Milton to Cromwell

CORRIDOR MANAGEMENT PLAN

8

2018-2028

NZ TRANSPORT AGENCY
WAKA KOTAHI

New Zealand Government

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Executive summary

The Milton to Cromwell Corridor comprises SH8, commencing at its most eastern point where it intersects with SH1 (Clarks Junction) just south of Milton, running generally north west to its intersection with SH8B at Cromwell.

The corridor is approximately 162 km long (1.4% of the state highway network). The total value of assets along the corridor is $208M (0.9% of the total national asset value).

The corridor is the main connection between Dunedin and Queenstown. The route serves as an economic enabler and as a secondary tourist route, facilitating recreational, commercial and tourist travel between Southland, West Coast and Otago Regions. A significant portion of commercial and business travel between Dunedin and Queenstown occurs on this route as there are no direct flights between the two cities. The corridor provides freight access to key customers including fruit orchards, vineyards, wine processors as well as stock and fuel transportation. Commuter traffic is generally low and is localised between and around the urban centres of Cromwell and Alexandra. Many small businesses along the corridor, such as orchards, wineries, and galleries rely on the SH8 for passing trade.

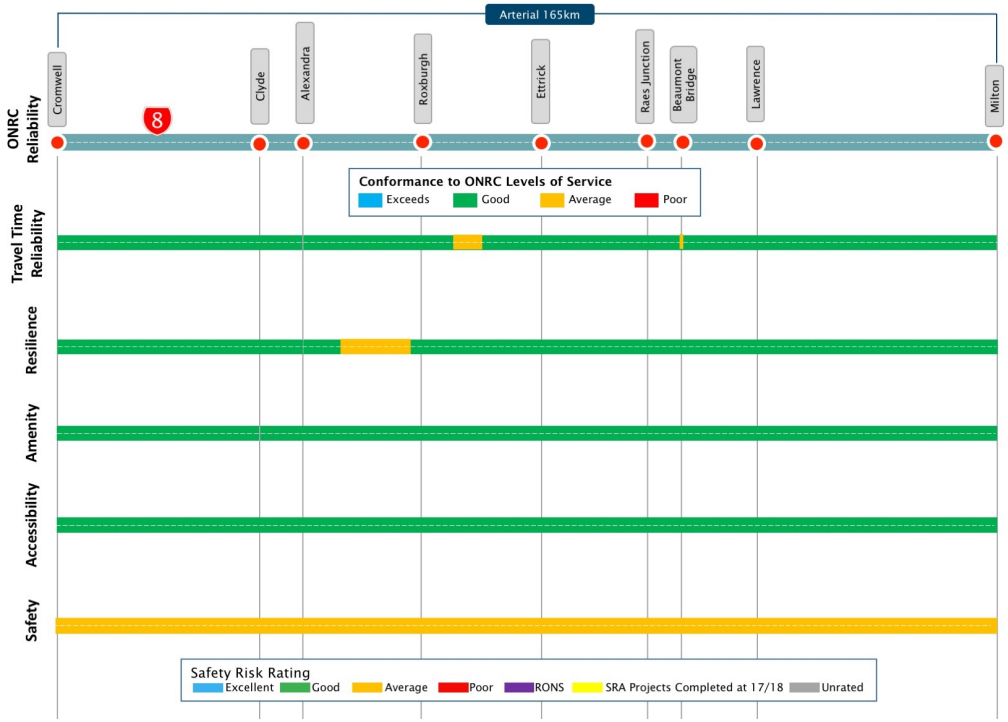
The key influencer for the corridor is growth in the Queenstown Lakes area, driving expansion of nearby towns, particularly Cromwell and Alexandra. Tourism related industries are becoming increasingly important while commercial hubs are also experiencing significant growth to support this increased demand. The corridor is also developing as a gateway to recreational destinations with many national cycle trails and recreational activities accessed from SH8.

Along its length, the corridor generally provides reliable travel times due to low traffic volumes. Minor reductions in levels of service can occur at narrow and winding sections of the corridor where there is a lack of passing places, this becomes more of a problem during holiday seasons and over the weekends as tourist and recreational users use the route. Resilience is generally good along the corridor. There are localised areas where resilience is average due to the length of alternative routes. Parts of the route are particularly vulnerable to rockfall and slips (Cromwell Gorge and Beaumont Hill). There are good maintenance procedures in place for rockfalls hence incidents are attended to promptly. Snow and ice have a significant impact on levels of service during winter through Manuka Gorge and Alexandra to Roxburgh. Given the proximity to river catchments, low lying areas of the route tend to be prone to flash flooding and flooding incidents. Alternative routes are available along most sections of the corridor via local roads and state highways however, there are no viable alternative routes from Roxburgh to Alexandra and Cromwell Gorge and some local routes are not suitable for heavy vehicle traffic. Lack of mobile phone coverage over parts of the corridor can decrease responsiveness to incidents.

The corridor has a good standard of amenity along its entirety. Several national cycle trails travel alongside the route within the disused rail reserve and although the surface may be rough in places, the trail provides separation from traffic on SH8. There are however several places along the route where the trail crosses the highway that will need to be monitored to ensure their fit for purpose for the number of cyclists using the facility. The aesthetics of the adjacent road environment reflect the character of the area and are appropriate for the mix of tourist, business/ commercial and recreational users of the route. Within urban areas there are limited on road cycle facilities, however facilities are deemed appropriate for the level of development within these areas.

SH8 provides a good level of accessibility along its length from Cromwell to Milton appropriate for its classification. There are various rest stops and attractions along the route however these are appropriate for the level of traffic using these.

Figure 1 - Performance of the corridor against ONRC outcomes



As tourism and recreation continues to increase along the route and in the Central Otago area, the route is expected to require further investment to support an increase in traffic volumes and also to support increased use of alternative modes such as recreational cycling along the route.

Introduction

Purpose

What is the corridor management plan?

This Corridor Management Plan describes the customer service delivery story for the Milton to Cromwell, 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.

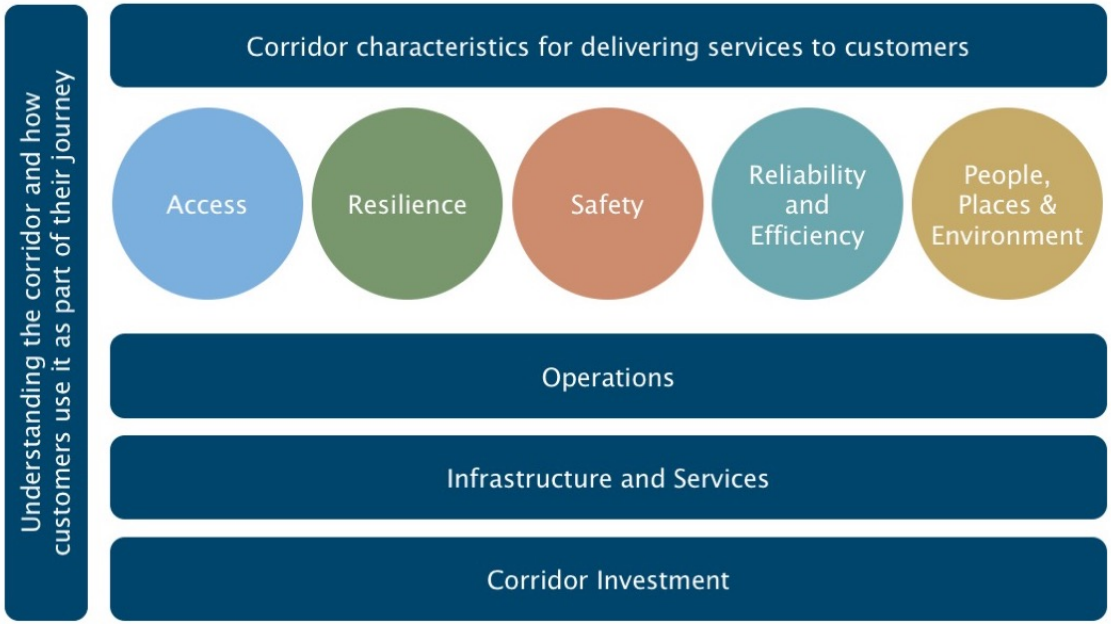
Planning is currently undertaken at the regional level, but typically significant journeys traverse more than one region. By considering the significant customer journeys and destinations, the corridor management plan is a vehicle to engage in regional and inter-regional conversations by focusing on 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 Milton to Cromwell Corridor comprises SH8, commencing at its most eastern point where it intersects with SH1 (Clarks Junction), running generally north west to its intersection with SH8B at Cromwell.

The corridor is the main connection between Dunedin and Queenstown. The route serves as an economic enabler and as a secondary tourist route, facilitating recreational, commercial and tourist travel between Southland, West Coast and Otago Regions. A significant portion of commercial and business travel between Dunedin and Queenstown occurs on this route as there are no direct flights between the two cities. The corridor provides freight access to key customers including fruit orchards, vineyards, wine processors as well as stock and fuel transportation. Commuter traffic is generally low and is localised between and around the urban centres of Cromwell and Alexandra.

The regional economy

The Otago region has a population of 219,200 (4.7% of New Zealand's population), and accounts for 4.3% of NZ GDP. Dunedin and Queenstown are the main population centres.

Since 2011, Queenstown Airport consistently ranks 4th for passenger numbers behind Auckland, Christchurch and Wellington (it ranks much lower for aircraft movements). The corridor is a critical link in the supply chain, facilitating the transport of aviation fuel from Port Otago to the airport daily.

The Clutha and Waitaki Districts are relatively specialised in sheep, beef cattle and grain farming, and both districts have seen increased levels of dairying over the past decade. The corridor supports these industries; providing a key connection for moving grazing stock.

Cromwell is the most inland town in NZ, this remoteness exposes the area to specific resilience issues and climatic conditions which are more challenging than other areas of the network. Significant industry between Cromwell and Milton includes stone and pip fruit, grape growing and wine production, as well as, forestry and tourism and recreation activities linked to the strong tourism focus in Queenstown-Lakes District.

The hospitality industry (accommodation and food services) in Queenstown provides 22% of employment, compared to 6.4% for the rest of the county. The district has experienced employment growth above the national average in most industries, with growth in the past decade being particularly strong for professional, scientific and administrative services and construction.

As recreational and tourism activities grow along the route, management of the corridor will focus on resilience and travel time reliability. The corridor plays a key role in maximising efficiencies for commercial and business customers using the corridor by facilitating access for economic activity.

Figure 3 – Corridor overview

Understanding our customers

Key customers

The key customers using 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 commuters/business and commercial users

The corridor has low levels of commuter traffic which is localised around the Alexandra and Cromwell urban areas. As these areas grow, commuting between Alexandra and Queenstown may become more predominant. Business and commercial travel between Dunedin and Queenstown is an important movement on the corridor as there are no air or rail modes connecting the areas. There are no public transport services operating along the corridor.

Insights into daily commuter/business users:

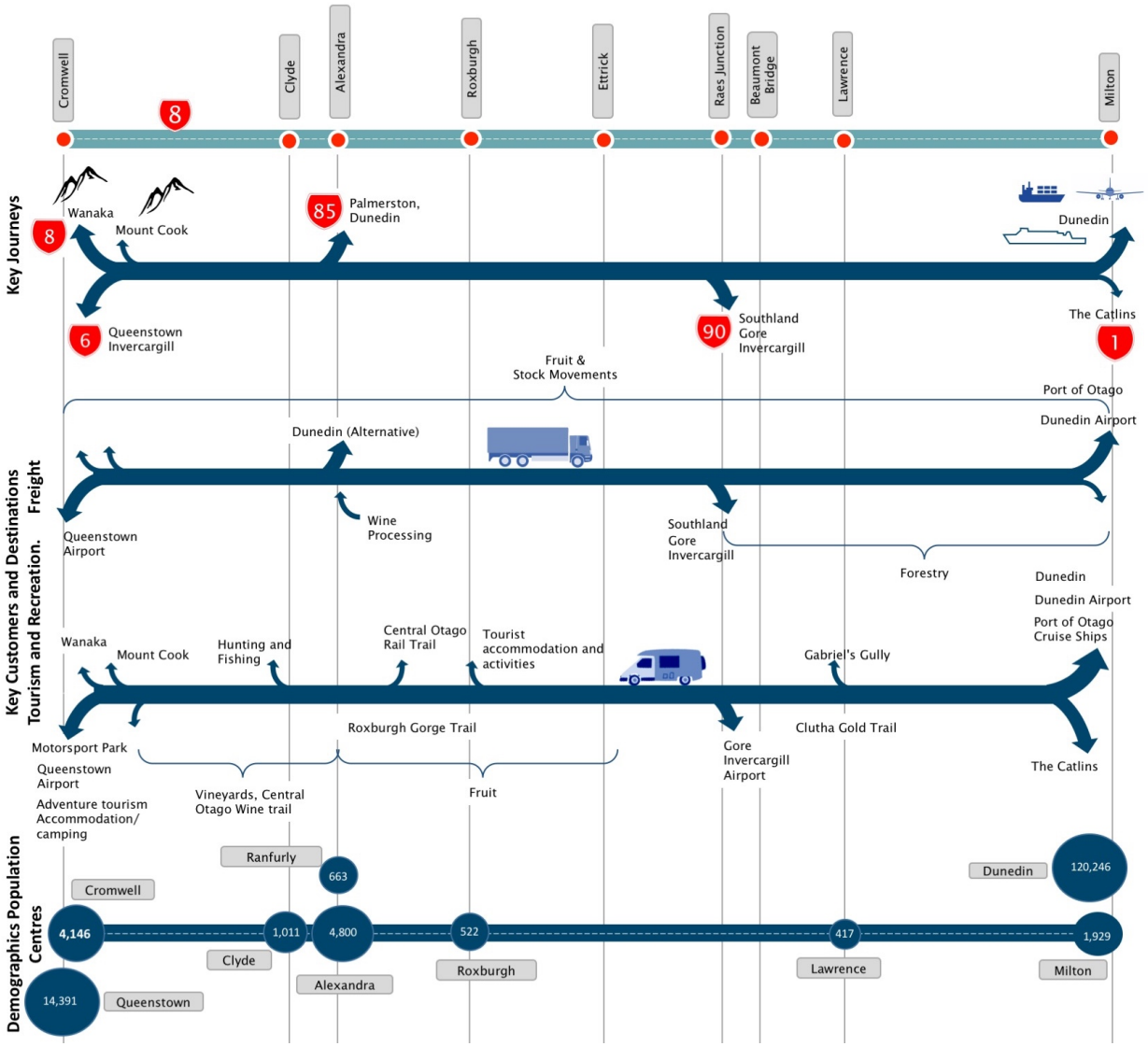
Road use: Commuters between Milton and Cromwell have limited choice of transport modes; hence are dependent on car usage.

Road knowledge: Commuters and business/commercial users are familiar with the route and off corridor alternatives in the event of a restriction. Outside peak seasons, journey times on the corridor are predictable. Weather and road conditions can be unpredictable during winter leading to a high level of uncertainty, particularly during early morning or late evening journeys.

Pain points: Increasing amounts of recreational and tourist use results in longer journey times during peak holiday seasons. Increase in commuting traffic volumes in the future between Alexandra to Queenstown may reduce passing opportunities through Cromwell Gorge.

Daily commuters expect: Predictable journeys at peak times, accurate and up to date traffic information (peak and off peak), weather, road conditions and hazards. Accurate and timely information about road conditions during winter is important for those travelling early morning or late evening when there may be less awareness of road conditions.

Figure 4 - Key customers, journeys, and destinations



Tourist and recreational users

Queenstown is the key tourist destination for this corridor and has several significant attractions. The corridor also supports tourist journeys to Wanaka, Milford Sound, the West Coast and Mount Cook from the east. The route has developed as a recreational destination for both international and domestic tourists with an abundance of tourism and recreational destinations along the corridor including golf courses, hunting, fishing, National cycle trails, motorsports centres and wineries.

Generally private car, rental car, campervan and coach trips predominate while a small number of tourists may choose to cycle.

Insights into tourist and recreational users are as follows:

Road use: Domestic tourists and recreational users during weekends and/or periodically to access recreational activities along the corridor, may be towing a boat. International self-drive visitors often drive long distances to make a holiday destination schedule, and may drive late into the night. Some travel in self-drive campers or as part of a coach tour group. Private bus/shuttle services operate between Dunedin and Queenstown serving the tourist market, including day trips for cruise ship visitors coming into Port Chalmers.

Road knowledge: High level of road knowledge by frequent recreational users of the corridor. International visitors and infrequent domestic tourists have low levels of road knowledge and may focus on the landscape and the adventure. They can be overconfident on travel times, have no knowledge of places on the journey where the road narrows or becomes windy and are not competent during winter driving conditions. The corridor is a challenging route to navigate for unfamiliar drivers, especially as holiday traffic volumes increase.

Pain points: Increased traffic volumes associated with long weekend and holiday season travel causes pressure on the corridor. A lack of passing opportunities can result in queues and driver frustration, particularly in the Manuka Gorge and between Beaumont and Roxburgh Hydro Hill. Use of unsuitable rest areas or unofficial stopping places immediately west of Roxburgh Hydro Hill can create a hazard.

Tourist and recreational users expect: Ease of getting around the country, including using complementary travel modes, good directional/information signage of tourist destinations including distances, safe access to rest areas and places to stop for refreshments and toilet breaks.

Freight operators

Primary industries in Otago drive much of the area's economic growth, so good access and freight services linking farms and forests, suppliers, processors and export gateways are critical. Since the corridor is the key road link between Dunedin and Queenstown, it is susceptible to increasing trends in land-use such as growth in dairy conversions from dry-stock farming, fruit growth, wine production and maturing forestry. This drive increased freight and stock movement across the corridor. The corridor provides the primary part of the journey for fuel tankers between Queenstown Airport and Port Otago.

Insights into freight operators are as follows:

Road use: Journey time reliability and route resilience is important for schedule and time restrictions. Suitable rest stops with appropriate parking and ability to undertake the Dunedin to Queenstown and return trip including load/unloading and rest breaks within a shift. The corridor itself delivers good travel time reliability, however the 'off corridor' journey between Cromwell and Queenstown is likely to be impacted by delays and congestion. Require stock effluent disposal sites at convenient locations on route.

Road knowledge: Knowledge of road conditions is high in normal conditions and drivers have good communication systems between vehicles. In winter, changing weather and road conditions make the drive more challenging and confidence of road conditions is lower. Drivers have been known to take calculated risks during winter conditions to keep business going.

Pain points: Road cross sections and topography are challenging for heavy vehicles, which can result in stock effluent spilling onto the carriageway creating a hazard. There is only one stock effluent disposal site located on the route. The overhead trusses on Alexandra Bridge affect accessibility for over height vehicles, hence an alternative private route must be used. Steep ascents and descents at Roxburgh Hydro Hill reduce optimal speeds and lack of passing places in this area can reduced travel time reliability. Traffic signals at Beaumont Bridge create a point of constraint on the corridor.

Freight operators expect: Increased availability of stock effluent disposal facilities for stock movement, improved structures able to accommodate larger heavy vehicles, reliable journey times, convenient places for truck to stop for drivers to have a rest and passing lanes to maintain consistent journey times. Accurate and up to date information on road conditions particularly during winter.

How we deliver services along the corridor

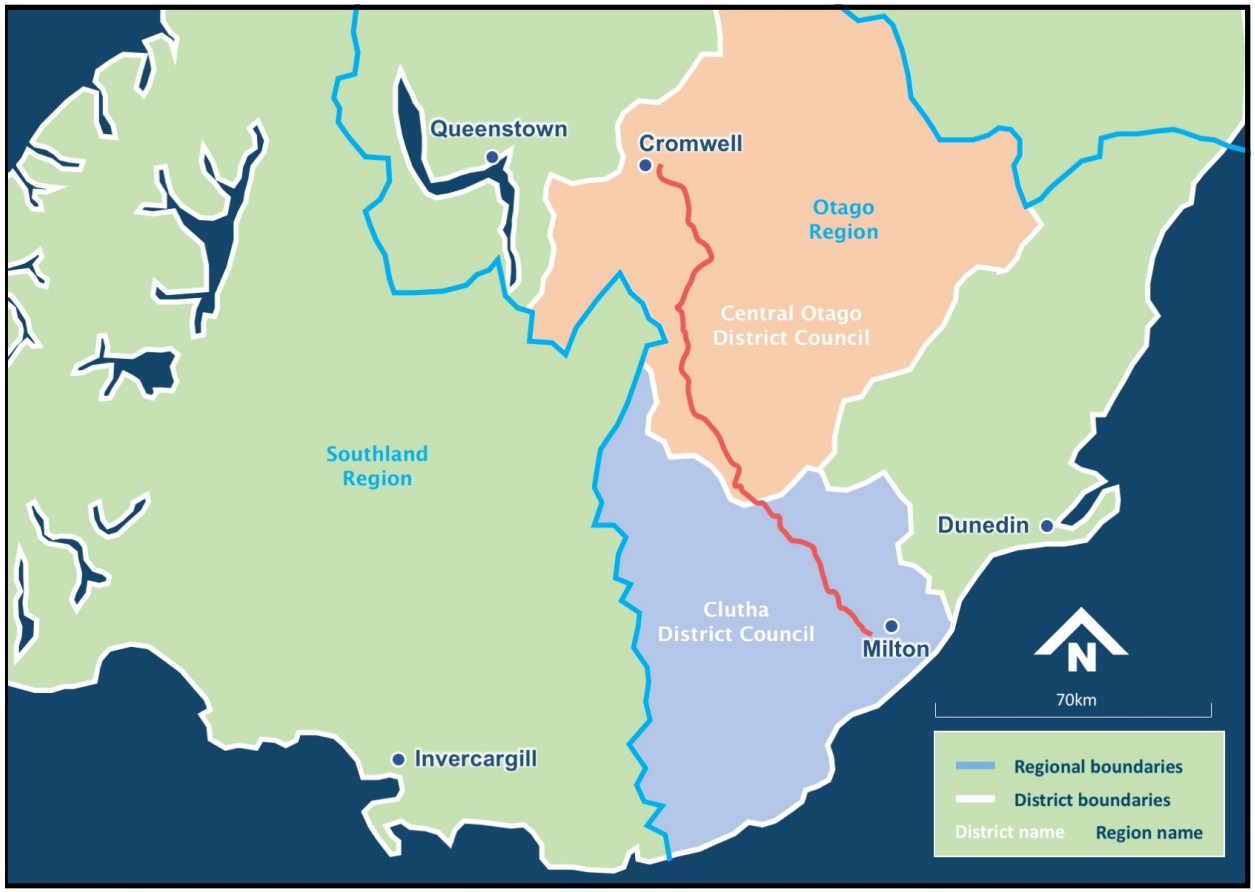
Transport partners

The New Zealand land transport system comprises more than State Highways. To provide customers with a reliable and safe journey usually requires the use and co-ordination 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.

On this Milton to Cromwell corridor, we work closely with the Territorial Local Authorities (TLA's) and regional councils along the corridor shown in Figure 5.

SH8 Brass monkey motorcycle rally Central Otago

Figure 5 - Map of associated local authorities



Network Outcomes Contracts approach

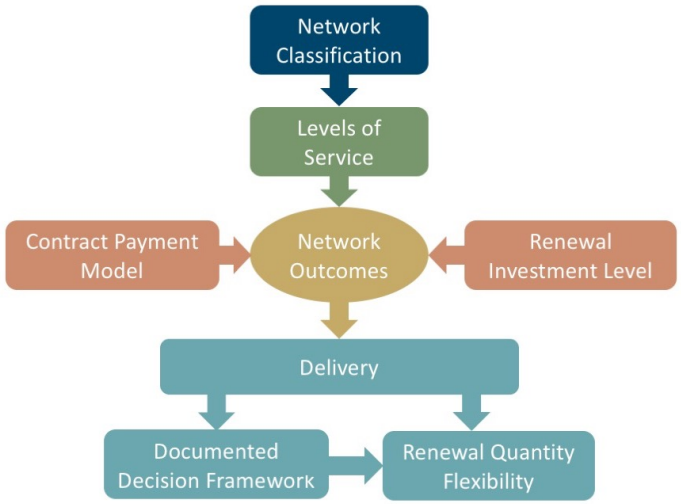
Network Outcome Contracts (NOC) are aimed at improving the effectiveness of service delivery for maintenance and operations of the state highway network. Elements of previous procurement methodologies (PSMC, Hybrid and Traditional models) have been integrated into the NOC contract model which delivers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

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

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

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

Figure 6 - NOC process



Collaborative delivery of services

The Milton to Cromwell corridor passes through two NOC contract areas as outlined below. The boundary of the two contract areas occurs inland at Raes Junction where SH90 intersects SH8. SH8 from Milton to Raes Junction is within the Coastal Otago NOC area while the section between Raes Junction to Cromwell is within the Central Otago NOC area.

Coastal Otago Network Outcomes Contract

The Coastal Otago NOC is undertaken by Highway Highlanders supported by Southroads, Downer, MWH, McDonough, and Buxton Consulting. The contract commenced on 1 July 2016 for a 7-year period with the possibility of a 2-year extension. It covers routine maintenance and operations as well as the operation of Intelligent Transport Systems (ITS) at Beaumont Bridge. WTOC operate and monitor signals and cameras at Beaumont Bridge. This contract is supported by the following specialist maintenance contracts:

- **Traffic monitoring sites:** Undertaken by AGFirst and commenced in 1 July 2014 for a period of 5 years until 30 June 2019.
- **Regional bridge and structures (O/207):** Undertaken by Opus International Consultants which was awarded on 1 July 2014 for a period of 5 years until 30 June 2019.
- **Scaffolding for Beaumont bridge:** Undertaken by Bramwell Scaffolding. The contract has been extended to 10 November 2019 with the possibility of another 3-year extension to 10 November 2021.

Central Otago Network Outcomes Contract

The Central Otago NOC contract is undertaken by Aspiring highways led by Fulton Hogan Ltd supported by Opus Consultants, Base Contracting and Whitestone Contracting. The contract commenced on 1 October 2016 for a 7-year period with the possibility of a 2-year extension. This contract is supported by the following specialist maintenance contracts:

- **Traffic monitoring sites (O/210):** Undertaken by AGFirst and commenced in 1 July 2014 for a period of 5 years until 30 June 2019.
- **Bridges and structures(O/207):** Undertaken by Opus International Consultants which was awarded on 1 July 2014 for a period of 5 years until 30 June 2019.

Drivers for change

The Milton to Cromwell corridor caters for variable levels and types of customers and this demand is expected to grow in the future. The drivers for change associated with the corridor are briefly described below.

Although Queenstown is outside the corridor and is covered by other Corridor Management Plans, Queenstown has a major influence on the use of the corridor.

Queenstown growth

Growth in Queenstown-Lakes District has a direct effect on development on the corridor around Cromwell, Clyde and Alexandra. Tourism related industries are becoming increasingly important as Queenstown RTO saw 7.4% growth in guest nights in 2016. Population expansion and new residential and holiday home developments accompany the economic growth. Increasing housing prices in Queenstown are encouraging lower income residents to relocate to neighbouring areas including Cromwell, Clyde and Alexandra which are within commuting distance of Queenstown, and of each other.

Cromwell acts as a service and retail gateway to Central Otago and Southern Lakes regions. Commercial and industrial hubs to support the current and planned tourism increases are also growing.

Alexandra has an expanding industrial hub supporting Queenstown's growth. This will continue to intensify commercial traffic on the corridor between Alexandra and Queenstown. Having a road system that can accommodate this increasing trend whilst maintaining consistent LoS is becoming more challenging for this corridor.

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.

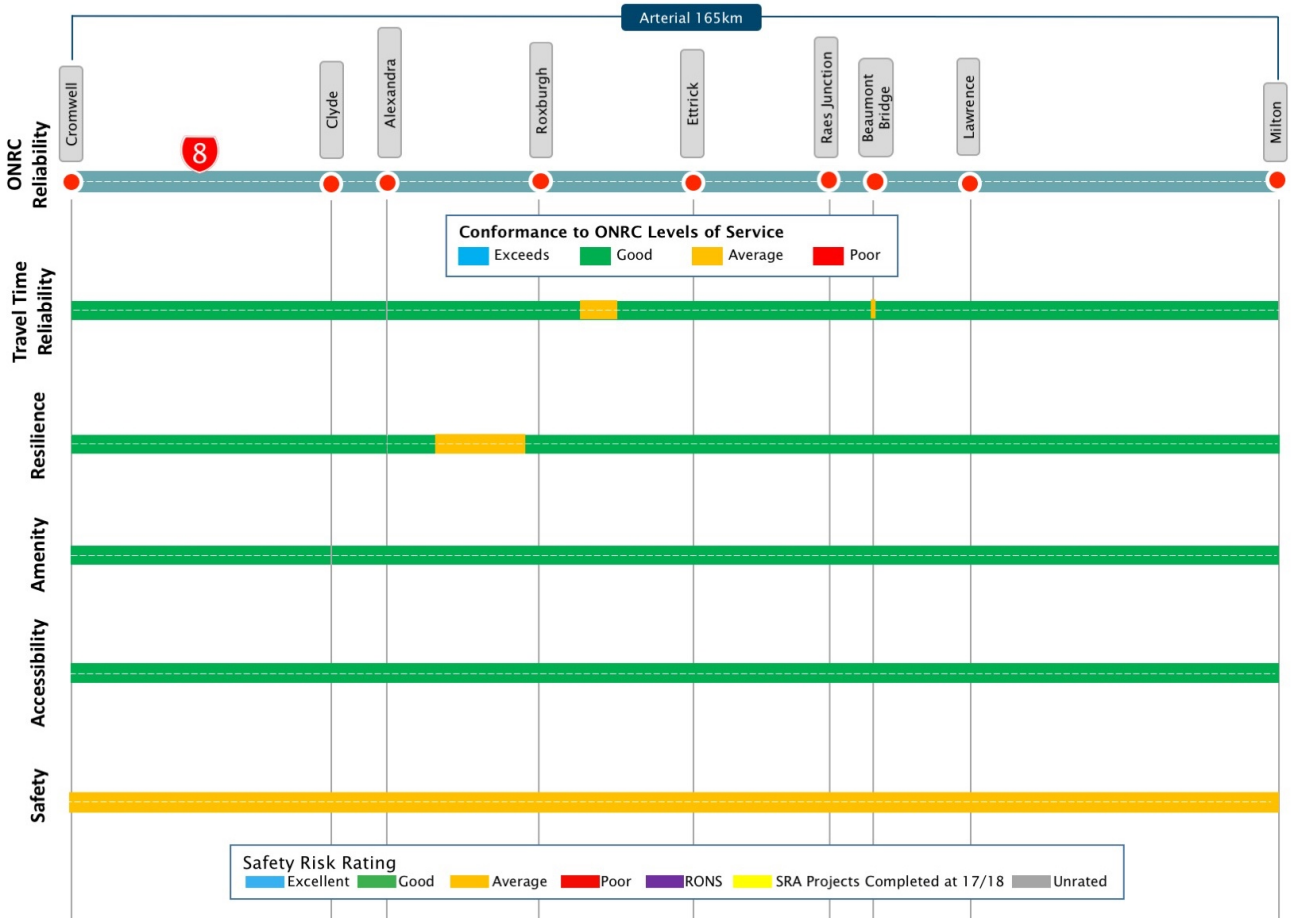
Overall, customers will be provided with the right level of road transport infrastructure where it is needed, determined by a robust, impartial, nationally consistent tool – the ONRC.

Road classification

The SH8 corridor from Milton to Cromwell is classified as arterial and is the priority road transport link between Dunedin and Queenstown.

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 Milton to Cromwell corridor is performing against the ONRC Levels of Service, as they relate to each of the three current classifications.

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

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

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

Travel time reliability

Along its length, the corridor provides reliable travel times due to low traffic volumes. Reduced LoS can occur at narrow and winding sections of the corridor where there is a lack of passing places, such as on the Roxburgh Hydro Hill. This is exacerbated during holiday seasons and over weekends, as tourist and recreational users less familiar with the route become more predominant. Traffic signals and single lane configuration at Beaumont Bridge creates a minor choke point on the corridor. For customers undertaking the journey between Dunedin to Queenstown, reliability can be affected by 'off corridor' issues.

Resilience

Resilience is generally good along the corridor. There are localised areas where resilience is average due to the length of alternative routes. Mobile phone coverage is limited in some areas which can impact on incident response times. Parts of the route are particularly vulnerable to rockfall and slips (Cromwell Gorge and Beaumont Hill). There are good monitoring and management procedures in place for rockfalls, hence incidents can be attended to promptly. The route is prone to snow and ice during winter. The higher areas closer to the coast (Manuka Gorge to Lawrence) are more prone to black ice due to the wetter climate. Use of CMA during rain is ineffective, exposing users to risk areas. Given the proximity to river catchments, low lying areas of the route tend to be prone to flash flooding and flooding incidents, although there are viable alternate routes via local roads and state highways in these areas.

Amenity

The corridor has a good standard of amenity along its entirety. National cycle trails travel alongside the route within the disused rail reserve and although the surface may be rough in places, the trail provides separation from traffic on SH8. There are several places along the route where trails cross the highway. These crossings will require ongoing monitoring to ensure they are fit for purpose to accommodate increased numbers of cyclists using the facility. The aesthetics of the adjacent road environment reflect the character of the area and are appropriate for the mix of tourist, business/ commercial and recreational users of the route. Within urban areas there are limited on road cycle facilities, however the facilities are appropriate for the level of development and mode share within these environments.

Accessibility

SH8 provides a good level of accessibility along its length from Cromwell to Milton appropriate for its classification. There are various rest stops and attractions along the route and these are appropriate for the level of traffic using these, although this will need to be controlled and monitored as new tourist attractions develop and traffic volumes increase. Intersections along the route are appropriate for the current levels of traffic using these. Further development in Alexandra has already facilitated the need for a new right turn bay at Boundary Road.

Safety

Safety on the corridor is good for the road's arterial classification. Crash types are typical of high speed rural state highways and predominantly: run off road, head on and intersection crashes. Poor skid resistance in some areas between Milton and Lawrence increases risks to road users.

The collective risk rating is medium from Clyde to south of Alexandra, around Ettrick and south of Lawrence. SH8 predominantly has a high personal risk from Raes Junction to Milton. Where the corridor only meets the 2-star rating it is likely that the constrained road alignment and out of context curves present along the route will contribute to the low star rating.

Challenges in the future may relate to the increased number of cyclists crossing the corridor, particularly through the Cromwell Gorge as there are limited sealed shoulders for cyclists to travel within safely, and ensuring rest areas are managed appropriately for visiting driver needs.

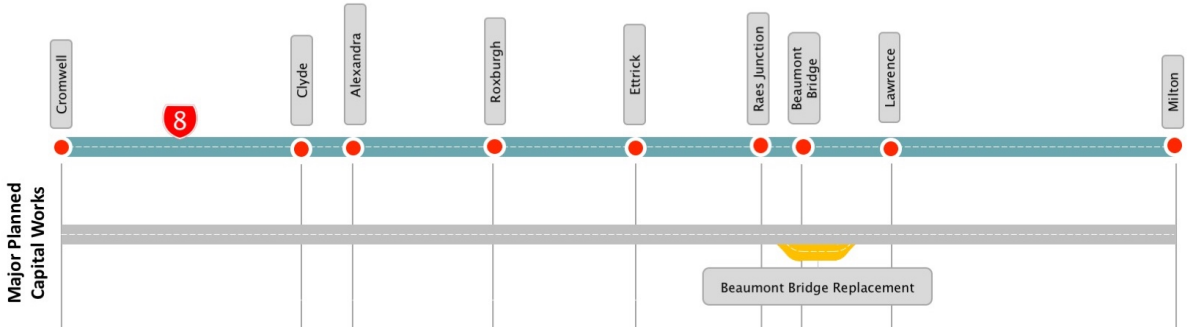
Improving the customer experience

In responding to Customer Levels of Service it is important to acknowledge that significant improvements to the corridor are planned or underway. On the Milton to Cromwell corridor, the most significant project will be the Beaumont Bridge replacement. Traffic signals at the bridge protect the integrity of the structure from further heavy vehicle damage. Although further damage to the bridge has been mitigated, road users experience delays to their journey.

The bridge replacement, part of the National Bridge Replacement Programme, will involve realignment and new bridge construction over the Clutha River to replace the current structure which has reached its end of economic life. The project is planned for completion by the end of 2021 and once complete, will result in improvements to the performance of this area against the Efficiency and Access ONRC outcomes.

Planned improvements are discussed in greater detail later in this document.

Figure 8 – Significant corridor planned improvements



Access

Carriageway configuration

The corridor consists of a two-way single carriageway along its length. There are sections where passing lanes and slow vehicle bays are provided, however there are instances where these are below current standard. The carriageway cross section varies along the route with narrow and winding sections though Manuka Gorge and around Roxburgh Hydro Hill. The road narrows to one lane at Beaumont Bridge and this is managed by traffic signals. The corridor has multiple out of context curves along its length.

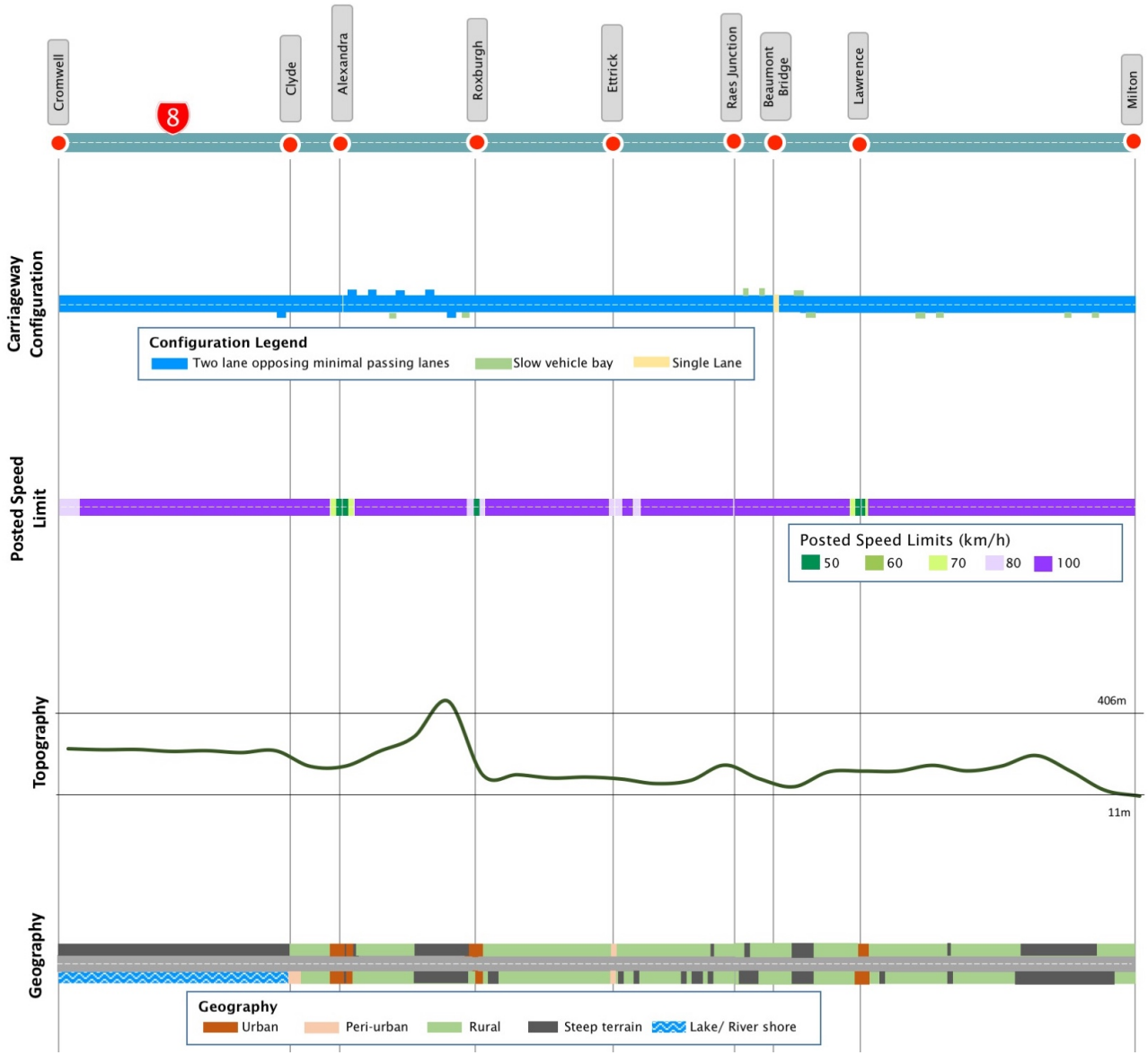
Speed limits

The corridor is generally 100km/h, with sections through towns and communities having lower posted speeds appropriate for those environments.

Topography/geography

Topography is varied along the corridor with steep climbs and declines around Roxburgh. Whilst the road is relatively flat elsewhere along the corridor, the topography surrounding the road is often steep and sloping above and below the road. Cromwell and Manuka Gorges are typical of this geography. The corridor is predominantly rural highway transitioning though low density urban towns. Sections of the corridor around Ettrick and towards Milton are low lying flat areas. Alexandra sits in a basin, making the area prone to low lying fog which is further exacerbated by the Clyde Dam.

Figure 9 - Corridor characteristics

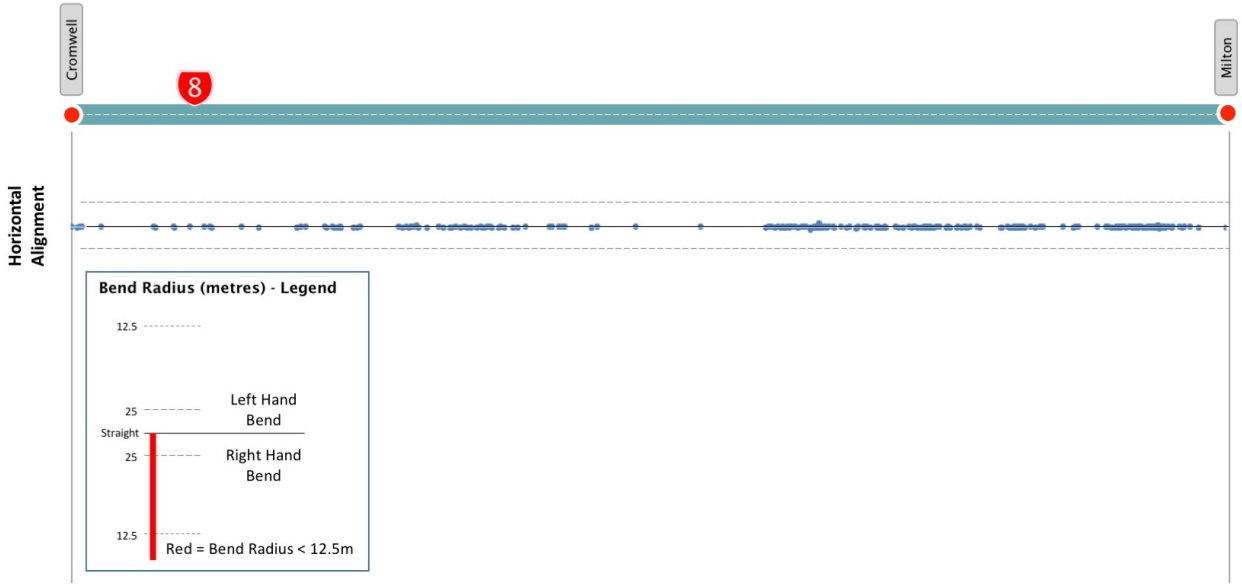


Horizontal alignment

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, with a higher concentration at the southern end of the corridor. The corridor contains no sharper bends with a radius below 25m.

Figure 10 – Horizontal alignment



Volumes

Traffic volumes are generally low along the entire corridor. Traffic volumes are highest in Alexandra for both 'All vehicles' and 'Heavy vehicle' traffic. The higher volumes of traffic between Alexandra to Cromwell represent commercial vehicle and commuter activity from Alexandra supporting Queenstown and recreational/ tourist traffic movements which are more prominent between these areas.

HPMV routes

Strengthening works on Beaumont Bridge were completed in 2016 providing full HPMV access for the corridor (albeit one-way across the bridge).

Some over height vehicles cannot be accommodated on Alexandra Bridge due to the overhead trusses restricting movement. This bridge is prone to impact damage incidents by over height vehicles.

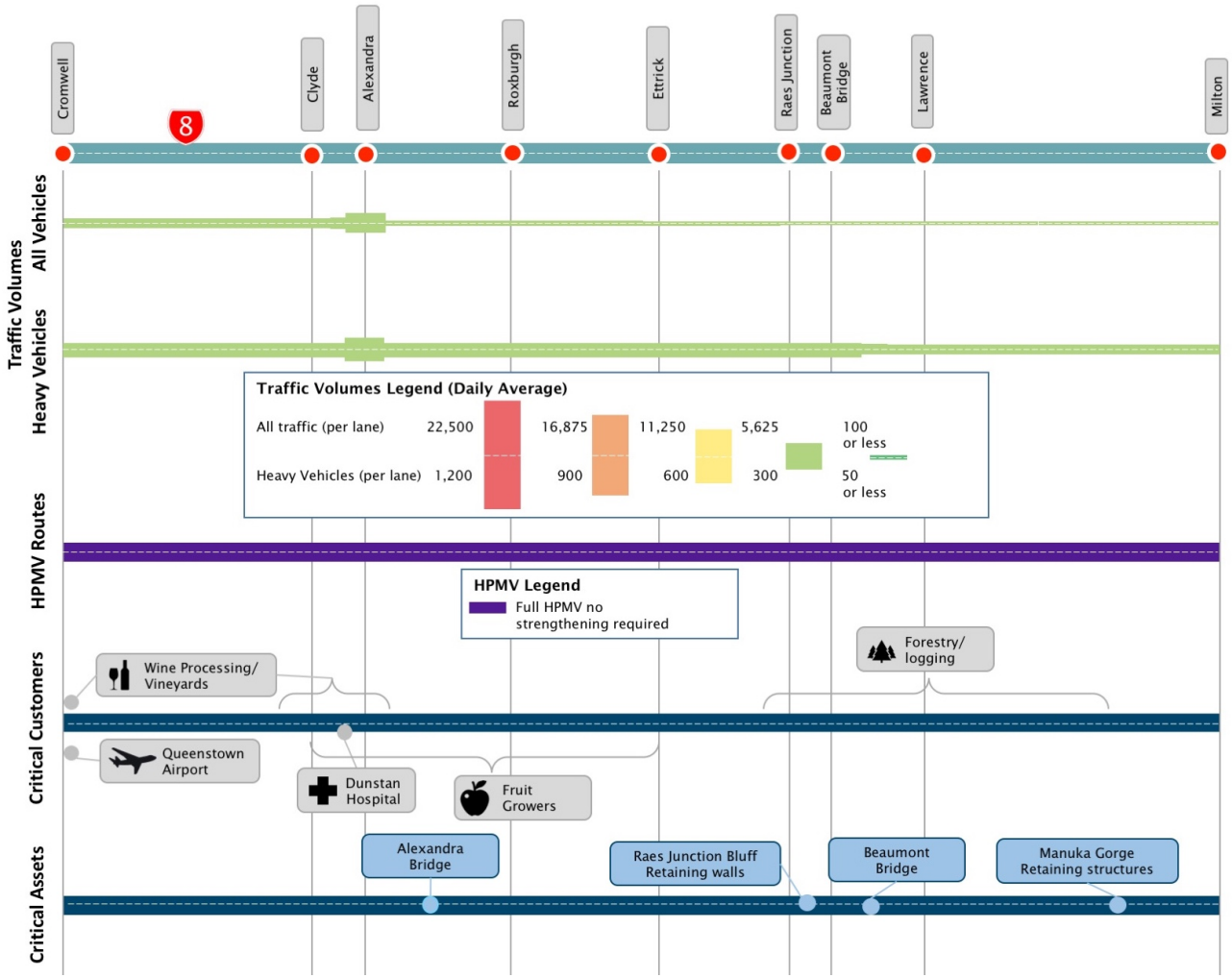
Critical customers and assets

There are several critical customers adjacent or close to the corridor which rely on the corridor to be open 24/7. These customers are vulnerable to having short term interruptions which impact productivity and include: Dunstan Hospital, Queenstown Airport and local fruit and wine processing plants.

Critical assets on the route include Alexandra Bridge, which also carries local council services, and Beaumont Bridge. The Beaumont Bridge is at the end of its economic life. Permanent scaffolding on the bridge allows regular inspection, monitoring and maintenance activities to take place. This requires a high level of ongoing investment.

There are several key retaining walls located through Manuka Gorge and Raes Junction Bluffs supporting the road structure. These are inspected and maintained under the NOC contract arrangements.

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 the following:

- **Restrictive and challenging topograph**y: The challenging terrain impacts journey times particularly when there are higher numbers of unfamiliar roads users on the corridor. As growth in recreation activities and tourism continues along the route this will increase numbers of unfamiliar drivers and slower vehicles which may decrease the journey time reliability. It is expected this will mainly occur during holiday and weekend periods.
- **Growth in Queenstown:** Continued growth in tourism around Queenstown is encouraging holiday home development around Cromwell and the western end of Alexandra. As tourism growth in the area increases, the volume of traffic on the corridor will increase and this may place additional pressures on the corridor between Cromwell and Alexandra. Similarly, continued expansion in Alexandra's industrial area is likely to increase commercial vehicle traffic on the route between Cromwell and Alexandra.

Future considerations

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

- **Maintaining appropriate levels of service**: As tourist, commercial and recreational traffic volumes increase. Investment in additional passing lanes/ slow vehicle bays will increase passing opportunities and assist in maintaining levels of service and journey time reliability, particularly between Ettrick to Milton and upgrading those existing bays to standard through Manuka Gorge, Island Block and Roxburgh Hydro Hill. This will build on the existing Passing Lane Strategy covering Central Otago.
- **Changes in travel behaviour:** Increasing tourism, recreation and commercial development along the corridor will require monitoring to ensure reverse sensitivity is avoided, expectations are managed and there is no increased maintenance burden. The route may also see changes in travel behaviour, for example the increasing popularity of cycle trails along the route. The NZ Transport Agency will need to work closely with delivery partners to ensure the corridor is appropriately considered in terms of appropriate access and facilities for anticipated users. This may also involve consideration of potential changes in use of the corridor resulting from developments off corridor such as cycle trails.
- **Critical cycling link:** There is no cycle path between Clyde and Cromwell, this critical cycling link is currently being developed on the opposite side of Lake Dunstan to SH8 through Cromwell Gorge. The SH8 corridor through Cromwell Gorge is not a suitable environment for cyclists due to lack of shoulder and the dish channel drainage infrastructure.
- **Review stopping places as part of the Visiting Drivers Strategy:** All stopping places along the corridor will have to be reviewed for appropriateness and safety. It has also been discussed nationally to provide fewer but higher quality rest/stopping areas adjacent to state highways. Gorge Creek Miners Monument is a location that will be looked at as part of this.

Resilience

The corridor is the priority link between Dunedin and Queenstown, with the highest road classification and shortest distance between the two centres. Some small businesses in Clyde, Alexandra and Roxburgh are reliant on passing highway traffic trade given the remote area.

Unplanned incidents do occur along the route, however good management practices ensure these rarely cause prolonged corridor closure. Some areas of the corridor lack mobile phone coverage which can prolong incident response times.

Vulnerabilities

The corridor is susceptible to rockfalls and slips through Cromwell Gorge and between Alexandra and Roxburgh. A large slip reaching Lake Dunstan has a high risk of triggering a tidal wave. The NZ Transport Agency and Contact Energy work closely together to monitor the slope. There is also an active slip at Beaumont Hill.

Flooding triggered by weather events affect areas of the corridor. Culverts around Roxburgh to Raes Junction and from Lawrence to Milton are vulnerable to flash floods. High winds can also trigger tree falls along the corridor. The corridor is snow and ice prone. This is prominent in higher altitude areas around Alexandra to Roxburgh. NOC contractors for both Coastal and Central Otago use CMA on high risk sections of the route to mitigate icy conditions although this is less effective in rain. Trials for ice warning sensors are ongoing through Manuka Gorge.

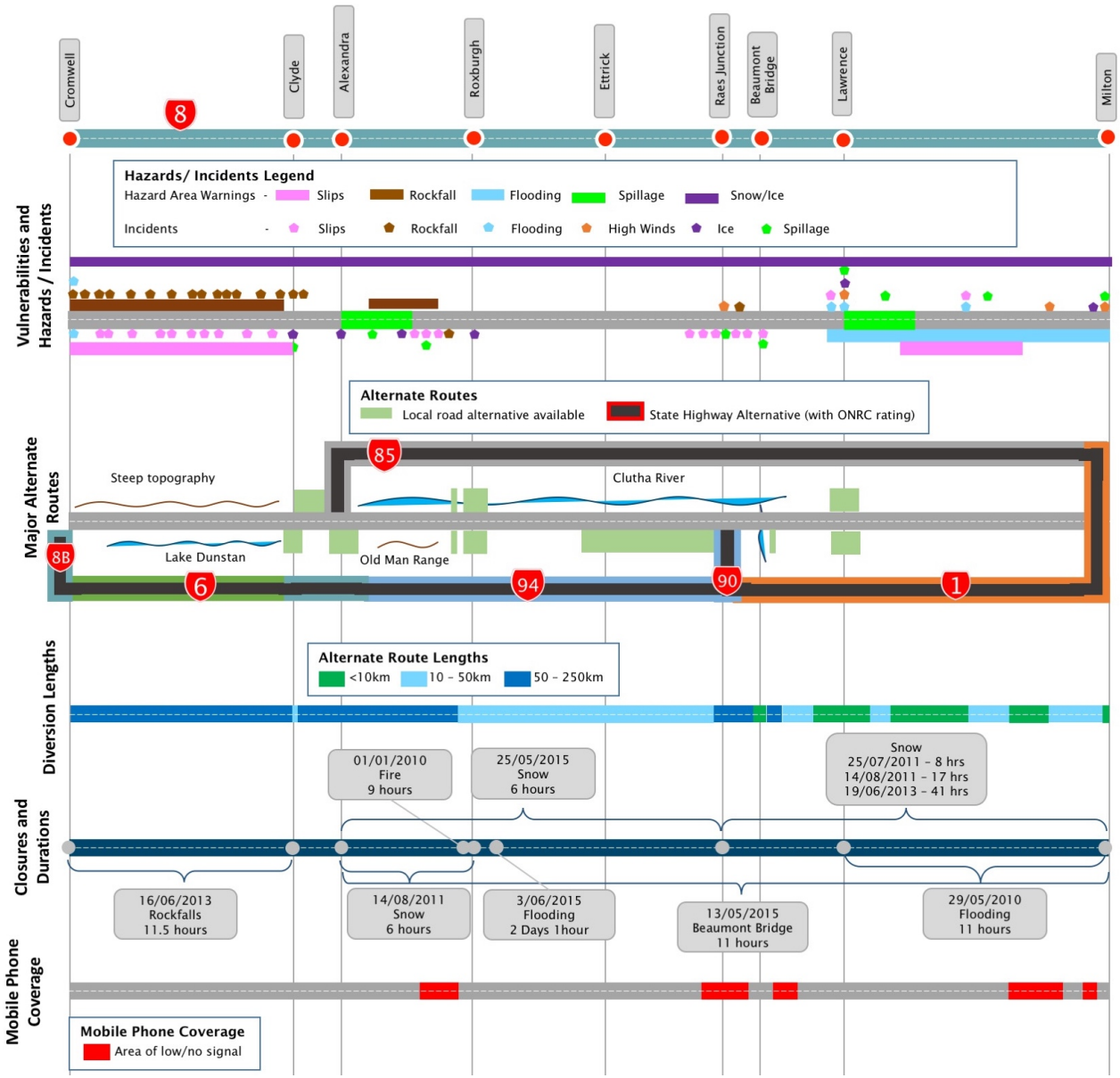
Alternative routes and diversion lengths

There are state highway alternative routes for the corridor as winter weather allows. Over sections of the corridor between Roxburgh and Alexandra and the Cromwell Gorge the alternative State Highway routes are particularly long at around 230km. Some local route alternatives are unsuitable for heavy vehicles.

Closures and duration

The major unplanned road closures since 2010 and duration of interruption along the corridor 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:

- **Rock falls and slip**s: Steep terrain along the corridor from Cromwell to Clyde has resulted in numerous rock fall and slip incidents, affecting the road and Lake Dunstan. The Clyde Dam on Lake Dunstan is a critical asset for Contact Energy, capable of producing 432 megawatts of power from its four turbine generator units. Landslides and rock falls pose a risk to the dam, the resilience of the road and Cromwell town.
- **Flooding:** Flooding events affect the corridor between Roxburgh to Raes Junction and from Lawrence to Milton. Constraints on maintenance and the inability to elevate road height between these sections limit the treatment options available. In the event of a flood, the affected section of corridor may be closed for an extended period, increasing the demand for a viable alternative route that also caters for heavy vehicles and over dimension/HPMV vehicles.
- **Mobile phone coverage:** When customers and maintenance staff encounter issues or incidents, they may be unable to contact the relevant incident responders immediately due to areas of the corridor having no/little mobile phone coverage. This can result in a delay in incident response times.
- **A lack of alternate routes during widespread snow and ice events:** During significant weather events, many alternative state highway routes may also be closed. This corridor is the priority link, therefore other state highways may rely on SH8 as an alternative route. This means there is significant pressure to ensure that winter maintenance activities, procedures and investment is sufficient to ensure the route can remain open.
- **Winter maintenance:** Appropriate funding levels to ensure winter maintenance of corridor keeps levels of service. A significant portion of the maintenance budget is spent on preventing or mitigating winter road conditions. In addition, uncertainty of weather and road conditions makes it difficult to budget for winter maintenance accurately, hence putting the budget at risk and under pressure. Manuka Gorge and Roxburgh require special maintenance under the NOC. This includes the use of CMA and specific placement of plant to attend to incidents in a timely manner.
- **Winter conditions affect travel times:** Due to a lack of awareness of road conditions, commuters and business/commercial users travelling early morning and at night, are more vulnerable to risk due to the road conditions. Ensuring that routes are patrolled appropriately and that adequate information is available to those on the road is important.

Future considerations

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

- **Providing better and timely information to customers:** Proactive messaging using variable message signs would provide commuters with real time information in a short time frame. This is especially important for commuters already travelling on the corridor in case of a hazard or incident, particularly where flooding or rock fall can occur rapidly with little warning.
- **Communication and mobile phone coverage:** Improved mobile phone coverage along the route will allow quicker response times to incidents, allowing the efficient movement of people and goods.
- **Improved innovation in technology and practices:** Technology is used to monitor the active slip at Beaumont Hill and electronic barrier rockfall sensors signal immediately following an incident, leading to quicker response and clearance times. Resilience is a focus for this corridor therefore it will be increasingly important to ensure that new technologies are employed and best practices are utilised for winter maintenance and incident response to maintain optimum levels of service.
- **Partnership arrangements:** There are parties along the corridor that have a vested interest in reducing vulnerabilities along the route i.e. Contact Energy around Cromwell Gorge. Working collaboratively with these parties will assist in enhancing resolution/ management of some of these vulnerabilities leading to enhanced resilience on the corridor.
- **Increasing resilience:** Resilience along the corridor from flooding and flash flooding incidents and particularly having appropriate consents in place to respond appropriately where there are special maintenance requirements.

Reliability and efficiency

Efficiency

The corridor provides a good level of travel time reliability however, there are some sections where reliability can be variable through constrained points of the network such as Beaumont Bridge and Roxburgh Hydro Hill, and Manuka Gorge where geometry is constrained and challenging.

Generally, the corridor performs well for efficiency, achieving a LoS A along most sections of the route during AM and PM peaks. Owing to its urban nature and increased traffic volumes, Alexandra has LoS C to D during the AM and PM peaks. The constrained geometry between Alexandra and Roxburgh has contributed to low LoS due to vehicles slowing to navigate steep ascents and descents. Beaumont Bridge also indicates a low LoS due to the traffic signals in operation over the bridge. Cameras have recently been installed at Beaumont Bridge which are monitored by WTOC. This enhances operation at the bridge and is expected to have a positive impact on user delays.

Anecdotal evidence suggests that no areas of the corridor operate at capacity, and user delays are minimal.

Variability

There is no variability data available for the corridor.

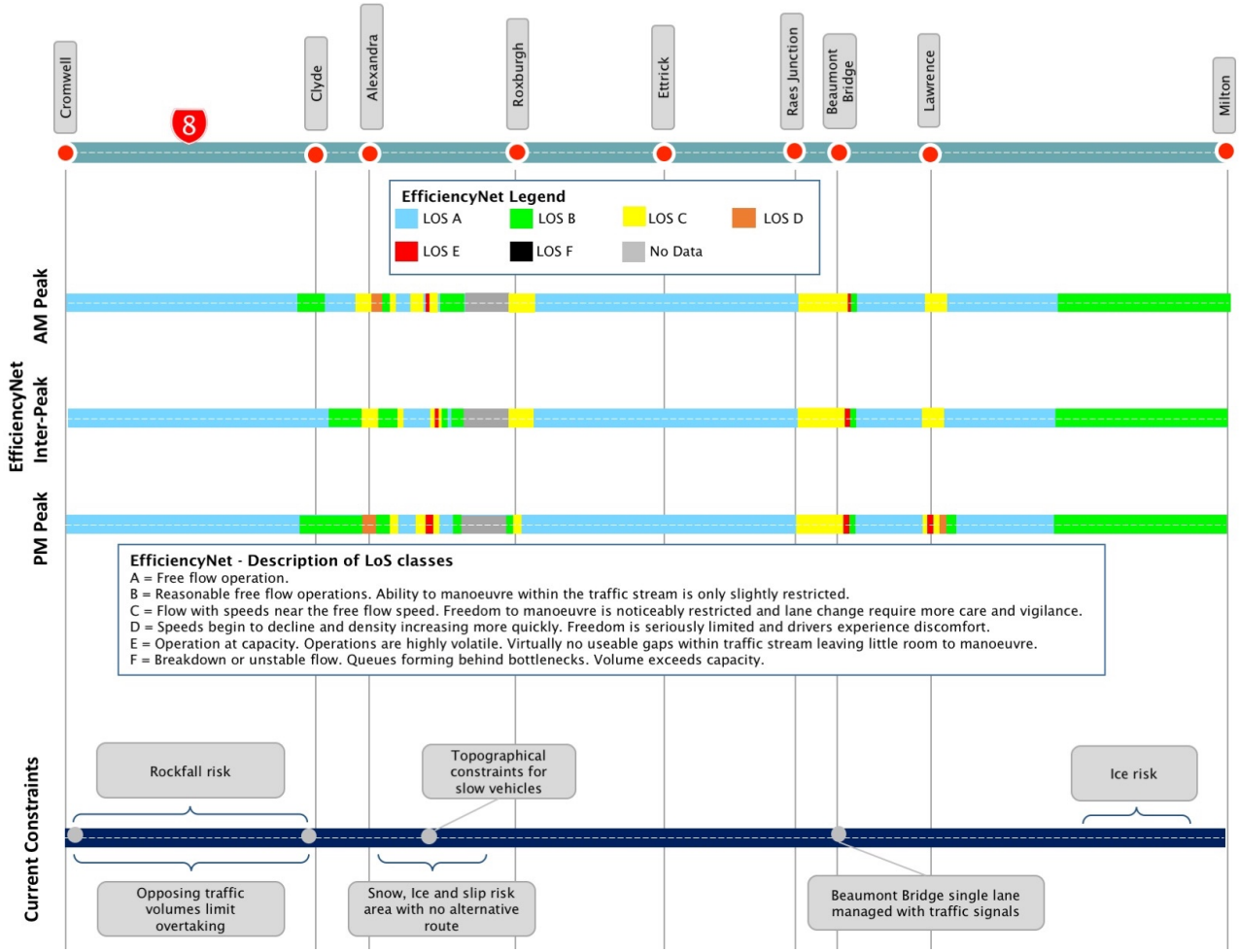
Commercial vehicle average speed

There is no commercial vehicle average speed data available for the corridor.

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 following:

- **Inaccurate and incomplete datasets:** There is no data available for the Roxburgh Hydro Hill area of the route. The variability measures and the levels of service do not appear commensurate with anecdotal network observations of the user delay experienced for this classification of corridor.
- **Increasing commercial development:** Increase in commercial growth around Alexandra and generally in Central Otago is likely to increase traffic growth. This pressure is likely to be focussed on the corridor between Cromwell and Clyde/ Alexandra and will result in fewer passing opportunities.
- **Beaumont Bridge user delay:** The current one-lane one-way configuration with traffic signal operation requires vehicles to stop prior to crossing the bridge. This creates a constraint point on the route.
- **Growth in tourism use of the route:** The use of the corridor is moving more towards recreational and tourist (secondary) route as growth in this area continues across Central Otago. Better driver information is important to ensure journey planning. This includes increasing signage along the route displaying distances between townships as well as providing accurate and up to date information that can be accessed online.
- **Journey times for the Key Journey Dunedin to Queenstown:** Although the corridor itself experiences good travel time reliability, those users undertaking the journey through to Queenstown are likely to be impacted by delays outside the corridor between Cromwell and Queenstown. Advanced warning of these circumstances on this corridor would be of benefit to improve overall journey information for those completing the Dunedin to Queenstown Journey.
- **Lack of passing opportunities:** A lack of passing opportunities on the corridor impacts journey times and can lead to driver frustration. Travel speeds of heavy vehicles within these areas is typically lower. Raes Junction to Cromwell and Beaumont to Island Block, east of Ettrick are areas of the corridor where passing opportunities are limited or could benefit from improvement.

Future considerations

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

- **Investment in accurate and complete data sets:** The corridor should be monitored so that variability of travel time and speed can be measured as the traffic volumes increase. This information will be particularly important for freight, commercial vehicles and business trips that require reliable journey times so that appropriate levels of service can be maintained.
- **Responding quickly and efficiently to incidents:** on the network is important to maintaining reliable and efficient journeys for customers. A robust monitoring and response regime is in place over the corridor supported by technology in some cases (i.e. rock barriers linked to activated signage), however the appropriateness of this should be reviewed as the travel demands of corridor users change and to ensure appropriate levels of investment are maintained.
- **Provision of information:** Informing customers of delays, road conditions, incidents and journey times on the route will become increasingly important. Having permanent variable messaging signs (VMS) in place will allow commuters to get real-time information on road conditions in a short amount of time, enabling them to make suitable amendments to their journey, particularly in advance of areas with no alternative routes. Supporting this information by GIS data will also be a benefit to assist users less familiar with the route.
- **Investment in additional passing lanes/ slow vehicle bays**: This will increase passing opportunities and assist in maintaining levels of service and journey time reliability, particularly between Ettrick to Milton. Upgrading sub-standard bays to current standard at Manuka Gorge, Island Block and Roxburgh Hydro Hill will build on the existing Passing Lane Strategy covering Central Otago.

Safety

Collective risk

SH8 is predominantly rated as low or medium-low for collective risk. There is a medium risk rating along half of the corridor between Lawrence and Milton, around Ettrick and also from Clyde to the south of Alexandra.

Personal risk

There is a high personal risk rating for sections of the SH south of Alexandra and Ettrick and for most of the corridor between Raes Junction and Milton.

Between Beaumont Bridge and Lawrence it has a medium-high risk rating. The remainder of the corridor generally is either low or medium-low.

Star rating

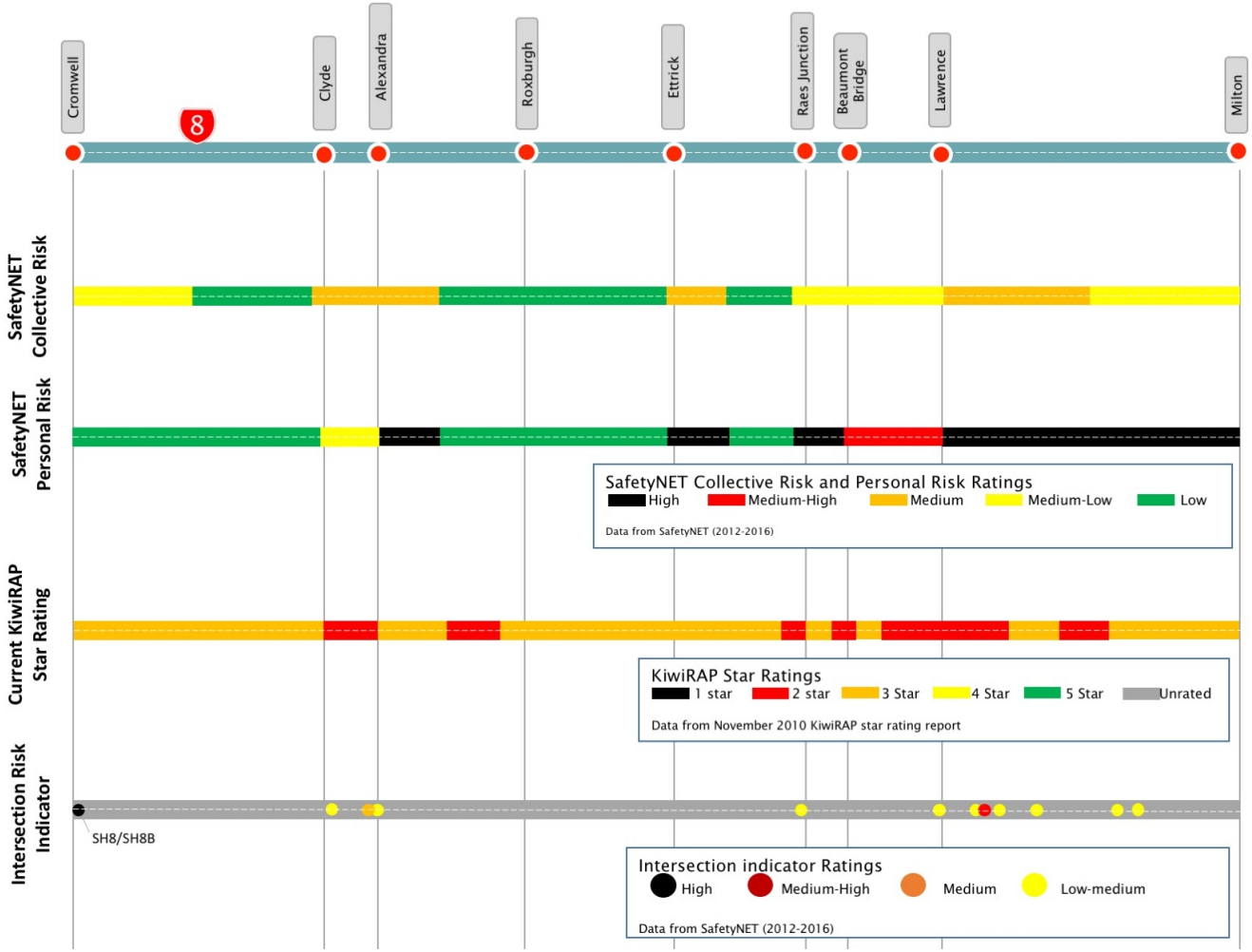
Between Cromwell and Raes Junction, the corridor is predominantly 3-star rated except between Clyde and Alexandra and a small section between Alexandra and Roxburgh.

From Raes Junction to midway between Lawrence and Milton its 2-star rated before reverting to 3 star on the approach to Milton.

Intersection risk indicators

The SH8 and SH8B intersection near Cromwell is the only high-risk intersection for the corridor. There are several rated intersections from Milton to Lawrence which are generally low-medium risk except for one intersection with a medium-high risk.

Figure 12 - 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:

- **Drive to decrease risk along the corridor:** Where the corridor has a 2-star safety rating, this is likely to be due to the road width, lack of safety barrier, out of context curves etc. There are no Safe Road Alliance projects planned on the corridor at this time, however investment will be required to increase the road star rating given the maintenance and geometry constraints on the corridor.
- **Increasing use of cycle facilities crossing SH8:** The increasing popularity of cycle trails along the corridor will increase interaction between cyclists and vehicular traffic at crossing points along the SH8. Similarly, poor surface quality of cycle trails off road may encourage cyclist to use the road where the trail is adjacent to the road which is not appropriate for cycle users.

Lake Dunstan recreational fishing

Future considerations

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

- **Recreational/visitor growth:** As the popularity of recreational travel together with visitor growth along the corridor, the suitability of the current access and facilities at rest areas will need to be considered and carefully monitored to avoid additional risk areas. This will include defining where entrances should be signed from SH8. There are areas along the route where there are no suitable places to locate safe stopping places such as Miners Monument.
- **Collaboration with other RCAs:** Collaboration in the region to approve mutually beneficial agreements to assist in maintaining skid resistance levels, agree suitable aggregate materials. This may extend to approving/ trialling the use of innovative materials to improve skid resistance on the corridor.
- **Cycle activity and cycle user:** Cycle user/vehicle interaction will need to be monitored to ensure safety issues do not develop and that cycle crossing facilities are appropriate for safer interaction between cyclists and vehicles. Better connections between inconsistent cycle trails and cycle trails crossing the SH8 may need consideration to cater for the anticipated patronage.

People, places and environment

Natural environment

Lake Dunstan is the key environmental feature between Cromwell and Clyde, with major ecologically significant landscape also running adjacent to the state highway. The Clyde Dam is an attraction along the corridor. Due to the geology of the area wilding pine and self-sown poplar trees can create slope stability issues and root jacking can occur in schist areas. This is managed through the Dangerous tree programme. Cromwell Gorge, Clutha River, Waitahuna River and Tokomairiro River Catchments traverse the corridor and contribute to flooding in areas between Roxburgh and Milton.

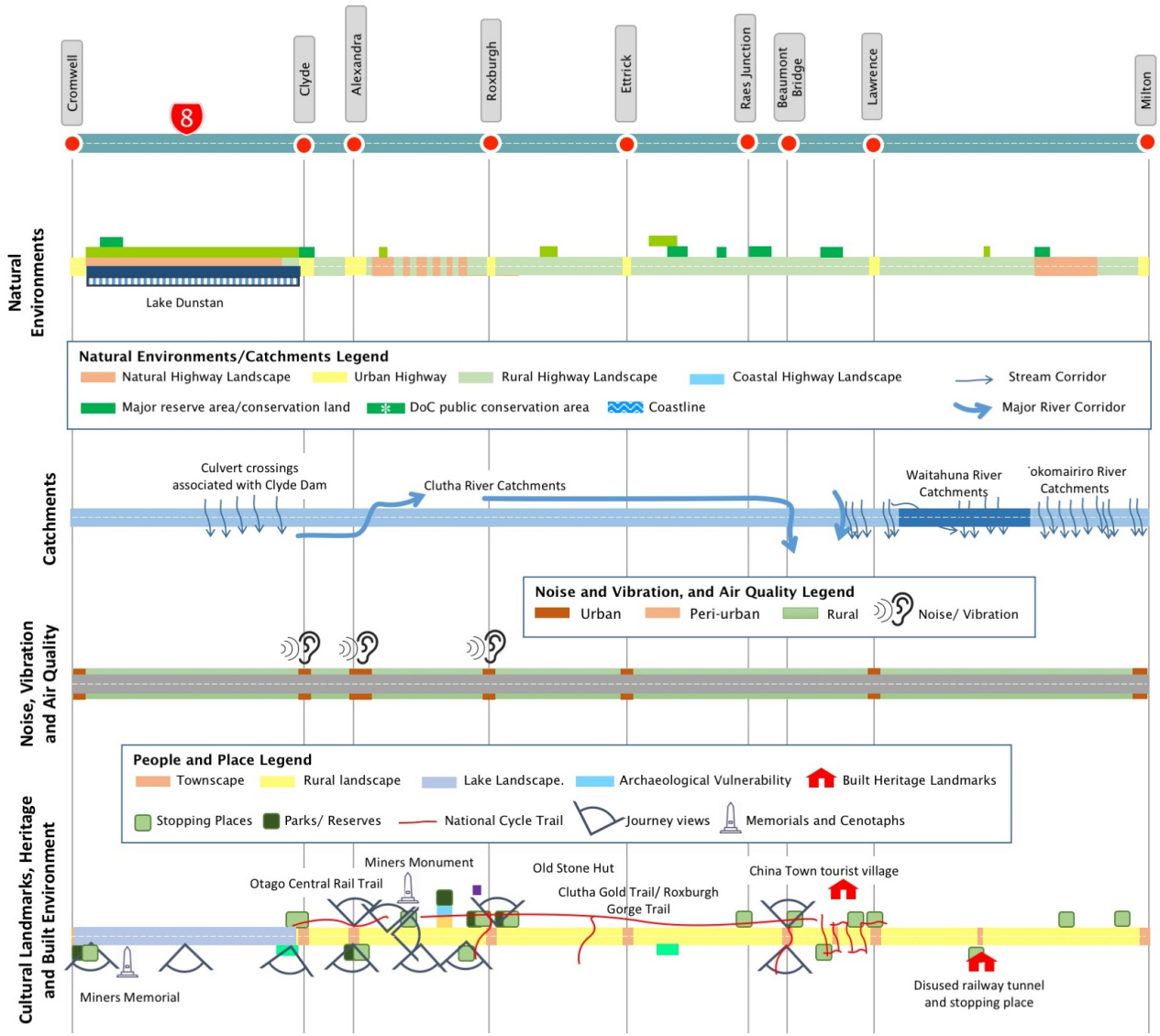
Noise, vibration and air quality

Residential areas in or near Clyde, Alexandra and Roxburgh are sensitive to noise. Due to its low-lying nature, air quality in Alexandra is poorer with fog during winter, however this is not vehicle related. Signage discourages engine breaking through Clyde, Alexandra and Roxburgh.

Cultural landmarks, heritage and built environment

The visual character of the corridor provides vibrancy and attractiveness to journeys, with a range of small town, urban and rural areas. As a recreation and secondary tourist route, there are a variety of stopping places, journey views, memorials and landmarks. There are also national cycle trails along the route including Clutha Gold Trail, Otago Central Rail Trail and the Roxburgh Gorge Trail. There are several locations between Raes Junction and Lawrence where these trails cross the SH8 although the cycle paths are off road. The development of a petrol station is planned adjacent to the corridor and there are plans to develop a restaurant at Beaumont Bridge. Extension of the cycle facility, and the development of the China Town attraction into a tourist village are also likely to attract more visitors around Lawrence. The popular Gabriel's Gully is also accessed from SH8.

Figure 14 – 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:

Natural environment

- **Highway flooding/ washout. Several vulnerable culverts along the corridor:** Maintenance restrictions prevent mitigation and repair in some areas (Lawrence to Milton).
- **Limited Stock effluent disposal sites:** A single effluent disposal facility, maintained by the Regional Council, is located at Raes Junction. Stock effluent spillage occurs in areas of steep and winding alignment resulting in contamination and can be a safety hazard. Increases in dairy farming will result in additional stock movement on the corridor.
- **Maintenance constraints:** Environmental constraints restrict maintenance activity around the Waitahuna and Tokomairiro River catchments. Risk of maintenance activity becoming more controlled, impacting budgets.

Noise, vibration and air quality

- **Noise and vibration near urban areas**: 'No engine breaking' signage is already used in some urban areas along the route. Noise complaints continue to be received in Clyde.

Cultural landmarks, heritage and built environment

- **Limited visibility:** The access to both Miners Monument and Cromwell lookout have limited visibility as these locations become a more popular stopping place with increasing tourist numbers the risk to users increases. Significance of the monuments and constrained topography in these areas limit solutions to enhance visibility.
- **Prevalence of fruit stalls along the route:** Increased pressure to control these activities to minimise maintenance burden and safety impact on the corridor.

Active modes

- **Increasing use of cycle facilities crossing SH8:** The increasing popularity of cycle trails will increase the number of cyclists interacting with vehicles. Poor surface quality of cycle trails off road may encourage cyclist to use the road where the trail is adjacent to the road which is not appropriate for cycle users.
- **Cycling trail from Lawrence to Clarkes Junction:** There are plans to develop a cycling trail between Lawrence and Clarkes Junction adjacent to the carriageway. The facility may use SH8 for some sections of the facility.

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:

- **Use of low noise surfacing in urban areas:** Surfacing appropriate for noise sensitive areas has been used around Roxburgh to reduce traffic noise, this may also be appropriate in other urban locations.
- Working with regulatory agencies to get global consents for maintenance activities, particularly around river catchment areas and sensitive areas (Lake Dunstan).
- **Review of rest areas:** A review of the rest areas along the corridor would assess the appropriateness of the current facilities. Given the increasing popularity of recreational activities accessed from the corridor and cycle trails adjacent to the route, investment to ensure adequate facilities, stopping areas and safety are provided for those users will be a future consideration. This will complement the existing Visiting Drivers Strategy.
- **Partnership arrangements:** There are parties along the corridor that have a vested interest in various tourist destinations along the corridor. Communities can also benefit from collaborative working. The extension of cycle trail facilities on the corridor is an opportunity to work collaboratively and proactively to mitigate potential issues.
- **Wayfinding and signage for cyclists:** Improving way finding signage around cycle crossing points and cycle paths as well as additional signage to warn drivers of the presence of cyclist will assist in ensuring cycle and pedestrian users are appropriately catered for around intersections, popular cycle access and corridor crossing locations.

Understanding the infrastructure assets

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

Corridor asset base

The state highway system is a significant national asset, made up of 11,412 km of roads and associated assets. This corridor contributes approximately 162 km of road network which reflects 1.4% nationally. The total value of the assets along the corridor is $208M.

The corridor assets have been divided into eight groups as shown in Figure 15 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 15 – Corridor asset base

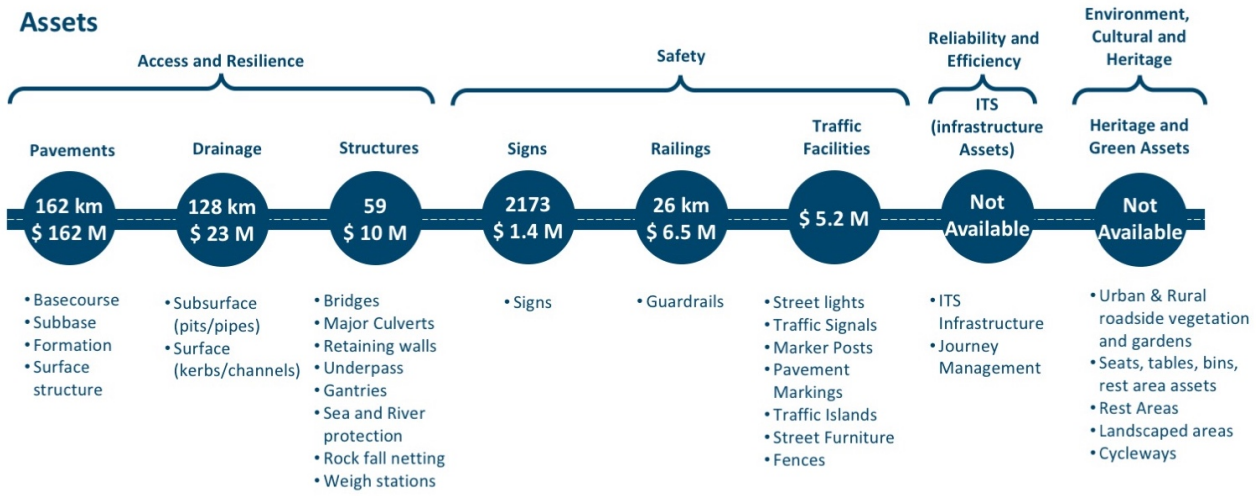


Figure 16 – Summary asset condition and performance

Asset condition and performance

Surface skid resistance

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

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

Surface skid resistance results below the threshold level occur continuously along the corridor between Clyde and Milton. Change across the three-year period shows an improvement in surface skid resistance approaching Milton, but otherwise shows a continued decline in surface skid resistance along the corridor. The greatest degradation in surface skid resistance occurs between RS365 and RS381, essentially from north of Roxburgh south through to Rae's Junction.

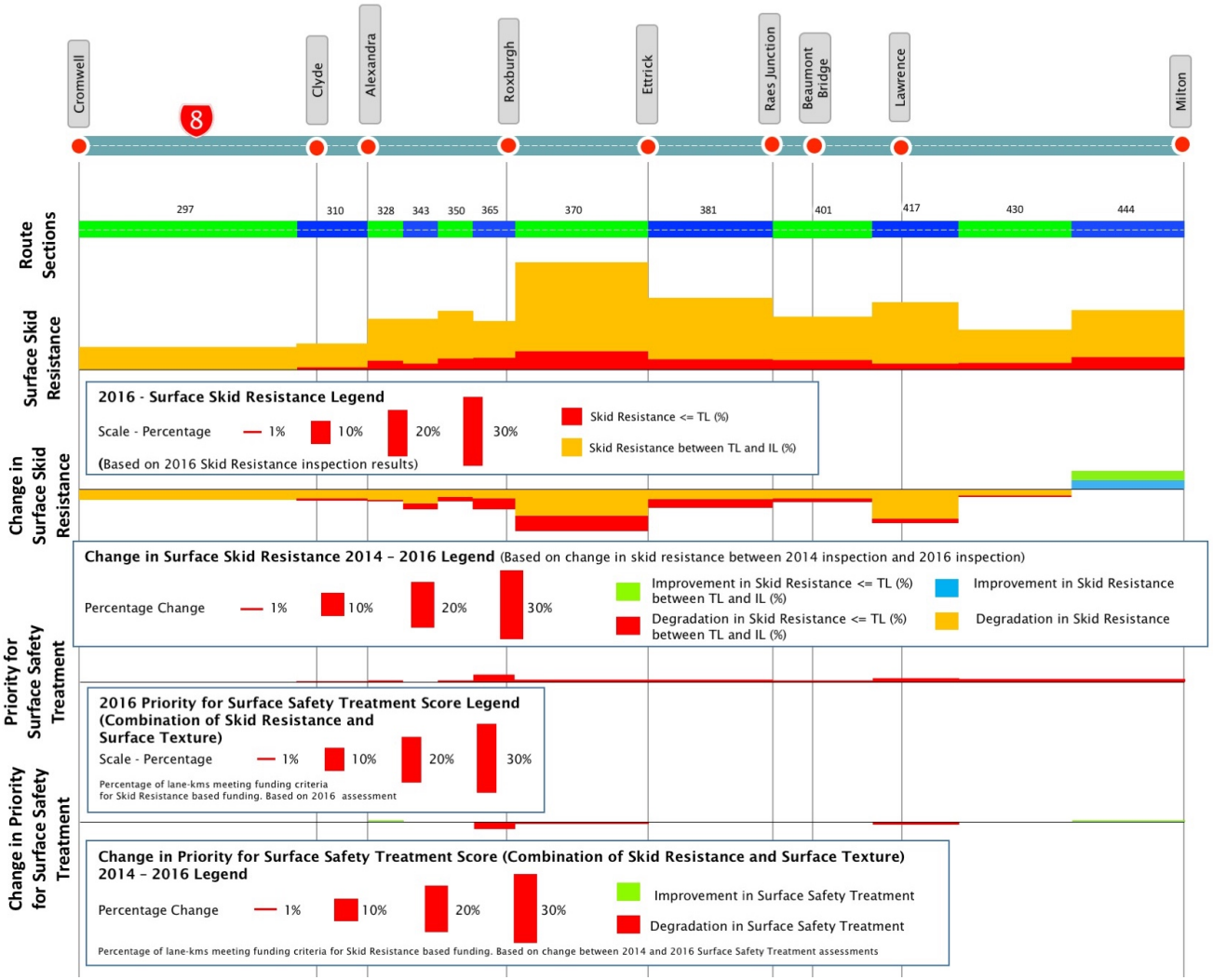
Priority for surface safety treatment

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.

Just 2 lane-km of this relatively short 324 lane-km corridor qualified for surface skid resistance based funding. The worst sections with greatest surface skid resistance degradation that qualifies for funding are SH8 either side of Roxburgh, at RS365 and RS370 and Lawrence, RS417.

Figure 17 – Asset condition



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, 12.5 % of the corridor achieves a score above which inspection is required. A section with significant lengths of surface requiring inspection is SH8/444 northwest of Milton. This section also shows a significant level of degradation in score over the last three years.

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.

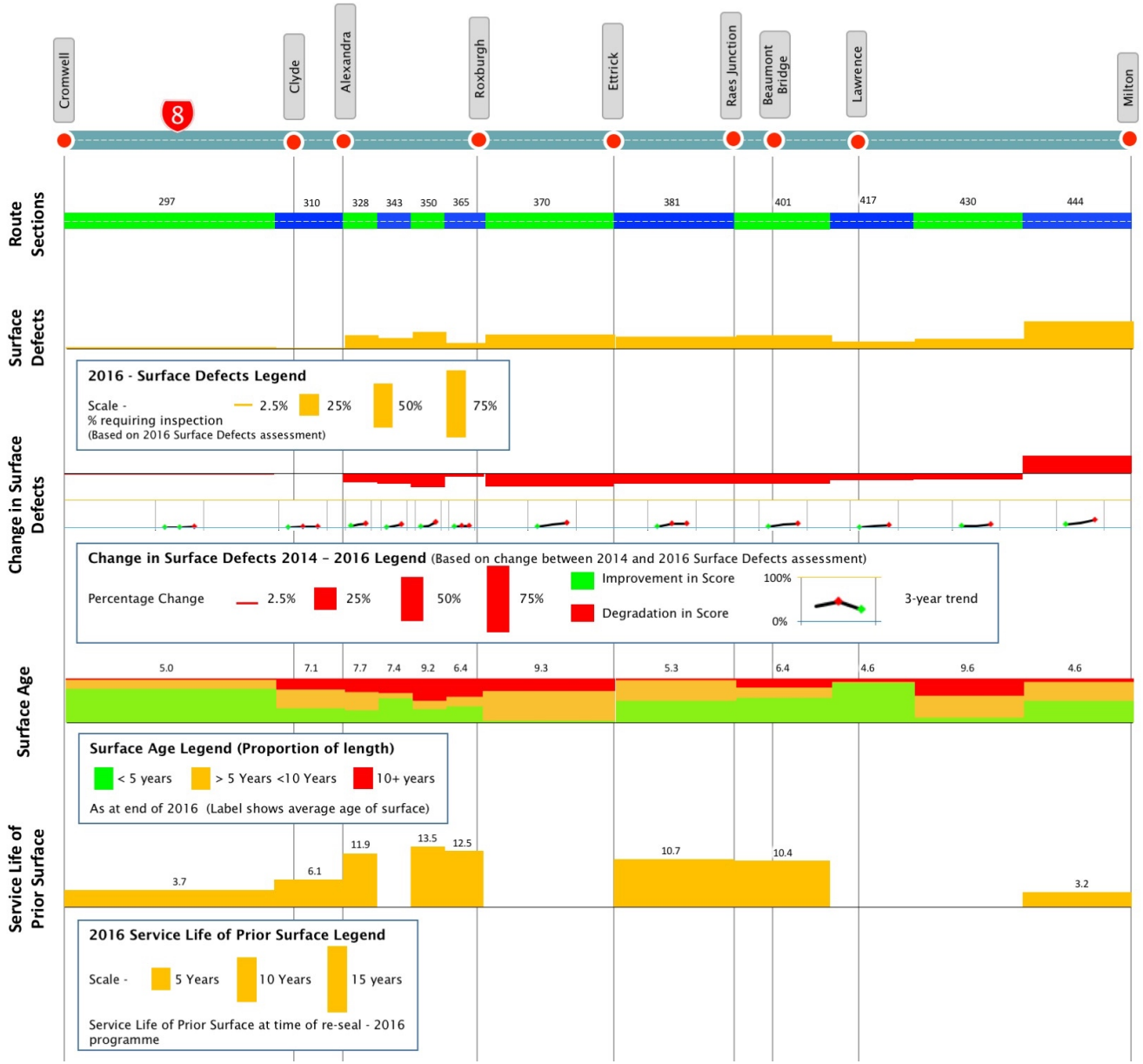
The base data is all the seal lengths and their age from RAMM. Then a weighted average is then calculated. Overall, all sections add up to 100%. The proportion is the length of corridor in a particular age band as a percentage of the total length of that section.

The sections of corridor with the oldest age profile are SH8/370 between Roxburgh and Ettrick, and, SH8/430 through Waitahuna.

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

Figure 18 – Asset condition 2



average age of the sections of seal that were overlaid by a new first coat seal. This is a standard ONRC measure.

Overall the re-surfaced sections achieved an average service life of 8.1 years, with sections SH8/350 and SH8/365 between Tawhiti and Roxburgh achieving an average service life in excess of 12 years.

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 SH8/350 around Lake Roxburgh Village, and, SH8/381 between Raes Junction and Ettrick.

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.

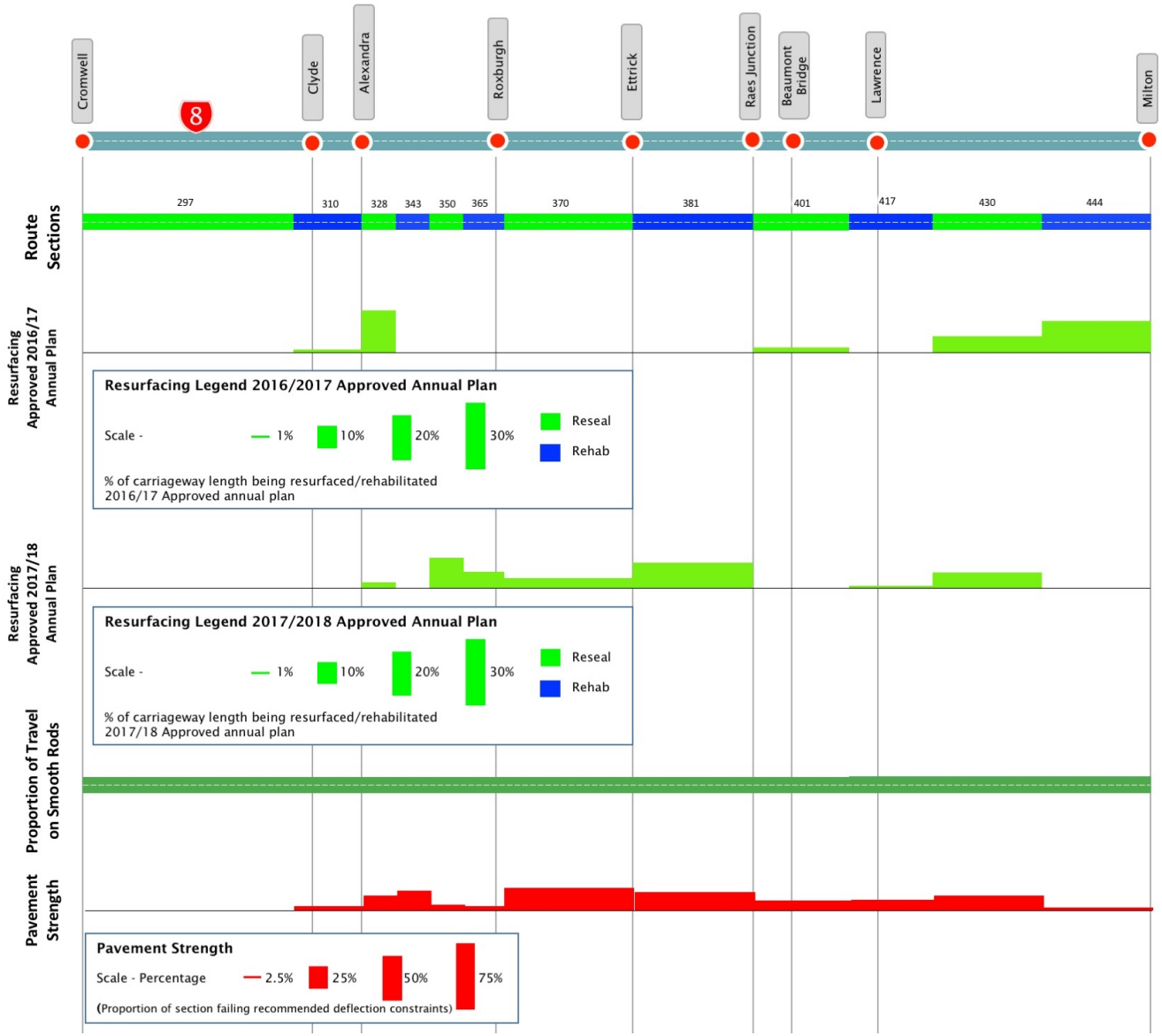
This corridor has no sections that fail to meet the minimum level of proportion of travel on smooth roads.

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 SH8/370 between Ettrick and Roxburgh.

Figure 19 – 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:

- **Cromwell gorge:** Rockfall issues, and is part of the slope check programme. Has a narrow carriageway that constrains maintenance, and dish channels provide no room for cyclists. Winter maintenance is also an issue with parts of the road permanently shaded during the winter months.
- **Centennial Ave Alexandra** – there are some issues with surface cracking, associated with a very old and delicate pavement.
- **Alexandra bridge** – this is a steel bridge, with issues of pigeon excrement causing corrosion, and the occasional bridge strike, southern abutment strength which will be programmed for strengthening
- **Alexandra to Roxburgh**: requires winter maintenance. There are some older sections of pavement. Traditionally an underinvestment in rehabilitation.
- **Raes Junction to Beaumont:** alignment and topology result in poor surface skid resistance. Requires winter maintenance.
- **Beaumont Bridge:** This bridge has a high cost of maintenance. An annual saving of $225K in maintenance will be realised once the bridge has been replaced.
- **Manuka gorge:** windy alignment and vulnerable structures (retaining walls) that are being strengthened, and drainage improvements made to stop further deterioration. Extreme heat and cold is causing issues.
- **Milton end:** – Requires resource consent to undertake maintenance activities due to the area being a flood plain.

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:

- **Alexandra bridge** – southern abutment strengthening will required to be programmed. A planned repair of the bridge will need to be programmed to minimise disruption.
- **Roxburgh to Raes Junction:** The maintenance programme will have to change as pavement in this section comes to the end of its serviceable life.
- **VMS at Milton:** Consideration should be given to installing a VMS sign at Milton for SH8.

SH8 Alexandra bridge

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 determining intervention requirements to specified levels of reliability
- Use resilience requirements to a specified range of weather conditions, considering climate change
- Define how sustainable development requirements are to be addressed

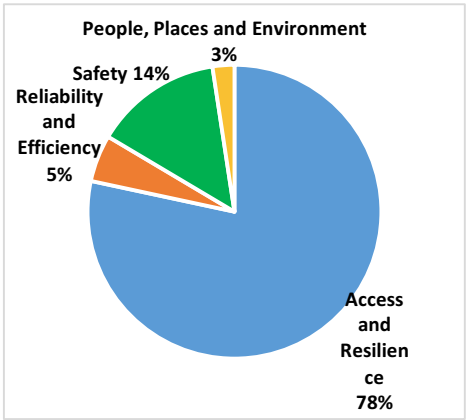
Summary investment

The proposed investment in the corridor is as follows:

Table 1- Summary corridor investment ($000)

Outcome	Expenditure Category	2018-2021	2021-2024	2024-2028
Access and Resilience	Maintenance and Operations	$1,814	$1,908	$2,862
	Renewals	$2,500	$3,231	$4,761
	Improvements	$18,768	$0	$0
Reliability and Efficiency	Maintenance and Operations	$615	$648	$970
	Renewals	$36	$35	$59
	Improvements	$0	$0	$0
Safety	Maintenance and Operations	$1,276	$1,334	$2,000
	Renewals	$550	$519	$755
	Improvements	$0	$0	$0
People, places and Environment	Maintenance and Operations	$296	$307	$461
	Renewals	$12	$10	$14
	Improvements	$0	$0	$0
	Total	**$25,867**	**$7,991**	**$11,882**

Figure 20 – Corridor investment



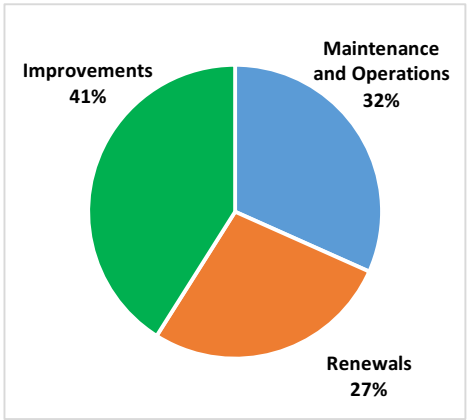


Table 2 - Summary investment by work category ($000)

Outcome	Work Category		2018-2021	2021-2024	2024-2028
Access and Resilience	111	Sealed Pavement Maintenance	$328	$338	$505
	112	Unsealed Roads	$0	$0	$0
	113	Drainage Maintenance	$128	$140	$212
	114	Structures Maintenance	$203	$217	$328
	121	Environmental Maintenance	$647	$691	$1,037
	122	Traffic Services Maintenance	$9	$14	$19
	124	Cycle Path Maintenance	$0	$0	$0
	151	Network & Asset Management	$401	$407	$611
	161	Property	$99	$100	$150
	211	Unsealed Road Metalling	$0	$0	$0
	212	Sealed Road Resurfacing (excl. surface skid resistance)	$1,596	$2,068	$2,731
	213	Drainage Renewals	$56	$60	$86
	214	Pavement Rehabilitation	$551	$820	$1,519
	215	Structures Component Replacements	$274	$256	$385
	222	Traffic Services Renewals	$23	$27	$40
	321 - 341	Improvements	$18,768	$0	$0
Reliability and Efficiency	121	Environmental Maintenance	$251	$265	$399
	123	Operational Traffic Management	$240	$257	$385
	151	Network & Asset Management	$106	$108	$159
	161	Property	$18	$18	$27
	222	Traffic Services Renewals	$36	$35	$59
	321 - 341	Improvements	$0	$0	$0
Safety	111	Sealed Pavement Maintenance	$372	$382	$571
	112	Unsealed Roads	$0	$0	$0
	113	Drainage Maintenance	$48	$42	$63
	114	Structures Maintenance	$76	$83	$125
	121	Environmental Maintenance	$20	$25	$38
	122	Traffic Services Maintenance	$480	$510	$766
	124	Cycle Path Maintenance	$0	$0	$0
	151	Network & Asset Management	$238	$248	$373
	161	Property	$42	$44	$66
	212	Surface Skid Resistance	$371	$399	$599
	214	Pavement Rehabilitation	$0	$0	$0
	215	Structures Component Replacements	$21	$24	$37
	222	Traffic Services Renewals	$158	$96	$119
	321 - 341	Improvements	$0	$0	$0
People, places and Environment	111	Sealed Pavement Maintenance	$21	$21	$32
	121	Environmental Maintenance	$221	$232	$347
	151	Network & Asset Management	$43	$43	$65
	161	Property	$11	$11	$16
	221	Environmental Renewals	$12	$10	$14
	321 - 341	Improvements	$0	$0	$0
		Total	**$25,867**	**$7,991**	**$11,882**

To be confirmed through the RLTP process

Investing in access and resilience

Operations and maintenance

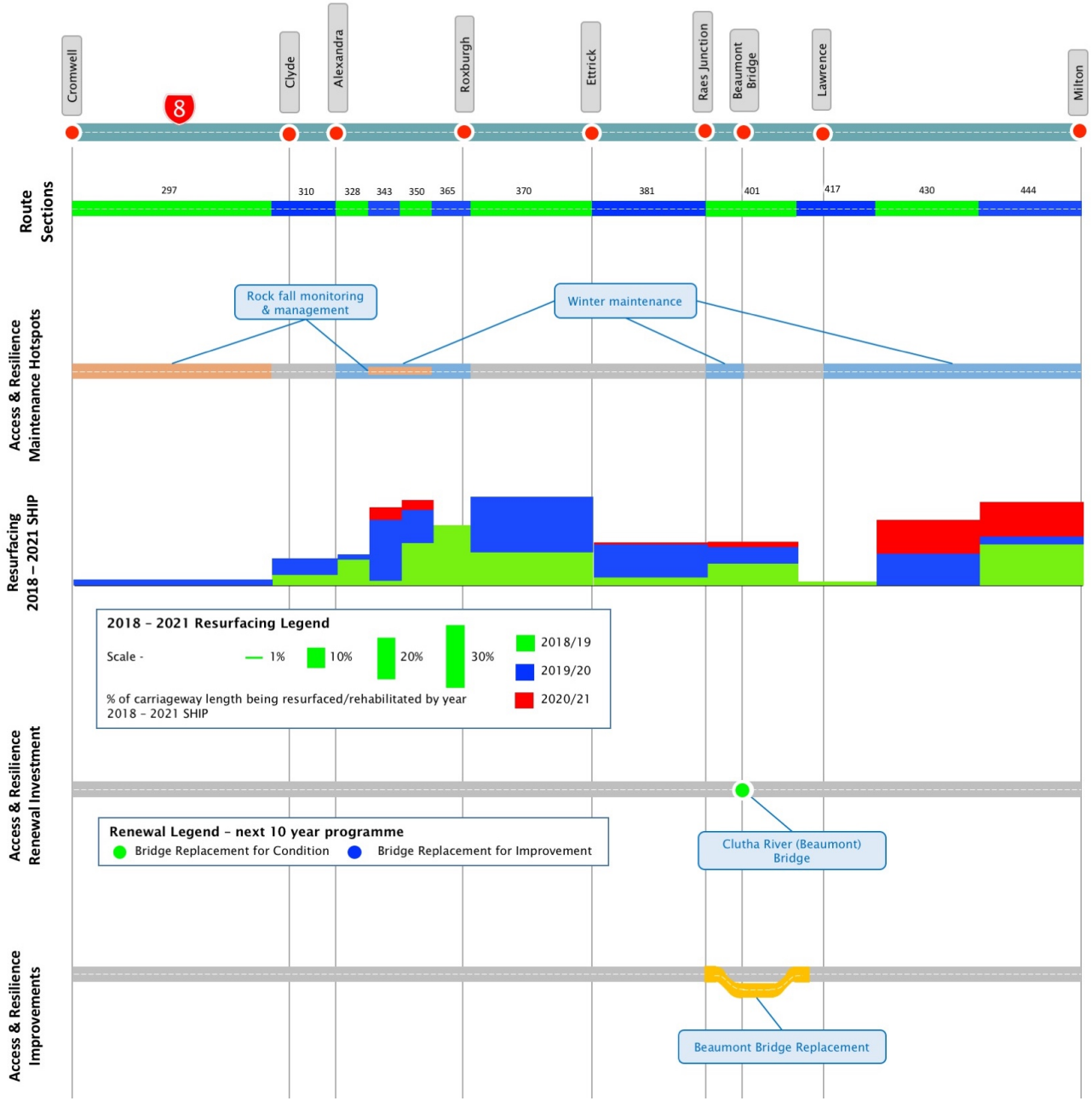
The main areas of investment to provide and preserve access and resilience are drainage maintenance, sealed road surfacing and structural component replacements and vegetation control. A key focus is to realign the base preservation quantities toward increased preventative maintenance and to slow pavement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

Maintenance hot spots

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

- **Cromwell gorge:** This section of the corridor is affected by rockfall issues, and is on the slope check programme for 6 monthly inspections.
- **Alexandra to Roxburgh:** A lower level of rockfall management is required on sections SH8/343 and SH8/350.
- **Winter Maintenance:** Between Alexandra and Roxburgh, in the Manuka gorge, between Lawrence and Milton, and between Raes Junction and Beaumont, winter maintenance is required during the colder months of the year.

Figure 21 – Access and resilience investment



Renewals

Resurfacing

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

Significant investment in resurfacing is planned for sections: SH8/343 and SH8/350 between Tawhiti and Lake Roxburgh Village, SH8/370 between Roxburgh and Ettrick, and, SH8/444 northwest of Milton.

Structure Renewal

The renewal investment infographic shows the planned bridge replacements along the corridor. One bridge is planned for replacement due to asset condition, at a total estimated cost of $15M.

Cromwell gorge

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/

SH8 – Beaumont Bridge Replacement

Description: The bridge replacement, part of the National Bridge Replacement Programme, will involve realignment and new bridge construction over the Clutha River to replace the current structure which has reached its end of economic life. The project is planned for completion by the end of 2021 and once complete, will result in improvements to the performance of this area against the Efficiency and Access ONRC outcomes.

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

No identified issues associated with reliability and efficiency are identified on the corridor.

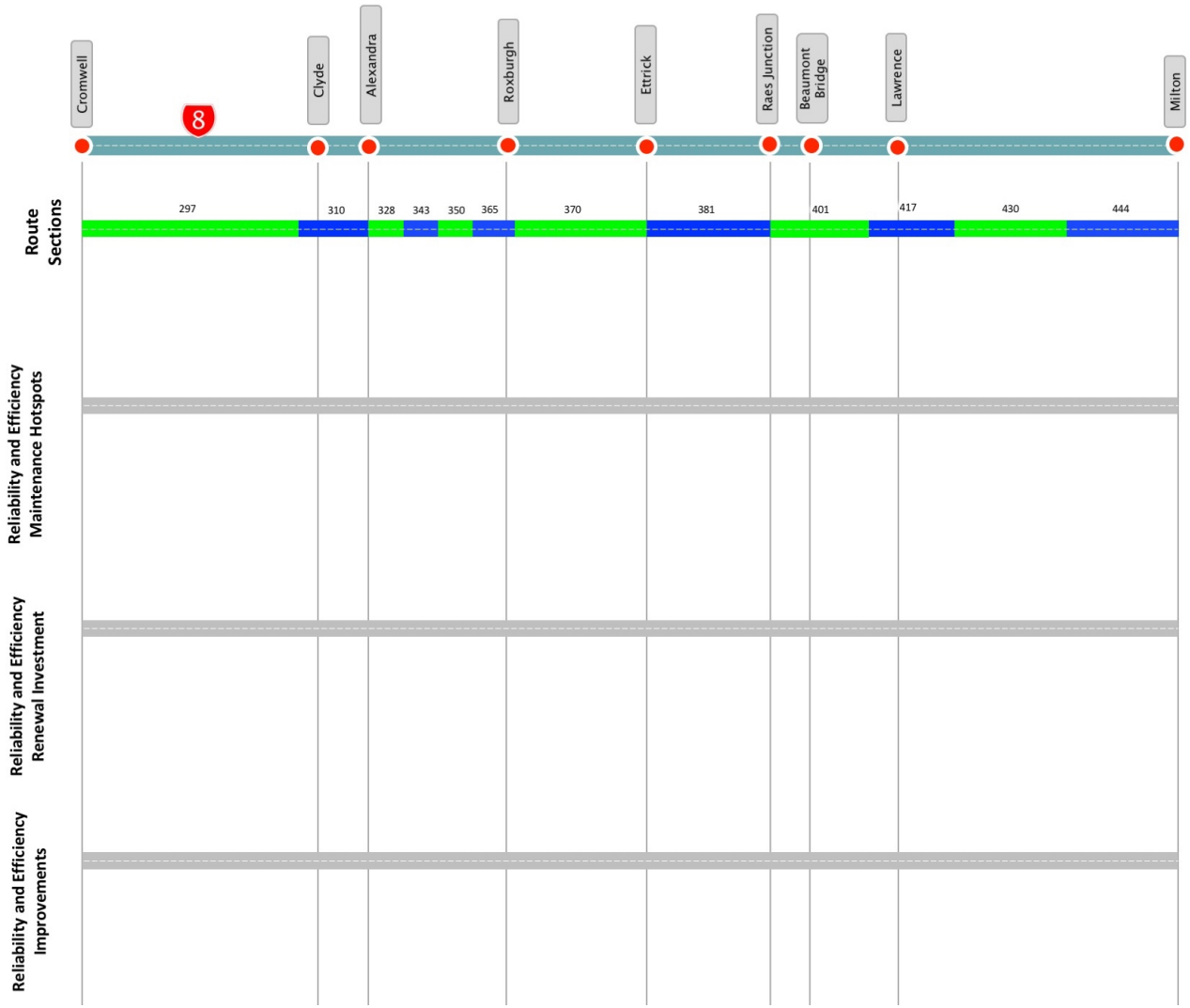
Renewals

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

Improvements

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

Figure 22 – Reliability and efficiency investment



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

No identified issues associated with safety are identified on the corridor.

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 moderate potential for reducing fatal and serious injury savings along the whole corridor where targeted, low cost, high coverage improvements will be beneficial.

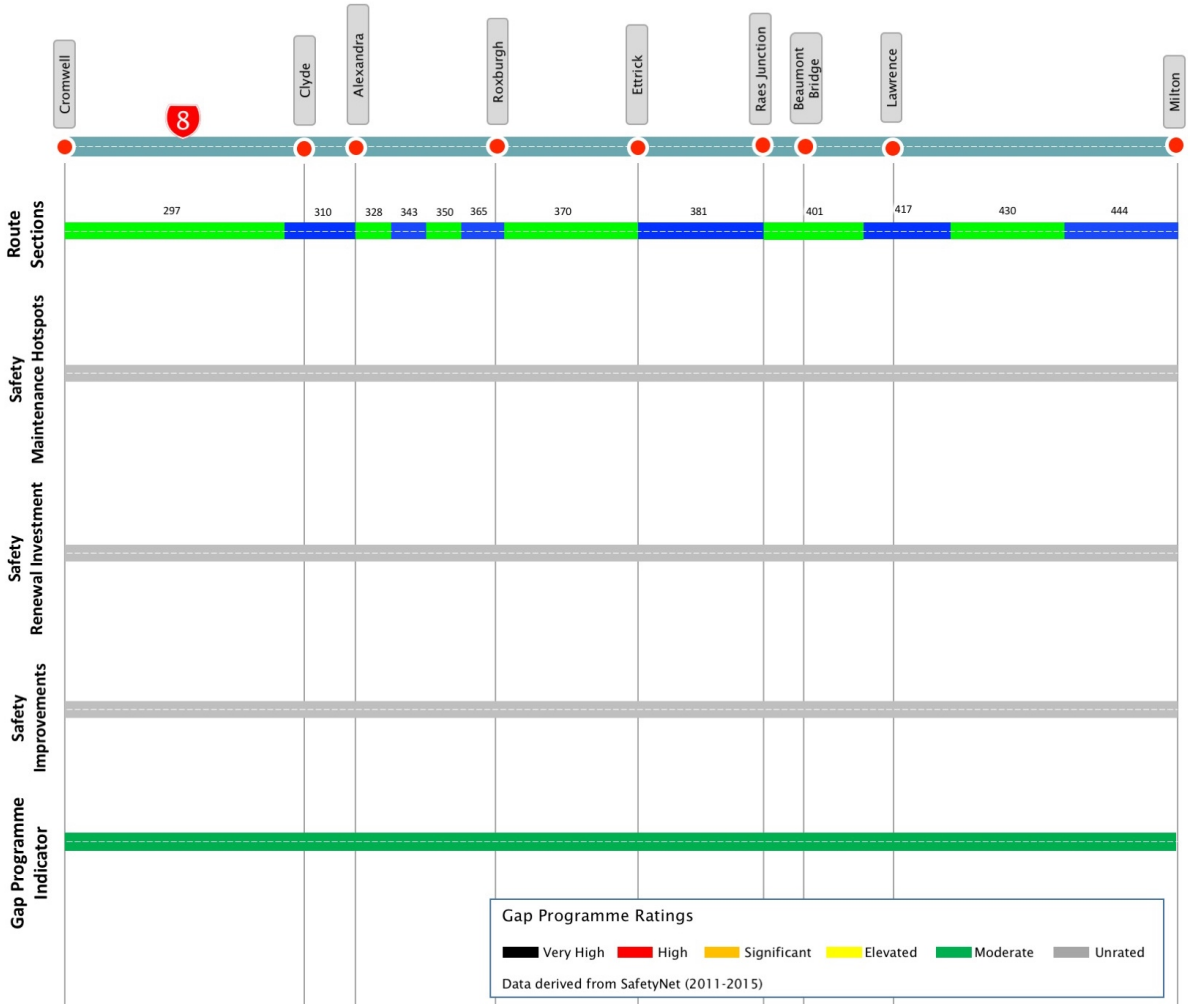
Renewals

There are no safety related renewals planned for the corridor.

Improvements

There are no safety related improvements planned for the corridor.

Figure 23 – Safety investment



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:

- Stock Effluent – Alexandra to Raes Junction, there is an issue with stock trucks dropping effluent on the road. Central Otago District Council and Otago Regional Council are currently considering locations to install additional stock effluent sites along the corridor to reduce the likelihood of stock effluent spillage.
- Ettrick – there is an issue of winter shading of road by trees

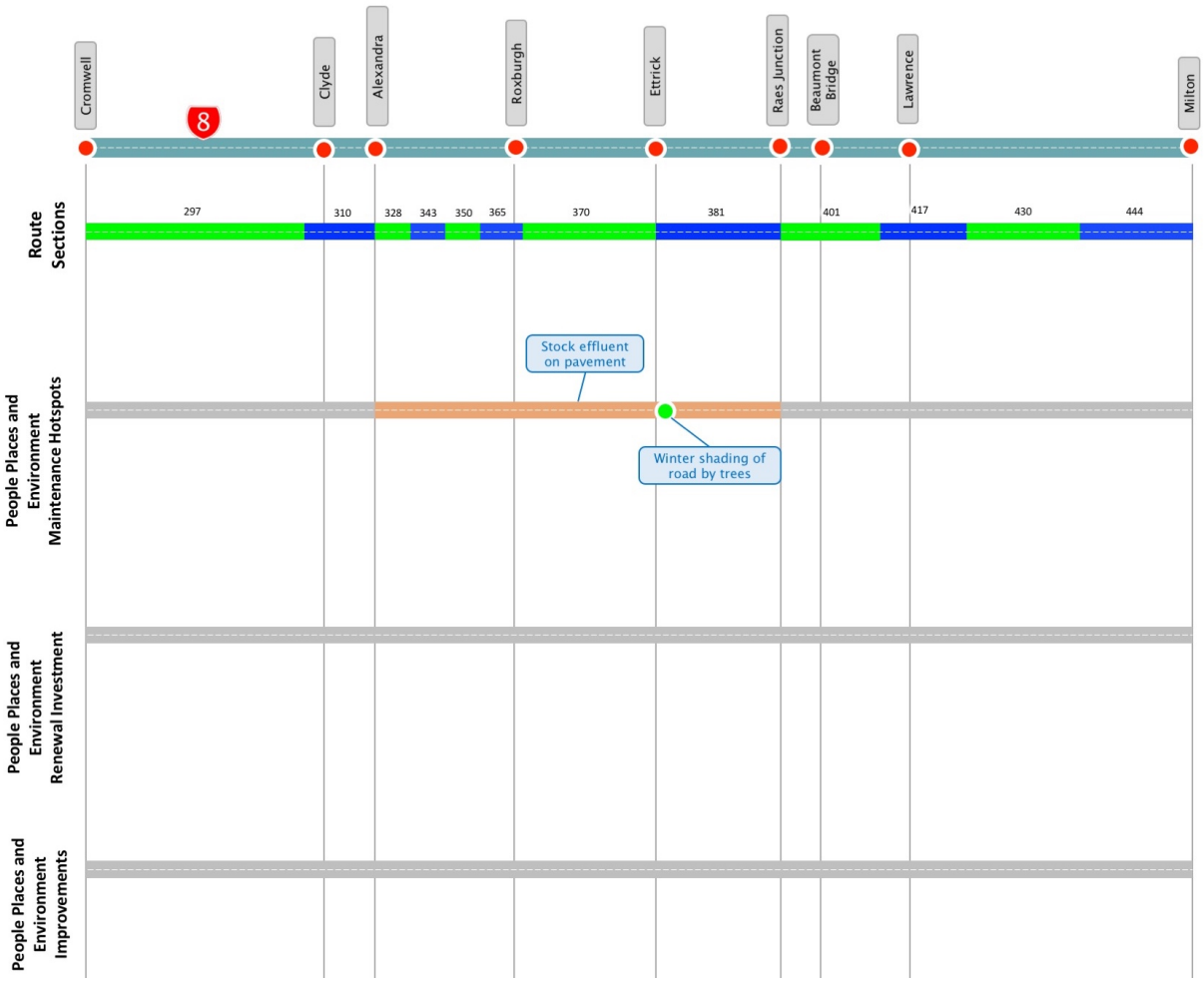
Renewals

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 24 – 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.

- **Growth in Queenstown:** Continued growth in tourism around Queenstown is encouraging holiday home development around Cromwell and the western end of Alexandra. As tourism growth in the area increases, the volume of traffic on the corridor will increase and this may place additional pressures on the corridor between Cromwell and Alexandra. Similarly, continued expansion in Alexandra's industrial area is likely to increase commercial vehicle traffic on the route between Cromwell and Alexandra.
- **Winter maintenance:** Appropriate funding levels to ensure winter maintenance of corridor keeps levels of service. A significant portion of the maintenance budget is spent on preventing or mitigating winter road conditions. In addition, uncertainty of weather and road conditions makes it difficult to budget for winter maintenance accurately, hence putting the budget at risk and under pressure.

Reliability and efficiency

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

- **Beaumont Bridge user delay:** The current one-lane one-way configuration with traffic signal operation requires vehicles to stop prior to crossing the bridge. This creates a constraint point on the route.

Safety

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

- **Availability of aggregate stone in the area:** The cost of bringing in higher quality aggregate material from the North Island to maintain skid resistance levels may increase as skid resistance becomes more of an issue on the corridor.
- **Managing trees adjacent to the corridor:** Forestry development/ farmers planting shelter belts close to SH8 results in shaded areas, particularly around Manuka Gorge, Lawrence, Ettrick and other isolated areas. This can lead to ice which is a significant safety issue.
- **Snow and ice:** Winter maintenance is the biggest issue the corridor faces. Confidence is low during winter conditions as weather and road conditions can be hard to predict. The ability to respond quickly to snow and ice incidents is crucial, putting pressure on the adequate management and monitoring of snow and ice. There is a need to innovate and make use of best practice for winter maintenance activities and procedures.
- **Drive to decrease risk along the corridor:** Where the corridor has a 2-star safety rating, this is likely to be due to the road width, lack of safety barrier, out of context curves etc. There are no Safe Road Alliance projects planned on the corridor at this time, however investment will be required to increase the road star rating given the maintenance and geometry constraints on the corridor.

People, places and environment

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

- **Prevalence of fruit stalls along the route:** There is increased pressure to control these activities to minimise maintenance burden and safety impact on the corridor.
- **Regular amenities:** The corridor is well served by small town and the associated amenities available decreases the burden of having to provide maintained rest areas.

Investment future considerations

- **Additional resources for winter maintenance:** The provision of additional resources will help reduce current maintenance budget pressures and the risk of inadequate funding. Additionally, as current winter maintenance practices are of high standard, customers will expect that the current levels of service continue.
- **Shelter belt management:** Proactively working with local farmers to manage tree shelter belt planning near the corridor will reduce areas of shading and icy patches on the route.
- **Provision of information:** Informing customers of delays, road conditions, incidents and journey times on the route will become increasingly important. Having permanent variable messaging signs (VMS) in place will allow commuters to get real-time information on road conditions in a short amount of time, enabling them to make suitable amendments to their journey, particularly in advance of areas with no alternative routes.
- **Collaboration with other RCAs:** Collaboration in the region to approve mutually beneficial agreements to assist in maintaining skid resistance levels, agree suitable aggregate materials. This may extend to approving/ trialling the use of innovative materials to improve skid resistance on the corridor.
- **Growth in tourism use of the route:** The use of the corridor is moving more towards recreational and tourist (secondary) route as growth in this area continues across Central Otago. Better driver information is important to ensure journey planning. This includes increasing signage along the route displaying distances between townships as well as providing accurate and up to date information that can be accessed online.
- **Increasing use of cycle facilities crossing SH8:** The increasing popularity of cycle trails along the corridor will increase interaction between cyclists and vehicular traffic at crossing points along the SH8. Similarly, poor surface quality of cycle trails off road may encourage cyclist to use the road where the trail is adjacent to the road which is not appropriate for cycle users. Improving way finding signage around cycle crossing points and cycle paths as well as additional signage to warn drivers of the presence of cyclist will assist in ensuring cycle and pedestrian users are appropriately catered for around intersections, popular cycle access and corridor crossing locations.
- **Increasing maintenance burden:** Pressures to increase the star rating along the corridor, given the geographic and topographical constraints will involve implementing safety barrier systems and frangible assets. Additionally, implementation of the Safe and Appropriate Speeds framework may lead to additional speed signage. Additional assets will increase the maintenance burden on the corridor.
- **Review stopping places as part of the Visiting Drivers Strategy:** All stopping places along the corridor will have to be reviewed for appropriateness and safety. It has also been discussed nationally to provide fewer but higher quality rest/stopping areas adjacent to state highways.

Appendix A – Information sources

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

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

Section	Infographic	Information Source	Date
	Variability	NZTA / Beca Dwg No. GIS-3391515-500-4 Network Performance - Attachments.pdf March 2012 eRUC Commercial Vehicle Data – State Highway Austroads Variability Assessment	2012
	Commercial Vehicle Average Speed	NZTA / Beca Dwg No. GIS-3391515-500-5 Network Performance - Attachments.pdf March 2012 eRUC Commercial Vehicle Data – State Highway Average Speeds	2012
	Current Constraints	Network Manager and Regional Staff Corridor drive-over	2016
Safety	KiwiRAP Collective Risk	https://nzta.abley.com/SafetyNET_2017 SafetyNET	2016
	KiwiRAP Personal Risk	https://nzta.abley.com/SafetyNET_2017/ SafetyNET	2016
	KiwiRAP Star Rating	http://www.kiwirap.org.nz From 2010 KiwiRAP star rating report.	2010
	Intersection Risk Indicator	https://nzta.abley.com/SafetyNET_2017/ SafetyNET	2016
	Gap Programme Rating	https://nzta.abley.com/SafetyNET_2017/ SafetyNET	2015
Environment Culture and Heritage	Natural Environment	NZTA - Environment and Urban Design Team	2016
	People and Place: Journeys	NZTA - Environment and Urban Design Team	2016
	People and Place: Landmarks and Heritage Places	NZTA - Environment and Urban Design Team	2016
	Noise and Vibration	NZTA - Environment and Urban Design Team	2016
	Drainage Catchments	NZTA - Environment and Urban Design Team	2016
Understanding the Infrastructure Assets			
Overview	Corridor Asset Base	NZTA_ 2017 Values by Corridor.xlsx complied by Opus International Consultants from RAMM and other asset information sources	
	Asset Condition and Performance	Summarised from the data sets described below	
Asset condition and performance	Surface Skid Resistance	SCRIM data derived from RAMM by NZTA Data Quality and Access team	2016
	Surface Safety Treatment	SAL data derived from RAMM by NZTA Data Quality and Access team	2016
	Surface Defects	100m Priority data derived from RAMM by NZTA Data Quality and Access team	2016
	Surface Age	Surface Age data derived from RAMM by NZTA Data Quality and Access team	2016
	Service life of Prior Surface	Surface Age data derived from RAMM by NZTA Data Quality and Access team	2016
	Resurfacing	Resurface data derived from forward works programme	2016
	Proportion of Travel on Smooth Roads	STE data derived from RAMM by NZTA Data Quality and Access team	2016
	Pavement Strength	Deflection data derived from RAMM by NZTA Data Quality and Access team	2016
Investing in the Corridor			
Summary Investment	Summary Corridor Investment	2028-21 SHIP programme funding requests 2017/18 Annual Plans	2017
	Summary investment by work category	2028-21 SHIP programme funding requests 2017/18 Annual Plans	2017
Investing in access and resilience			
Investing in access and resilience	Maintenance Hot Spots	Network Manager and Regional Staff	2017
	Resurfacing 2018 - 2021	Resurface data derived from forward works programme	
	Renewal Investment	National Bridge Replacement Programme National bridge replacement programme 2017 LCMP data.xlsx	

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

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

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