critical to patient recovery.
- **Safety risk on sections of the highway to be bypassed:** SH1 between Warkworth and Wellsford, has an elevated level of collective risk (medium-high). It has high and mixed traffic volumes as well as adjacent land use activities competing for the same two-lane undivided road space. Eventually, the Warkworth to Wellsford section of the RoNS will reduce this safety risk, but in the interim minor works treatment and careful management will be required to maintain/hold risk levels.
- **Roadside hazards:** Unforgiving roadsides are creating potential safety issues on sections of the corridor. This is being caused by a combination of topography and geometric constraints.
- **Driver fatigue:** Fatigue is a contributory factor to crashes. Long travel times for key journeys and lack of stopping facilities contribute to fatigue. This is exacerbated when travel time is longer due to the temporary increase in traffic around key holidays.
- **Out of context curves:** The terrain and topography of the corridor results in a tortuous road environment in places, and out of context curves, requiring lower speeds and careful navigation when driving such as the Brynderwyns.
- **Mix of agricultural activities with traffic:** 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.

Future considerations

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

- **Alternative pavement materials:** The degradation of pavement surfaces places a burden on SCRIM management. Investigation into alternative pavement materials which provide an improved balance between cost and benefit may be warranted.
- **Stopping places:** Review the appropriateness of rest and heavy vehicle pull over areas along the corridor to encourage drivers to stop for a break. Incentives such as food and beverage or Wi-Fi connections may assist in increasing use of these areas.



Significant safety improvements have been undertaken on the Brynderwyn Hills

People, places, and environment

Natural environment

The SH1 & SH16 corridors are characterised by topography, catchments and harbours, and native forest fragment. Protection of threatened fauna and biosecurity (e.g. Kauri Dieback) are key factors. Examples of these interactions include: SH1 interface with the Puhoi River's estuarine habitat and flora. The Pohuehue Viaduct on SH1 across the Pohuehue Scenic Reserve (DOC) south of Warkworth. Through the Dome Valley to the Brynderwyns adjacent pockets of habitat supporting threatened fauna. Causeways' crossing the upper reaches of the Whangarei Harbour near Oakleigh interfacing with estuarine habitat and flora. SH16 interface with the Kaipara Harbour catchments between Helensville and Tauhoa. Between Helensville and Kaukapakapa alongside the Kaipara and Kaukapakapa Rivers, and Kaipara Harbour to Tauhoa, including crossing the Makarau and Hoteo Rivers to the north.

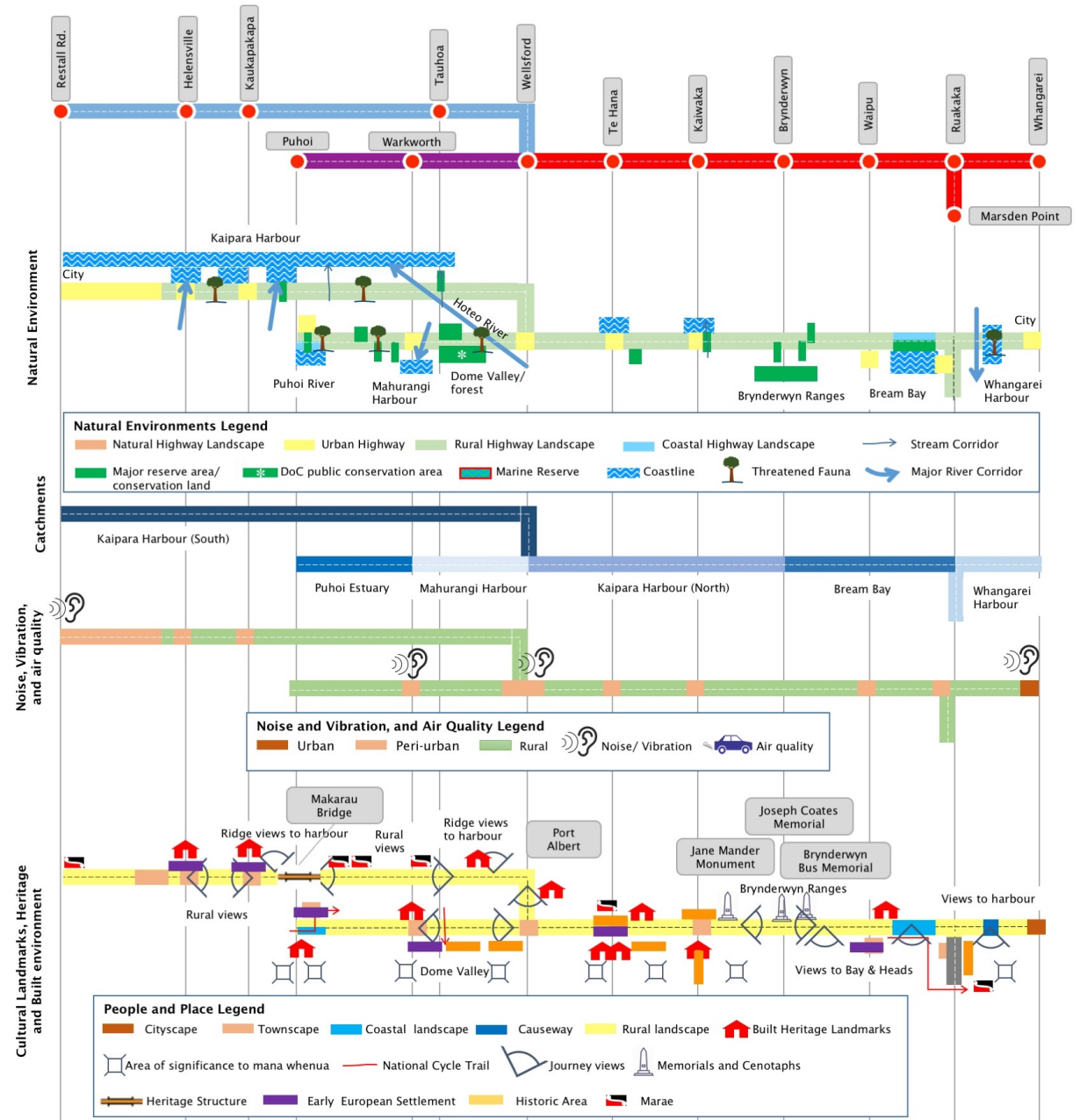
Noise, vibration and air quality

Congested urban areas, including Kumeu, Warkworth and Wellsford are subject to noise issues. Consistent heavy traffic volumes on SH1 along with periods of high light vehicle traffic create noise issues in Warkworth and Wellsford where residential development abuts the highway.

Cultural landmarks, heritage and built environment

Visible landmarks include pa, early colonial houses, monuments to local politician Joseph Coates, author Jane Mander, a memorial to lives lost in a bus crash on the south side of the Brynderwyns, and the Makarau Bridge on SH16. Lookouts and views capture the Kaipara Harbour (SH16), and Bream Bay heads and islands (SH1). There are a number sites and buildings of both European and Maori significance along the corridor. The Makarau Bridge on SH16 north of Kaukapakapa is a scheduled heritage bridge. Many layers of exploration, occupation and settlement prevail along the corridor providing rich archaeological deposits with some of the earliest known Maori sites. Urban settlements along the corridor provide stopping places for highway customers, local trade and have their own sense of place, entrances and streetscapes (along the highway). A number of these urban settlements are also subject to recent urban development, land use and urban form changes.

Figure 15 – People, places and environment



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:

- **High standards of environmental management:** in relation to stormwater, erosion and sediment control and the reduced use of herbicides for plant pest management may be required for works in the vicinity of coastal and estuarine areas, such as the Kaipara Harbour, near Puhoi, along Bream Bay and at Oakleigh. Activities in these areas may also be restricted to certain times of the year impacting maintenance programmes.

Similarly changes in how activities are undertaken in areas of threatened fauna through the Dome Valley and Brynderwyns. In addition, biosecurity matters in relation to Kauri dieback regional wide.

- **Noise, vibration and air quality:** As urban growth continues in the North (Warkworth, Wellsford) and North West (Auckland north-west of Kumeu), the need to manage impacts will increase. New urban development will be constructed with current building requirement for acoustic glazing which will reduce potential impacts from noise.

The Puhoi to Warkworth RoNS will significantly reduce traffic volumes and congestion in Warkworth helping to potential reduce impacts on noise, and air quality. Expansion of urban area in Warkworth to the edge of P2W counter acts improvements.

- **Sites of cultural and heritage significance:** There are several built heritage (urupa/ cemeteries, monuments/memorials and buildings) along the route which will need to be managed and/or protected as the corridor develops. There are increasingly higher standards of assessment and management in relation to cultural and built heritage, and archaeology.
- **View shaft and vegetation management:** Providing adequate amenity & facilities to stopping places (including rest areas) along the corridor are an important part of the journey experience and development of the corridor.
- **Town entry treatments:** Increased pressure to support communities with appropriate town entry treatments, streetscape and signage to support local services and facilities will need to be considered as a whole. Particularly where new sections of highway bypass existing settlements and connections are redeveloped.

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:

- **Increasing urban development** will place pressure on the corridor in terms of capacity and safety. Collaboration with other road controlling authorities to consider alternative routes to develop a long term strategic transport network. Similarly avoiding reverse sensitivity issues early, through land use planning and urban form conversations.
- **Combining stopping places** (including rest areas and look outs) with places of interest, heritage sites, local business areas and main streets, and future electric vehicle charging infrastructure. Utilising these places to tell local stories and enhance the attractiveness and amenity of journeys. Integrating stopping places for all customers that are safe and attractive.
- **With desirable walking & cycling facilities** crossing, public parking and access along SH corridor is increasing, primarily SH1, such as Moir Hill Walkway, SH12 Intersection (commuter and ride share parking) and Waipu Cove/Uretiti (DOC camp site and coastal lookout) there is opportunity to partner with others to rationalise all sites and mitigate safety and access issues, including way finding signage and intersection safety to popular places.
- **Environmental/ permit CSVUE compliance** for the corridor is currently high. There is a drive for an increased level of compliance in CSVUE for capital projects in particular, and more robust evidence to support compliance for all activities, including maintenance operating up to consent/ regulations
- **Opportunities for consolidation/rationalisation of resource consents**, particularly for regular maintenance activities.
- **Mapping sensitive ecological areas.** Managing biosecurity and biodiversity issues along the corridor through smart technologies and monitoring.
- **Streamlining environmental assessment work.** Opportunities for Archaeological assessments across the corridor, and guidance from tangata whenua would assist in work on cultural and heritage places, and what should be budgeted for, e.g. structures such as the scheduled Makarau Bridge.

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 11,412km of roads and associated assets. This corridor contributes approximately 191 km of road network which reflects 1.7% nationally. The total value of the assets along the corridor is \$351M (excluding ITS, and, heritage and green assets).

The corridor assets have been divided into eight groups as shown in Figure 16 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 16 - Corridor asset base

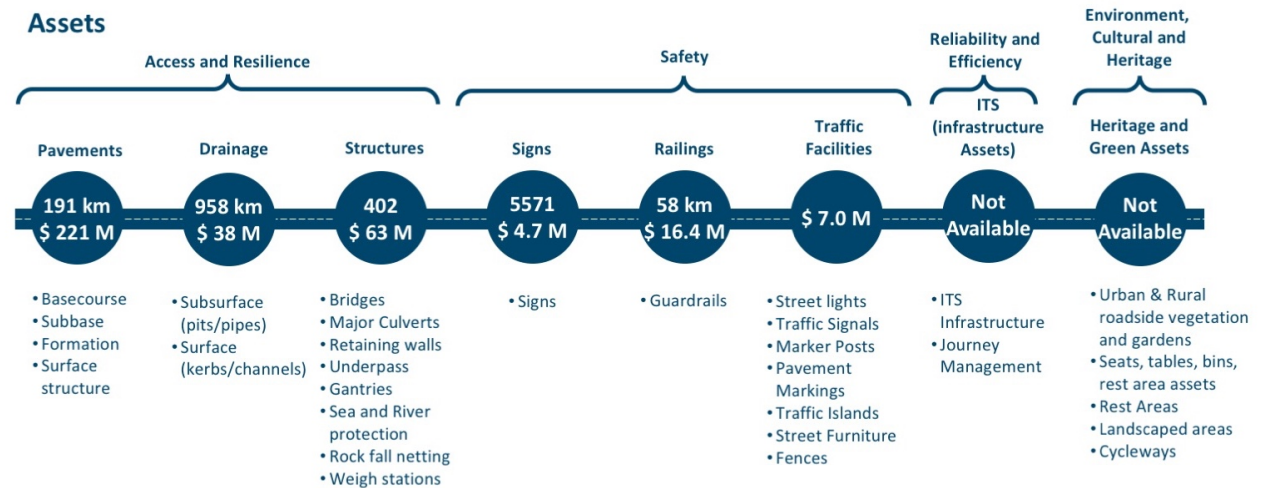


Figure 17 - Summary asset condition and performance

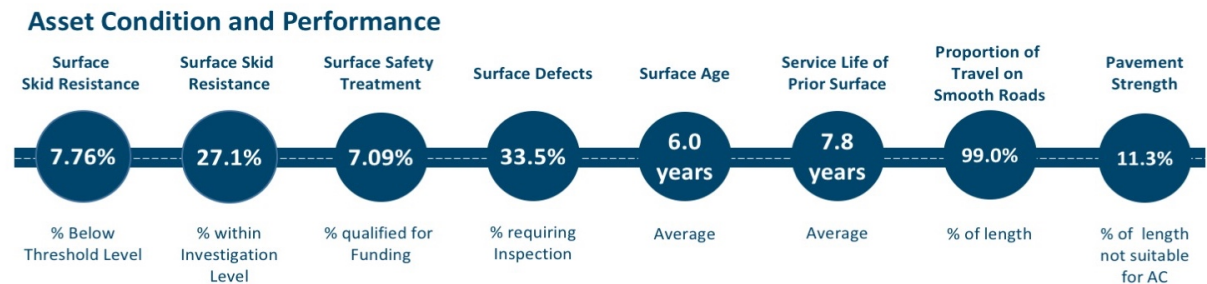


Figure 18 – Asset condition

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.

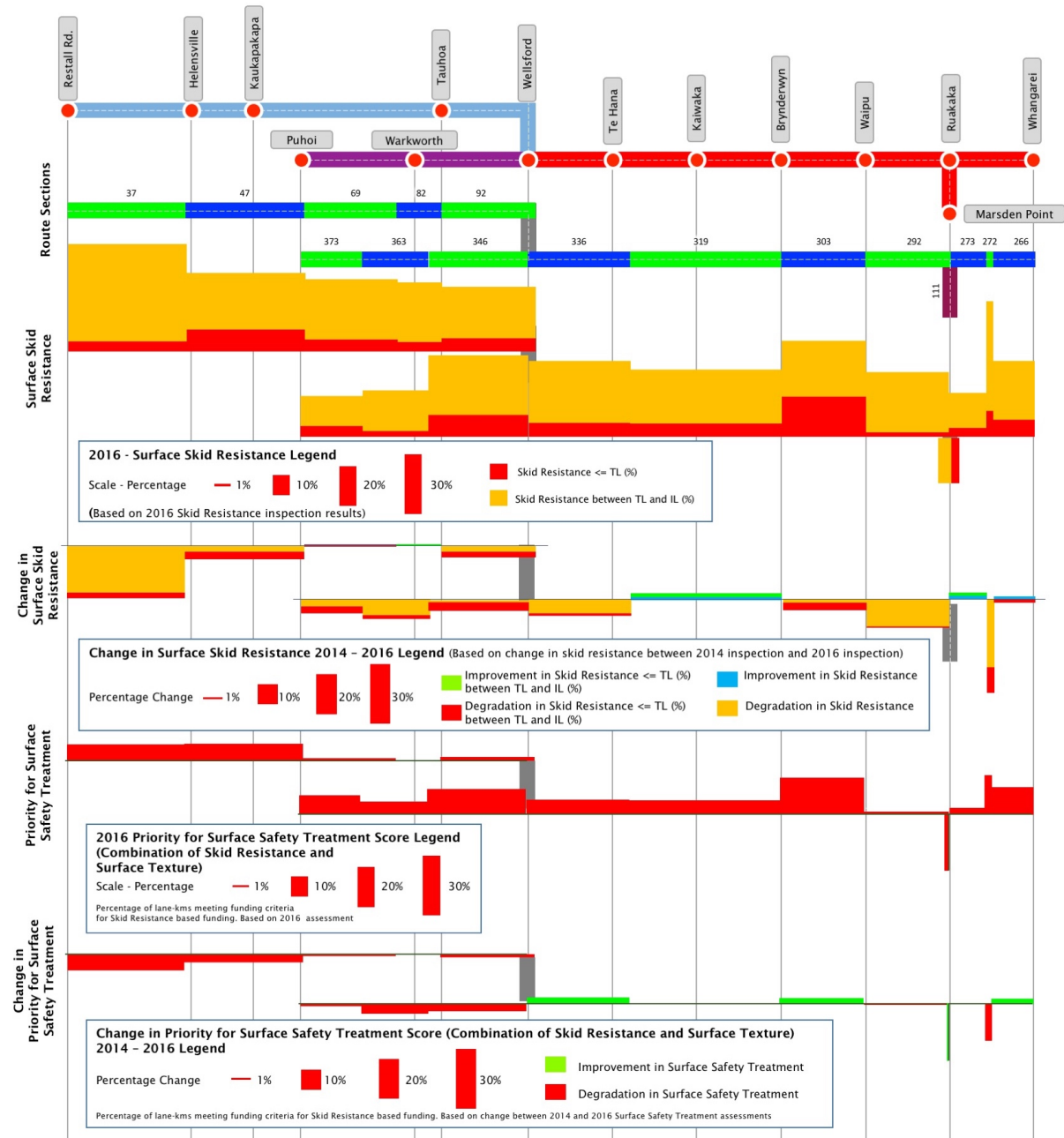
The corridor shows poor performance in terms of surface skid resistance for its entire length except for section SH15/111 at Marsden point. Also, surface skid resistance has been deteriorating along most of the corridor except for sections 1N/273 at Ruakaka, and 1N/319 between Brynderwyn and Te Hana.

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.

With 30 lane/km eligible for Surface safety treatment funding, 7.28% of the corridor, this is one of the worst performing corridors and a priority for intervention. While the section of corridor north of Wellsford has shown an improvement or at least stayed steady over the past three inspections, SH16 and SH1N south of Wellsford have shown a degradation.



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, 27% of the corridor achieves a score above which inspection is required. Sections with significant lengths of surface requiring inspection include: SH1 between Ruakaka and Warkworth, and 1N/266 in Whangarei. Rutting is a significant issue contributing to the level of surface defects.

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.

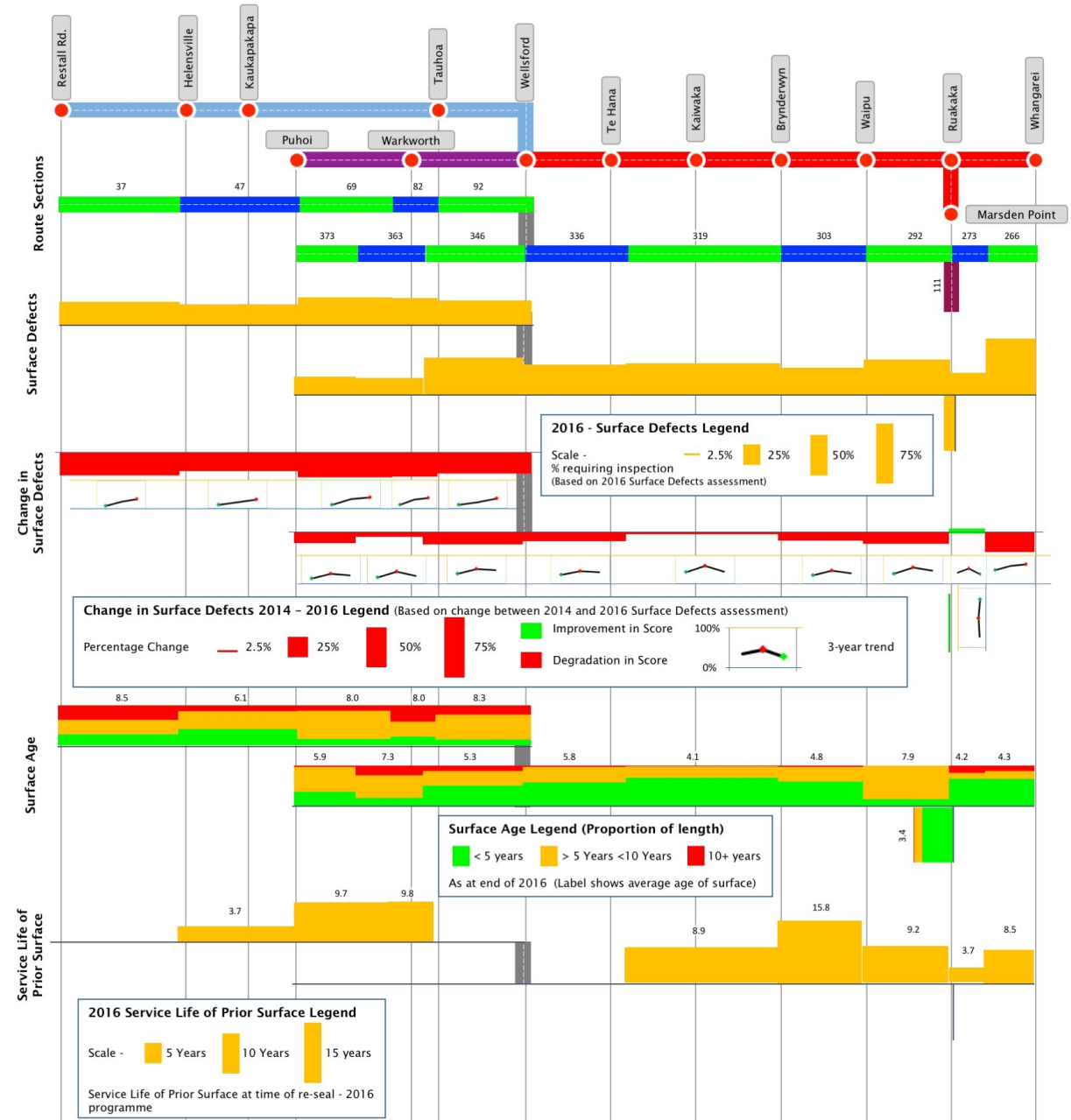
The sections of corridor with the oldest age profile are 16/37 West of Waimauku, and 16/69, 16/82, and 16/92 between Kaukapakapa and Wellsford.

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 7.8 years.

Figure 19 – Asset condition 2



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 1N/292 and 1N and 1N/303 between Ruakaka and Brynderwyn.

Proportion of travel on smooth roads

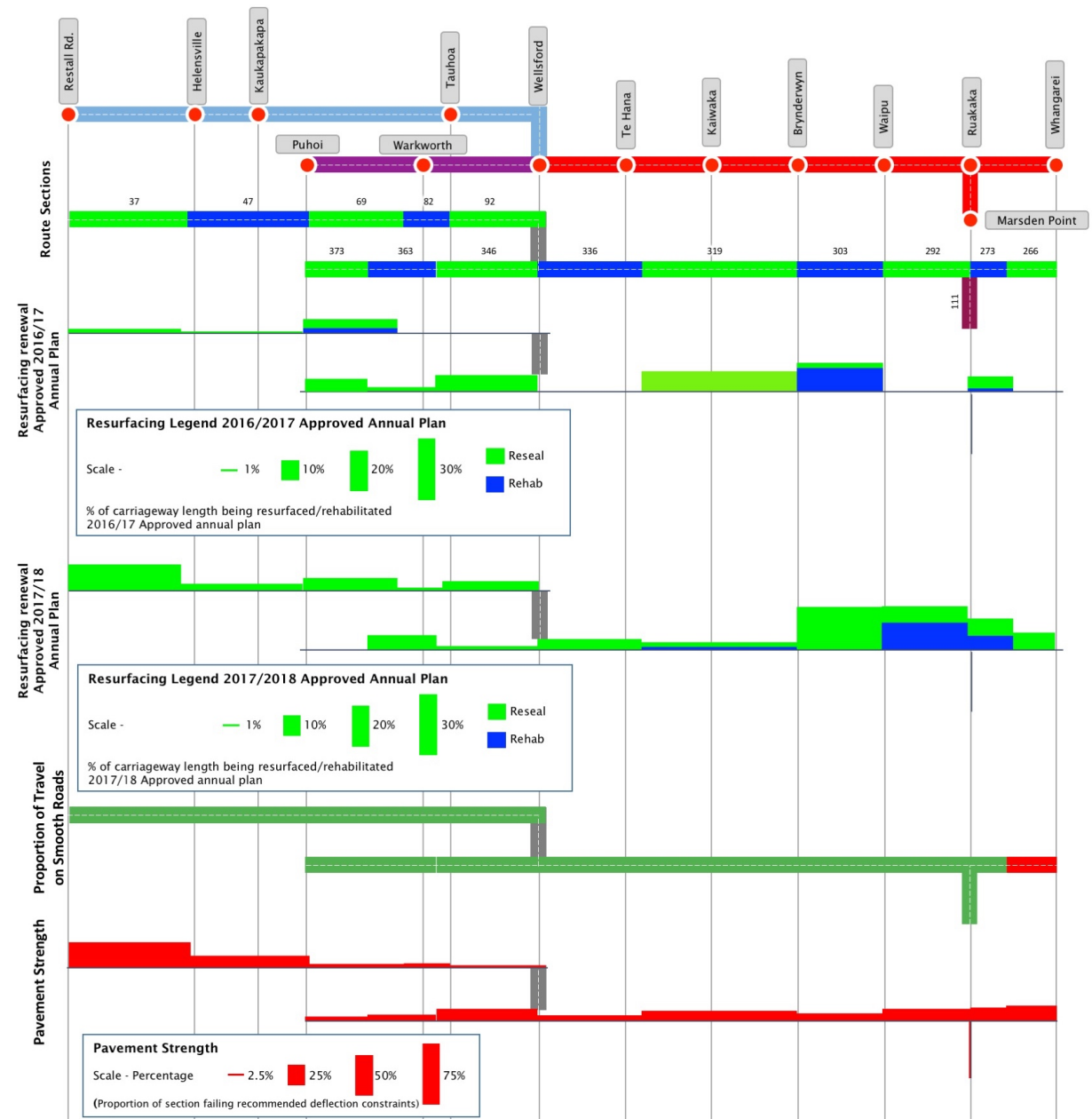
The infographic shows whether the route section passes the ONRC standard for Proportion of Travel on Smooth Roads (Smooth Travel Exposure). 97% is the ONRC target for proportion of travel on smooth roads. The infographic simply shows whether the route section achieves this level or not.

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 the northern end of SH1N between Waipu and Whangarei.

Figure 20 – Asset condition 3



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:

- **Critical corridor:** This is a critical route linking Auckland and the economy of Northland. Any loss of access to the route would be significant and cause major disruption to customers.
- **Surface skid resistance:** Surface skid resistance and priority for surface safety treatment is a real issue on this corridor, particularly on the higher volume section between Puhoi and Whangarei on SH1N.
- **Poor pavement base:** Much of the route is based on the original alignment of road and so has a pavement base where there has been no formal investigation of geotechnical aspects of the pavement. This may cause issues with the underlying base having not been fully prepared.
- **Poor aggregate:** Surface aggregate is of poor quality and susceptible to moisture. When the aggregate gets wet it degrades rapidly.
- **Cultural sensitivity:** There is cultural sensitivity around where the road is formed, meaning when maintenance is undertaken iwi consultation is critical.
- **Environmental pressures:** There are environmental maintenance pressures associated with litter, improving the aesthetic value of the route, and a desire for improvements in rest areas and stopping places.
- **Road Markings:** The alignment of the road means line markings wear out quickly, having to be renewed on a more frequent schedule than normal.
- **Incident Response:** There is an ongoing issue with effective incident response and quick proactive management of road closures.
- **Night works:** Due to volumes on the corridor and the carriageway configuration, much of the maintenance is carried out as night works, so that maintenance has an acceptable level of impact on travel. This is also required to ensure the Health and Safety of the maintenance workforce and the travelling public.

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:

- **Programme Alignment:** There are emerging plans for major works north of Wellsford. As the details of these initiative firm up this will need to be coordinated with the maintenance programme to ensure expenditure is applied in the right areas.
- **Alternative pavement treatments:** Volume of growth may generate the need for alternative methods of pavement rehabilitation.
- **New Highways:** The two RONS projects will bypass most of the current route between Puhoi and Wellsford. This will address the medium-term asset condition issues for this part of the corridor.



Under slips can quickly undermine the pavement

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 significant 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 determine 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 and Operations	\$8,830	\$9,854	\$15,330
	Renewals	\$16,067	\$13,719	\$21,667
	Improvements	\$4,300	\$7,500	\$0
Reliability and Efficiency	Maintenance and Operations	\$4,977	\$5,163	\$7,775
	Renewals	\$388	\$451	\$621
	Improvements	\$72,735	\$103,600	\$500,000
Safety	Maintenance and Operations	\$7,993	\$8,909	\$13,932
	Renewals	\$3,112	\$3,856	\$6,021
	Improvements	\$302,700	\$120,000	\$13,910
People, Places and Environment	Maintenance and Operations	\$2,142	\$2,008	\$3,062
	Renewals	\$305	\$591	\$786
	Improvements	\$8,000	\$9,000	\$0
Total		\$431,550	\$284,652	\$583,104

Figure 21 – Corridor Investment

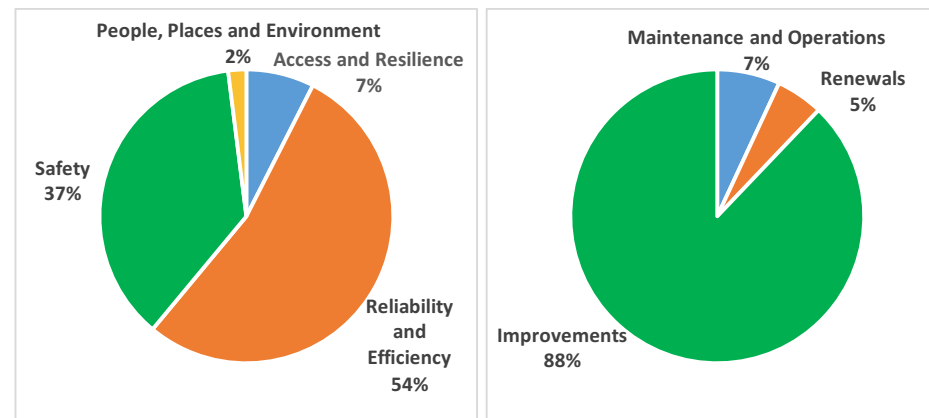


Table 2 - Summary investment by work category (\$000)

Outcome	Work Category	2018-2021	2021-2024	2024-2028
Access and Resilience	111 Sealed Pavement Maintenance	\$2,374	\$3,113	\$5,108
	112 Unsealed Roads	\$0	\$0	\$0
	113 Drainage Maintenance	\$394	\$563	\$876
	114 Structures Maintenance	\$1,252	\$1,365	\$2,114
	121 Environmental Maintenance	\$1,430	\$1,540	\$2,313
	122 Traffic Services Maintenance	\$56	\$66	\$102
	124 Cycle Path Maintenance	\$8	\$8	\$12
	151 Network & Asset Management	\$2,712	\$2,621	\$3,936
	161 Property	\$605	\$578	\$868
	211 Unsealed Road Metalling	\$8	\$8	\$13
	212 Sealed Road Resurfacing (excl. surface skid resistance)	\$9,042	\$5,925	\$11,262
	213 Drainage Renewals	\$944	\$549	\$703
	214 Pavement Rehabilitation	\$4,252	\$5,284	\$6,796
	215 Structures Component Replacements	\$1,628	\$1,816	\$2,696
	222 Traffic Services Renewals	\$194	\$138	\$197
321 - 341 Improvements	\$4,300	\$7,500	\$0	
Reliability and Efficiency	121 Environmental Maintenance	\$1,294	\$1,388	\$2,084
	123 Operational Traffic Management	\$2,475	\$2,620	\$3,957
	151 Network & Asset Management	\$1,097	\$1,051	\$1,576
	161 Property	\$111	\$105	\$158
	222 Traffic Services Renewals	\$388	\$451	\$621
	321 - 341 Improvements	\$72,735	\$103,600	\$500,000

Outcome	Work Category	2018-2021	2021-2024	2024-2028
Safety	111 Sealed Pavement Maintenance	\$2,678	\$3,567	\$5,778
	112 Unsealed Roads	\$15	\$16	\$24
	113 Drainage Maintenance	\$463	\$274	\$418
	114 Structures Maintenance	\$300	\$334	\$510
	121 Environmental Maintenance	\$127	\$161	\$242
	122 Traffic Services Maintenance	\$2,694	\$2,808	\$4,217
	124 Cycle Path Maintenance	\$0	\$0	\$0
	151 Network & Asset Management	\$1,458	\$1,496	\$2,364
	161 Property	\$258	\$253	\$380
	212 Surface Skid Resistance	\$1,882	\$2,015	\$3,027
	214 Pavement Rehabilitation	\$19	\$37	\$55
	215 Structures Component Replacements	\$263	\$955	\$1,437
	222 Traffic Services Renewals	\$949	\$849	\$1,502
	321 - 341 Improvements	\$302,700	\$120,000	\$13,910
	People, places and Environment	111 Sealed Pavement Maintenance	\$496	\$336
121 Environmental Maintenance		\$1,318	\$1,361	\$2,044
151 Network & Asset Management		\$263	\$250	\$376
161 Property		\$65	\$62	\$93
221 Environmental Renewals		\$305	\$591	\$786
321 - 341 Improvements	\$8,000	\$9,000	\$0	
	Total	\$431,550	\$284,652	\$583,104

To be confirmed through the RLTP

Investing in access and resilience

Operations and maintenance

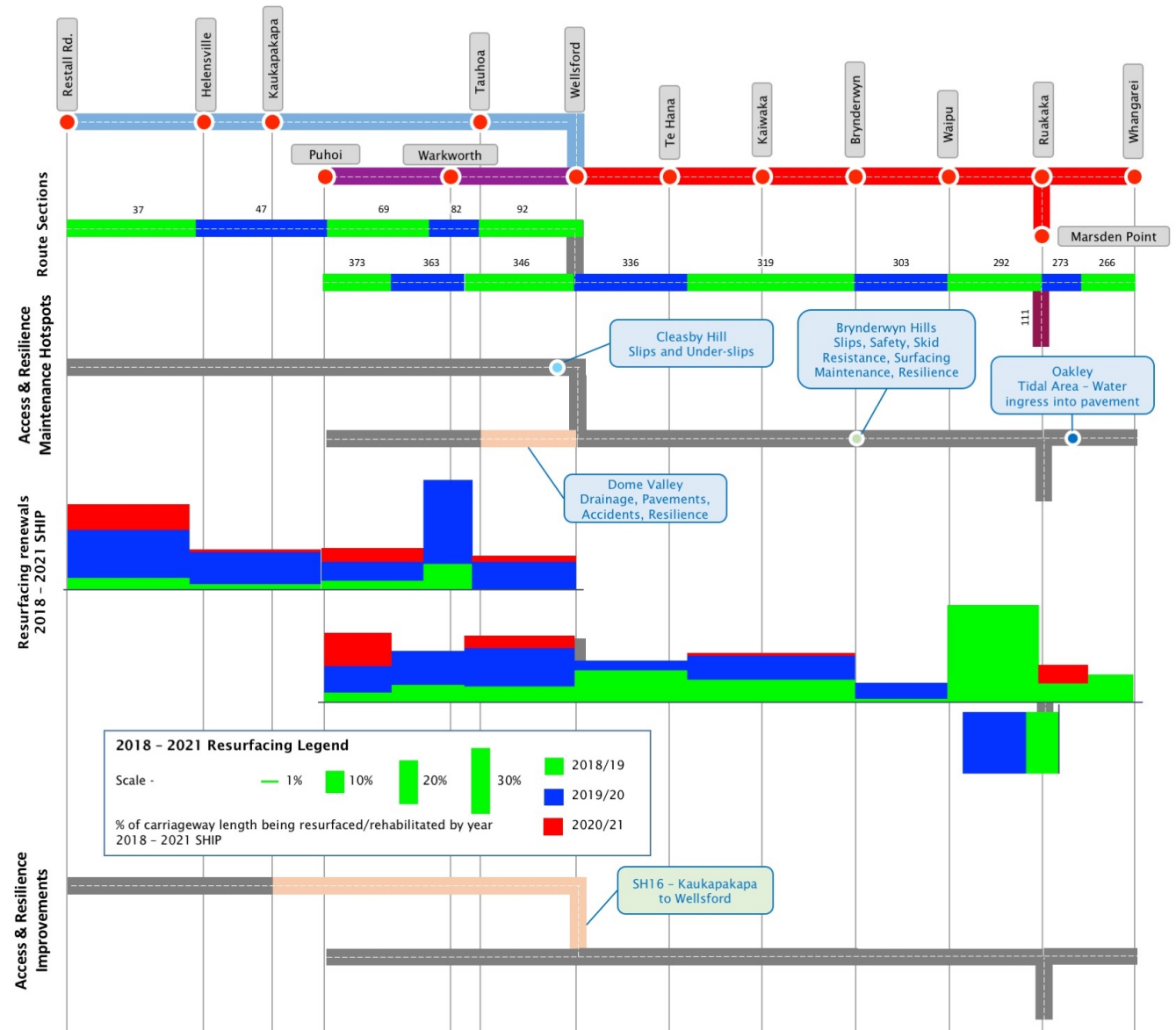
The main areas of investment to provide and preserve access and resilience are drainage maintenance, sealed road surfacing and structural component replacements and vegetation control. A key focus is to realign the base preservation quantities toward increased preventative maintenance and to slow pavement deterioration specially through improved drainage.

Maintenance hot spots

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

- **South side of Brynderwys** – safety, slips, pavement, barriers, surface skid resistance, surface maintenance, and resilience are all issues.
- **Oakley** – This is a tidal area where water ingress can cause pavement degradation issues.
- **Dome Valley** – this section of corridor has drainage, pavement, safety, resilience issues. Ongoing attention to these issues will be required until the Puhoi to Wellsford RONS eventually bypasses this section of corridor.
- **Cleasby hill SH16/RS92** – this section of the corridor experiences slips and under-slips

Figure 22 – Access and resilience investment



Renewals

Resurfacing renewals 2018-2021 SHIP

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: 1N/292 between Ruakaka and Waipu, 16/37 Between Waimauku and Helensville, and, 16/82 south of Tauhoa.



Improvements

Planned

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

Draft Regional Land Transport Programme considered for the SHIP

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

Table 3- Draft regional programme considered for the SHIP

Project	Funding Status	Description
SH16 - Kaukapakapa to Wellsford		Resilience improvements to SH16 to address flooding

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

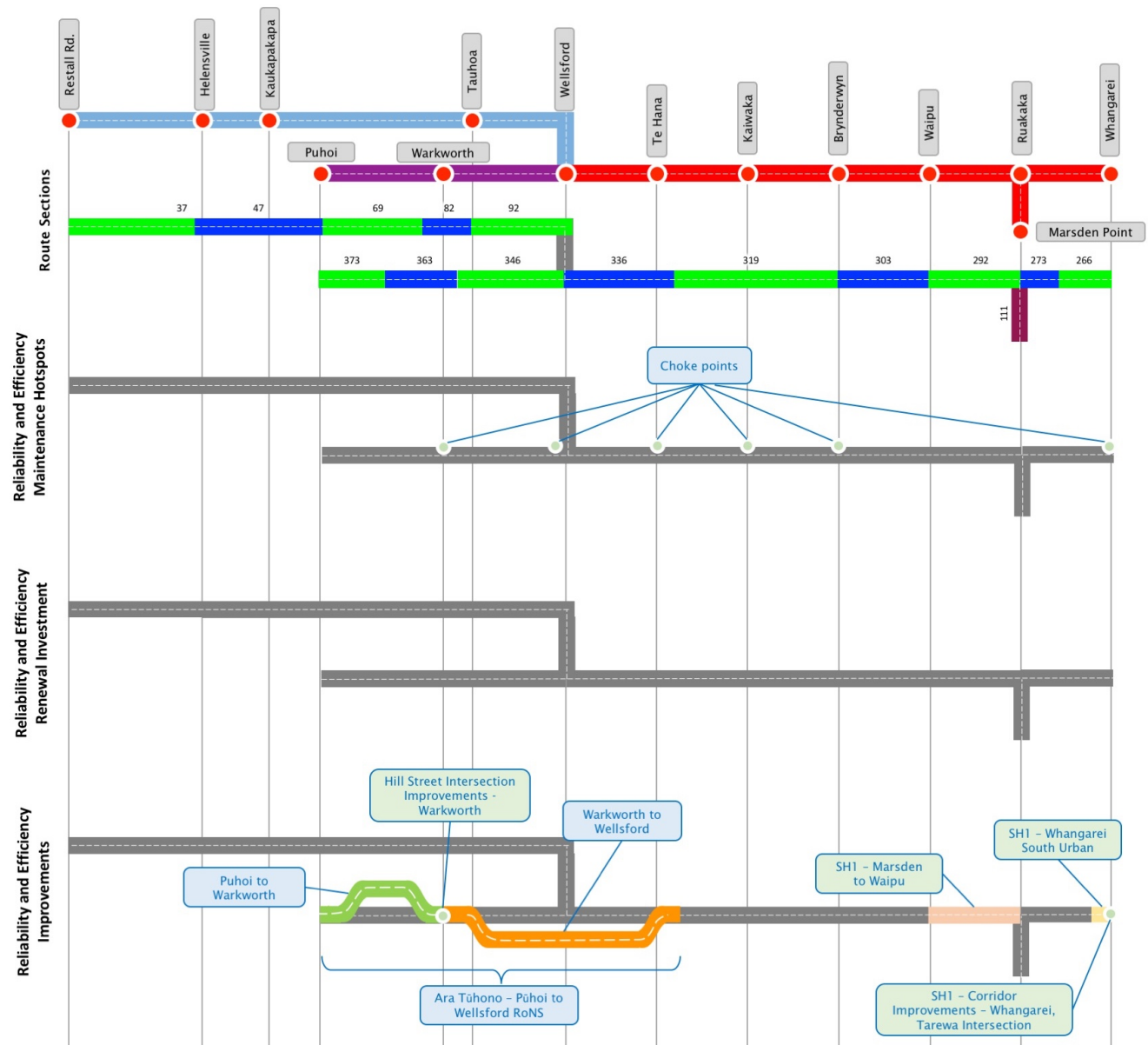
The following maintenance ‘hotspots’ require additional monitoring or cause an increased maintenance burden along the corridor:

- The following locations are hotspots in terms of their importance in keeping the road open to ensure reliable and efficient journeys, and given priority when responding to issues.
 - Dome Valley
 - Kaiwaka
 - Brynderwyns
 - Otaika Valley
 - South of Whangarei



Investing in making the Dome Valley safer for everyone

Figure 23 – 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/>

SH1N – Pūhoi to Warkworth

Description: The Warkworth to Wellsford project is the first stage of Ara Tūhono Pūhoi to Wellsford. SH1 between Pūhoi and Warkworth is a key transport link connecting the north to the upper North Island freight triangle of Auckland, Waikato and Tauranga. The route is part of the Roads of National Significance programme that the New Zealand Government has established to move people and freight between and within major centres more safely and efficiently.

SH1N – Warkworth to Wellsford

Description: The Warkworth to Wellsford project is the second stage of Ara Tūhono Pūhoi to Wellsford - one of the seven Roads of National Significance (RoNS). The RoNS are essential state highways that the Government has identified that require upgrading to reduce traffic congestion, improve safety and support economic growth in New Zealand.



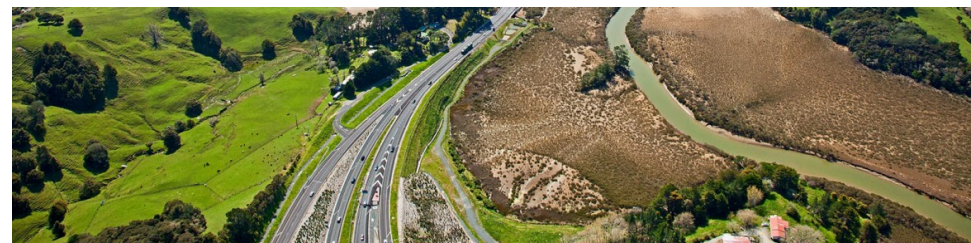
Aerial view of Schedewys Hill

Draft Regional Land Transport Programme considered for the SHIP

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

Table 4- Draft regional programme considered for the SHIP

Project	Funding Status	Description
SH1 – Whangarei South Urban (Tarewa Rd to Toetoe Rd)		Improvements to SH1 to increase capacity, improve safety and provide for more transport choice
SH1 – Marsden to Waipu (SH15 to Schultz Rd) LTS		Capacity and safety improvements on a good alignment with divided carriageway
SH1 – Corridor Improvements – Whangarei, Tarewa Intersection		Improvements to SH1 to increase capacity, improve safety, provide transport choice, and facilitate local growth
Hill Street intersection improvements - Warkworth		This intersection improvements were previously part of Warkworth Stage 1 project with the primary objective of managing current and future growth on the State Highway 1 (SH1) through Warkworth



Pūhoi to Warkworth is a key transport link connecting the north to the upper North Island freight triangle of Auckland

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, road marking including audio-tactile markings (ATP), signage, edge markers, safety barriers, speed limits, roadside vegetation control, and, street lighting.

Maintenance hot spots

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

- **Seven slippery seal sites** – Dome Valley, and the Brynderwyns are included in the list of sites with significant surface skid resistance issues.

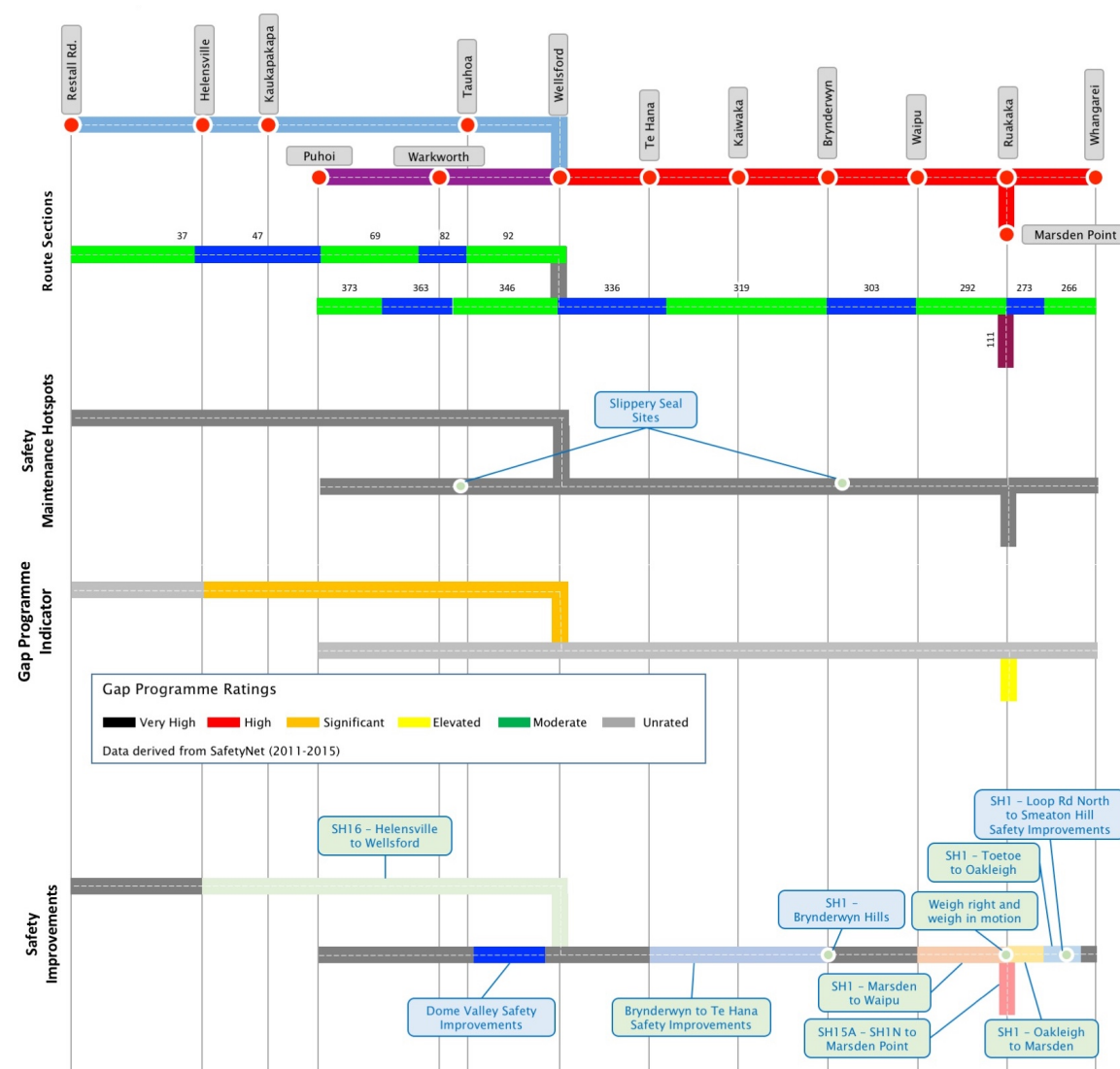
Gap programme indicators

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 significant potential for reducing fatal and serious injuries in the section between Wellsford and Helensville through targeted, low-medium cost improvements. There is an elevated potential between Ruakaka to Marsden Point which would benefit from targeted, low cost, high coverage improvements.

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

Figure 24 – Safety investment



Renewals

The following describes the approach to asset renewals related to safety, for assets at or near the end of their useful life.

- Installation of significant amounts of additional wire-rope barrier and ATP is requiring an increase in budgets for maintenance and renewal of these assets.
- The levels of Surface Skid Resistance and Priority for Surface Safety Treatment mean that significant amounts of the national investment are put into addressing these issues on the Northland corridors.

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/>

SH1N – Dome Valley Safety Improvements

Description: General treatments could involve widening to provide side barrier treatments along the corridor. Provisional wide centreline or alternative median treatment at high risk locations would be considered. Treatments to be confirmed following completion of the investigation phase.

SH1 – Brynderwyn Hills

Description: Realignment of the existing road to improve safety to the north face of the SH1 Brynderwyn Hills, south of Whangarei

SH1 – Loop Rd North to Smeaton Hill Safety Improvement

Description: Improvements to the SH1 and Loop Road intersection to make it safer and easier to use. This is part of the important strategic link between Auckland and Whangarei.

Draft Regional Land Transport Programme considered for the 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
SH1 – Toetoe to Oakleigh		Capacity and safety improvements on a good alignment with divided carriageway (potentially offline). High quality connections provided between SH1 and SH15.
SH1 – Oakleigh to Marsden		Capacity and safety improvements on a good alignment with divided carriageway. High quality connections provided between SH1 and SH15.
SH1 – Marsden to Waipu		Short term safety improvements to address the high crash rate
SH1 – Brynderwyn to Te Hana		Short term safety improvements to address the high crash rate
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
SH16 – Helensville to Wellsford		Safety Gap Analysis work undertaken across the country to determine the safety improvements that would be necessary
SH15A – SH1N to Marsden Point		Safety Gap Analysis work undertaken across the country to determine the safety improvements that would be necessary
SH1N – Puhoi to Johnstone’s Hill Tunnel		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.

Maintenance hot spots

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

- **Stopping places** - During the day there are frequent opportunities to stop in the many small towns along the route. However, nothing is open in the evening or at night north of Wellsford.
- **Litter along the corridor is an ongoing issue** -Traffic volumes means it is hard to deal with. A solution has been to use a big truck mounted vacuum unit to minimise disruption while picking up litter.
- **Brynderwyn and Dome Valley** - Hofstetter frogs need to be considered when working in areas where this vulnerable fauna are known to exist.
- **Discharge into estuaries** - oil and heavy metal contaminants discharging into sensitive receiving environments is an issue. There is a requirement to maintain the road to current environmental standards.

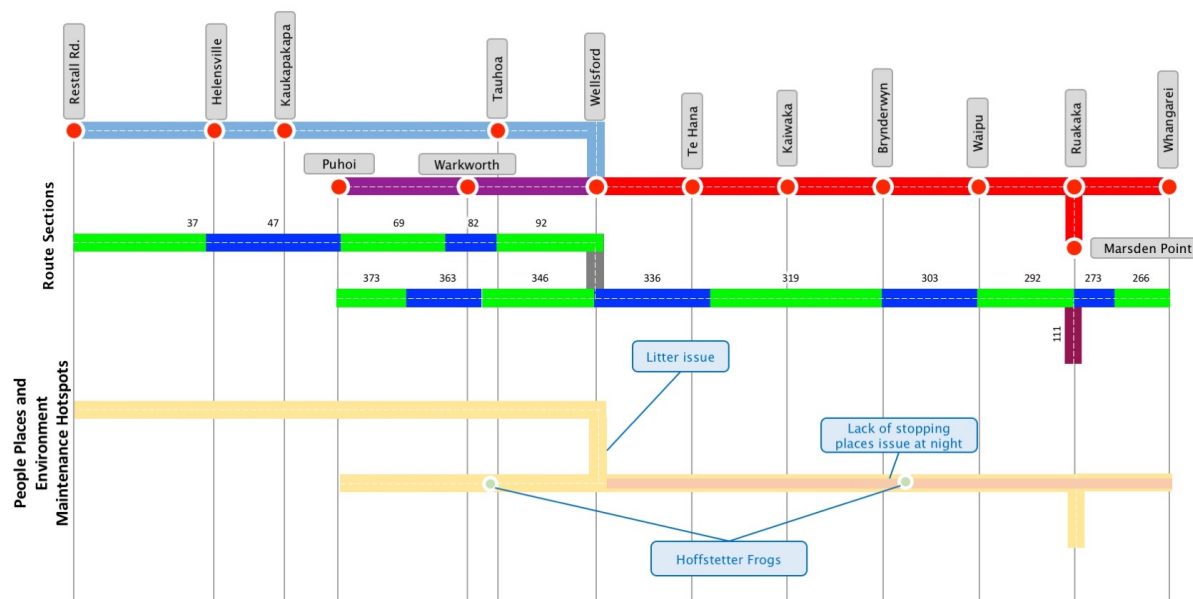
Renewals

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

Improvements

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

Figure 25 – People, places and environment investment



Investment pressures

Access and resilience

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

- **Maintaining delineation** at a level that is optimal creates a need for constant monitoring.
- **Reaction time to crashes:** Prompt response to crashes to ensure continuity of service is essential on the high-volume sections of the corridor. The Transport Agency are working with their partners to minimise disruption because of the limited alternative routes.
- **Bridge approaches:** Ride quality on approaches to bridges is an issues due to settlement of the approaches, as many have no transition slab.
- **Poor quality local road alternatives:** Some of the local road detour routes are substandard and unable to support heavy vehicles.
- **Higher priced and more frequent treatments:** are required for robustness, and to keep route open by ensuring less interruptions.
- **Increasing standards of maintenance treatments:** The combined effect of land use change and significant capital works may create pressure for access to resources for regular corridor maintenance – such as the finite Glenbrook smelter aggregate used for high skid resistance sites, or for locally available high-quality aggregates in northern parts of the network.
- **Identifying the right level of maintenance:** Continued maintenance of future revoked routes is required and continued until the route is superseded or there is a change to the classification and agreed level of service. This may require modified design assumptions to ensure that planned maintenance continues appropriately.

Reliability and efficiency

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

- **Mid-term maintenance investment in SH16:** In the past maintenance investment on SH16 has been higher than normal. Going forward, the investment in maintenance will be more in line with the classification of this part of the corridor.
- **Night works:** Due to the importance of the route and the high level of traffic, night works are undertaken along SH1N to ensure the least amount of disruption to customers. This however reduces the window/opportunities when this can occur.

- **Unreliable travel times:** SH1 travel times are considered unreliable at times due to levels of traffic and road conditions. However, there is a lack of good efficiency data for the corridor, especially during seasonal peaks that makes this unreliability difficult to quantify.
- **Lack of passing lanes:** Due to a lack of passing lanes along SH16, this route is not as efficient as it might be, especially when being promoted as an alternative route to SH1N.

Safety

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

- **Increasing maintenance burden:** The section of SH16 north of Helensville has had additional safety assets installed that would be considered extra-ordinary for a primary collector road, but have been a response to high levels of personal risk along that section of the corridor.
- **Wire rope barriers:** The northern side of the Brynderwyn Hills has wire rope barriers. This will place an increased burden on maintenance to keep these assets in a serviceable condition. Similarly, planned improvements to the Dome Valley will also increase safety assets requiring maintenance. Increasing use of wire rope barriers, both on medians and shoulders (particularly on the outside of bends), creates an increased and less predictable maintenance cost for these sacrificial assets.
- **Narrow bridges:** There are a number of narrow bridges that have no active mode (walking/cycling) capacity with the exception of Kaiwaka bridge.

People, Places and Environment

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

- **Electric vehicle charging stations** – Currently there is a dearth of EV charging stations along the major route supported by the corridor, however, an upcoming EV policy should address this.

Investment future considerations

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

- **New Highways:** The RONS projects will cause a shift of emphasis in terms of asset maintenance and operation in the southern part of the corridor. In the shorter term the maintenance burden will be lightened, compared levels for the current alignment. It is expected that a high level of investment in corridor improvements will continue north of Wellford in the medium to long term
- **Surface skid resistance:** Ongoing, continued investment into the reduction of surface skid resistance will be required to ensure the corridor performs in terms of the desired safety outcomes. Investigation into alternative pavement materials which provide an improved balance between cost and benefit may be warranted.
- **Future levels of service:** Future proofing and maintaining appropriate levels of service for communities will be a key consideration for investment along this corridor as it continues to face changes in land use, travel behaviour, demand and mode share.
- **Development of alternative routes:** The lack of good HCV alternative routes requires increased investment in mitigation to ensure the main corridor remains available. Investment in improving local road alternative could have a positive impact on maintenance costs.
- **Levels of service:** Increasingly operational constraints and Level of Service decisions may determine the type and nature of works applied to the corridor, not necessarily the conventional least cost outcomes. The choice of treatment applied is increasingly dictated by the constraint of time on the network – how rapidly can we get in and out, how often we need to revisit, how quickly we can remediate, and how robust the treatment is.

- **Increasing urban development along the corridor:** The corridor will require protecting from reverse sensitivity as growth continues, particularly where this creates higher expectations and a maintenance burden (such as noise reducing surfacing or noise attenuation treatment and constraints upon hours of work within the corridor.)
- **Timeliness of incident response:** Being able to respond quickly and efficiently to incidents on the network is important to maintaining reliable and efficient journeys for customers, this requires a higher level of response – both in identification and response.
- **Stopping places:** Consideration of combining stopping places (including rest areas and look outs) with places of interest, heritage sites, local business areas and main streets, and future electric vehicle charging infrastructure. Incentives such as food and beverage or Wi-Fi connections may assist in increasing use of these areas. Integrating stopping places for all customers that are safe and attractive while having a positive influence on the cost to maintain.



Fonterra picks up milk from large parts of the region

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
Access	ONRC classification	The Road Efficiency Group https://www.nzta.govt.nz/roads-and-rail/road-efficiency-group/onrc/	2013

Section	Infographic	Information Source	Date
	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
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

Section	Infographic	Information Source	Date
Understanding the Infrastructure Assets			
Overview	Corridor Asset Base	NZTA_ 2017 Values by Corridor.xlsx compiled 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	



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