Marlborough Sounds Future Access

PROGRAMME BUSINESS CASE

PREPARED FOR MARLBOROUGH DISTRICT COUNCIL | July 2023

Stantec

Revision schedule

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Abbreviations

Enter Abbreviation	Enter Full Name
AEP	Annual Exceedance Probability
DSI	Death and Serious Injury crashes
GDP	Gross Domestic Product
GPS	Government Policy Statement for Land Transport
ILM	Investment Logic Map
IPM	Investment Prioritisation Method
KPI	Key Performance Indicator
LTP	Long Term Plan
MDC	Marlborough District Council
ONF	One Network Framework
ONRC	One Network Road Classification
PBC	Programme Business Case
RAMM	Road Asset Maintenance and Management
RCP	Representative Concentration Pathway
SSP	Shared Socioeconomic Pathway
Waka Kotahi	Waka Kotahi NZ Transport Agency

Part A – The Strategic Case

1 Introduction

1.1 Background

Marlborough has suffered multiple high intensity rainfall events over the past two years which have caused significant damage to Marlborough's transport network. There have been four events requiring a significant response: July 2021, February 2022, July 2022, and August 2022. The July 2021 event caused approximately 1,650 faults and $85m of damage to roads. It is estimated that the recovery from the August 2022 event could be in the order of three to four times this figure. Over 670 km of roads were affected and over 4,000 faults were identified[1]. Rai River experienced a 1 in 60-year event, its biggest flood on record. Communities in Canvastown and Rai Valley were cut off from Marlborough and Nelson with both State Highway 6 and State Highway 63 closed. Access in and out of the Sounds was seriously affected as roads experienced the effects of severe erosion, with a significant number of slips and dropouts making many roads unpassable.

The effect of the storm events has created stress and uncertainty for residents and businesses, many of whom can no longer rely on the roads they normally use to reach goods and services, or to get products to market. Transport has become an onerous problem, and alternatives are either not available, or have added time and cost to what were quite straightforward journeys prior to the storms. Authorities and the local community are concerned about the effect that subsequent storms and rainfall events could have on an already fragile road network.

Restoring access and repairing the damage following the storm events has been managed by the Marlborough Roads Recovery Team as a variation to the Network Outcomes Contract being delivered by a Fulton Hogan HEB Joint Venture. Highways and local roads in Marlborough are collectively managed by 'Marlborough Roads', a collaboration between Waka Kotahi and Marlborough District Council.

Marlborough Roads Recovery Team have submitted two emergency works applications to Waka Kotahi for repairs to damage arising from the four events. When approval and works are complete, 3,640 repairs will have been completed out of a total of 5,420 repairs. This leaves **1,780 faults outstanding**, pending the outcome of this Programme Business Case (PBC). These 1,780 faults include sites under permanent traffic management, requiring ongoing maintenance and regular safety checks. The road is down to one lane at these sites and traffic is managed by signals, which require a manual battery change every two days. Examples of faults outstanding are shown in the photos in Table 1-1.

Table 1-1: Examples of the 1,780 outstanding faults on the road network

[1] Totals for Marlborough District as of 24 November 2022.

These outstanding faults present a risk to road users and maintenance crews and affect access for businesses and communities. For example, a comprehensive assessment completed by Marlborough Roads and GoBus reported that they do not feel that it is safe for them to run the school bus down Moetapu Bay Road and Kenepuru Road past the Moetapu Bay turnoff (Kenepuru Zone) due to health and safety concerns. As the road is expected to be in this condition for some time, the Moetapu Bay Road section, and the last 4.5 km along Kenepuru Road has been removed from the school bus route. This means parents need to transport their children to the recycling station located near the Moetapu Bay turn off where they can catch the school bus. This demonstrates the way in which normal trips have become a challenge.

1.2 Purpose

The current situation where access is severely affected for long periods following a storm event is unsustainable economically and socially for authorities and locals alike. To provide certainty for all parties, this business case has been established to identify a sustainable long-term solution for safe and resilient transport access to the Sounds. The preferred program considers the likely implications of future storm events and proposes approaches to adapt the transport network over time. The programme identifies priorities and determines the levels of service that will be provided for access. The next steps are identified, with some improvements recommended to progress immediately, and others moving to a more detailed business case stage.

The business case will also confirm the outcome for the 1780 outstanding faults on the road network that have not yet been repaired and are still affecting access.

1.3 Governance

Marlborough District Council led the development of this Programme Business Case, working closely with iwi and Waka Kotahi partners. A Governance Group was established to oversee the process, ensure milestones were met, the right organisations involved, and to consider recommendations. The Governance Group consisted of representatives from:

- Marlborough District Council
- Marlborough Roads
- Mana whenua and tangata whenua representatives
- Te Kotahi o Te Te Tauihu Charitable Trust
- Port Marlborough
- Waka Kotahi NZ Transport Agency
- Department of Internal Affairs
- National Emergency Management Agency
- Department of Conservation
- Regional Public Service Lead - Te Tau Ihu.

1.4 Extent

The extent of the study area is shown in Figure 1-1 and encompasses the Sounds. As shown the Sounds are split into five zones according to the primary access road for each area. All local roads were considered within each zone.

The five zones are as follows:

- **French Pass:** access to the Sounds from Ronga Road (Rai Valley)
- **Pelorus:** access to the Sounds from Kaiuma Bay Road
- **Queen Charlotte Drive:** alternative for SH6 between Havelock and Blenheim, alternative for SH1 between Blenheim and Picton.
- **Kenepuru:** access to the Sounds from Queen Charlotte Drive, Kenepuru Road and outer Sounds
- **Port Underwood:** access to the Sounds from Port Underwood Road (Picton to Rarangi).

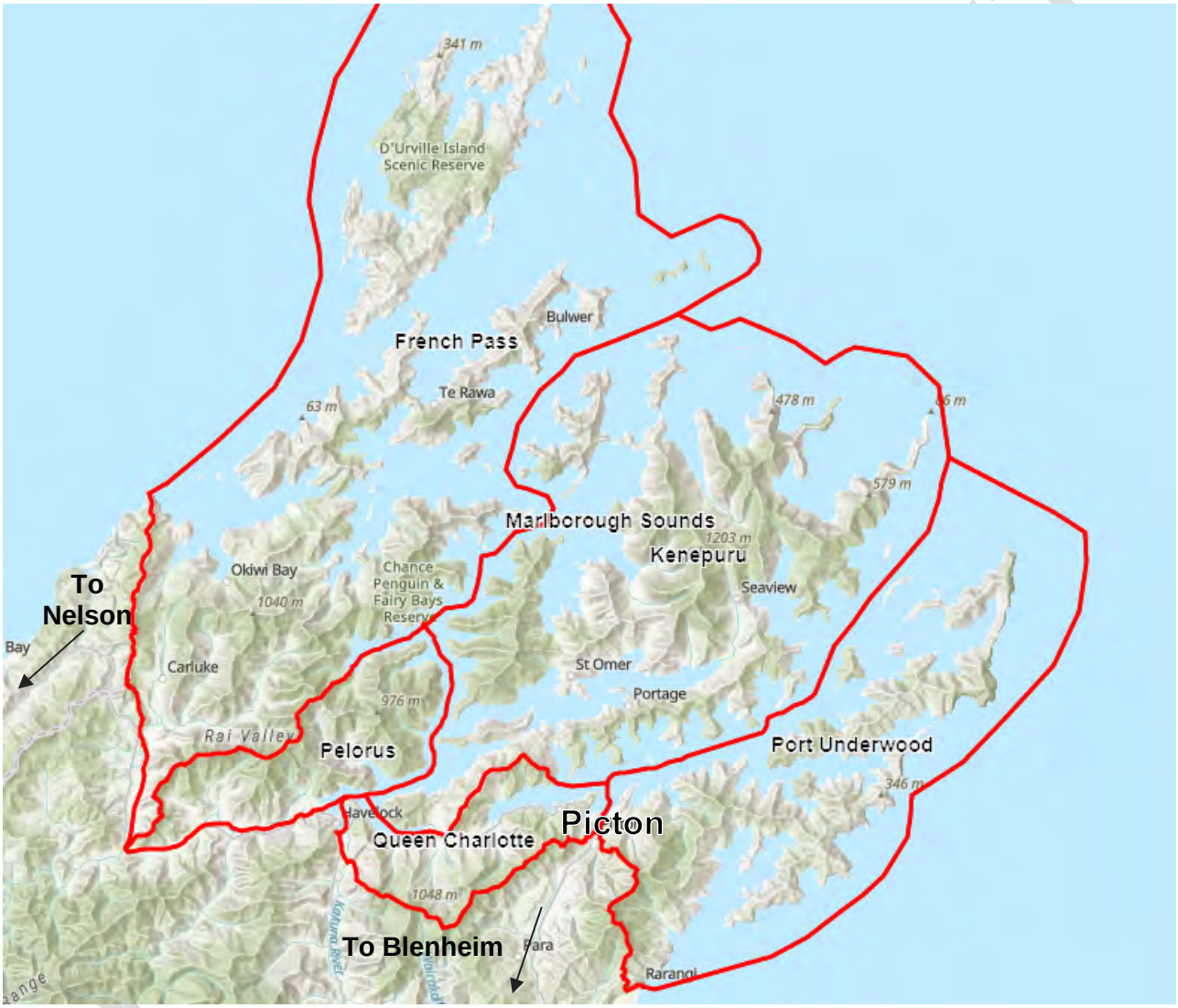


Figure 1-1: Project extent

2 Programme Context

2.1 Geographic and Environmental Context

The Sounds form the northern extent of the South Island. They are drowned river valleys which extend inland as far south-east as the Rai Valley[2]. To the west of the Rai Valley lie the Whangamoa Ranges through which Nelson and the west coast of the South Island can be accessed by road. The port town of Picton borders the study area to the south, along with the wider Marlborough Region. Directly north of the study area the Cook Strait separates the North and South Islands; ferries traverse the Strait transporting passengers and freight, and travel through the Queen Charlotte Sound.

The topography of the study area is varied. The Sounds comprise an array of small inlets, coves and islands which make up more than 10% of New Zealand's coastline[3]. Its larger islands, as shown in Figure 2-1, are mostly of hilly terrain and untouched native forests. There are also pockets of flat, high producing exotic grassland, which host livestock farms. The area, particularly the Pelorus Sound, is also home to many marine farms. Further inland, the Rai Valley is largely low-lying farmland surrounded by forested hilly to mountainous terrain. This area is the catchment for the Rai River; a primary watercourse which has many interactions with State Highway 6 on the edges of the study area.

Figure 2-1: Looking southwest towards Elaine Bay from the Outer Pelorus Sounds[4]

It is generally accepted that the Marlborough Sounds were formed by tectonic movements and sea level changes over the past 15-20 million years. River erosion and subsidence of uplifted land followed[5]. This formation mechanism provides little protection from coastal erosion. The strike-slip Wairau Fault, a segment of the larger Alpine Fault tectonic border, passes south of the region and is considered as having a relatively high seismic hazard[6]. The geology of the study area is mainly sedimentary greywacke and metamorphic semi-schist, materials with typically poor slope stability performances during earthquakes. These rock types are susceptible to coastal erosion and erosion during storm events. Rising sea levels and more extreme weather events because of climate change are predicted to further exacerbate this vulnerability.

There are a number of conservation programmes in the area. The absence of introduced predators has allowed kiwi and various native birds to thrive on predator-free islands, as well as tuatara, gecko and native frogs. Pelorus Sound is home to one of New Zealand's two native bat species. The waterways within the Sounds are excellent habitats for dolphins,

[2] For simplicity, the total study area including the Rai Valley is referred to as the "Sounds" or "Marlborough Sounds study area" within this report.

[3] Boffa Miskell (2015) "Introduction to the Marlborough Landscape" in *Marlborough Landscape Study.* https://www.marlborough.govt.nz/repository/libraries/id:2ifzri1o01cxbymxkvwz/hierarchy/documents/environment/land/marlborough-landscape-study-list/Marlborough_Landscape_Study_2015_Section_B.PDF

[4] Marlborough District Council (n.d.) "Regional Policy Statement" https://www.marlborough.govt.nz/your-council/resource-management-policy-and-plans/regional-policy-statement

[5] A Nicol (2011) "Landscape history of the Marlborough Sounds, New Zealand." *New Zealand Journal of Geology and Geophysics*, 54:2, 195-208, DOI: 10.1080/00288306.2010.523079

[6] Judith Zachariasen, Kelvin Berryman, Robert Langridge, Carol Prentice, Michael Rymer, Mark Stirling and Pilar Villamor (2006) "Timing of late Holocene surface rupture of the Wairau Fault, Marlborough, New Zealand." *New Zealand Journal of Geology and Geophysics*, 49:1, 159-174, DOI: 10.1080/00288306.2006.9515156

stingrays, seals and locally farmed sea life, and often host seasonally migrating orca and whales. Continued access is important to continue pest control programmes and protect native species.

The key problems addressed within this PBC are related to major disruption and vulnerability of access around the Marlborough Sounds. The local geography and environment are major factors; there is little protection for roading infrastructure from high impact natural disasters.

2.2 Cultural Context (tbc)

1-2 pages to be provided by iwi.

2.3 Social Context

2.3.1 Overview

Most people living, working or visiting the Sounds will have been affected by the storms to some extent.

For this study the Sounds community has been categorised into several different groups with different demographics:

- Permanent residents, around a third of whom are retired.
- Business owners – predominantly primary industry (agriculture, forestry, aquaculture, etc) or tourism.
- Property owners who are not permanent residents, only visiting for holiday periods. If this group rent out their property in the meantime e.g., via AirBnB, they may be part of the group above.
- Domestic and international visitors.

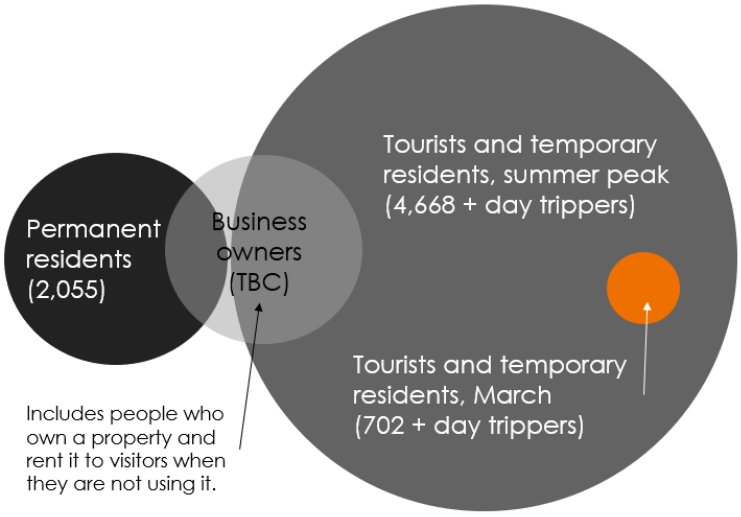


Figure 2-2: People living, working in, or visiting the Marlborough Sounds

2.3.2 Permanent Residents

2.3.2.1 Demographics

Approximately 2,055 people usually reside within the project area[7] according to the 2018 Census. Kenepuru is the most populated zone with 57% of the population, followed by French Pass (22%), Port Underwood (12%) and Pelorus (9%).

A comparison of the Sounds, Marlborough and New Zealand for some key 2018 Census data is shown in Table 2-1, Figure 2-3, and Figure 2-4. They show that:

- Like other rural areas, the Sounds population is older than the rest of Marlborough and New Zealand

[7] Statical Area 1 (SA1) boundaries were used to build up an approximate of the areas of interest excluding the Picton urban area and the Havelock township. The SA1 boundaries do not exactly align with the areas of interest so all totals are estimates. The SA1's used are as follows:
- French Pass: 7023222, 7023225, 7023228, 7023233, 7023234, 7023236
- Pelorus: 7023224
- Queen Charlotte: 7023239, 7023241, 7023243, 7023245, 7023247
- Kenepuru: 7023242, 7023250, 7023252
- Port Underwood: 7023249, 7023251, 7023253, 7023254, 7023255

- The median age is just over 10 years greater than the Marlborough median, and 20 years greater than the New Zealand median
- The percentage of people over the age of 65 is also significantly greater for the Sounds
- Kenepuru has the oldest population, followed closely by Port Underwood and French Pass.

The exception to this is Pelorus which has a much younger median age than the rest of the Sounds (more in line with the rest of the Marlborough region) and double the percentage of those under 15 years of age. This means it is likely a more family centric area which may have different transport needs when compared to the rest of the Sounds.

As the 65 years and older population has been growing, the population has been shrinking in the 15-64 age bracket, with a flow on effect to the younger age group.

Table 2-1: Comparison of population information

Location	Usually resident population				Median Age	Median Personal Income
	Under 20 years	20 – 64 years	65 years and older	Total		
French Pass	69	228	138	459	52.6	$24,425
Pelorus	42	99	30	183	47.4	$34,200
Queen Charlotte	93	396	216	711	56.7	$27,293
Kenepuru	39	231	189	462	61.3	$25,119
Port Underwood	27	129	84	240	58.2	$35,018
The Sounds (Total)	**270**	**1,083**	**657**	**2,055**	**56.2**	**$27,681**
Marlborough Region	10,620	26,166	10,548	47,340	45.5	$31,500
New Zealand	1,225,227	2,759,367	715,170	4,699,755	37.4	$31,800

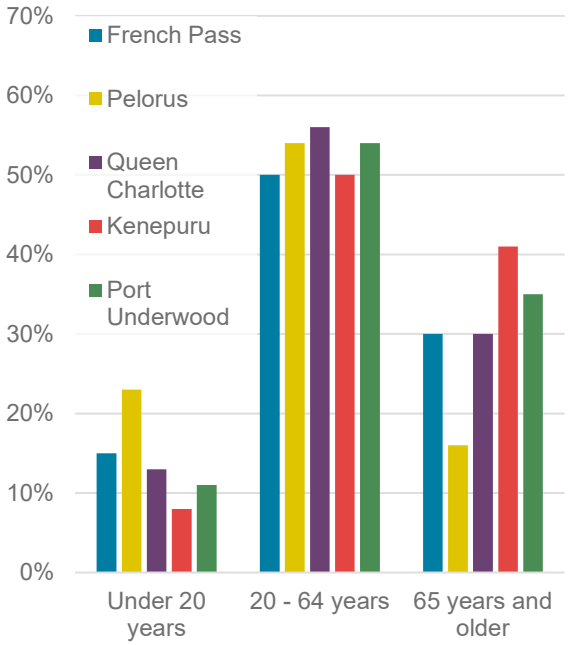


Figure 2-3: Comparison of the age of people across the Sounds

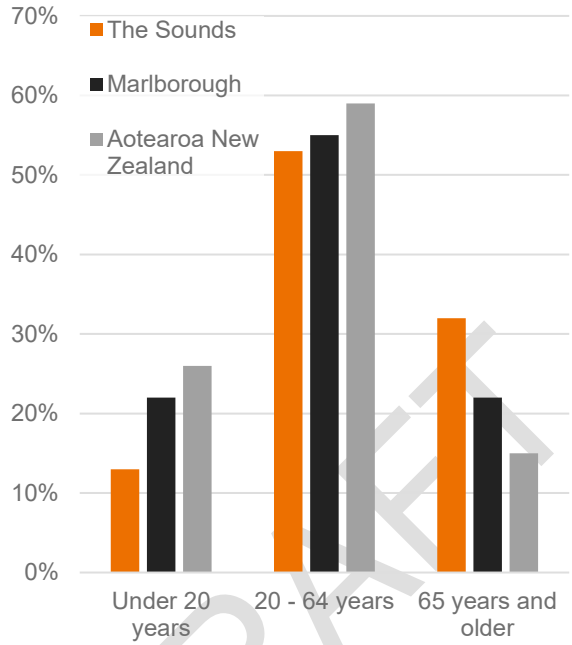


Figure 2-4: Age of people in the Sounds compared to Marlborough and New Zealand

2.3.2.2 Socio-Economic Deprivation

Socioeconomic deprivation is measured by the deprivation index[8], which uses a scale of one to ten, where one is least deprived and ten is most deprived. Scores show the west Sounds are more deprived than the east Sounds, with a score of six and four respectively.

These averages hide the fact that there are areas within the Sounds with much higher deprivation scores. All the land north of Kenepuru Head has a deprivation score of eight, meaning it is in the top 20% of most deprived places in New Zealand. Conversely areas such as Moetapu Bay, Anakiwa, and parts of Port Underwood have deprivation scores of one or two, meaning they are some of the least deprived areas in New Zealand.

According to Environmental Health Intelligence New Zealand, people who live in more deprived areas are more susceptible to environmental risks. They may also have less capacity to cope with the effects of environmental risks, and fewer resources to protect themselves from environmental hazards.

2.3.3 Business Owners

There are many businesses operating in the Sounds. The community survey completed in early 2023 showed that 157 out of 920 respondents identified as 'Resident and Business' (17%), and 29 respondents identified as 'Businesses' (3%). This includes people who own properties that are normally rented to visitors. A breakdown by business type is shown in Figure 2-3.

[8] The deprivation index is an area-based measure of socioeconomic deprivation. It measures the level of deprivation for people in each small area and is based on nine Census variables.

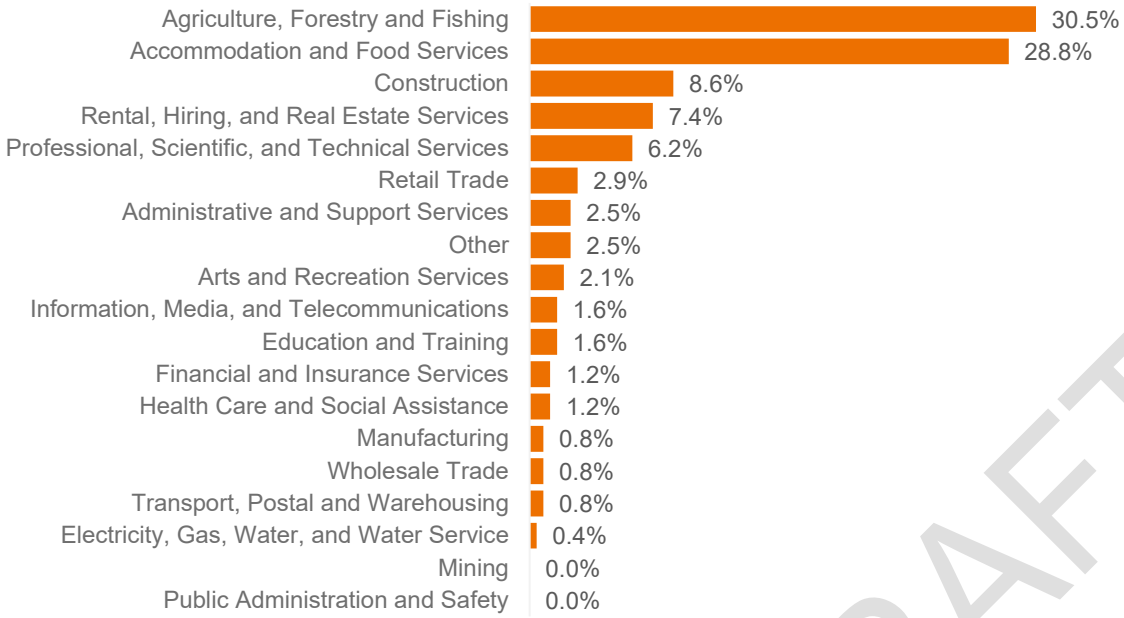


Figure 2-5: Business Classification (Source: MDC Survey 2023)

This data shows that the most significant business sector is agriculture, forestry and fishing, with 74 such businesses responding to the survey (31%). This category is diverse, and includes sheep, cattle, and deer farms, aquaculture (muscles, oysters, salmon, paua, crayfish, seaweed), and apiary. Accommodation and food services is the second largest business type, with 69 survey respondents (29%) identifying this as their business sector. It is believed up to 20% of these operations could be people who own family bachs that are rented out while they are not in use by the owner.

Regarding the tourism sector, an audit of tourism operations in Marlborough was completed by Destination Marlborough to inform their 2022/23 Destination management plan. The audit found that there were 227 tourism offerings in the Sounds. There were 101 accommodation business, 23 tour operators and 12 transport businesses. This number is significantly higher than those identified through the Sounds Survey 2023, which could either mean many are no longer operating, or, that there are many more operators who did not respond to the Sounds Survey.

2.3.4 Visitors

The Sounds are a popular holiday destination, and the total population is often greater than the usually resident population. Overnight visitors account for approximately 26% of the total census night population, and this is 35% greater than the usually resident population. The difference between the usually resident population and the actual population on census night is shown in Figure 2-4.

Marlborough District experiences peak population in December and January as shown in Figure 2-5, and this is expected to be true for the Sounds also. Figure 2-5 shows that in January 2022 the total visitor population in the Marlborough Region was just over 11,000 people. If a just 20% of these visitors were in the Sounds (a very conservative estimate) the total population would be double the usually resident population.

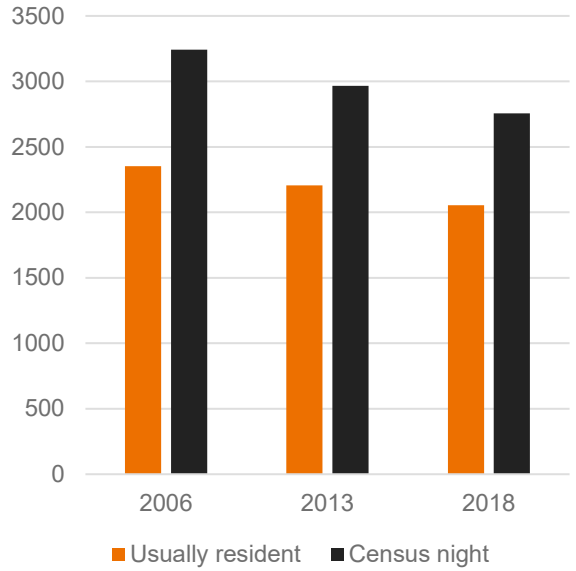


Figure 2-6: Usually resident population vs census night population

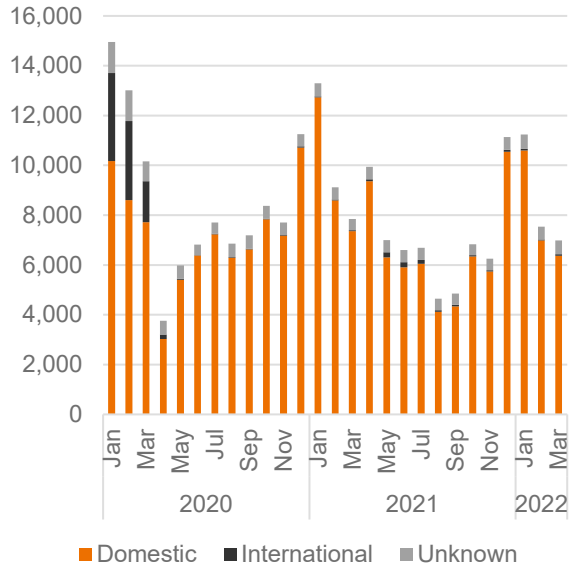


Figure 2-7: Monthly average of daily visitors present in Marlborough at noon[9]

The 2013 Census[10] recorded 3,369 dwellings in the project area, of which 63% were empty at the time of the census. It is believed most of these dwellings will be holiday homes. This figure is significant – in comparison, 14.6% of dwellings are empty across the Marlborough region, and only 10.3% are empty across New Zealand.

Council's rating database shows there are 3,057 properties with dwellings in the Sounds. This is about 9% less than the number of dwellings recorded in the 2013 Census. This is expected given the area considered using the census data is slightly greater than the actual project area.

Table 2-2 gives a breakdown of the recorded dwelling status by zone, and a comparison to the current Council rating data. Please refer to Appendix A for a more detailed breakdown of the census information.

Table 2-2: Percentage of empty dwellings

Zone	2013 Census Dwelling Data					Properties with Dwellings
	Occupied	Residents Away	Empty	Total	Percentage Empty	
French Pass	252	24	564	849	**66%**	727
Pelorus	69	3	30	102	**29%**	110
Queen Charlotte	324	24	300	648	**46%**	563
Kenepuru	318	30	912	1,269	**72%**	1,241
Port Underwood	150	12	333	501	**63%**	416
Total	**1,113**	**93**	**2,139**	**3,369**	**63%**	**3,057**

Table 2-3 shows that over half of the properties with dwellings in the Sounds are owned by people outside of Marlborough.

[9] Data sourced from Destination Marlborough
[10] Data from the 2018 Census is not used as the dwelling occupancy status variable did not receive a quality rating in 2018. The 2018 Census counted fewer private dwellings in Marlborough Sounds East, Marlborough Sounds West, and Marlborough Sounds Coastal Marine than existed at census time.

Table 2-3: Owner location by postal address for properties with dwellings in the Sounds[11]

Zone	Marlborough	Nelson/ Tasman	Other South Island	North Island	Overseas/ Unknown	Total	Percentage outside Marlborough
French Pass	265	312	76	66	8	727	64%
Pelorus	59	22	19	8	2	110	46%
Queen Charlotte	335	40	142	35	11	563	40%
Kenepuru	490	96	414	204	37	1,241	61%
Port Underwood	215	9	94	87	11	416	48%
Total	**1,364**	**479**	**745**	**400**	**63**	**3,057**	**55%**

2.3.5 Importance of Access

Maintaining access is critically important to the community described above. The main rural service towns are Havelock and Picton, providing supermarket shopping, medical centres, and schools. There are minor centres at Linkwater and Okiwi Bay. There are very few local services. The rural population is highly dispersed and isolated, and many people live long distances from these centres. In many cases the road is the only option for people to reach essential goods and services. Access is also crucial for emergency management responses and later recovery work.

Key trips are explained further in Section 2.5.1.

2.4 Economic Context

2.4.1 Summary

The Marlborough Region accounted for 1.0% of the national gross domestic product (GDP) in 2022. The region is showing signs of recovery from the impacts of COVID-19 with a +5.1% growth in GDP in 2022, having experienced a decline in GDP growth from a +2.4% increase in 2020 to a +0.3% increase in 2021. The GDP growth for the region is positive and slightly less than national GDP growth which was recorded as a 5.3% increase in 2022.[12]

Nationally, unemployment was 3.4% for 2022, while the wider Marlborough region recorded 2.8% unemployment.[13] Within the Sounds unemployment is estimated at 1.8%.[14]

On average people living in the Sounds earn less than elsewhere in New Zealand. The median gross personal income is $27,700, around 87% of the national median at $31,800. This is supported by data from the 2023 Sounds Survey, where approximately half of respondents provided a household income range. For the year ending June 2022, the average household income across NZ was $117,000[15], but for the Sounds the average household income was $107,500.

2.4.2 Key Economic Activities

Agriculture, mainly livestock and marine (aquaculture), is a significant source of employment, with StatsNZ reporting approximately 29% of employment in 2018 within the Sounds was in this industry. Many sheep (lamb/ wool) and cow (beef/ milk) livestock farms operate on the low-lying areas north and west of Kenepuru Head.

The drowned river valleys throughout the Sounds allow fresh seawater to continually circulate and flow around the area, creating an ideal environment for farming a variety of marine life such as salmon, mussels, oysters, seaweed, and kelp. Marine farming in Marlborough produces approximately 80% of all commercially grown seafood in New Zealand. On average 65,000 tonnes of mussels and about 6,000 tonnes of salmon are harvested each year in Marlborough, together earning more than $300m in exports[16]. The coasts of the French Pass and Kenepuru zones are home to most of these farms. There are also some marine farms off the coast of the Port Underwood Zone and through the Tory Channel.

[11] Sourced from Council's rating database

[12] Infometrics (nd). "Regional Economic Profile: Marlborough District." Accessed 12/01/2023 https://ecoprofile.infometrics.co.nz/Marlborough%20District

[13] Infometrics (nd). "Regional Economic Profile: Marlborough District." Accessed 13/02/2023 https://ecoprofile.infometrics.co.nz/Marlborough%20Region/Employment/Unemployment

[14] Sounds Future Access Survey. Refer to Appendix F for more detail.

[15] Sourced from Stats NZ

[16] Marlborough District Council (n.d.) "Marine Farming." Accessed 27/01/2023 https://www.marlborough.govt.nz/environment/coastal/marine-farming

The tourism industry is well established and made up approximately 12-20% of employment within the area in 2018[17]. There are many attractions, including walking and cycling tracks (such as the Queen Charlotte Track), recreational fishing and diving, sailing, kayaking, and various wildlife, and conservation locations. These tourism activities are seriously impacted by storm events; initial disruption caused by the weather is exacerbated by the damaged road network which stifles recovery efforts, and limits short-term access for tourists.

Construction activities in 2018 were estimated at 9% of total employment. This likely reflects population growth and expansion of agriculture and tourism infrastructure. This industry will be partially limited by a reduced transportation network but also stimulated by the repair and recovery of the network.

2.4.3 Importance of Access

Access is essential to keep the economic activities thriving. Transporting stock, forestry products and other produce to Picton and/or the highway network is critically important. Transport delays can lead to multiple issues, including health and safety issues for animals. These key trips are explained further in the Transport Context below.

2.5 Transport Context

The transport network for the Sounds is heavily dependent on the road network. This is more pronounced in the inner Sounds, while the outer Sounds generally have a more balanced reliance on both the water and roading networks. There is little public transport, and the walking and cycling tracks tend to cater for recreation rather than everyday needs. Most communities have some form of water access, usually a public boat ramp or jetty.

2.5.1 Key Journeys

2.5.1.1 Services and Markets

The main community facilities are shown in Figure 2-6. Havelock and Picton are the main service centres, with smaller centres at Okiwi Bay, Rai Valley, Canvastown and Linkwater. These are the main destinations for most trips. The closest hospitals and a wider selection of city amenities are in Blenheim and Nelson which are between two and a half and three and a half hours drive from the most remote parts of the Sounds.

The fuel stations at French Pass, and Port Underwood only supply diesel. This is important as private household generators typically run off petrol. There are also no fuel stations in the Kenepuru zone, apart from one at the start of Kenepuru Road in LInkwater.

[17] StatsNZ "2018 Occupation Summaries – Marlborough Region" Accessed 27/01/23. As the designation for listed tourism activities are not within one bracket, a range is provided. https://www.stats.govt.nz/tools/2018-census-place-summaries/marlborough-region#occupation

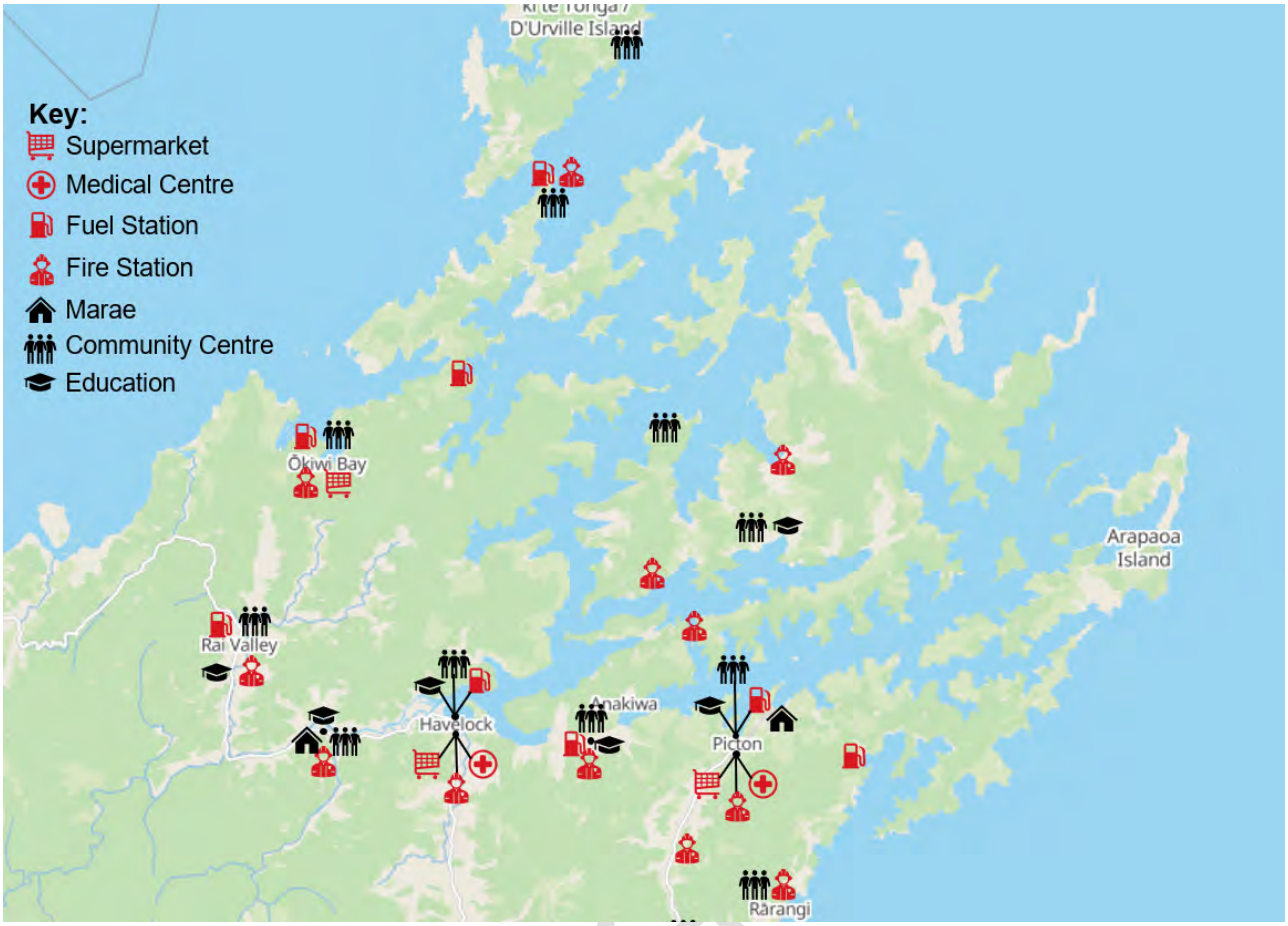


Figure 2-8: Location of community facilities

2.5.1.2 Education

Travel to and from school is also a key journey. There are six primary schools with proximity to the Sounds, and two composite schools,[18] Rai Valley Area School and Queen Charlotte College. Neither of these schools offer boarding. Secondary school students living in the Sounds can:

- Travel to and from Rai Valley Area School or Queen Charlotte College daily
- Privately board in Rai Valley or Picton and return home in the weekends
- Board at one of the secondary schools in Nelson and return home in the weekends, or for term breaks
- Be home schooled.

Figure 2-7 shows the school bus routes for schools in the Sounds. It should be noted that the bus route for Waitaria Bay School is directly resourced. This means the school receives funding from the Ministry of Education and organises the transport for students themselves, which is why it is not shown in Figure 2.

Since the 2021 and 2022 events there have been some changes to one of the school bus routes. The route along Kenepuru Road has been cut back approximately 4.5 km to the recycling station located near the Moetapu Bay turn off. This is the last area the minibus can turn around before approaching sections of road that it cannot negotiate due to storm damage. Students that live beyond this point must now make their own way to and from the transfer station. There are also three students from Waitaria Bay Primary School who are brought out by water taxi once a week for Technology courses in Havelock.

[18] Year 1 to year 13

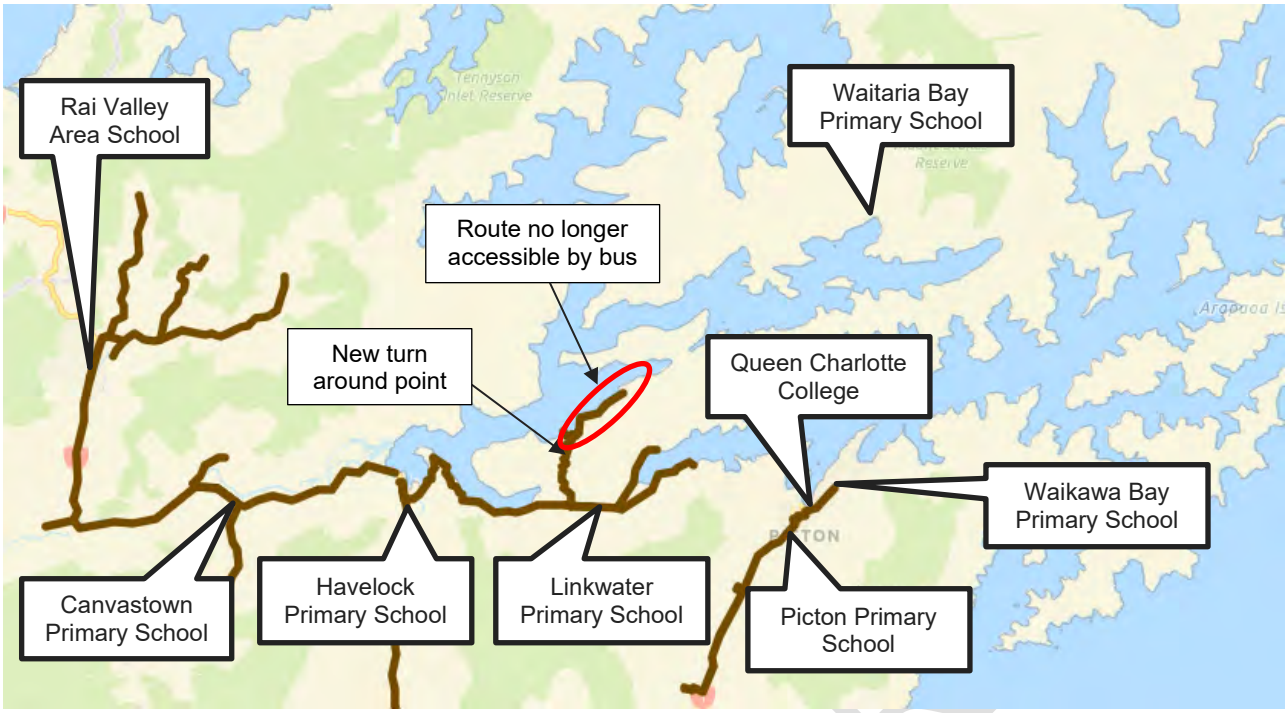


Figure 2-9: School bus routes for the Sounds[19]

2.5.1.3 Economic Journeys

Figure 2-8 and Figure 2-9 show the 2018 Census travel to work data for the Sounds. It shows that:

- 39% of people living in the Sounds work from home, compared to 16% for Marlborough, and 12% for New Zealand
- 50% of people living in the Sounds drove to work (or were a passenger in a car), compared to 74% for Marlborough, and 73% for New Zealand
- Kenepuru and French Pass have the greatest percentage of people working from home (both at 45%)
- Queen Charlotte and Port Underwood have the greatest percentage of people who drive to work (59% and 60% respectively) and the smallest percentage of people who work at home (32% and 33% respectively). This is still double the percentage that work from home compared to Marlborough and the rest of New Zealand.

[19] https://school-transport.maps.arcgis.com/apps/dashboards/9f200f5c371a47feaf68941dc2637b22

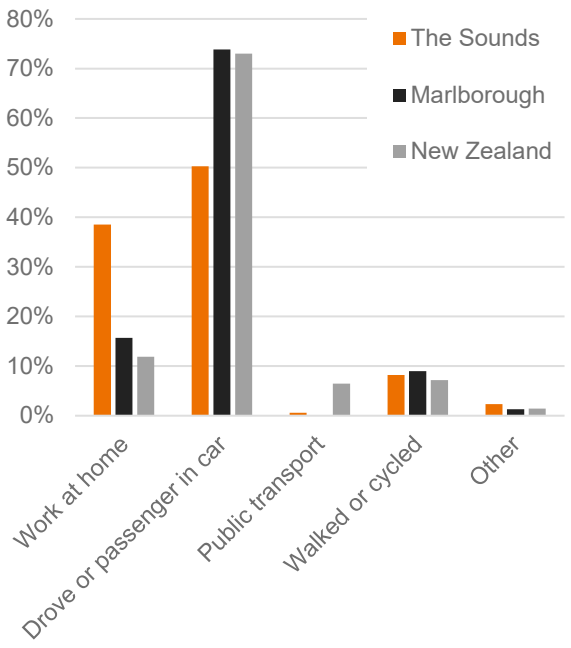


Figure 2-10: Travel to work comparison across the Sounds, Marlborough and New Zealand

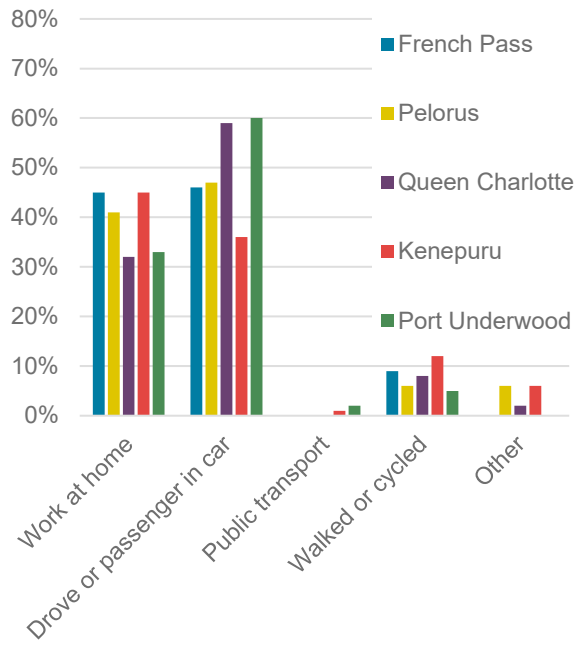


Figure 2-11: Travel to work in the Sounds

The aquaculture industry has indicated that heavy vehicle access to the following ports (in order of priority) is key for being able to move product to efficiently and effectively:

1. Havelock
2. Port Underwood/ Oyster Bay
3. Elaine Bay
4. Okiwi Bay
5. French Pass
6. Picton.

It was mentioned that Port Havelock does not enough capacity to cope with all the aquaculture business in the Sounds which is why they rely on the other access points. It was also noted that Port Underwood is very isolated if cut off by road and there are few vessels that would be able to make the trip from Port Underwood and around the cost to the Tory channel and into Waikawa or Picton due to the coast's exposure to the Cook Strait.

Access into Kenepuru Sound is not a priority for the aquaculture industry.

For the farming industry key journeys are about getting stock and product to market and supplies to the farm. These journeys were typically made by heavy vehicles prior to the 2021 and 2022 weather events. However, following the weather events this is no longer possible for the Kenepuru zone and stock and product now have to be barged to and from Havelock.

2.5.2 Roads

Despite the challenging environment, road transport is the preferred form of movement for residents and business owners. There are 525 km of road in the Sounds, and just under half are sealed. The roads are highly vulnerable to adverse weather events and typically have the following features as shown in Figure 2-10:

- a tortuous alignment
- medium to narrow lane widths
- very narrow shoulders
- high-moderate to high severity roadside hazards[20]

[20] Cliffs, deep water, aggressive vertical faces, etc

- low intersection density
- low access density
- low traffic volumes.

Figure 2-12: Croisilles-French Pass Road

The classification of the roads within the One Network Framework (ONF) is shown in Figure 2-11 and defined as:

- **Rural Roads** provide access to rural land. They are the most common and diverse roads in rural areas. There are low levels of traffic and roadside activity from local people going about their daily lives. Some Rural Roads are important for freight, collecting dairy and forestry and other primary produce from their source, while others, where volumes of vehicle traffic are very low, can provide safe and pleasant recreational and tourism routes.
- **Rural Connectors** make it easy for people and goods to move between different parts of rural areas, and link Rural Roads with Interregional Connectors. They support an increased level of traffic moving through the area, while also providing access from the land they pass through. Land around rural connectors is usually farmland, and these roads may also run through national parks or other natural areas. There are low levels of roadside activity related to the way surrounding land is used.

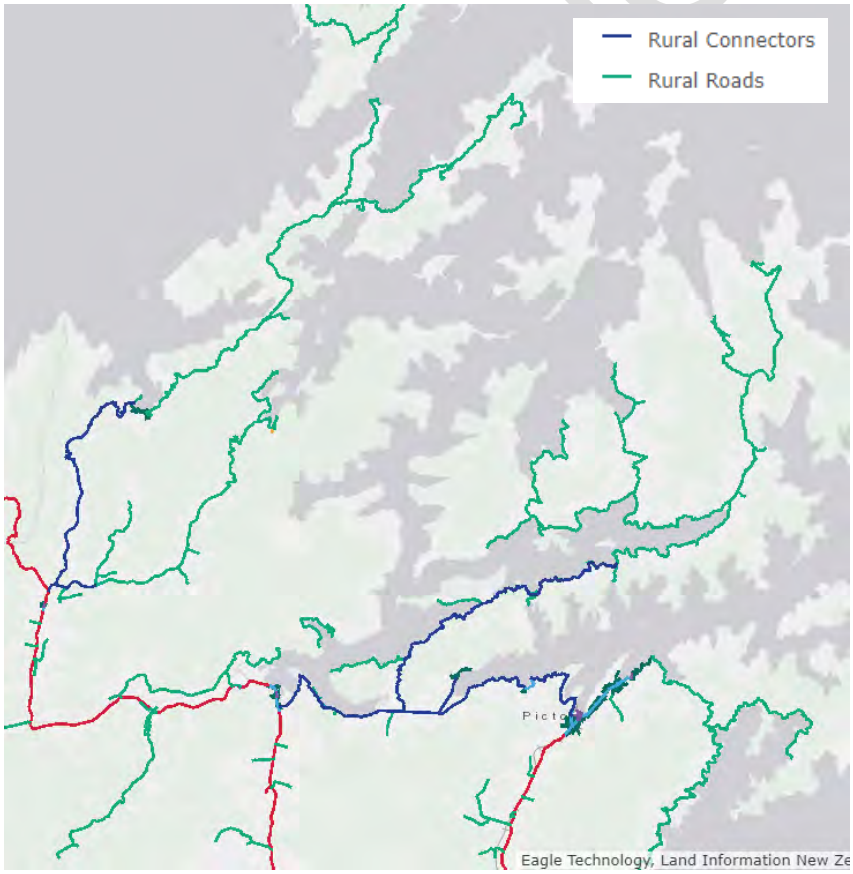


Figure 2-13: One Network Framework

The most recent traffic volume estimates available are from 2015. More recent counts have been completed, but the traffic volume estimates have not been updated. It is believed this work is underway and should the updated information become available it will be taken into consideration.

Table 2-3 lists a selection of sites throughout the Sounds and details the difference between the 2015 AADT estimates and the more recently completed counts. It should be noted that the counts only reflect the traffic volume on the day of the count and do not reflect seasonal or daily adjustment factors.

Table 2-4: Comparison of 2015 traffic volume estimates and more recent counts

Road	2015 estimates		Recent Counts		
	AADT	% heavies	Date	Count	% heavies
Ronga Road	381	12%	5/03/2022	378	12%
Opouri Road	195	11%	5/03/2022	162	11%
The Parade (Okiwi Bay)	56	12%	5/03/2022	59	12%
Croisilles-French Pass Road at Elaine Bay Turnoff	130	11%	22/12/2021	203	11%
Kaiuma Bay Road at Te Hoiere Road	120	11%	8/01/2022	166	13%
Queen Charlotte Drive at Whenuanui Bay	870	9%	6/08/2022	120	9%
Kenepuru Road at Linkwater	392	11%	6/08/2022	150	11%
Port Underwood Road at Whatamango Bay	195	13%	9/02/2022	237	13%
Port Underwood Road south of Robin Hood Bay	77	11%	9/02/2022	57	11%

The posted speed limits and mean operating speeds for the Sounds are shown in Figure 2-12 and Figure 2-13. They show that the posted speed limit is typically 100 km/h, apart from Okiwi Bay, Tennyson Inlet, and all the Port Underwood Zone. The operating speeds are generally much lower than the posted speeds are typically less than 40 km/h, except for Ronga Road and Opouri Road which operate at 60km/h.

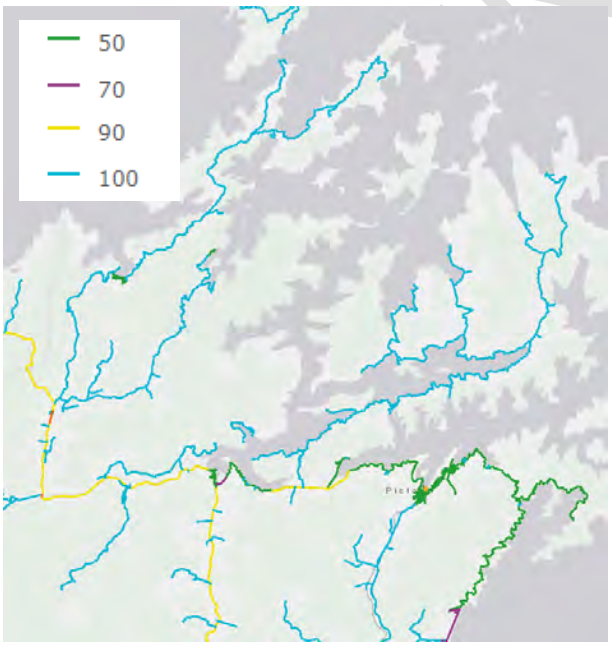


Figure 2-14: Posted speed limits

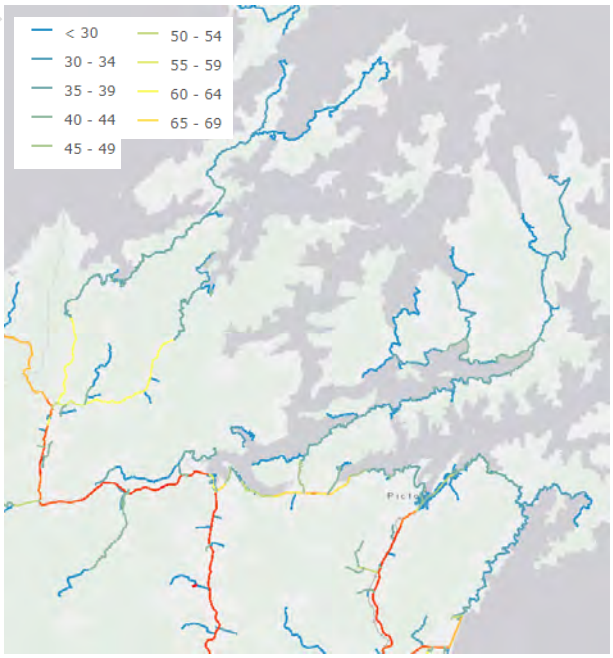


Figure 2-15: Mean operating speeds

2.5.3 Walking and Cycling

There are many walking and cycling tracks, but these are mainly used for recreation, rather than access. Data from Strava[21] shows that:

- Queen Charlotte Track is popular with both walkers and cyclists
- Nydia Track is more popular with walkers, but is still used by cyclists
- Link Pathway is moderately used by walkers and cyclists
- Cyclists also use the road network to access French Pass and Kenepuru.

2.5.4 Public Transport

There are a handful of water taxis that operate in the Marlborough Sounds, with most only operating in Queen Charlotte Sound. These operations cater to tourists and visitors to the Sounds and are considered unaffordable and inconvenient by locals. A short one-way trip from Torea Bay to Picton would cost a minimum of $50 per person and take just under three hours to complete due to the route the boat takes. As with road travel, the number of trips made peaks over the summer months.

There is no bus service. The InterCity bus has stops in Picton, Havelock, Pelorus Bridge, and Rai Valley. The stops in Havelock, Pelorus Bridge, and Rai Valley are only for pre-booked customers.

2.5.5 Water Access

2.5.5.1 Summary

Figure 2-14 shows the known barge sites, public boat ramps, common water taxi destinations, and commercial and public jetties in the Sounds. Although Figure 2 highlights common water taxi destinations, it should be noted that they can access virtually anywhere in the Sounds if required.

Most of the water transport offerings are typically geared towards tourists over residents. For more information regarding some of the difficulties with water access refer to Section 4.3.4.

[21] Strava is an internet service for tracking physical exercise which incorporates social network features. It is mostly used for cycling and running using Global Positioning System data.

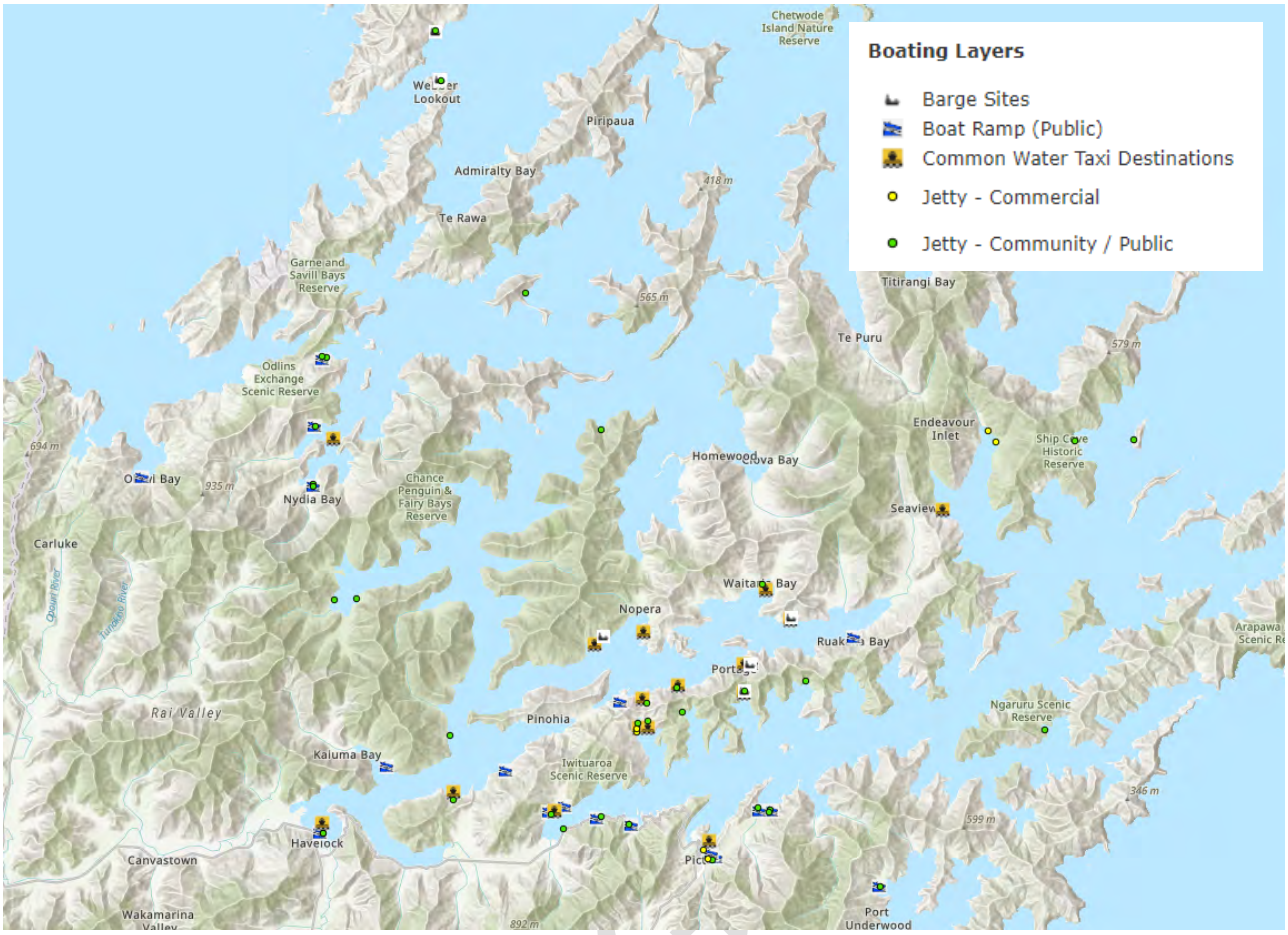


Figure 2-16: Existing water network infrastructure

2.5.5.2 Existing Properties with no Road Access

There are 923 properties with habitable buildings in the Sounds that do not have road access. The only way these people can access their properties, or the services located in Havelock and Picton is via boat. The areas with properties with no road access are shown in Figure 2-15 and detailed in Table 2-4. The area in the Kenepuru zone shown as having no road access, despite having roads running through it, is a very large Department of Conservation property where most of the property is boat access only.

Table 2-5: Dwellings with no road access

Zone	Total dwellings	No road access	Percentage with no road access
French Pass	733	100	14%
Pelorus	111	56	50%
Queen Charlotte	562	0	0%
Kenepuru	1,250	570	46%
Port Underwood	410	200	49%
Total	**3,066**	**926**	**30%**

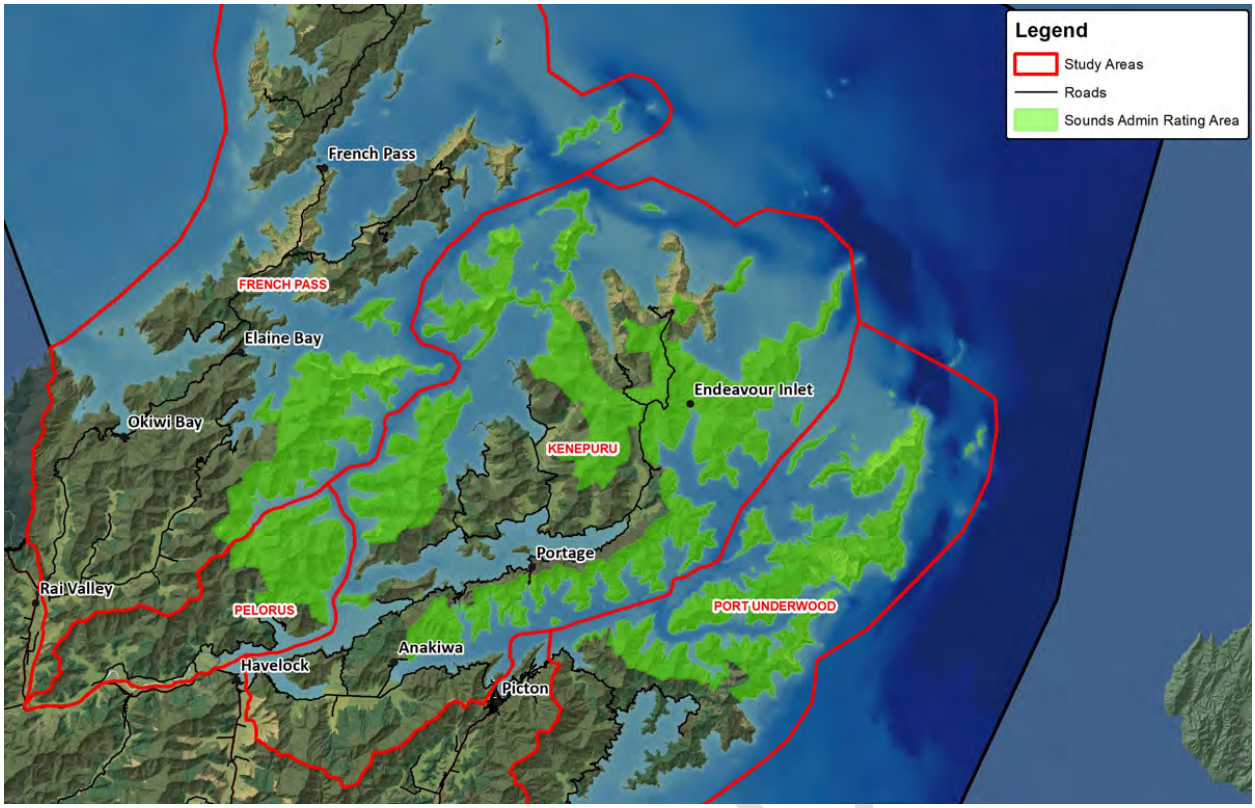


Figure 2-17: Properties with no road access

2.5.5.3 Port Marlborough

Port Marlborough is a Council owned business responsible for operating the region's port and marinas and facilitating the operation and growth of some of Marlborough's most significant industries including recreational boating, forestry, fishing, marine farming, and domestic and international tourism.[22]

A summary of the infrastructure and operations supported by Port Marlborough is below[23]:

- **Shakespeare Bay (Picton):** Accommodates the log export industry, and can accommodate cruise vessels
- **Waitohi Picton:** Caters to the inter-island ferries. The town wharf area provides berthage for commercial, fishing, aquaculture and tourism vessels and business, as well as providing recreational boating facilities.
- **Motuweka Havelock:** The port and marina at Havelock supports marine farming, tourism, forestry and commercial barging, as well as supporting recreational boating.
- **Marlborough Sounds Marinas:** This is a subsidiary of Port Marlborough and provides facilities for over 2,000 vessels in berths, boatsheds and storage in Picton, Waikawa, Havelock and Elaine Bay.
- **Marlborough Sounds:** Port Marlborough provide wharf and port landing facilities in Elaine Bay and Te Whanganui Port Underwood to support marine farming operators in the Sounds.

2.5.5.4 Public Wharves and Jetties

Council has a Wharves and Jetties Policy which classifies jetties into the categories described in Table 2-5. The table also lists some of the jetties and wharves in each category.

[22] https://www.portmarlborough.co.nz/about/
[23] Port Marlborough (2022) "About the Port" in *Port Marlborough Annual Report 2022*.

Table 2-6: Summary of Wharves and Jetties Policy classifications

Definition	Ownership Structure	Jetties/ Wharves
A **strategic** wharf/jetty facility is a necessary and strategic link in the district transport network. They are key facilities in Marlborough's tourism industry and are heavily used by commercial operators. Strategic jetties may also be important to the community as cultural and/or historical sites.	It is vital that Council ensures that these are adequately maintained and are safe and fit for purpose. It is necessary that Council retains ownership and responsibility for funding capital improvements.	French Pass: • French Pass/ d'Urville Kenepuru: • Portage • Te Mahia • Waitaria Bay • Torea Bay • Onahau Bay
A **community/ amenity** wharf or jetty in this category still has a role in the context of the transport network but much less so than the "strategic" jetties. Use is more recreational than commercial. The facility is highly valued and used by both the community at large and the local community and residents as a point of access and/or as an amenity for recreational purposes.	Community groups (residents' associations etc) manage these facilities with input and some assistance from Council. The local communities own these facilities and are responsible for the finances and for the implementation of any capital improvements and for the ongoing maintenance and safety of the facility. A financial contribution to these activities from the Council would be made. Council would require a formal relationship to be established with the community group responsible for the jetty, via a Memorandum of Understanding.	Kenepuru: • Tirimoana • Momorangi • Ngakuta • Homewood Port Underwood: • Waikawa Bay • Waikawa Bay North
Local/ amenity jetties are seen to have no substantive connection with or importance to the district transport network and are significantly of less interest to the community at large for either access or amenity purposes. The facility is highly valued and used by the local community. Jetties in this category are to all intents and purposes serving a local interest only. That is not to say that there will not be casual use from time to time from visitors or recreational users as is the case for many of the private jetties spread throughout the Sounds.	The local community group assume ownership and responsibility for the facility into the future. This includes being responsible for the financial requirements of capital improvement and ongoing maintenance. In the event that the local community could not manage those obligations the structure would be disestablished.	French Pass: • Penzance Bay • Okiwi Bay Ramp[24] Queen Charlotte • The Grove Kenepuru: • Kenepuru

2.5.6 Air Access

The main airports available for those living in the area are at Nelson and Blenheim. There are 12 airstrips in French Pass and 12 in Kenepuru, as shown in Figure 2-16. The airstrips are largely agricultural and used to assist with farming, although a handful are used by Pelorus Air to transport people to and from the start or end of walking or biking tracks.

Limited information is available regarding helicopter landing sites.

[24] The wharf is privately owned

Figure 2-18: Airstrips in and around the Sounds

3 Partners and Key Stakeholders

3.1 Investment Partners

3.1.1 Waka Kotahi NZ Transport Agency

Waka Kotahi is responsible for managing, operating, planning and improving state highways. The priority for Waka Kotahi is to identify a long term solution for the ongoing access issues that have been experienced following storms in 2021 and 2022. The solution must be cost effective and provide certainty for residents and businesses.

3.1.2 Marlborough District Council

Marlborough District Council is responsible for fully managing the local road network that forms, with the state highway, the transport network connecting the Sounds to the state highway and remainder of the district's road network. It is also responsible for some public jetties and boat ramps. The priority for the Council is to identify a long term solution for access to the Sounds. Any investment identified through this business case process will be the responsibility of Marlborough District Council, which will lead the development of any funding applications required for the preferred option as well as leading implementation.

3.1.3 Iwi

MDC to provide words to replace this section.

3.2 Key Stakeholders

The key stakeholders described in Table 3-1 were invited to participate in the business case process. All stakeholders share the desire for long term certainty over access to the area. There are differences between how stakeholders see the long-term access being provided, with many wanting further investment in the road network to provide the levels of service that were commonplace before the two storm events. Others, however, believe the network will continue to experience outages as storms increase in intensity and sea level rises, and want alternative options such as water transport to be better developed as well as, or instead of, investment in the road network.

Table 3-1: Stakeholders

Stakeholder		Area of Focus
Department of Conservation		Landowner manages tracks and trail assets. Assisting the team understand current and future demands.
Ministry of Education		Responsible for ensuing access to education and managing education assets.
Nelson Marlborough Public Health		Part of Te Whatu Ora Health NZ, comprising health promoters, health protection officers, public health nurses, medical officers, public health analysts. Respond to public health risks and work in a variety of settings. Provide a range of services. Represent health interest and concerns relating to access.
Insurance Council		Represents insurance industry, informs and educates consumers about key insurance risks. Aims to make the insurance industry responsive and sustainable to safeguard New Zealand.
Rural Women NZ (originally Women's Division of the Farmer's Union)		Advocates for health services, education, environment and social issues in the rural sector.
Destination Marlborough		Not for profit Trust responsible for marketing Marlborough as a visitor destination.
Emergency Services	Civil defence Police Ambulance Fire and Emergency NZ	Future and continued provision of emergency service access for the area.

Stakeholder		Area of Focus
Utility Owners	Marlborough Lines Chorus Transpower Vodafone Spark	Continued management and maintenance of utilities infrastructure.
Business Groups (General)	Marlborough Forest Industry Association Chamber of Commerce Marlborough Sounds Integrated Trust Marine Farming Association Fisheries NZ Outer Queen Charlotte Sound Tasman Pine Forests Ltd Apiarists Association Federated Farmers Ministry for Primary Industries Nova Energy	Understand and represent different business interests across the Sounds. Advocating and assisting the team understand business needs for future access, including current and future demands.
Transport Groups	Port Marlborough – Havelock and Picton Ports Barge companies Water taxis Transport companies Automobile Association Harbour Master Heavy transport Private owners of roads and jetties	Understand and represent different business interests across the Sounds. Advocating and assisting the team understand business needs for future access, including current and future demands.
Residents Associations (13)	Port Underwood, Duncan Bay Central Pelorus, Lochmara Queen Charlotte Sound, D'Urville Island, Moetapu Community Association, Pelorus, French Pass, Kenepuru and Central Sounds, Okiwi Bay, Ngakuta Bay, Cissy Bay, Kaiuma and Wakaretu	Understand and represent residents needs including access.

3.3 Engagement with Stakeholders

Key stakeholders have been invited to participate in the following workshops:

- 24 January - Issues and Options Workshop (Appendix B)
- 14 March - Hui with local iwi (Appendix C
- *[provide complete list for final business case]*

3.4 Engagement with Community

The wider community have been seriously affected by the loss of access resulting from the storm events. As part of the business case, it was essential to enable the community to have their say and explain how they have been affected. Community participation was unprecedented, through the following channels:

- 31 January – 3 February - series of open days at French Pass, Rai Valley, Havelock, Picton, Portage, and Waitaria Bay (Appendix D)
- 8 February - Online zoom meeting for those who could not make the in-person sessions (Appendix D)
- 27 January – 22 February – Sounds Community Survey (Full Report Appendix E)
- *[provide complete list for final business case]*

4 Problems

4.1 Defining the Problems

A facilitated investment logic mapping workshop was held in November 2022 with the investors - representatives from Council and Waka Kotahi - to clarify current issues and business needs. The investors agreed the following problems:

- **Problem One – Disrupted Access:** The impacts of climate change are increasing the frequency and duration of disrupted access (30%)
- **Problem Two – Lack of Alternatives:** Reliance on roads for access to services and lack of alternatives has led to increased vulnerability to the community during road closures (20%)
- **Problem Three – Asset Vulnerability:** Poor construction standard and unstable geology means the Marlborough Sounds roads have a high maintenance cost and safety risk (50%).

These problems were tested through subsequent stakeholder and community workshops, and no changes were made. Further analysis of the problem statements is presented below.

4.2 Problem 1: Disrupted Access

The cause, effect and consequence for Problem 1 are show in Table 4-1 with evidence provided below. The primary cause of this problem is that the land is susceptible to erosion and inundation from sea level rise, and also from storms, which are predicted to increase in severity as a result of climate change. This leads to slips and dropouts affecting the roads, which become unsafe to use. When this happens, people cannot reach essential goods and services. Evidence supporting Problem 1 is provided below.

Table 4-1: Cause, Effect and Consequence for Problem 1

Problem 1: The impacts of climate change are increasing the frequency and duration of disrupted access (30%)	
Causes	Sea level rise Vertical land movement Coastal erosion Storm frequency and intensity changes
Effects	Increased frequency of road closures Increased duration of road closures
Consequence	Impacts on access

4.2.1 Sea Level Rise and Vertical Land Movement

Rising sea levels will exacerbate future coastal risks to some parts of the road network. New Zealand's mean relative sea level has risen 1.81 (±0.05) millimetres per year on average since records began more than 100 years ago. However, the rate of sea level rise around New Zealand is increasing as a result of climate change. The average rate of sea-level rise for 1961–2018 was twice the average rate between the start of New Zealand records and 1960. This has caused an increase in coastal flooding which will only be exacerbated by future sea level rise. [25]

Figure 4-1 shows the long term predicted sea level rise at Portage under the Shared Socioeconomic Pathway (SSP) 2-4.5[26] and SSP5-8.5[27] scenarios. It shows there is medium certainty about projected sea level rise until 2150, but after that certainty significantly decreases. Under SSP2-4.5 the sea-level rise by 2300 could be between 1.2 m and 3.5 m, but under SSP5-8.5 it could be anywhere from 5.3 m to 15.1 m.

[25] Ministry for the Environment & Stats NZ (2020). *New Zealand's Environmental Reporting Series: Our atmosphere and climate 2020*.

[26] This is a world with moderate emissions (+2.7°C warmer world). This approximates the path associated with current global policy settings.

[27] This is a worst-case scenario world with very high emissions (>4°C warmer world). It is unlikely to materialize given ongoing climate mitigation.

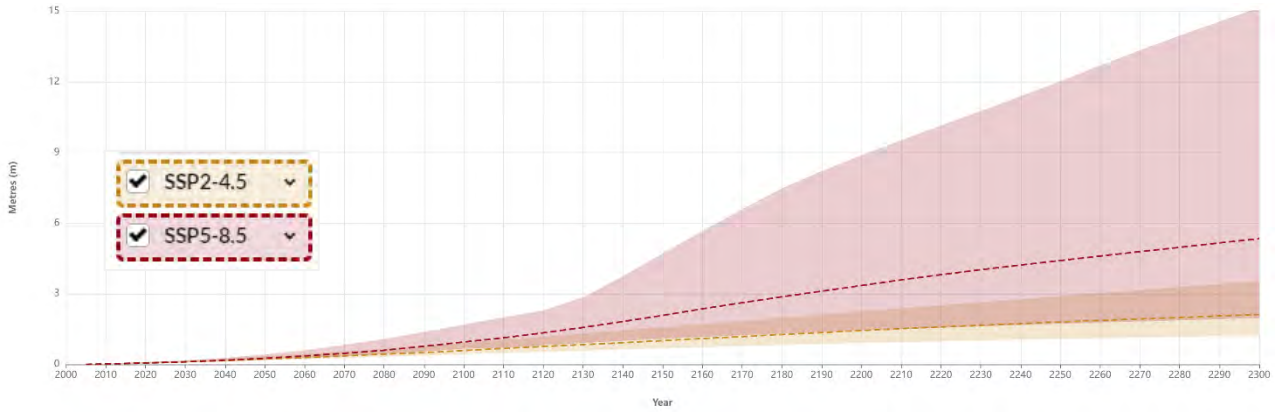


Figure 4-1: Long-term sea-level rise predictions

Vertical land movement also needs to be considered when planning for sea-level rise effects. New Zealand is on a dynamic plate boundary which means the land is always moving. As well as tectonic movement, sedimentary basins compact over time and subside. Human influences such as land reclamation and drainage, groundwater extraction, and petroleum reservoir depletion also cause the land to subside. In areas with subsidence, the impacts of sea-level rise are accelerated, and impacts will be experienced sooner.

Figure 4-2 shows the predicted vertical land movement for various points around the Marlborough Sounds, from the NZ Sea Rise website. It shows that while most places are sinking up to 6 mm/year, some are rising at a rate of 5 mm/year. This has been based on comparatively recent observations (predominantly 2003-2011) which reflect ongoing 'creep' adjustments but not major surface rupture events on say the Alpine or Wellington faults. There is therefore some inherent uncertainty in vertical land movement when projecting these rates far into the future.

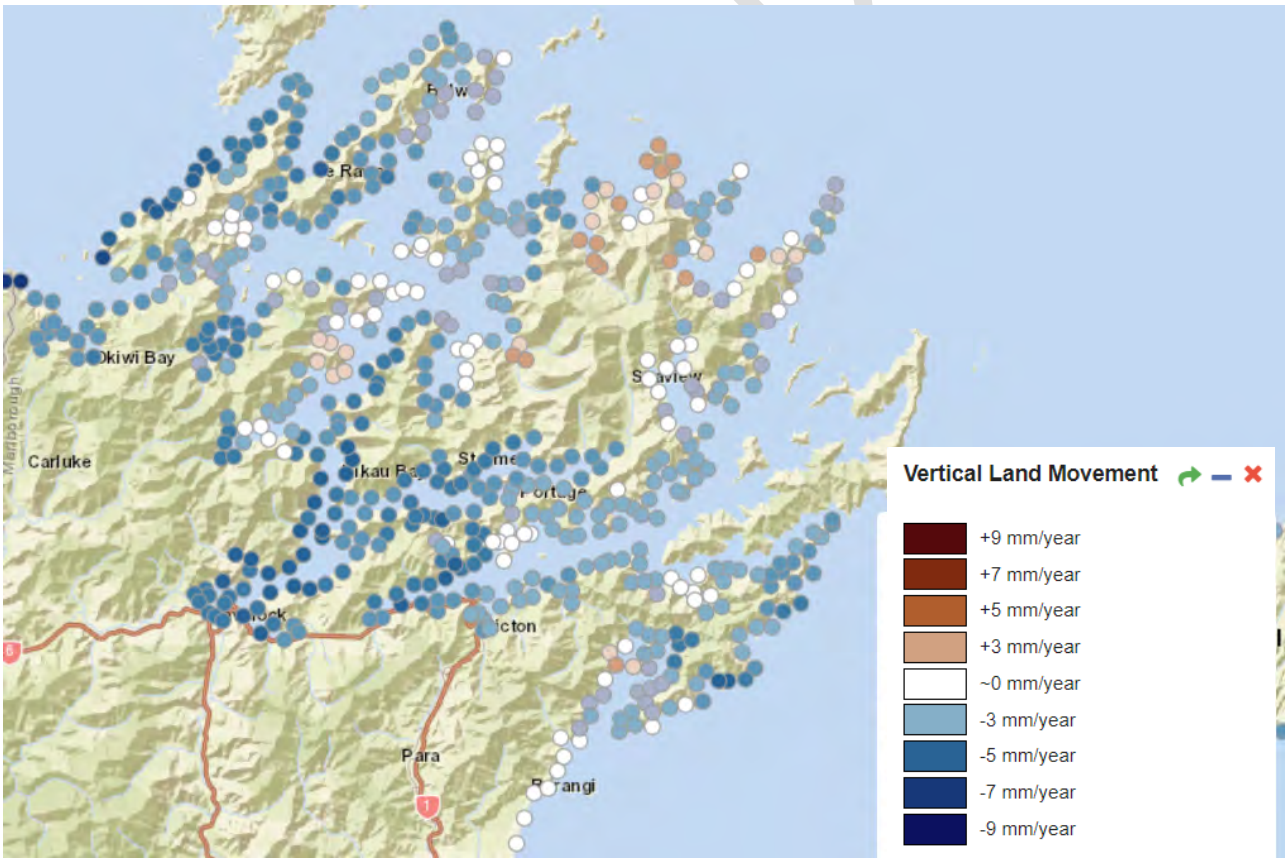


Figure 4-2: Vertical land movement for the Marlborough Sounds[28]

Figure 4-3 shows the expected sea level rise under the SSP2-4.5 scenario combined with the vertical land movement for Portage. The land at Portage is sinking at a rate of 1.59 mm/year. The land movement combined with the anticipated

[28] NZ Sea Rise Map, Takiwā. https://searise.takiwa.co/ (11/01/2023)

sea level rise under SSP2-4.5 means that by 2050 the total sea level rise will be 30 cm, and 73 cm by 2100. Under SSP5-8.5 the total sea level rise by 2100 could be up to 1 m. The total sea level rise in places with faster rates of vertical land movement will be greater than what is detailed above.

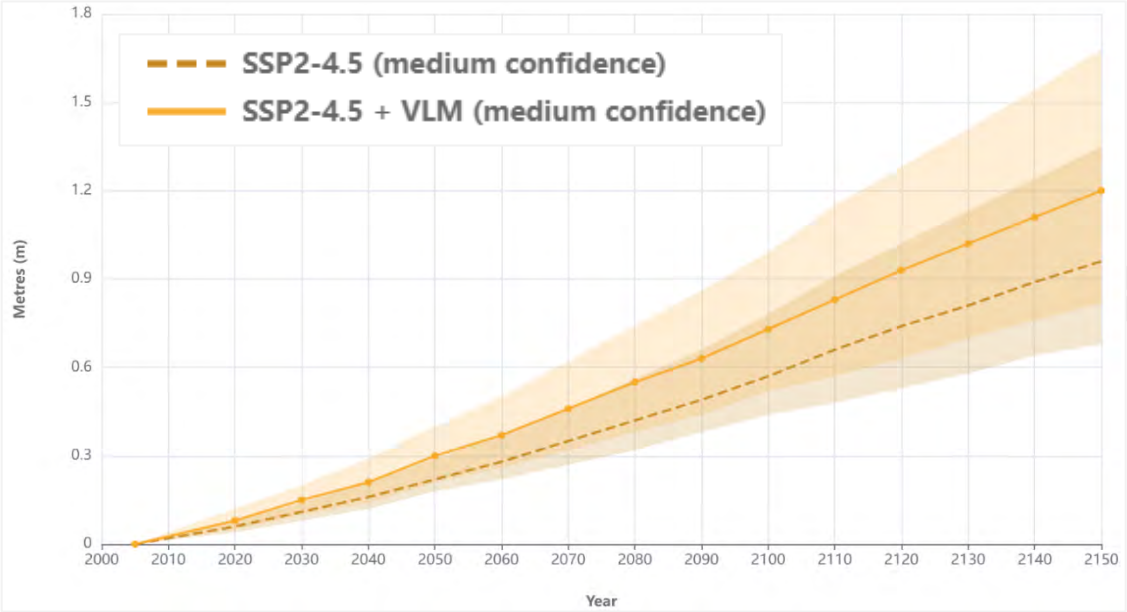


Figure 4-3: Total sea level rise with vertical land movement for Portage under SSP2-4.5[29]

4.2.2 Coastal Erosion and Inundation

According to the Ministry for the Environment's climate change projections for Marlborough, coastal roads and infrastructure may face increased risk from coastal erosion and inundation, increased storminess and sea-level rise. This is already happening in parts of the Sounds with the following areas experiencing inundation during exceptionally high tides:

- Okiwi Bay along the Esplanade and the Parade
- Queen Charlotte Drive between address 882 and 924
- Kenepuru Road (Heads to Raetihi):
    - Ohauparuparu Bay/Taradale
    - Waitaria Bay
    - Goulter Bay
    - Nopera Bay.

Figure 4-4 shows the sections of roads within the Sounds that are considered at high risk and medium risk from coastal erosion and/or inundation, based initially on topographic screening criteria. Areas of high risk are below 3m elevation, and areas of medium risk are between 3m and 5m elevation, or within 100m of the coastline.

Any area lower than 3m is considered at high risk due to the high tidal ranges possible, such as the top of Kenepuru Sounds. This area currently has a high tide of 1.5m which in addition to sea level rise and vertical land movement (Section 4.2.1) could lead to a high tide level around 3m by 2150 and extended inundation during exceptionally high tide events. This could lead to road closures but also potentially to accelerated erosion and damage to the road pavement.

Areas between 3m and 5m elevation may be at risk from combinations of high astronomical tides, storm surge, wave run up and erosion effects which would extend above the static water level described above. This would be dependent on the bathymetry, wind fetch, rocky/sandy shoreline, topography etc. In addition, roads within lateral 100 m of the coast have also been flagged as potentially medium risk for further investigation due to the potential for erosion, depending on geological conditions (for example by erosion at the coast accelerating upslope instabilities).

[29] NZ Sea Rise Map, Takiwā. Sea Level Rise Predictions by Decade for site 6768, https://searise.takiwa.co/ (11/01/2023)

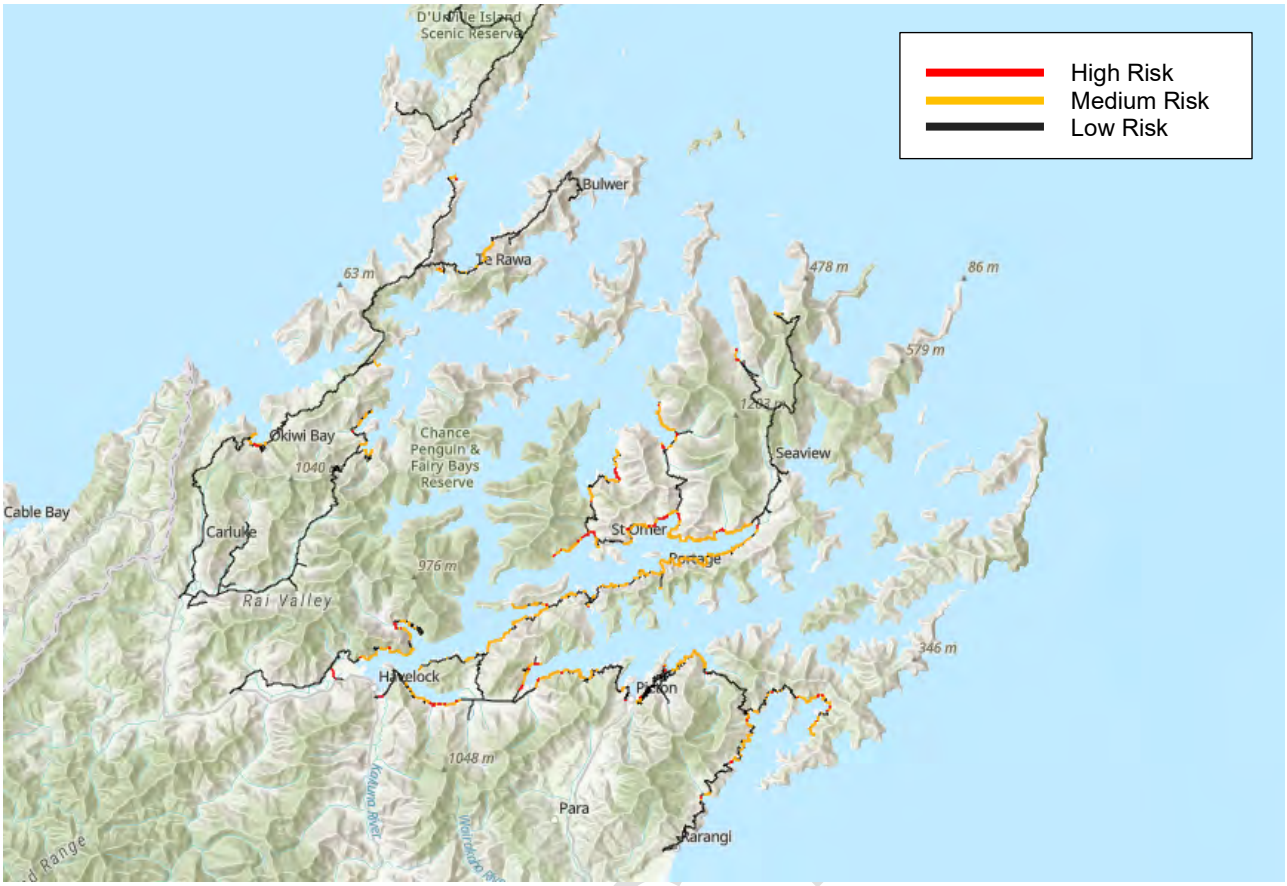


Figure 4-4: Roads with potential risk of future coastal inundation or erosion

4.2.3 Storm Frequency and Intensity Change

The effects of climate change are already being experienced in Marlborough. The Ministry for the Environment's climate change projections for Marlborough are that infrastructure may face increased risk from increased storminess. Anecdotally the duration and frequency of storms affecting the region has been increasing. Figure 4-5 shows the regional monthly rainfall in 2021 and 2022 compared to the long term monthly averages, which shows that the events well exceeded the long term averages.

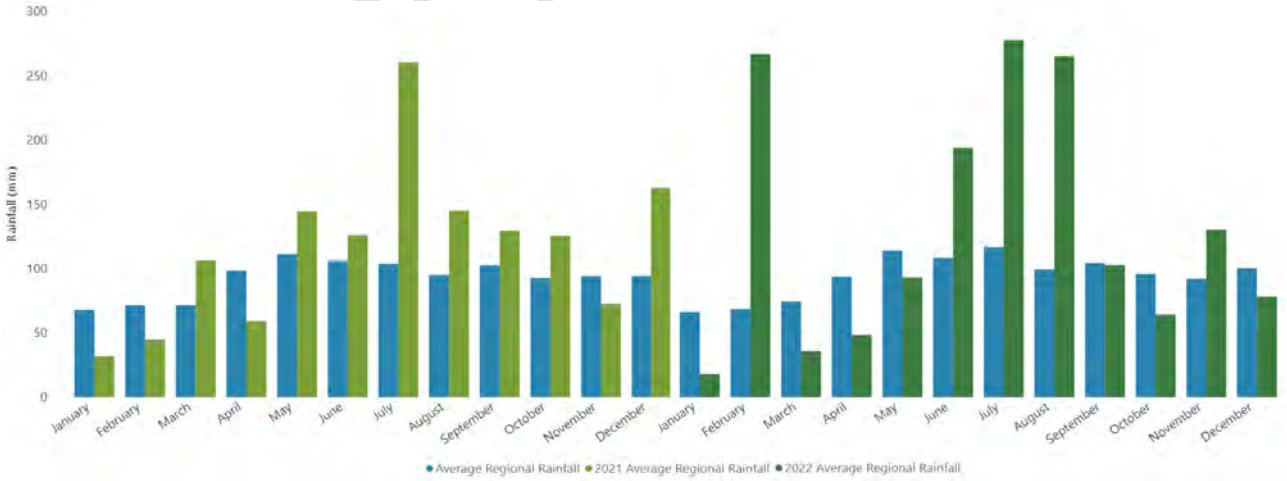


Figure 4-5: Regional monthly rainfall total compared to long term monthly averages (2021-22)

While two years of data does not prove storm events are increasing in frequency, it does show how extraordinary the events of the last two years have been.

Data demonstrating that such events are increasing in intensity is more readily available. Figure 4-6 shows a comparison of the August rainfall at Tunakino and Rai Falls. It shows that the August 2022 rainfall was:

- Tunakino (data from 1979 to 2022):

- Two and a half times larger than the previous August maximum recorded in 2017
- 36% greater than the previous monthly maximum recorded in October 1998
- Five times larger than the historic August average

- Rai at Rai Falls (data from 2000 to 2022):
  - Two times larger than the previous August maximum recorded in 2010
  - 53% greater than the previous monthly maximum recorded in December 2010
  - Four times larger than the historic August average

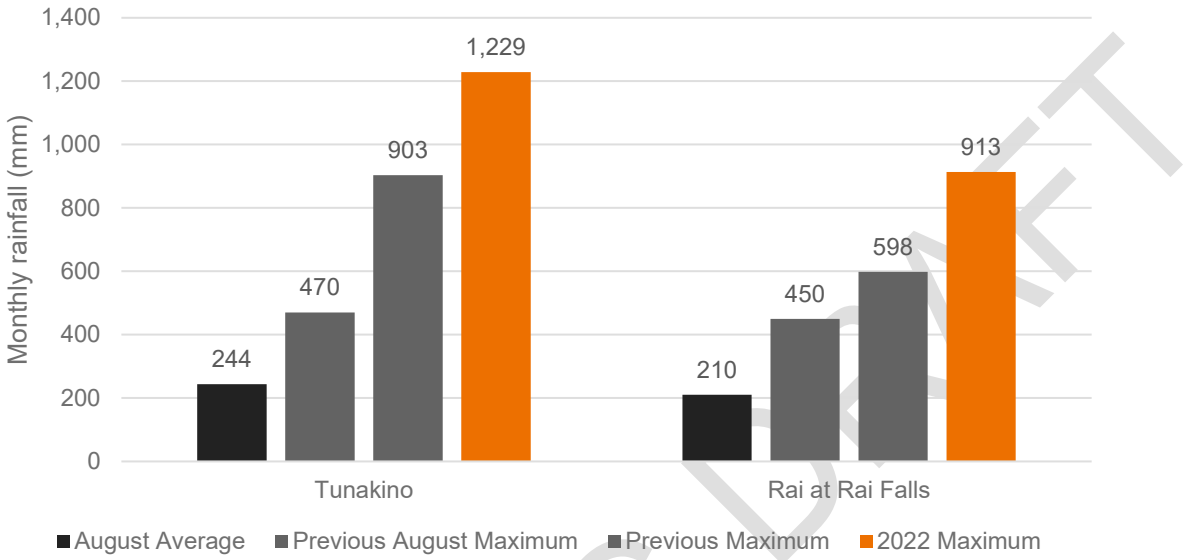


Figure 4-6: August rainfall comparison

It is predicted the recent trend of extreme rain events will continue, albeit sporadically, on account of climate change. Short duration high intensity rainfall is expected to experience greater increases than long duration events. This is illustrated in Figure 4-7 for the 1:100 annual exceedance probability (AEP) event[30], showing two emissions scenarios, based on NIWA's High Intensity Rainfall Design System (HIRDS) version 4[31].

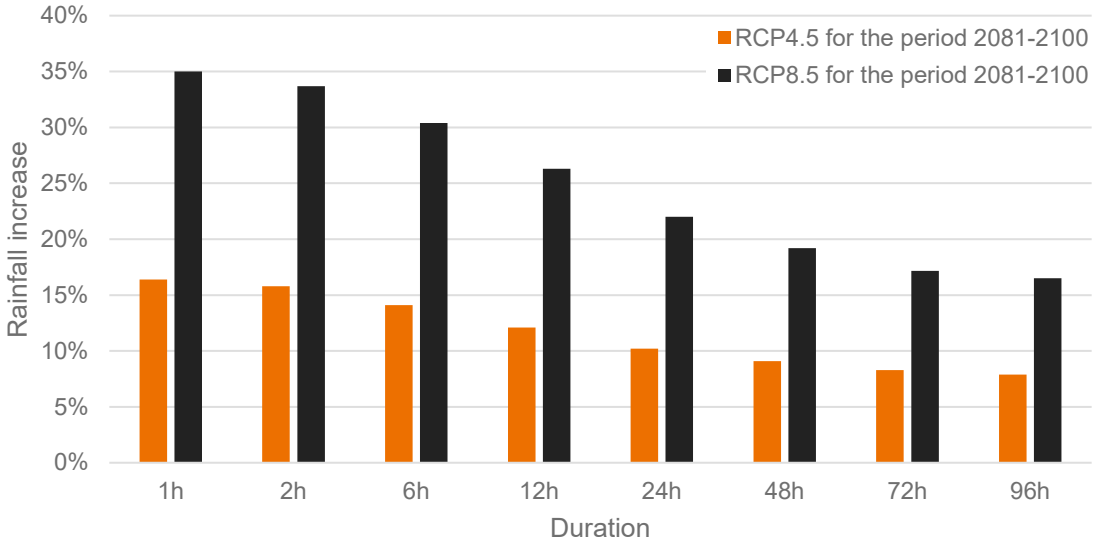


Figure 4-7: Increase in rainfall on account of climate changefor 1:100 AEP rainfall

[30] An annual exceedance probability (AEP) is the probability of an event occurring in any given year. i.e. A 1:100 AEP means that on average one event of this size will occur every 100 years. This means there is a 1% chance in any given year of the event occurring.
[31] NIWA's high intensity rainfall design system

Based on the climate change factors from HIRDS version 4, it is anticipated that:

- Under RCP4.5 2081-2100:
  - the 1:100 AEP future event will be about as intense as the 1:200 AEP historic intensity.
  - the 1:100 AEP historic event will be roughly twice as frequent (~1:60 AEP).
- Under RCP8.5 2081-2100, the 1:100 AEP historic event will be roughly three times as frequent (~1:33 AEP) for long duration storms, and five times as frequent (~1:20 AEP) for short duration storms.
- Short duration storms (e.g., summer thundershowers, up to a few hours) produce the highest intensity rainfall in a short time, and the highest peak water flow from small catchments. Overtopping of any undersized culverts may be short-lived and may produce less damage per storm event but occur more frequently than long storms. Climate change impacts on these events will be higher than on longer duration storms, as illustrated above.

4.2.4 Increased Frequency and Duration of Road Closures

The combined effect of sea level rise and increasing storm frequency and intensity will likely lead to an increase in frequency and duration of periods when roads are unavailable for use. Figure 4-8 shows the status of all roads in the Sounds immediately following the 2022 event. Most roads were either closed, or yet to be assessed.

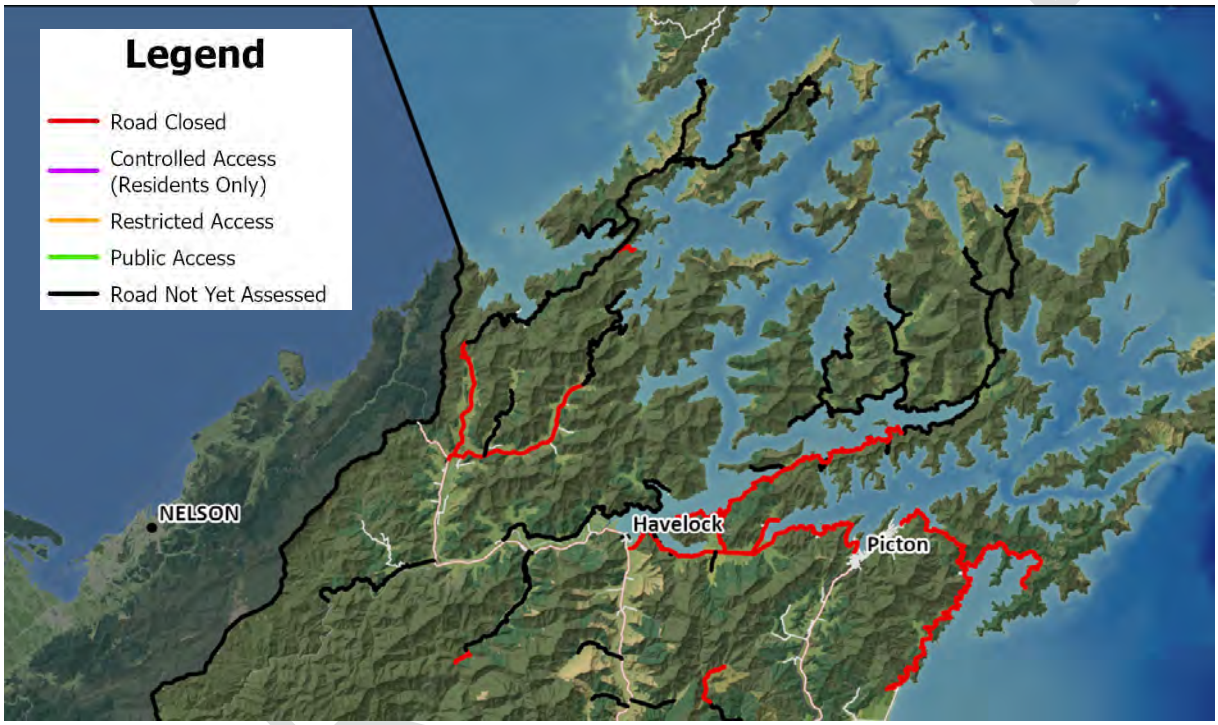


Figure 4-8: Road status following the August 2022 weather event

Prior to 2021 there is limited easily accessible information available regarding road closures. Figure 4-9 shows the status of the roads in the Kenepuru zone following the 2021 weather event to the end of 2022. Refer to Appendix G for information regarding other areas. Some key points from the available closure information are:

- The August 2022 event impacted an additional 230 km of road compared to the July 2021 event
- Pelorus:
  - 17 km of road were closed for one month, and under controlled access[32] for another month following the July 2021 event
  - Following the August 2022 event the roads were unassessed for a month, and then assessed and opened to the public.
- Queen Charlotte:
  - 7 km of road was closed, and an additional 20 km was under controlled access for a month following the July 2021 event

[32] Residents only access

- Following the August 2022 event 37 km of road was closed for a month. After this 19 km of road was opened to the public, and the remaining 18 km remained closed for another two weeks.

- Kenepuru:
  - Between 20 km and 50 km of roads were closed for three months following the July 2021 event
  - Some roads were under controlled access for at least a year following the 2021 event
  - All roads in Kenepuru were closed for two weeks following the August 2022 event, and 40 km of road was closed for an additional two weeks.
  - 60 km of road is still under restricted access following the August 2022 event
- French Pass, Port Underwood, and the rest of Marlborough:
  - No roads were closed following the July 2021 event
  - Up to 210 km of roads were closed following the August 2022 event

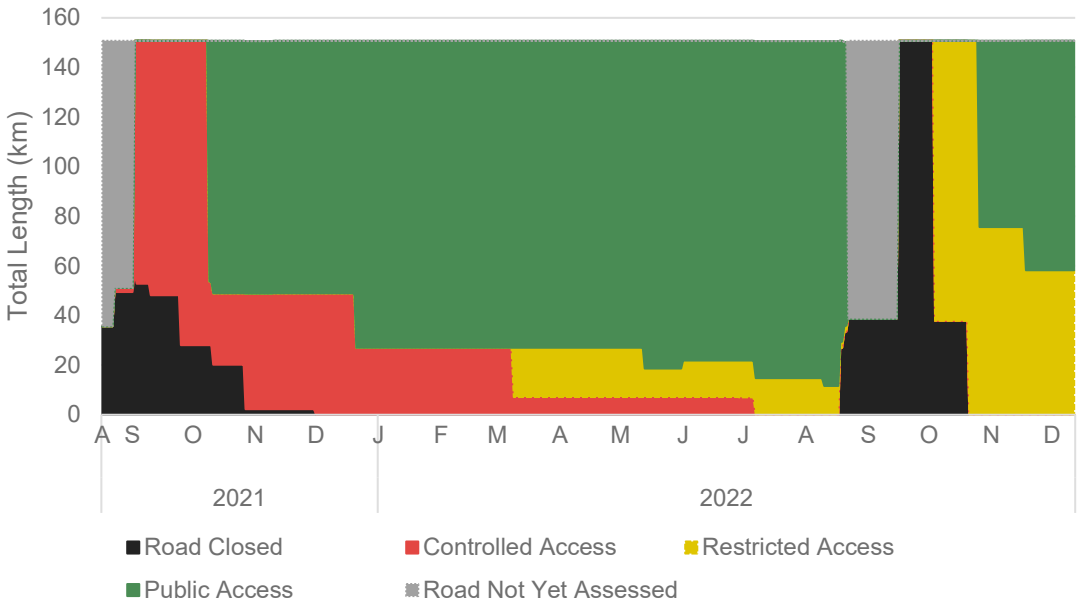


Figure 4-9: Road Closure Data for Kenepuru Zone

4.2.5 Impacted Access

As discussed in Section 4.2.4 there were months of road closures following both the 2021 and 2022 events. This peaked at 380 km of road closed for two and a half weeks following the August 2021 event.

As there are no alternate routes for the majority of these roads (Section 4.3.2), and current water/air travel is not suitable or affordable for residents or most businesses (Section 4.3.3 and Section 4.3.4), access during this time was challenging.

As the area is so remote, there are very few services provided locally and most are accessed by road (Section 2.5.1 and 4.3.6). The key services people were unable to access in the normal way during this period included:

- Routine healthcare including regular prescriptions and visits to healthcare providers
- Education
- Supermarket
- Getting stock to markets
- Connecting with friends and family.

To ensure people could at least access these essential goods and services once or twice a week, the Council organised subsidised water taxi services for residents, workers and visitors. Council and Port Marlborough also provided fully subsidised parking for residents at marinas in Havelock and Picton, until September 2023.[33]

4.3 Problem 2: Lack of Alternatives

Table 4-3 provides the root cause analysis for Problem 2. The primary cause of this problem is that people rely on roads, alternative routes do not exist, and water or air travel is underdeveloped. This means that if the road is unavailable, lifelines are lost, and people cannot reach services or markets. This leads to uncertainty, and has physical and mental health impacts, as well as economic impacts. Evidence supporting Problem 2 is presented below.

Table 4-2: Cause, Effect and Consequence for Problem 2

Problem Two: Reliance on roads for access to services and lack of alternatives has led to increased vulnerability to the community during road closures (20%)	
Cause	Permanent and temporary residents live here Businesses are established here No alternative overland routes Limited air routes Water options underdeveloped
Effect	Loss of lifelines during events Loss of access to services and markets
Consequence	Uncertainty Health impacts Economic impacts

4.3.1 Groups Affected

4.3.1.1 Full Time and Holiday Residents

One of the main groups affected by Problem 2 are permanent and temporary (holiday) residents. This means that the total number of people impacted by road closures will vary depending on the time of year. For example, storm events that occur in summer will affect around 7,000 people, whereas winter storm events will impact around 3,000 people.

4.3.1.2 Businesses

Section 2.3.3 provides details of the number and type of business affected, estimated from responses to the Sounds Survey 2023. The total number of businesses affected is at least 150.

4.3.2 No Alternative Overland Routes

As shown in Figure 4-9 most of the roads connecting key services within the project scope do not have an alternate route. This means that should a section of road get washed out, flooded, or need to be closed all points beyond the closure are also cut off. Kenepuru Road, Queen Charlotte Drive and French Pass Roads are all roads where closure has widespread implications for all communities beyond the closure.

[33] Marlborough District Council (n.d.) "Water taxi subsidies and marina parking." Accessed 14/02/2023. https://www.marlborough.govt.nz/civil-defence-emergency-management/august-storm-event-2022/general-recovery-information-august-2022-storm-event/water-taxi-subsidies-and-marina-parking

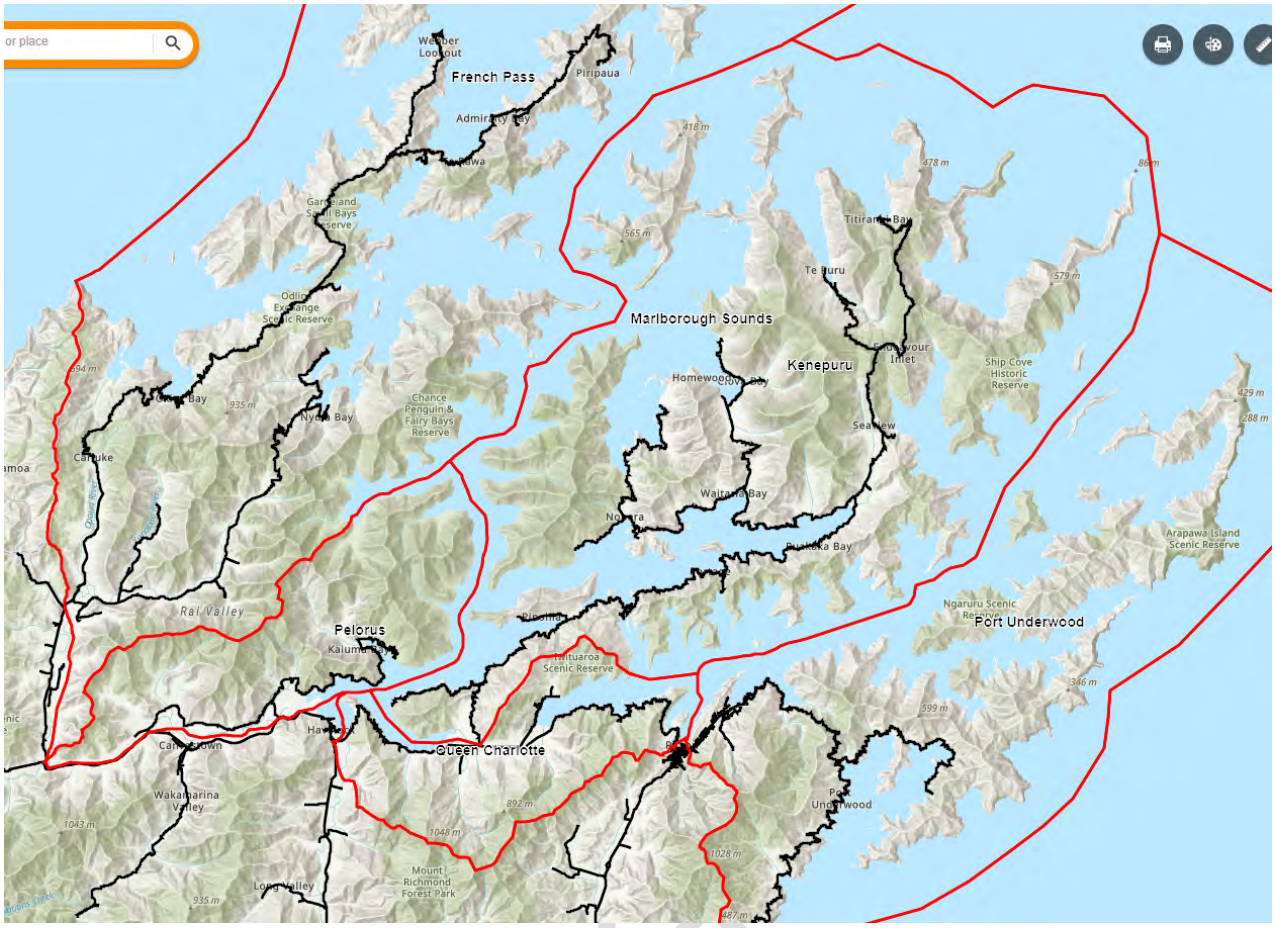


Figure 4-10: Roads in the Marlborough Sounds

Queen Charlotte Drive is critically important for resilience of the state highway network as it provides an alternative route between Blenheim and Havelock in the event of a closure of SH6, and between Blenheim and Picton in the event of a closure of SH1.

4.3.3 Limited Air Routes

As discussed in Section 2.5.6 there are a number of air strips located in the French Pass and Kenepuru zones. However, there are largely agricultural airstrips and used to assist with farming. While there may be good coverage of airfields, they are often very remote and in private ownership so are unavailable to other users. Also, air travel is not considered an affordable everyday option for most people. The same is true of helicopters – these are used by some, including emergency services, and there are landing sites across the Sounds. However, these are not an affordable option for many.

4.3.4 Challenges with Water Routes

The existing water routes and boating infrastructure in the Sounds are discussed in Section 2.5.5. While there is reasonable coverage of the Sounds, there are issues with water transport. Constraints for users include:

- Not everyone is able to easily get on or off the water taxis as they often don't have steps - people must climb on
- It is not considered an affordable option (as discussed in Section 2.5.4)
- It is not considered a convenient option when compared to road access
- Not every property has direct water access. Table 4-4 details the dwellings in the Sounds that are in proximity to a private jetty.
- Deep draft barges are restricted to areas with suitable water depth. Figure 4-10 shows areas in the Kenepuru and Pelorus Sounds that have been highlighted as too shallow for a barge to access.

Table 4-3: Dwellings within 50 m and 100 m of a jetty[34]

Zone	Dwellings[35]		Dwellings within 50 m of jetty		Dwellings within 100 m of jetty	
	Total	Water access only	Number	Percentage	Number	Percentage
French Pass	733	100	97	13%	174	24%
Pelorus	111	56	13	12%	33	30%
Queen Charlotte	562	0	37	7%	73	13%
Kenepuru	1,250	571	448	36%	636	51%
Port Underwood	410	200	159	39%	224	55%
Total	**3,066**	**927**	**754**	**25%**	**1,140**	**37%**

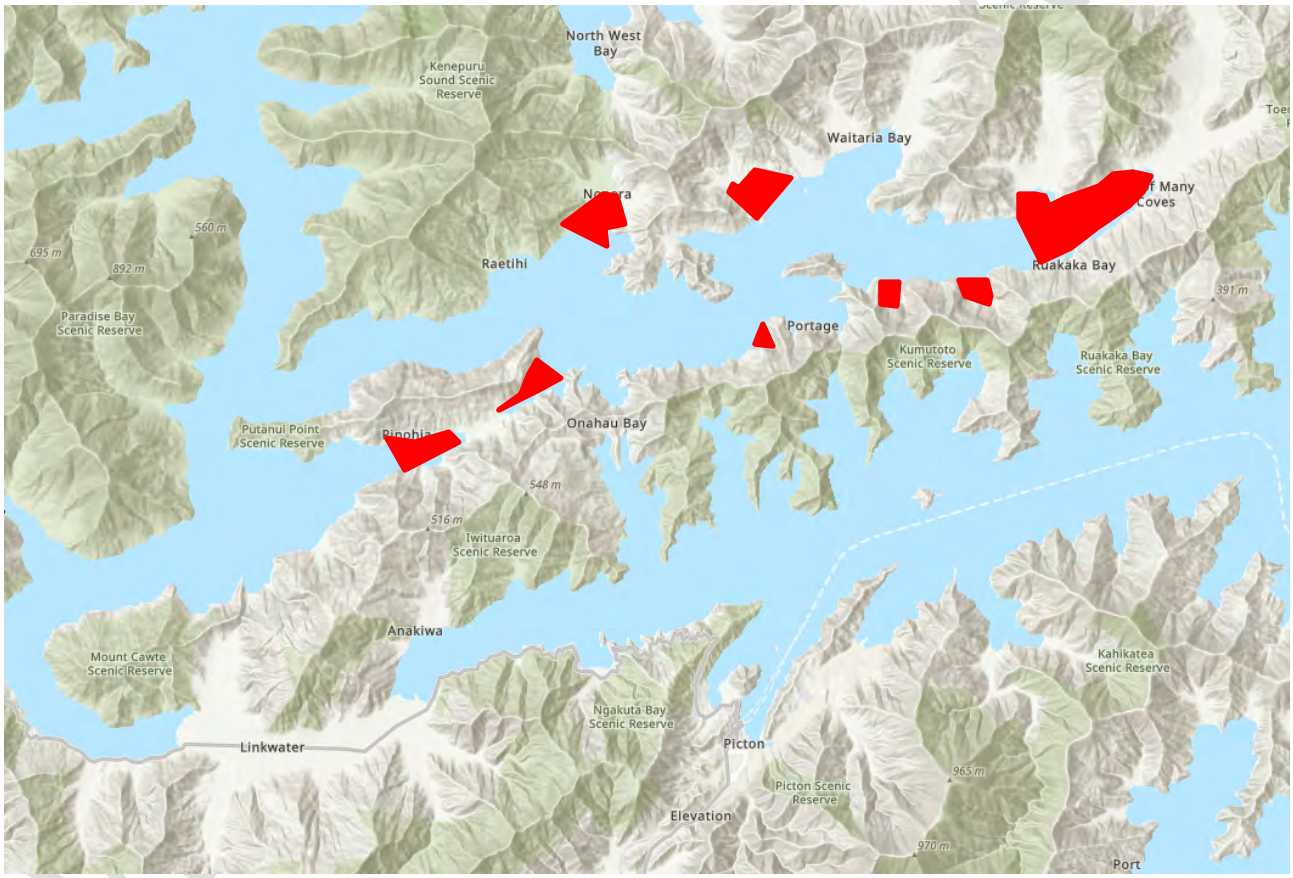


Figure 4-11: Areas identified as too shallow for barges

There are also challenges with the Sounds themselves, such as shallowness, silting, tidal ranges, and adverse weather conditions. Silting and sedimentation decreases water depth and particularly at lower tides can restrict the size of boats able to access certain areas of the Sounds. It also has negative impacts on the marine environment. Dating of seabed sediment layers in the inner Pelorus Sound/Te Hoiere shows sedimentation rates have experienced a ten-fold increase

[34] The totals shown here are greater than those in Table 2-3. This is because Table 2-3 counts properties with dwellings, whereas this table counts the total number of dwellings.
[35] As per the Council rating database

since the early 1900's.[36] Water transport can also be temporarily limited by adverse weather conditions. The smaller the vessel the greater the limitations, i.e. a large barge can still be used in conditions where a small water taxi would be unsuitable.

4.3.5 Risks to Lifeline Infrastructure

4.3.5.1 Cook Strait Power Cable

Transpower's high voltage direct current (HVDC) cable, otherwise known as the Cook Strait Power cable, is **critically important national** infrastructure. The cable supplies the North Island with electricity generated in the South Island. It is the only interisland power cable. The cable is 610 km long, much longer than the Cook Strait section.

The cable is on overhead lines along Port Underwood Road and Tumbledown Road. These roads are essential for cable maintenance – there are no other access options. The cable then passes 40km underneath Cook Strait to Wellington, within the Cable Protection Zone shown in Figure 4-12. This zone is principally for the HVDC cable but is also host to other cables, including critical fibre communication cables as discussed in Section 4.3.5.3.

The HVDC submarine cables are nearing the end of their operational life and will be due for replacement around 2030. Any replacement or new cables are likely to be installed in the late 2020's and early 2030's.[37]

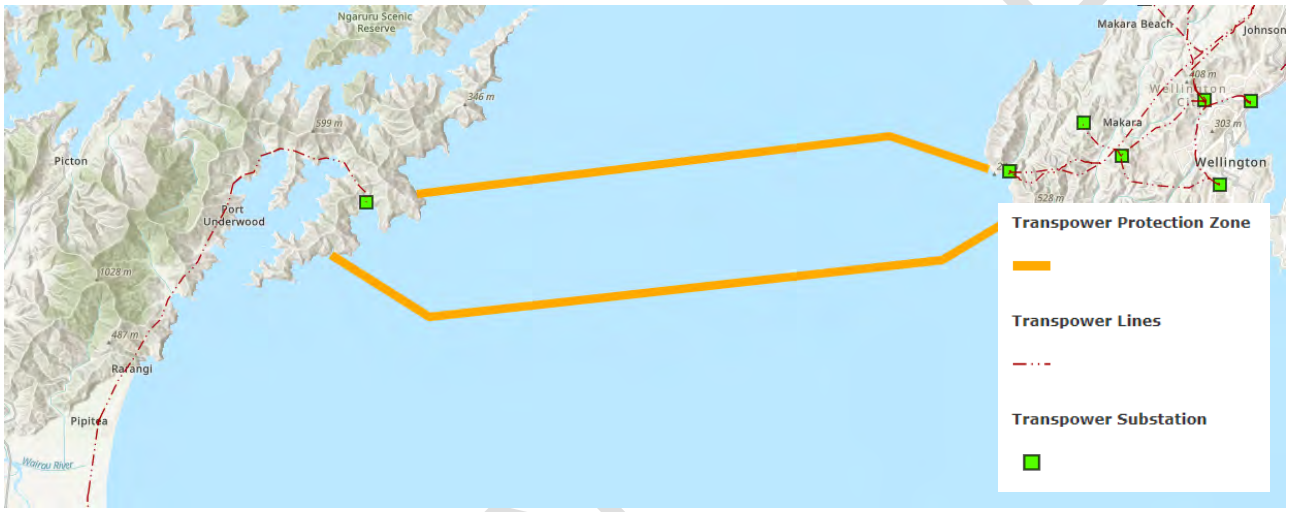


Figure 4-12: Locations of Cook Strait power infrastructure

4.3.5.2 Power Cables and Generators

At a local level, there are high voltage (HV) overhead spur lines, low voltage (LV) overhead distribution lines, and customer owned LV overhead service lines throughout the Sounds. Figure 4-13 shows the existing Marlborough Lines HV infrastructure servicing the Sounds. Diesel generators at Elaine Bay and Kenepuru Head provide back up in the event of outages. The generators can meet power needs for at least 26 and 40 hours respectively. There are no generators in the Pelorus or Port Underwood zones.

Marlborough Lines have indicated there are 3,173 electricity consumer connections within the Sounds. During the July 2021 event 6,075 consumer connections were impacted across Marlborough, while during the August 2022 event 5,027 consumer connections were impacted across the region. In both events the Kenepuru area was the most heavily impacted, accounting for 55% to 58% of the total disruption.

During both storm events, the fixed diesel generators located at Kenepuru Head were utilised to restore power supply to customers in the area until lines could be repaired. In the July 2021 event the generators provided approximately 30 hours of electricity for 881 customers, and in the August 2022 event they provided approximately 72 hours of electricity for 942 customers. During the August 2022 event there were issues with resupplying the generators with fuel as roads were closed. Tankers were eventually barged into Fish Bay and then drove to the generator site. This highlights the importance of being able to easily access these generators.

[36] NIWA (2021) *Sources of fine sediment and contribution to sedimentation in the inner Pelorus Sound/Te Hoiere*. https://www.marlborough.govt.nz/repository/libraries/id:2ifzri1o01cxbymxkvwz/hierarchy/documents/environment/coastal/sedimentation-reports-list/Sources_of_fine_sediment_Pelorus-NIWA_report.PDF

[37] https://www.transpower.co.nz/projects/hvdc-submarine-cable-replacement-and-enhancement-investigation

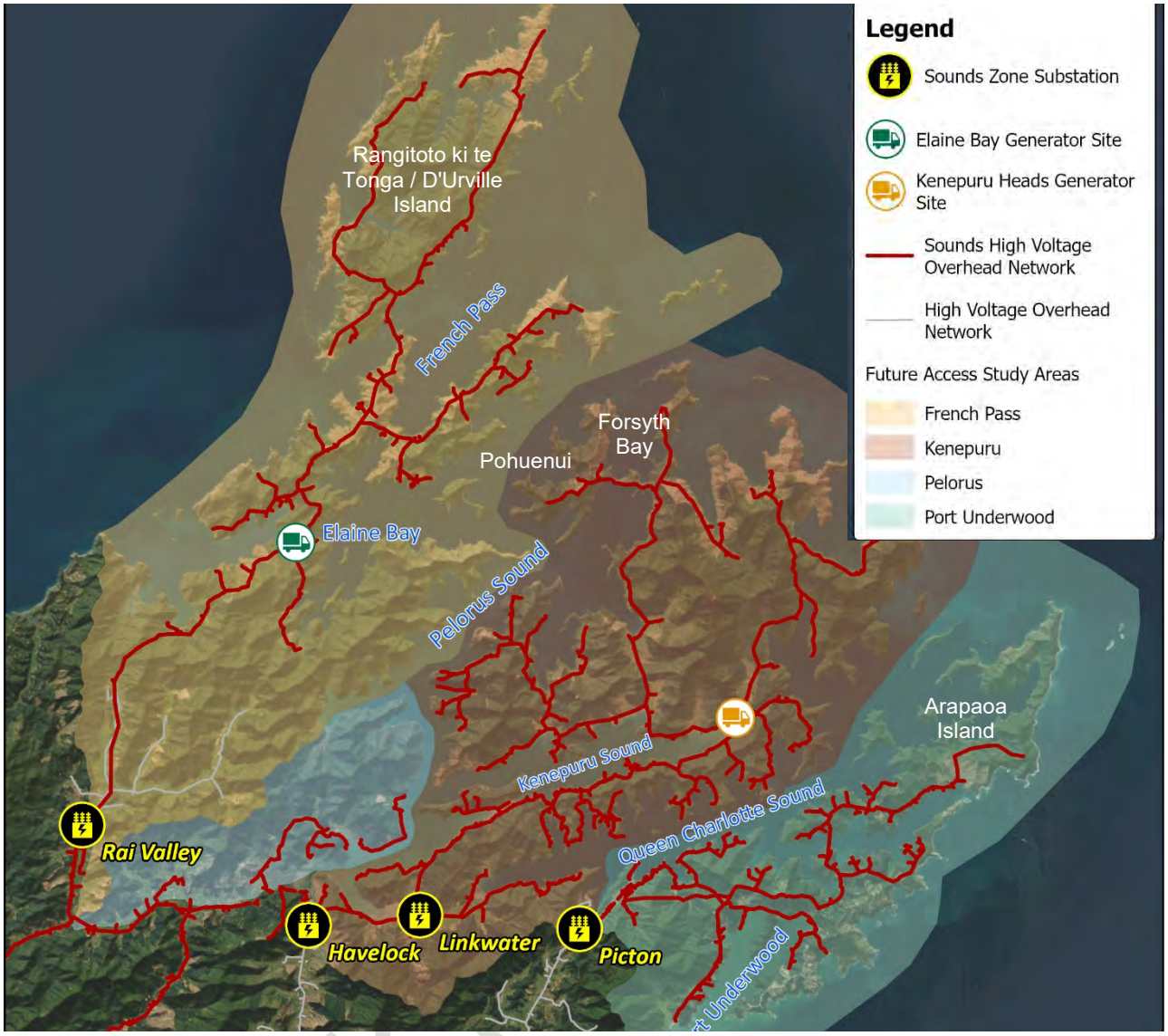


Figure 4-13: Marlborough Lines infrastructure[38]

Although the power assets in the Sounds are predominately accessed by vehicle (four-wheel drive utes, trucks, side-by-side utility all-terrain vehicles, and rugged utility e-bikes), some sites are accessed by boat, helicopter, or even on foot. However, Marlborough Lines highlighted their concern at losing road access via Kenepuru Road, as it provides access to the south side of the Kenepuru and to all the HV spur lines, LV distribution lines and maintenance tracks that supply Queen Charlotte Sound and beyond.

4.3.5.3 Communications

Chorus, Marlborough Lines, Vodafone, The Rural Connectivity Group, 2degrees and Spark own communication assets in the Sounds.

Arguably most significant is the interisland fibre cable that travels through the Transpower Cable Protection Zone, providing the South Island with internet connection. Like the Cook Strait Cable, the interisland fibre cable is maintained via Port Underwood Road and Tumbledown Bay Road, making these roads strategically important.

Other assets, such as cables, cabinets, radio sites for landlines and broadband, radio towers and cellphone towers are located across the area. Some radio towers have Brain FM co-located in a Civil Defence Capacity.

These assets are installed, maintained and replaced using roads where possible, but boat and barge access are already used extensively throughout Queen Charlotte Sound, Kenepuru Sound and Rangitoto ki te Tonga/ D'Urville Island. Some infrastructure (Eg Chorus multi access radio sites) is only accessible by helicopter. Where roads are used, light vehicle access is usually sufficient for maintenance purposes.

[38] Source: Marlborough Lines, received via email, 24/02/2023

Most of these telecommunication assets are powered by the Marlborough Lines network and any power outages result in service outages. There are some backup generators, but these only have a limited amount of fuel so only provide power for a limited amount of time. During the 2022 event multiple Chorus sites were affected due to power outages and landslips damaging cables and cabinets. In locations where cables were damaged or destroyed temporary cables have been installed to restore service. Permanent cables will not be installed decisions are made about future access.

4.3.6 Loss of Access to Community Facilities

As discussed in Section 2.5.1 Havelock and Picton are the main service centres, with smaller centres at Okiwi Bay, Rai Valley, Canvastown and Linkwater. These are the main destinations for most trips. As discussed in Section 4.3.2 there are no alternative overland routes, so if one section of road is cut off, everyone beyond that point is cut off, unless they have marine access.

Figure 2-5 (Section 2.5.1) shows the location of community facilities throughout the Sounds. A summary of key services is given in Table 4-4.

Table 4-4: Summary of key services in the Sounds

Area	Emergency Services	Health Care	Education	Groceries/Supplies
French Pass	**Fire**: French Pass, Okiwi Bay, Rai Valley	None	Primary and secondary school - Rai Valley	Fuel - French Pass, Elaine Bay, Okiwi Bay, Rai Valley Groceries - Okiwi Bay
Pelorus	**Fire**: Canvastown	None	Primary school - Canvastown	None
Queen Charlotte	**Fire**: Linkwater	None	Primary schools - Linkwater	Fuel - Linkwater
Kenepuru	**Fire**: Nopera, Sounds, Waitaria/ Clova Bay	None	Primary schools - Waitaria	None
Port Underwood	**Fire:** Rarangi	None	Not available	Fuel - Oyster Bay
Havelock	Police, Fire	Pharmacy, Medical Centre	Primary schools	Groceries and fuel
Picton	Police	Pharmacy, Medical Centre	Primary and secondary schools	Groceries and fuel
Blenheim and Nelson	Ambulance	Wairau Hospital (Blenheim), Nelson Hospital	Primary and secondary schools	Supermarkets and fuel

4.3.7 Uncertainty

A common theme throughout the community engagement sessions were the impacts of the uncertainty around future access (refer to Appendix E for summary notes). This was particularly apparent for Kenepuru community. Some of the comments received regarding uncertainty include:

- *"It's the not knowing with regards to the roads. It has placed a huge amount of cost on normal activities. Breakdowns etc cannot be fixed quickly and easily and any activities or requirements need to be organised days/weeks in advance"*[39]
- *"Not knowing creates inability to plan anything. We have no barge facility. Stock in and out a nightmare."*[40]

It was also reported that people are selling their homes, or are considering doing so, and have concerns about whether they will have the same access as when they brought their property, and how that will affect house prices.

Community expectations of the level of service provided by the roads in the Sounds are generally higher than detailed by the One Network Road Classification[41]. Customer Levels of Service as defined by Waka Kotahi for Access Roads (now Rural Roads) are that users will experience varied travel times because of other users, weather conditions or the physical condition of the road. It states the route may not be available in weather events, and alternatives may not exist. Clearance of incidents affecting road users will have the lowest priority. The road will be of variable standard and alignments, with lower speeds and greater driver vigilance required on some sections. The standards for Rural

[39] Sheppard Agriculture Ltd (2022) *Marlborough Sounds Post Flood Assessment: Report of Farm Survey*
[40] As above
[41] Now replaced by the One Network Framework

Connectors vary depending on traffic volume. Across most of the area volumes are low and standards will be similar to Rural Roads, although some busier sections may have a moderate priority for incident clearance and be expected to be available except in major weather events.

This mismatch between community expectations and the guidance given by the Waka Kotahi for Rural Connector and Rural Roads has increased the overall feelings of uncertainty as the community expectations of an appropriate level of service does not match what is likely to be proposed. A proportion of people appear to rely on roads as if they are in town and have the expectation that they can run down to one day of supplies as the road will always be open.

4.3.8 Negative Health Impacts

4.3.8.1 Marlborough Sounds Flood Assessment Report (2022)

Following the August 2022 storm event a survey was provided to 22 livestock farms in the Sounds, to gain an understanding of the wellbeing of those working in livestock farming following the event. Fourteen responses were received. It was concluded from the survey that all farmers affected by the storm event are experiencing significant mental health and welfare impacts.

One of the questions asked in the survey was "*Are you more concerned for your mental well-being since this weather event?*"; nine people (69%) responded yes. In addition to this response, a common theme among the supporting comments was additional pressure and stress with what used to be simple tasks.

Eight of the 11 that answered the question regarding availability of support following the event said they did believe there were sufficient support available. Five of these respondents commented that friends, family, and neighbours were their support, with two respondents commenting that the Rural Support Trust was also a good support for them. These responses highlight the importance of community, particularly when events such as the 2022 August floods occur.

The survey also asked a series of wellbeing questions, and the top three impacts from the 2022 weather events were:

- Losing interest in activities and tasks that were previously enjoyed
- Long periods of fatigue and tiredness
- Sleep problems – too much or too little

Additionally, several comments from the survey indicated that road closures and uncertainty influenced mental health. This is supported by the feedback received at the community engagement sessions where a common theme was the stress caused by uncertainty around the future of the roads in the Sounds (refer to Appendix E for summary notes).

4.3.8.2 Sounds Survey 2023

As part of this business case a community survey was available from 31 January to 22 February 2023. This was completed by 919 respondents. There were a number of health related questions where respondents were asked to score their physical and mental health before and after the storm events, on a scale of 1 to 10. Note this was not completed by all respondents. A summary of results for physical health is provided in Table 4-5, and mental health in Table 4-6. Please refer to Appendix H for the detailed results of the Social and Health Impact Assessment.

Table 4-5: Physical health results summary

	Residents				Business and Resident			
Zone	Count	Mean Score Before	Mean Score After	Mean Score Drop	Count	Mean Score Before	Mean Score After	Mean Score Drop
Kenepuru and Queen Charlotte Drive	167	8.29	7.30	**0.97**	47	8.87	6.89	**1.98**
Pelorus	6	8.50	6.83	**1.67**	3	9.33	8.00	**1.33**
Port Underwood	16	8.31	7.50	**0.81**	4	8.25	8.75	**-0.50**
French Pass	47	8.28	7.72	**0.55**	3	8.88	7.38	**1.50**
TOTAL	**236**	**8.29**	**7.39**	**0.89**	**62**	**8.85**	**7.13**	**1.73**

Table 4-6: Mental health results summary

Zone	Residents				Business and Resident			
	Count	Mean Score Before	Mean Score After	Mean Score Drop	Count	Mean Score Before	Mean Score After	Mean Score Drop
Kenepuru and Queen Charlotte Drive	186	8.62	6.23	**2.41**	47	8.87	5.61	**3.26**
Pelorus	6	7.50	6.00	**1.50**	3	9.33	7.00	**2.33**
Port Underwood	16	8.06	6.69	**1.38**	4	9.50	9.00	**0.50**
French Pass	48	8.81	6.79	**2.02**	8	9.13	6.00	**3.13**
TOTAL	**238**	**8.59**	**6.37**	**2.24**	**62**	**8.97**	**5.95**	**3.02**

The survey results show that:

- Mental health score decreased more significantly than physical health score, with the overall score across all zones for mental health dropping by 3 points on average, compared to 1.7 points on average for physical health.
- Those who are resident and operate a business in Kenepuru/Queen Charlotte Drive had the biggest reported drop in physical health, by 2 points on average (from 8.9 to 6.9). This group also reported the biggest drop in mental health, of 3.3 points on average (from 8.9 to 5.6). Residents who operate a business in French Pass also reported a significant effect negative effect on mental health, with a 3.1 points drop on average.
- Words with strong negative connotations (isolation, separation, etc.) appeared frequently in survey responses regarding social impacts.
- Words related to social relationships (parents, partners, friends, council, neighbourhood, etc.) showed high word frequency, indicating that social relations carried heavy weights when respondents described social impacts.

These findings demonstrate that the effect of the storm event on health, particularly mental health have been significant. This is true particularly for those residents operating a business in Kenepuru, Queen Charlotte Drive or French Pass.

4.3.9 Economic Impacts

4.3.9.1 Marlborough Sounds Flood Assessment Report (2022)

To gain an understanding of the scale of the damage on farms, the survey asked the respondents to rate issues between one and five, with one being 'Very Minor' and five being 'Severe.' The survey also asked for an estimated cost to fix the damage. Table 4-4 summarises the results.

Table 4-7: Total repair cost summary

Item	Respondents	Rating	Estimated Cost
Roading	13	4.0	$122,000
Stock access	6	4.0	$0
Other	3	3.3	$40,300
Barge sites and boat ramps	4	3.3	$22,000
Tracking	10	2.6	$157,000
Slip	12	2.4	$83,500
Fencing	12	2.3	$121,000
Other farm buildings	6	1.8	$20,000
Farmhouses	6	1.8	$6,500
Yards	6	1.7	$2,000
Wool shed	5	1.4	$1,800

The following comments were also made about the direct economic impact of the event:

- Having to buy or hire new equipment as the roads and farm tracks were not suitable for trucks
- Stock loss potentially due to the work required to gain access
- Increased costs associated with travel, the water taxis and barge usage
- *"The freezing company looks like coverings increased costs due to barging. We have increased costs of freight getting goods and fertilizer in"*
- *"Having to have goods shipped out via barge that we could normally pick up has cost us a lot these past two years. Coordinating collecting from Fish Bay barge ramp can be difficult."*
- *'We have Bookabach accommodations. We have had to cancel 95% of these bookings."*

4.3.9.2 Sounds Survey 2023

The Sounds Survey 2023 asked respondents who identified as residents whether their household income had been affected by the storm event and subsequent access difficulties, and asked respondents who identified as businesses whether their turnover and business costs had been affected. Respondents who identified as resident/business[42] were asked both sets of questions.

A total of 715 respondents provided information about income. The results are shown in Table 4-8.

Table 4-8: Economic impact of storm events

Percentage Loss	Lost Household Income (715)		Lost Business Turnover (152)	
0%	503	(70%)	45	(29%)
25%	156	(22%)	52	(33%)
50%	43	(6%)	29	(19%)
75%	7	(1%)	13	(8%)
100%	6	(1%)	17	(11%)
Average Loss	$28,555		$68,046	
Maximum Loss	$250,000		$337,500	

The data shows that the majority (70%) of residents have not experienced loss of income as a result of the storms. However, 30% estimate they have lost between 25% and 100% of their income, with a small number being very severely affected. The average income lost across all households was estimated at $28,555, and the maximum reported was $250,000.

The data shows that the 29% of businesses have not experienced a loss of turnover due to the storm events. However, 33% estimate they have lost around 25% of their turnover, and 38% estimate they have lost between 50% and 100% of their turnover. The average loss of turnover is estimated at $68,046 and the maximum reported was $337,500.

Business confidence has been negatively affected by the storm event, as shown in Table 4-9. Business owners' level of confidence in their business going concern dropped from 8.8/10 (prior to the storm events) to 6.3/10 (after the storm events), indicating strong negative impacts on business confidence and future outlook. Business owners living in Kenepuru and Queen Charlotte Drive are the worst affected, with a drop of 3.1 (from 9.1 to 6.0), followed by those in French Pass, with a drop of 2.0 (from 8.4 to 6.4).

Table 4-9: Business owner confidence

Zone	Count	Mean Score Before	Mean Score After	Mean Score Drop
Kenepuru and Queen Charlotte Drive	94	9.06	5.98	3.12
Pelorus	12	8.17	6.75	1.42
Port Underwood	13	8.92	8.31	0.62

[42] residents operating a business in the Sounds

Zone	Count	Mean Score Before	Mean Score After	Mean Score Drop
Port Underwood	34	8.38	6.38	2.00
TOTAL	**153**	**8.83**	**6.33**	**2.52**

4.3.9.3 Community Workshops

Anecdotally, there have been many comments made at the Stakeholder and Community Workshops about the increased cost of transporting stock, fertiliser, and farmed export products around the Sounds via barge instead of heavy truck and trailers. This is due to the light vehicles only restriction on some roads, particularly the Kenepuru Road. The cost of barging is currently 50% subsidised by Council. The barge companies say that the current way they are being utilised is not efficient and with some changes productivity could be improved.

The storm events also directly impacted farms as areas of productive farmland were damaged following deposits of silt, gravel, and logs, and damage was incurred to waterways and fences[43]. As discussed above, getting equipment in to fix these issues now requires far more planning than previously and is believed to be more expensive.

4.4 Problem 3: Asset Vulnerability

The cause, effect and consequence for Problem 3 are show in Table 4-7 and evidence provided below. Problem 3 results from a poor road construction standard combined with unstable geology. As a result, the roads are very vulnerable to landslips, and require a lot of maintenance and emergency works following events. There is also an increased safety risk for road users.

Table 4-10: Cause, effect, and consequence for Problem 3

Problem Three: Poor construction standard and unstable geology means the Marlborough Sounds roads have a high maintenance cost and safety risk (50%)	
Cause	Geology (Natural Slope Instability Hazards, Debris Flow Hazards) Poor construction standard (human induced slope stability hazards) Infrequent maintenance
Effect	Certain areas highly susceptible to global slope instabilities Road corridor is highly susceptible to over slips and under slips
Consequence	Increase maintenance cost High emergency works cost Increased safety risk

4.4.1 Geology

The Marlborough Sounds lie in the most seismically active part of the country near the southern limit of the Pacific plate, with the Wairau (alpine) fault to the south and the Waimea-Whangamoa fault to the west. The area is subject to frequent deep earthquakes and numerous shallow earthquakes. Earthquake events causing serious structural damage can be expected every 55 to 60 years.[44]

Climate, topography and geology all contribute to natural slope instability. In the Sounds there are numerous fault zones and rock types that are inherently unstable. The most significant effects of slope instability are slope failures and ground subsidence. These failures are naturally present and would occur even if the terrain wasn't altered by human influences.

Figure 4-16 shows the susceptibility of roads in the Sounds to natural slope instability. It shows that Moetapu Bay Road and Kenepuru Road between Te Mahia Bay and Kenepuru Heads has a large proportion of road length that has a high or very high susceptibility to natural slope instability. This area also has a very high susceptibility to human induced slope instability (Section 4.4.2). This instability is consistent with the high number of slips recorded during the 2021 and 2022 weather events (Section 4.4.4).

For more information regarding the natural hazards of the Sounds, refer to the *Marlborough Sounds Future Assess Study Preliminary Natural Hazard Susceptibility, Implications and Interventions Report*.

[43] https://www.marlborough.govt.nz/civil-defence-emergency-management/august-storm-event-2022/general-recovery-information-august-2022-storm-event/weekly-recovery-updates/marlborough-recovery-update-02

[44] Marlborough District Council (2003) "Natural Hazards." In *Marlborough Sounds Resource Management Plan Volume 1*., https://www.marlborough.govt.nz/repository/libraries/id:2ifzri1o01cxbymxkvwz/hierarchy/documents/your-council/environmental-policy-and-plans/msrmp-volume-1-list/Chapter_16_Natural_Hazards.pdf

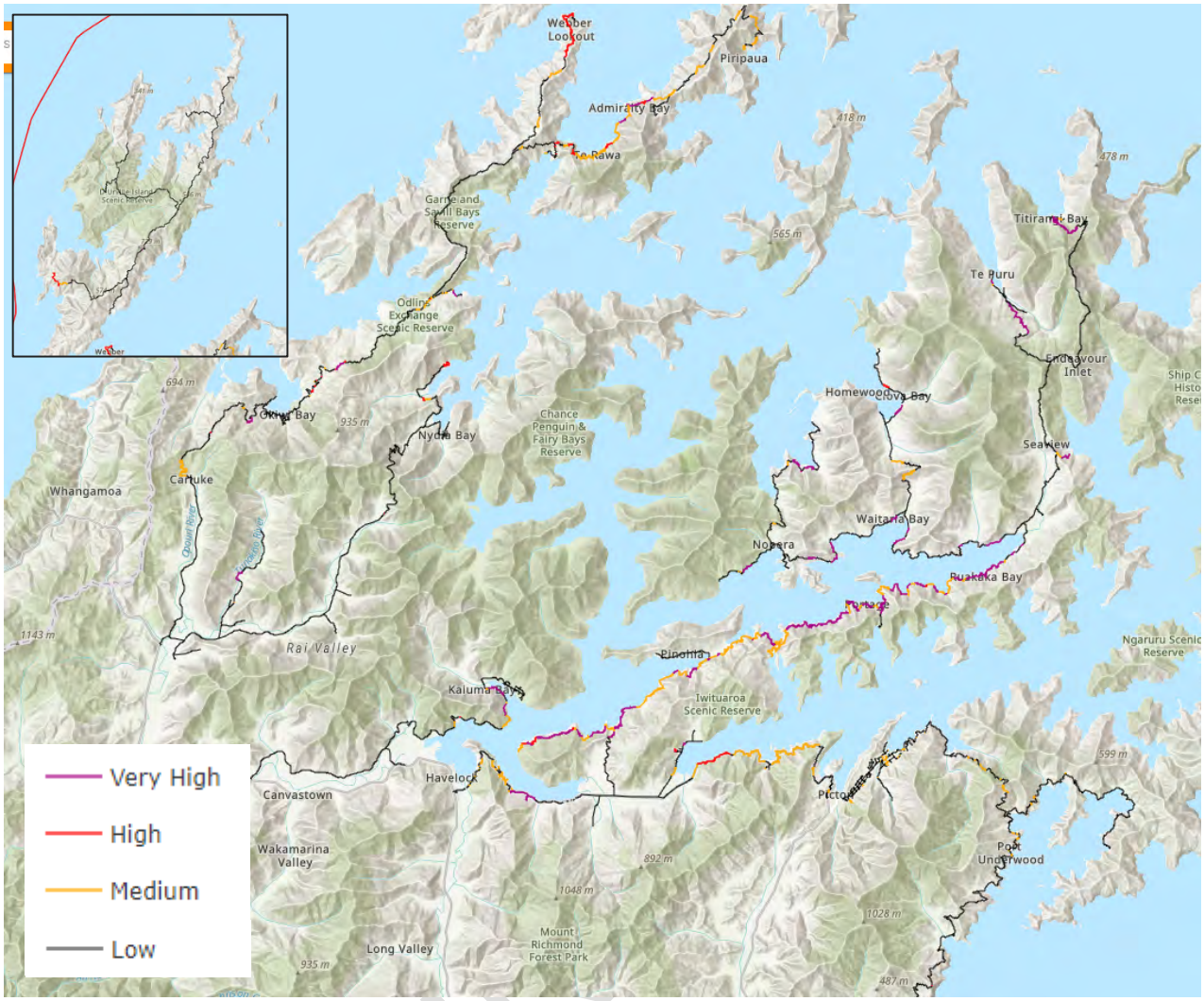


Figure 4-14: Map of susceptibility to natural slope stability

4.4.2 Poor Construction

Roading construction methods can contribute to slope instability, and this is known as human induced slope instability. Over steepened cut batters and non-benched side-cast fill slopes are common features of many Sounds roads that contribute to this instability. This is largely due to the inadequate design or poor construction techniques of the time (going through with a bulldozer) when compared to modern standards.

Vegetation removal and the alteration of drainage patterns can also be a contributing factor in this instability. The alteration of drainage patterns associated with reshaping the land tend to accumulate and focus water discharge which can adversely affect terrain stability. Roading, forestry and residential development can all contribute to changes in drainage patterns.

Several roads throughout the Sounds started as bridle tracks which were largely used for farming access and were only suitable for horses and other livestock. Between the 1910s and 1950s the bridle tracks were 'improved' to create narrow, sharply cornered, scrappily metaled roads with frequent ford crossings where passing was impossible in most places.[45] A number of new roads were also constructed during this time to a similar standard.

The road construction method at that time was 'cut and cast'. The road is created by driving through with a bulldozer or excavator, cutting out the up-slope side. That 'side cast' material is then used fill the down slope side. There is minimal engineering effort that goes into this type of construction with essentially loose fill material used on the downslope side to support the road, rather than engineered material which would be uniformly dense. In addition, the cut slopes were often over steep, with minimal drainage provided.

This process was repeated when the roads were widened from single lane to dual lane in the mid-1900s. The widening made the over steepened slopes higher and increased the amount of side cast material used as fill on unready unstable

[45] Ian Dougherty (2008) *The Making of French Pass Road in the Marlborough Sounds*. Auckland: No Ordinary Life.

slopes. These poorly constructed and non-compacted roads were then sealed for amenity reasons – to reduce dust and provide a smoother driving surface – from the 1980s onwards.

Figure 4-15 shows the typical failure scenario that was experienced by many of the roads during the recent storm events. Figure 4-16 shows how these roads would be constructed today. Refer to Appendix J for more images detailing the historic construction process.

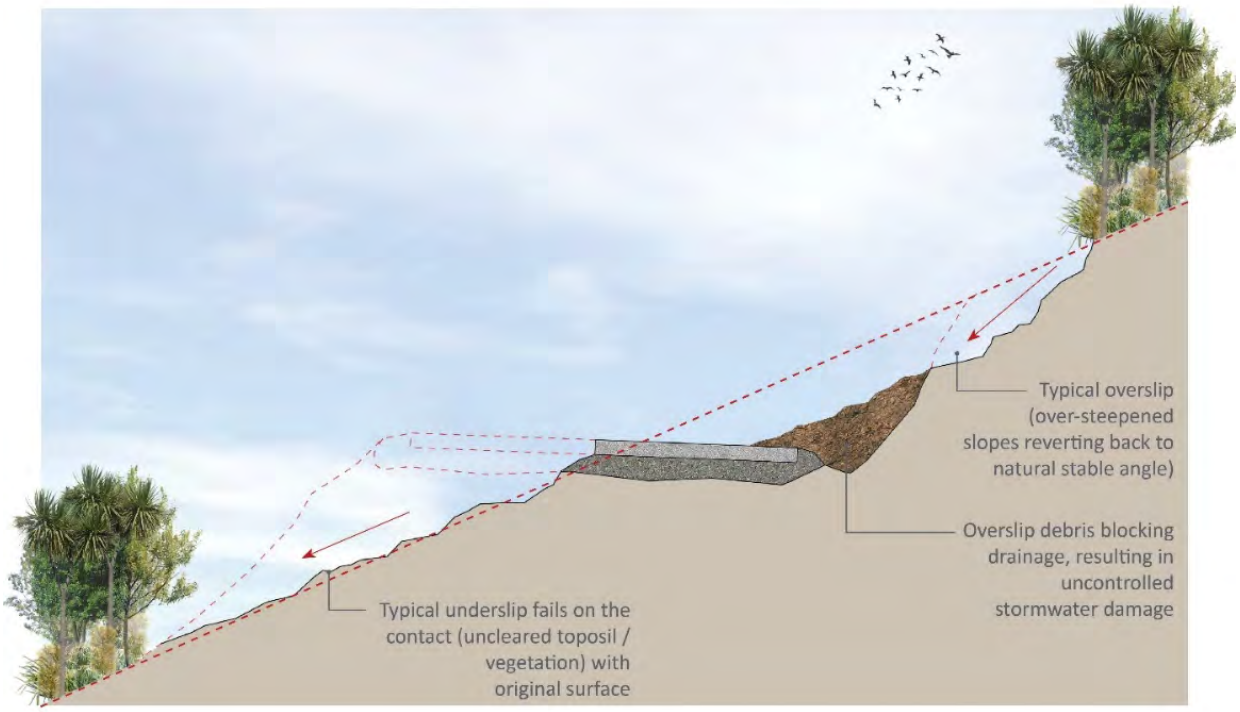


Figure 4-15: Typical failure method

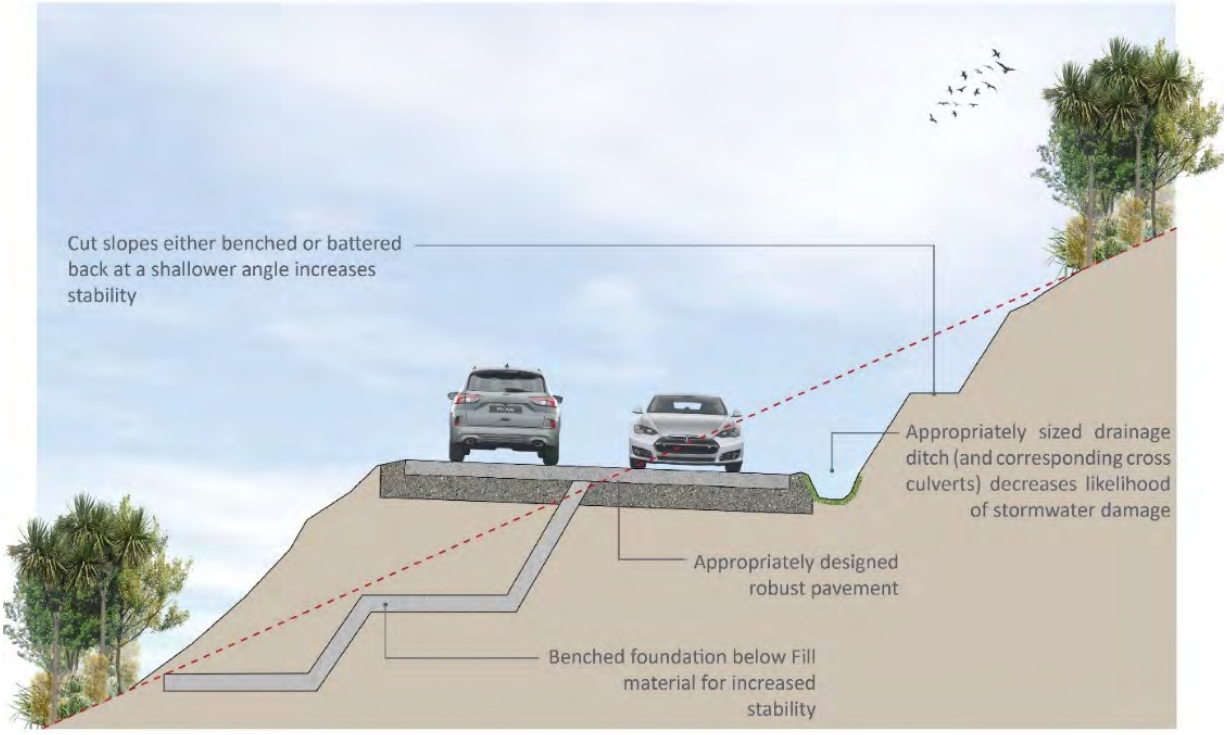


Figure 4-16: Modern road design features

Figure 4-17 shows the susceptibility of roads in the Sounds to human induced slope instability. It shows that approximately 70% of the length of road in the Sounds is either highly or very highly susceptible to human induced slope instability. Nearly 90% of the length of Port Underwood roads are either highly or very highly susceptible to human induced slope instability. Kenepuru Road between Linkwater and the Heads is also of concern, as much of this road is

very highly susceptible to human induced slope instability. This is compounded between Te Mahia Bay and the Heads where areas of very high human induced slope instability coincide with areas of very high natural slope instability.

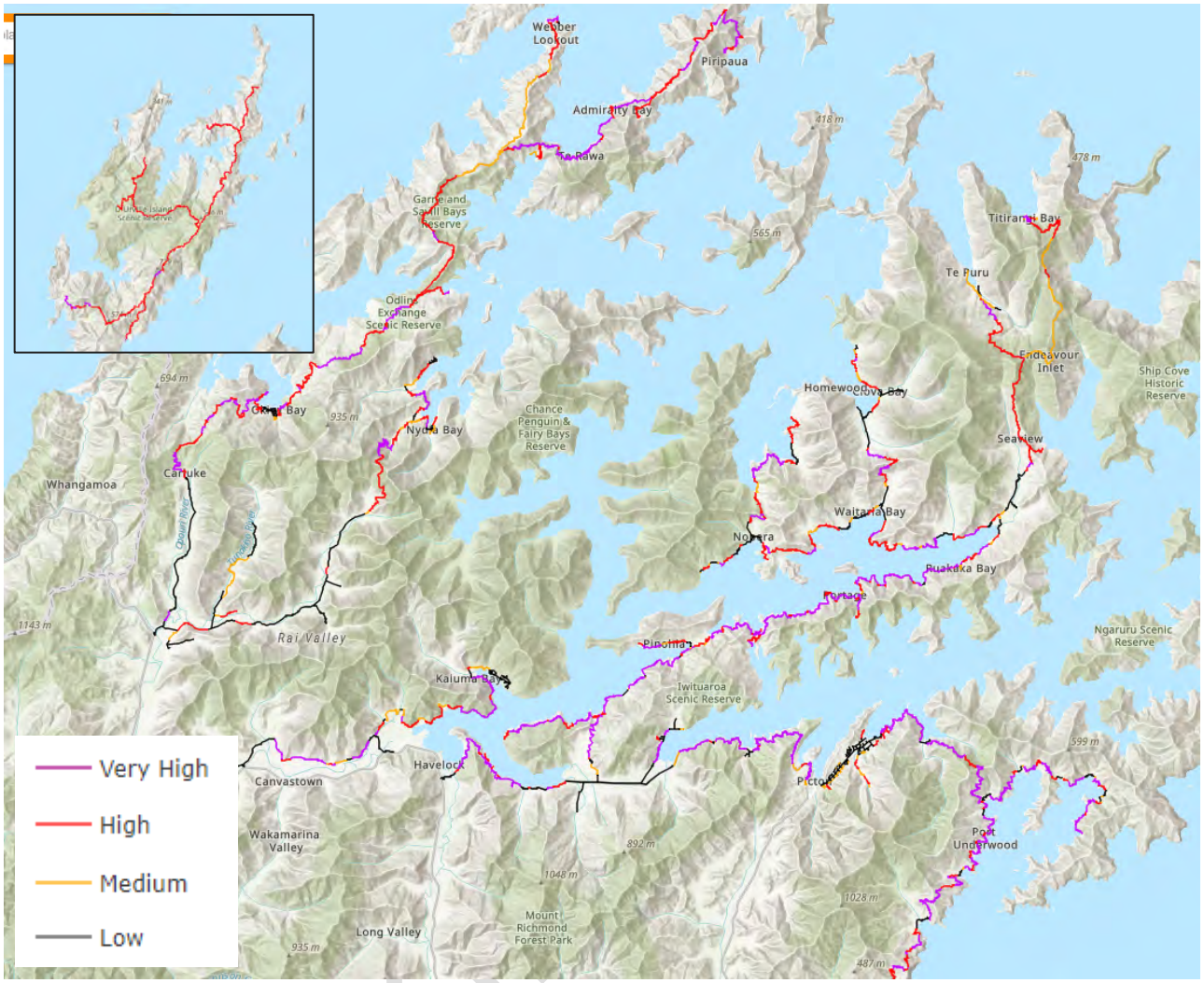


Figure 4-17: Map of susceptibility to human induced slope stability

4.4.3 Maintenance

Regular maintenance is important to ensure roads continue to provide access. In the case of the Sounds, the maintenance which would help to make these already vulnerable roads more resilient during storm events primarily relates to more regular culvert clearance and drainage work to ensure effective drainage during storm events. However, the drainage which is in place currently is not sufficient, so more maintenance may not have made a difference to the resilience during the storms.

The annual maintenance and emergency works spend per kilometre of road for the 10 years prior to 2020/21 is shown in Figure 4-17 to Figure 4-21. This shows there was generally a reduction in maintenance spending until 2018/19 when maintenance spending started to increase. The 2018/19 increase in maintenance spending was extreme in Queen Charlotte, and substantial in Pelorus and Kenepuru but dropped back down again in 2019/20.

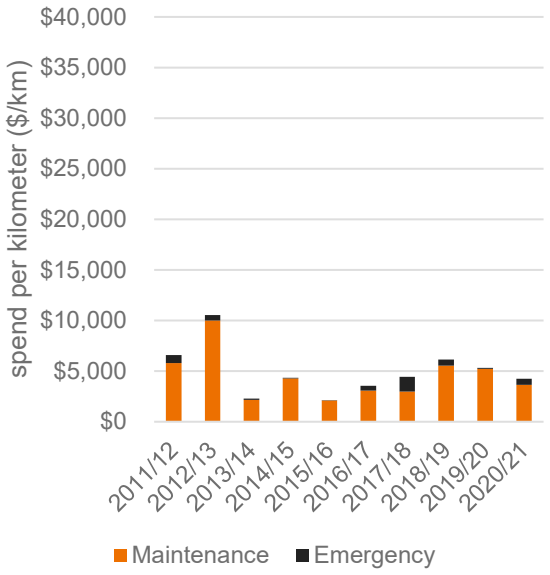


Figure 4-18: Maintenance and emergency spend per kilometre of road in the French Pass zone

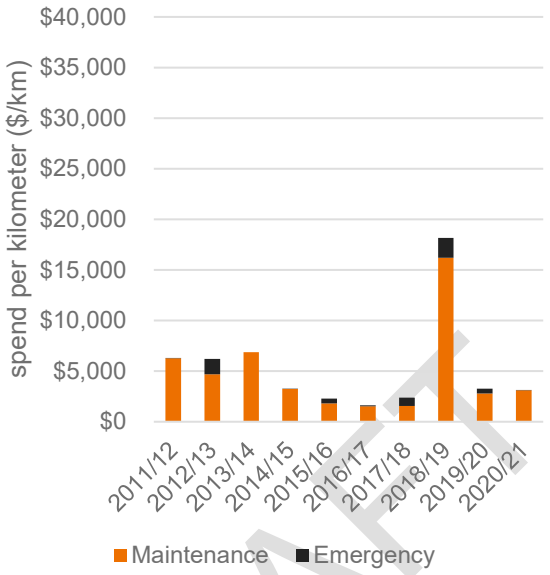


Figure 4-19: Maintenance and emergency spend per kilometre of road in the Pelorus zone

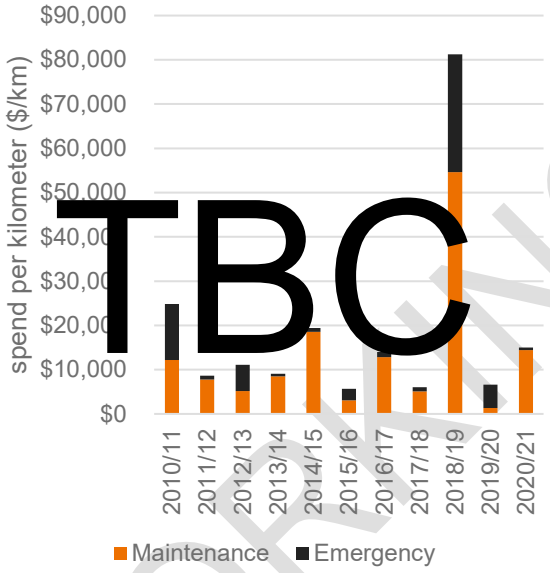


Figure 4-20: Maintenance and emergency spend per kilometre of road in the Queen Charlotte zone

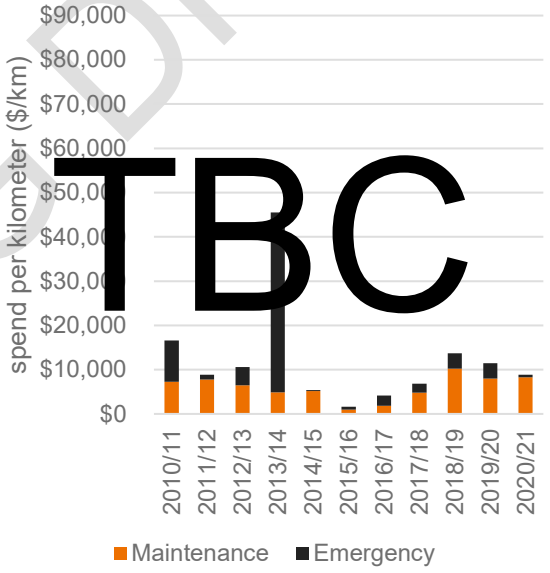


Figure 4-21: Maintenance and emergency spend per kilometre of road in the Kenepuru zone

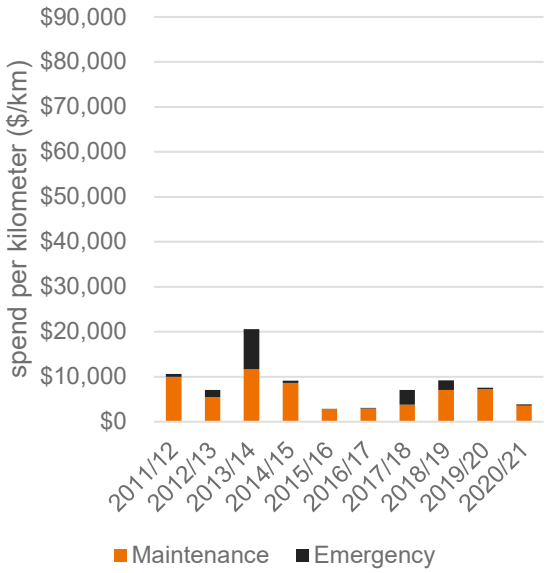


Figure 4-22: Maintenance and emergency spend per kilometre of road in the Port Underwood zone

The community provided strong messages that more regular maintenance would have ensured the roads would be more resilient during the storm events. Refer to Appendix E for a summary of comments from community engagement.

4.4.4 Susceptibility to Landslips

Table 4-8 provides a summary of the number of faults recorded after the 2021 and 2022 storm events. This demonstrates that over slips and under slips accounted for two thirds of faults after the 2021 and 2022 events.

Table 4-11: Faults recorded following storm events

Event	Total Faults	Over Slips	Under Slips	Total Slips
July 2021	Over 950	419 (44%)	193 (20%)	612 (64%)
August 2022	Over 3,000	692 (22%)	1,200 (39%)	1,892 (61%)

Figure 4-21 and Figure 4-22 show the over slips and under slips recorded during the 2021 and 2022 weather events. There is a close correlation between the location of slips and unstable land as mapped in Figure 4-14.

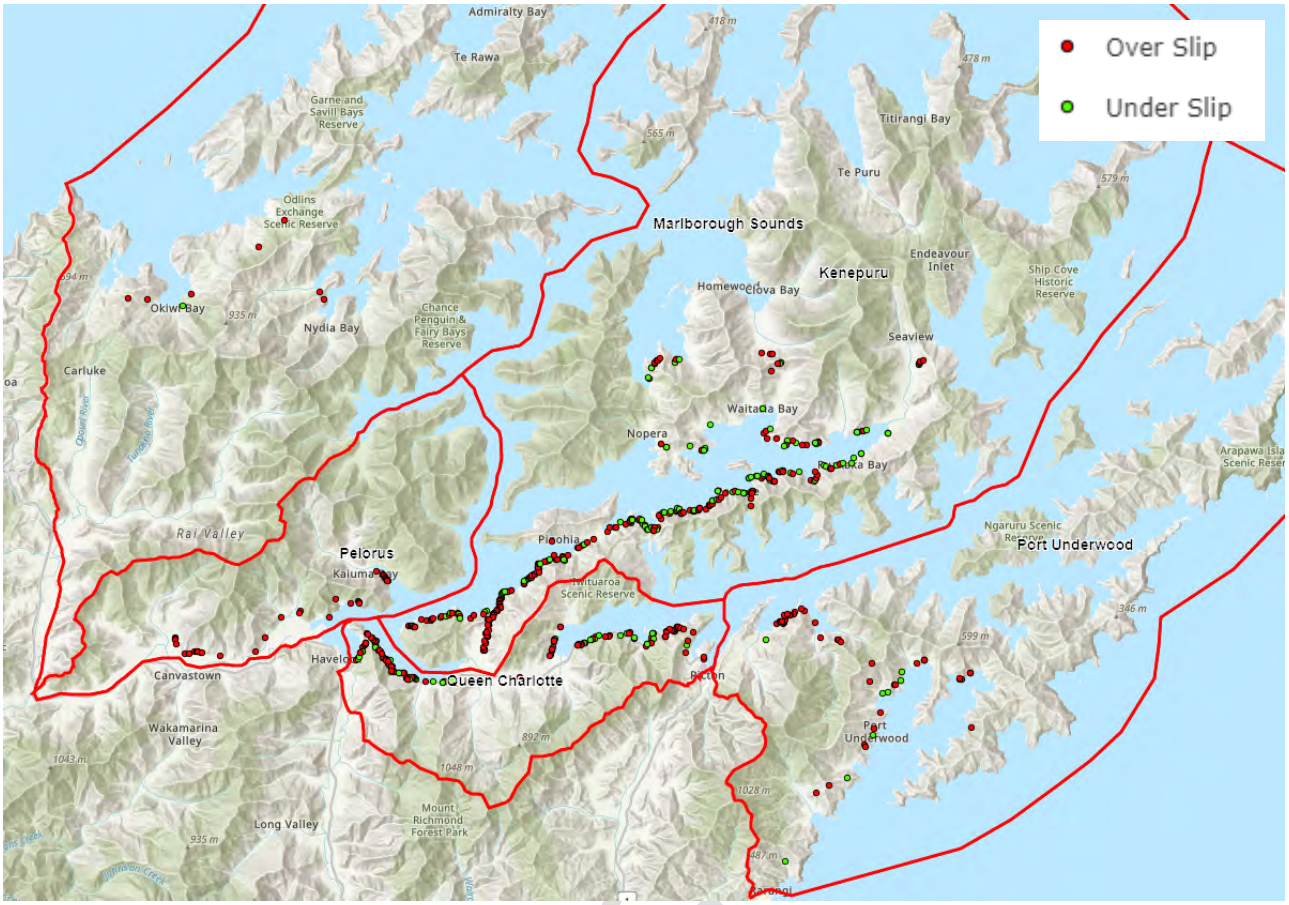


Figure 4-23: Under slips and over slips recorded from the July 2021 event

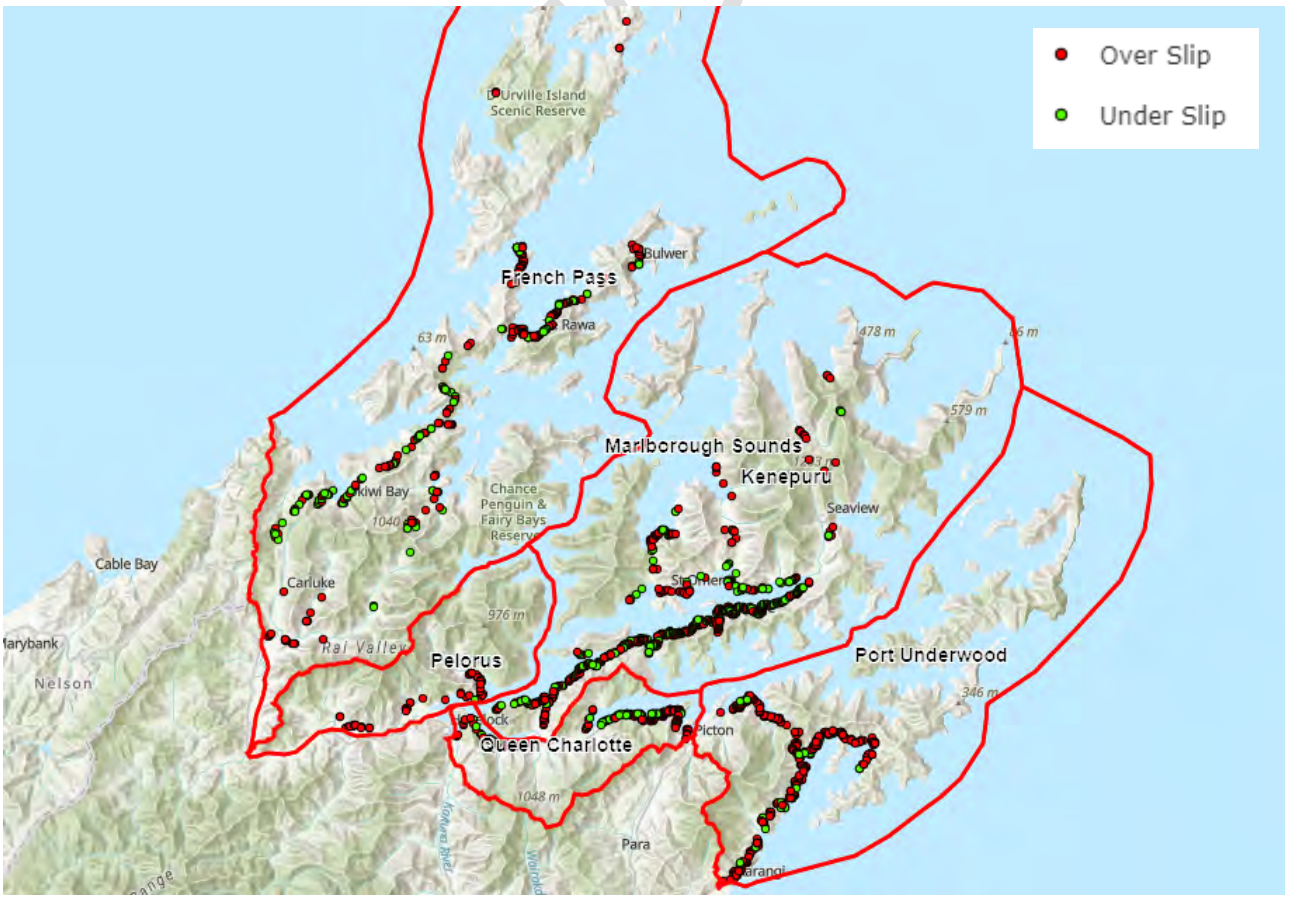


Figure 4-24: Under slips and over slips recorded from the August 2022 weather event

This is compelling evidence of susceptibility to landslips for the roads identified, particularly sections of French Pass Road, Kenepuru Road, Queen Charlotte Drive and Port Underwood Road. Refer to Appendix K for maps of all fault data.

4.4.5 Increased Spending

In February 2022 Council commissioned a report to determine Marlborough's costliest rural routes. Ten years of maintenance cost and asset data (July 2011 to June 2021) for all rural roads was extracted from RAMM.[46] Costs were grouped by maintenance or emergency works to differentiate maintenance, renewal and improvement works from emergency response and repair. Figure 4-26 shows the roads with a combined cost of greater than $100,000 per annum, or those that form part of key corridor with those high-cost roads[47]. The $100,000 threshold was selected as roads over this threshold represent 30% of the network by length but incur greater than 60% of the annual rural roads maintenance and emergency works cost across the whole network.

Looking at just the Sounds, the most expensive roads in the Sounds account for 30% of the annual rural roads maintenance and emergency works cost across the whole network, despite only accounting for 18% of the rural road network length.

Figure 4-27 shows the rural roads with the greatest combined cost per kilometre per annum. Roads in the Sounds that are highlighted as expensive by total road length (Figure 4-20) and per kilometre of road length (Figure 4-27) are:

- French Pass:
  - Ronga Road
  - Croisilles-French Pass Road
  - Opouri Road
- Pelorus: Kaiuma Bay Road
- Queen Charlotte: Queen Charlotte Drive
- Kenepuru:
  - Kenepuru Road (Linkwater-Heads)
  - Kenepuru Road (Heads-Raetihi)
  - Moetapu Bay Road
- Port Underwood: Port Underwood Road

Following the July 2021 event $30m was spent on Kenepuru Road (Linkwater-Heads). This corresponds to an additional emergency spend of $18,000/ km/ year, or an additional $3m/ year over a 10-year period. This was already the most expensive rural road section and third most expensive rural road per km prior to the 2021 event.

[46] Council's roading assessment and maintenance and management system
[47] Denoted by *

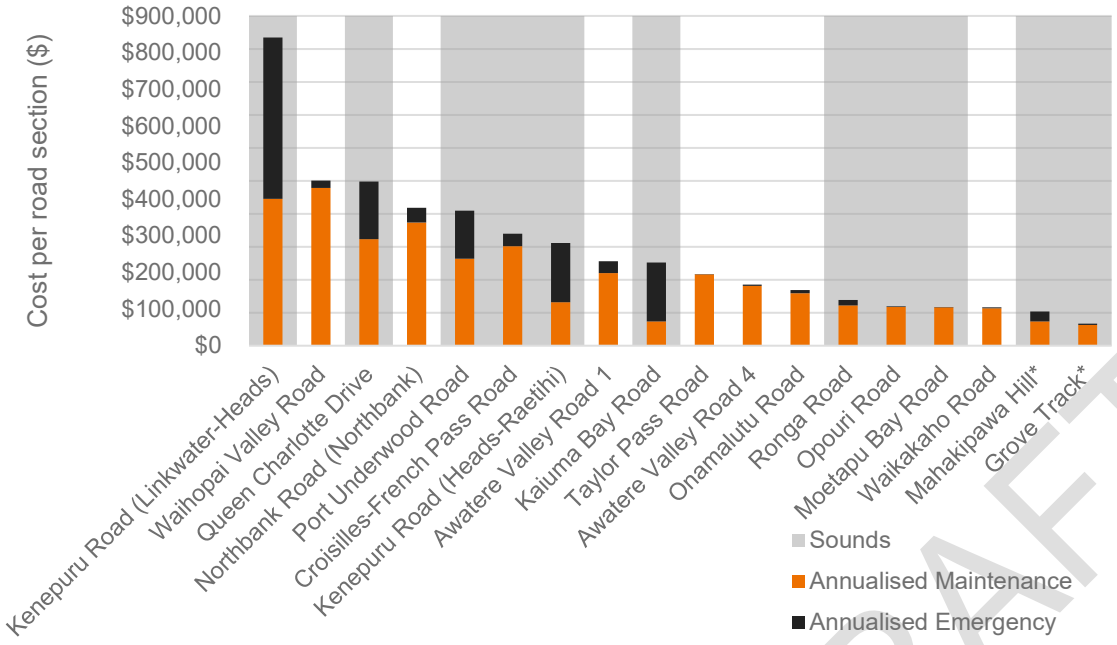


Figure 4-25: Rural roads that cost more than $100,000 per annum to maintain from 2011/12 – 2020/21

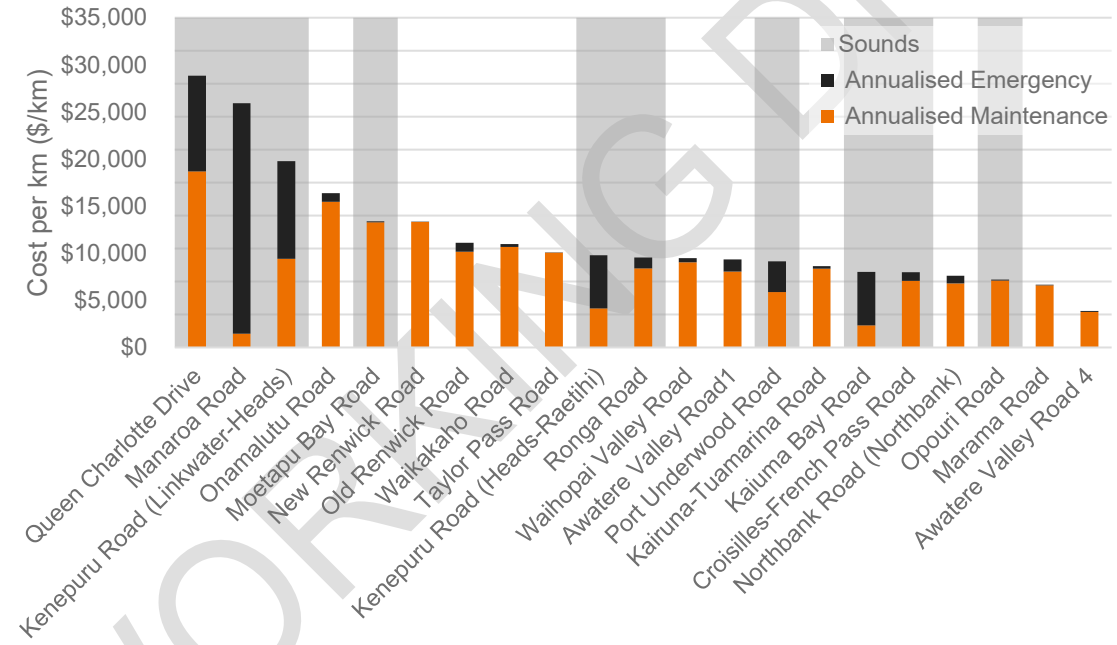


Figure 4-26: Rural road costs per kilometre per annum from 2011/12 – 2020/21

A comparison with MDC's peer group (refer Table 4-12) showed that for 'access' roads, which is most roads in the Sounds, Marlborough had the highest spend on bridge, pavement and shoulder maintenance per lane kilometre, and second highest spend on drainage and surfacing.

Table 4-12: Access Roads peer group comparison of maintenance spend per lane kilometre ($/km)[48]

District	Bridge Maintenance	Drainage	Pavement	Shoulder	Surfacing
Marlborough	135	719	986	177	10
Tasman	4	177	274	92	21
Whanganui	42	50	886	110	
Whangārei	3	834	261	52	2
Timaru		426	914		5

4.4.6 Safety

The Waka Kotahi Crash Analysis System (CAS) tool recorded 93 crashes in the study area (excluding Picton) in the last full five-year period between 2017 – 2021, including available 2022 data. The crash analysis was completed on 13 December 2022.

Between 2017 and 2021 83 crashes were recorded: four fatal crashes, seven serious injury crashes, 20 minor injury crashes, and 52 non-injury crashes. To date in 2022 there has been one fatal crash, three serious injury crashes, one minor injury crash and six non-injury crashes. It is likely these numbers underestimate the total number of crashes, as it is likely that many will not be reported e.g. vehicle may be towed out of ditch by local resident and just keep going.

The locations of the death and serious injury (DSI) crashes between 2017 and the end of 2022 are shown in Figure 4-28. DSI crashes account for approximately 16% of all crashes in the study area within this period.

Key points are summarised below:

- Approximately 80% of crashes occurred in fine weather, and 71% of all crashes happened during the day.
- The most common crash type was of the 'Bend – lost control/head on' type, at over 84%. Further, 14 of the 15 DSIs resulted from this crash type.
- Fatal crashes:
  - Two of five fatal injuries occurred in the French Pass region.
  - All five fatal crashes involved vehicle with only one occupant and were the result of a vehicle leaving the carriageway and falling down an embankment or gully. The fatal crash on Kenepuru Road occurred when a grass verge the vehicle had veered onto gave way beneath the weight of the heavy vehicle, causing the truck to slide down a steep bank.
  - Two trucks, a ute, an SUV and a tractor were the vehicles involved in the fatal crashes.
- None of the recorded crashes in this period involved pedestrians or cyclists.
- Five crashes involved drivers with overseas licences: one serious injury crash, two minor injury crashes, and two non-injury crashes.

[48] Te Ringa Maimoa, 2020/21

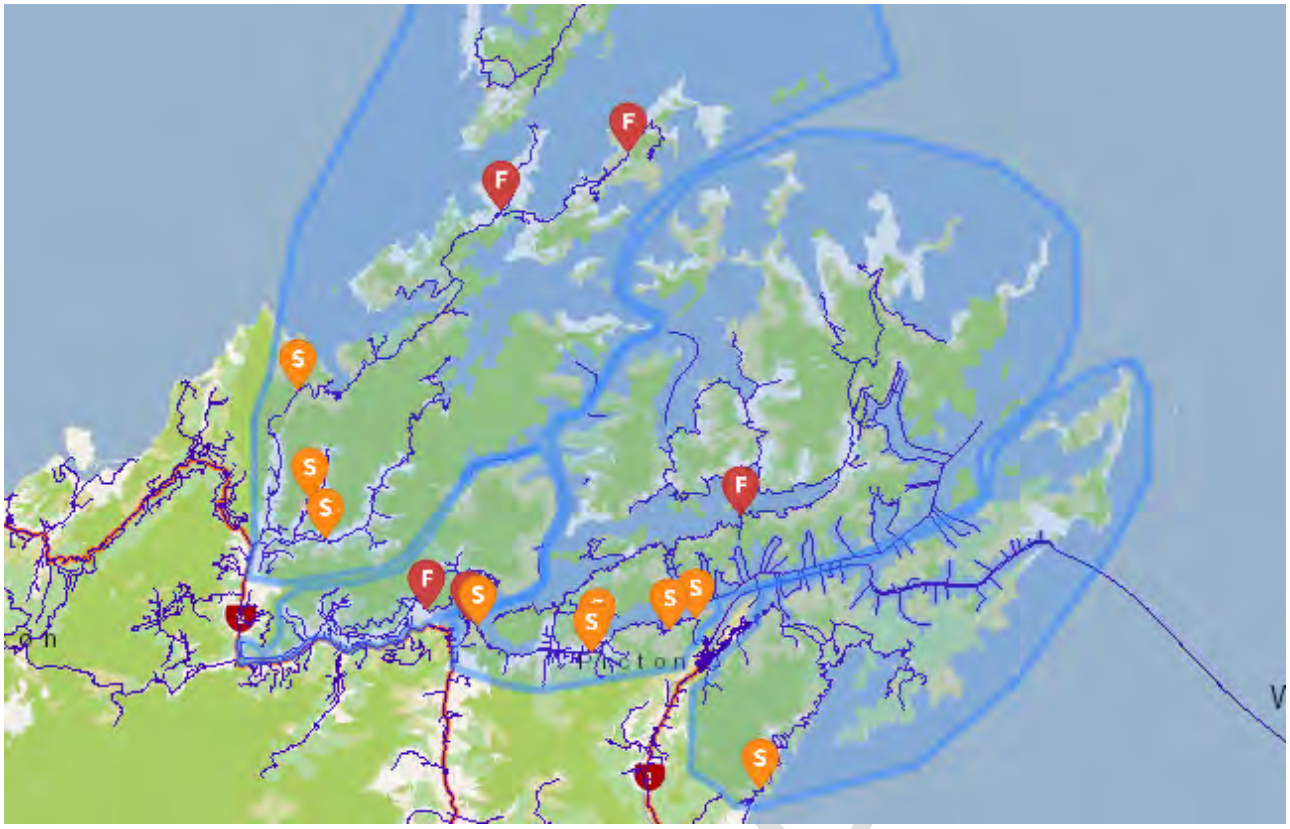


Figure 4-27: Death and serious injury crashes in the Marlborough Sounds

The Marlborough District is of 'medium concern' for driver distraction in comparison to other regions in the country, as outlined in the Communities at Risk Register 2022. This designation relates to communities with personal risk profiles greater than half a standard deviation from the mean, but below one. All other categories assessed by the register fall below this level of concern for Marlborough.

The following general comments have also been made by stakeholders when asked about the safety of the roads:

- **Safety issues:** driving off the edge, narrow, no edge barriers, conflicts between heavy vehicles and light vehicles, increasing number of narrow areas because of the storm events increasing safety risk, posted speed limit too high and people drive too fast.
- **Visitors:** tourists are not used to the roads; roads are not suitable for different types of tourist vehicles such as campervans and boat trailers.
- **Trucks:** heavy vehicles cross centrelines on blind corners, the trucks are not just farm servicing trucks but are also servicing other business sectors and development.

4.5 Problem Summary

A summary of the evidence collected for each problem in given in Table 4-7. The evidence shows relatively small numbers of people and businesses are affected, but that the effect of loss of access has been severe on that small group. This has been seen both in terms of mental health and disruption to normal practices – from going to school, to getting a prescription, to transporting stock to market. For many, daily life has become a challenge. After the 2022 storm event, road closure data shows that Kenepuru Road (Linkwater to Heads) was closed to all vehicles for two months and is still closed to heavy vehicles and non-residents today (six months). Although alternatives have been provided by way of water taxis and barges, these reportedly take longer and cost more to use than driving.

The combination of unstable geology, steep topography, poor road construction and extreme rainfall events resulted in 1,892 slips after the 2022 storm event, primarily affecting Kenepuru Road, French Pass Road, Queen Charlotte Drive and Port Underwood Road. These are the main roads connecting people to goods and services, as well as the wider state highway network and markets beyond. They are also used to service important lifeline infrastructure such as the Cook Strait power cable, which supplies the North Island with electricity generated in the South Island.

Currently there is some resilience provided by water access. Historically water access was important, and there are barge sites in the Kenepuru Zone at Fish Bay, Pudneys/Te Mara and Portage which have been used to provide access since the 2022 storm. There are also many public and private jetties and boat ramps, and some properties already rely on these for access. However, an estimated 75% properties are not located within 50 m of a jetty and must drive to public sites.

The 2022 weather event is described in Tiro Rangi, the Waka Kotahi Climate Adaptation Plan 2022-24, under the heading 'we are already responding to climate change'. The plan notes the significant strain on local teams, communities, and suppliers. It is expected that climate hazards will continue to affect the Sounds into the future, as sea levels rise and intense rainfall events continue or worsen in frequency and duration.

Table 4-13: Problem evidence summary

Problem			Summary
Problem 1: Disrupted Access	Cause	Sea level rise and land subsidence	• Sea rising at a rate of ~2.7 mm/year (at Portage, under the 2-4.5 (medium confidence) RCP scenario) and land is sinking on average 1.6 mm/year (at Portage), giving an estimated seal level rise of 30cm by 2050 for Portage. • Under the SSP5-8.5 scenario sea level could rise by up to 1m at Portage by 2100. Sea levels will continue to rise for many years beyond this due to historic greenhouse gas emissions.
		Costal erosion and inundation	• Areas under 3m elevation at high risk of inundation and erosion • Areas between 3m and 5m elevation at medium risk of inundation and erosion • Areas above 5m but within 100m of the coast may be at risk from future erosion
		Storm frequency and intensity change	• Frequency: with future climate change (RCP4.5 2081-2100), damaging events will be approximately twice as frequent as historic patterns • Intensity: August 2022 rainfall was three times the previous monthly maximum, and five times larger than the historic average. Intensities will increase with climate change. Under RCP4.5 2081-2100, the 1:100 AEP future event will be about as intense as the 1:200 AEP historic intensity.
	Effect	Increase in frequency and duration of road closures	• Data gap prior to 2021 • In December 2021 (5 months after storm event) 0.1 km of road was closed and 108 km of roads were under residents only access • In December 2022 (4 months after storm event) 2.3 km of roads were closed and 65 km were under restricted access. • Closures likely to become more frequent with climate change.
	Consequence	Impacted access	• There were months of roads closures following the 2021 and 2022 events. Kenepuru Road is still under restricted access and has been since the 2021 weather event.
Problem 2: Lack of Alternatives	Cause	People live here	• 2,055 permanent residents • 63% of dwellings are empty most of the time. • Sounds population peaks in summer when bach owners are other tourists come and stay (approx. 5,000 additional residents)
		Businesses are located here	• At least 150 businesses • Known businesses in the Sounds include farming (sheep, cattle, deer), forestry, aquaculture (muscles, salmon, seaweed, etc), and many tourism offerings including accommodation, cafes and guided tours.
		No alternative overland routes	• All roads in the Sounds are eventually dead ends, so if one part of a road is closed, everyone beyond that point loses access. The one exception to this is the Port Underwood Road. • **Queen Charlotte Drive is critically important for resilience of the state highway network as it provides an alternative route between Blenheim and Havelock in the event of a closure of SH6, and between Blenheim and Pickton in the event of a closure of SH1.**
		Limited water routes	• There are some existing water access points available, but they are more expensive and less convenient for locals, and some have tidal restraints. • Approximately 75% of properties are more than 50m from a jetty, and 63% are more than 100m from a jetty

Problem			Summary
			• The Sounds are generally considered too shallow for development of new water access points.
Problem 2 continued	Cause cont.	Limited air routes	• There is a reasonable collection of airstrips in the Sounds, however they are mostly privately owned and used for farming and agriculture. • Air travel is not an affordable or realistic option for many residents.
	Effect	Risk to lifeline infrastructure	• **The Cook Strait electricity cable runs along Port Underwood Road and Tumbledown Road, as does the interisland fibre optic cable. These provide the only national connection between North and South Island for telecommunications and power.**
		Loss of access to community facilities	• Health care can only be accessed in Havelock and Picton • Secondary education can only be accessed in Rai Valley or Picton • Supermarkets and food supply can only be accessed at Okiwi Bay, Havelock and Picton • If any road is cut off, currently no easy alternative
	Consequence	Uncertainty	• A common theme from the community engagement sessions was the impacts of the uncertainty around future access. This is compounded by some within the community having expectations of a higher level of service to what is detailed in Council's roading AMP and the ONF.
		Negative Health Impacts	• Sounds Survey 2023 showed people's mental and physical health scores declined after the storms, compared to before, with mental health strongly affected, with scores declining 30%. Business owners in Kenepuru, Queen Charlotte Drive and French Pass were disproportionately affected. • Based on the Sheppard Agriculture survey 69% of livestock farmers are more concerned with their mental wellbeing since the 2022 weather event. • A common them from the community engagement sessions was the stress caused by the uncertainty around the future of the roads.
		Economic Impacts	• Sounds Survey 2023 showed 18% of residents operating businesses in the sounds reported loss of income. The average loss was $27,000 and the maximum was $150,000. Business confidence dropped by 20-30%, with businesses in Kenepuru and Queen Charlotte Drive most negative, followed by those in French Pass. • Anecdotal evidence of increased cost to get stock/ product in and out of farms in Kenepuru.
Problem 3: Asset Vulnerability	Cause	Geology	• Many sections of road are built on unstable land. Many would not be constructed today due to the number of underlying hazards. • A long section of Kenepuru Road between Motapu Bay Road and Kenepuru Heads is on unstable land.
		Poor construction	• The construction standard of many of the roads was not suitable for the underlying geology and topography.
		Infrequent maintenance	• A recurring comment at all the community meetings was a perceived lack of road maintenance, particularly drainage maintenance. • A comparison with MDC's peer group that for 'access' roads, which is most roads in the Sounds, Marlborough had the highest spend on bridge, pavement and shoulder maintenance per lane kilometre, and second highest spend on drainage and surfacing.
	Effect	Susceptible to landslips	• Typically, the over slips and under slips from the 2021 and 2022 weather events occurred in areas of unstable land. • Kenepuru Road, French Pass Road, Queen Charlotte Drive and Port Underwood Road experienced the highest concentration of slips after the 2022 event. • There were 1892 slips affecting roads after the 2022 event.

Problem			Summary
Problem 3 continued	Consequence	Safety	• There have been four fatal crashes and seven serious injury crashes in the Sounds between 2017 and 2021. • In 2022 (until early December) there was one fatal crash and three serious injury crashes. • 66% of all crashes were loss of control off road crashes, and all fatal crashes were of this movement type • The road environment (tortuous alignment, very narrow shoulders, high-moderate to high severity roadside hazards) increases the severity of any crashes that do occur.
		Increased maintenance costs	• Prior to 2021/22 financial year 11 roads in the Sounds accounted for 30% of the total spending on rural roads despite only covering 18% of the rural road network.

4.6 Investment Objectives and Benefits of Assessment

4.6.1 Investment Objectives

Three investment objectives have been identified for the project, as shown in the Investment Logic Map below. The investment objectives clarify the future access needs. They summarise the desired outcomes of any investment, articulating what is needed to address the gap between existing and future needs. The agreed Business Case **Outcome Statement** is 'Provide access for the wellbeing of Marlborough Sounds Communities, through a safe and resilient transport system'.

The evidence presented clearly supports the three problem statements.

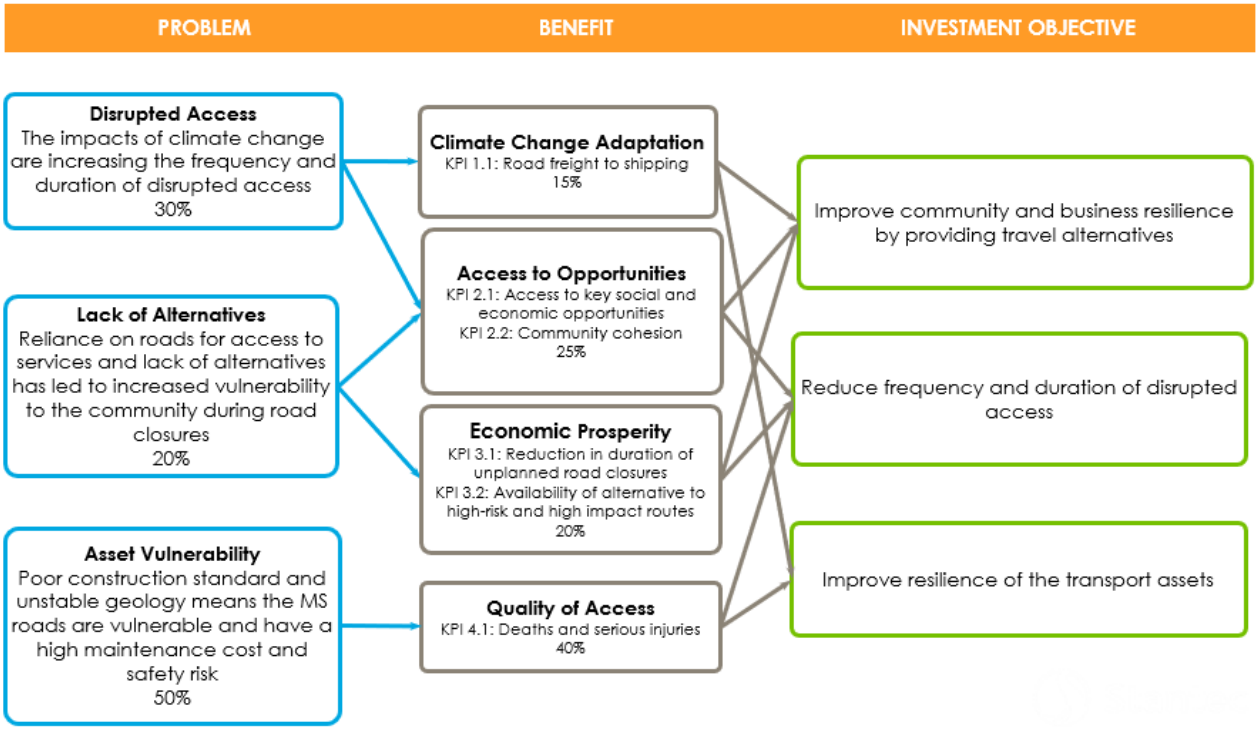


Figure 4-28: Investment logic map

4.6.2 Benefits

A benefits framework has been developed following discussion of project benefits with investors at the Investment Logic Mapping workshop. This is shown in Table 4-8. Key performance indicators (KPIs) have been identified for each project benefit. The KPIs are based on the Waka Kotahi Investment Prioritisation Method GPS alignment criteria, and the Benefits Framework. These KPIs will allow the success of any implementation programme to be measured.

Table 4-9 outlines the baseline for these KPIs.

Table 4-14: Project benefits

Benefit	Key Performance Indicator		
		Name	Measure
Climate Change Adaptation Adapting our transport networks to be able to better withstand or avoid the effects of climate change is a focus of the Tiro Rangi and the Government Policy Statement for Land Transport. Peak rainfall intensity and duration events are increasing and this situation will develop progressively as the climate continues to warm. The benefit of the programme will be to address a known climate change issue that is occurring now. Reducing the exposure of Sounds access to the impacts of climate change will assist in reducing the frequency of road closures and will provide the community and businesses with certainty around future access.	1.1	Road freight mode share to coastal shipping	Percentage of total freight by weight moved via coastal shipping
Access to Opportunities Access to social and economic opportunities is essential for wellbeing and to support the economy and economic activities. Closure of the road impacts on access for the community and businesses, as there are no alternative routes and water/air access is not currently well established. Lack of access leads to isolation and lack of community cohesion, which has negative physical and mental health impacts.	2.1	Access to key social and economic opportunities	Proportion of population able to access key social opportunities such as education, health care and supermarkets.
	2.2	Community cohesion	Social connectedness Severance Isolation
Economic Prosperity Damage caused by the storm events has led to road closures and restrictions, and this has had a social and economic cost for the community as alternative transport methods have been more expensive and involved additional uncertainty and planning, with longer lead in times required as well as longer actual travel times. Queen Charlotte Drive provides an alternate route for both SH1 and SH6, in the event of a closure of either between Blenheim and Picton or Blenheim and Havelock respectively. Port Underwood Road and Tumbledown Road are used for maintenance of the critically important Cook Strait Power Cable and the interisland fibre optic cable. The North Island relies on the power cable for electricity, the South Island relies on the fibre optic cable for internet.	3.1	Road availability	Number and duration of resolved road closures
	3.2	Availability of alternative to high-risk[49] and high impact[50] routes	Percentage of high risk, high impact routes with a viable alternative
Quality of Access The existing roads have known safety risks. Improving the resilience of the transport network will reduce safety risk.	4.1	Deaths and serious injuries	Number of deaths and serious injuries
	4.2	Travel speed gap[51]	Difference between the safe and appropriate speed and the actual operating speed.

[49] High-risk routes are those that may be disrupted or impacted by significant events (including earthquakes, storms, volcanos, and tsunamis).
[50] High-impact routes are those that are of high importance for social and economic activities.
[51] Speed limits are being reviewed as part of ongoing Council work

Table 4-15: Key performance indicators baseline

KPI	French Pass	Pelorus	Queen Charlotte	Kenepuru	Port Underwood
1.1 Road freight to coastal shipping	Prior to the 2021 event tbc% was moved via coastal shipping	0% tbc	0% tbc	0% tbc	0% tbc
2.1 Access to social and economic opportunities	The closet education is in Rai Valley, health care in Havelock, and supermarket in Okiwi Bay. Residents can access these by road.	Havelock is the closest location with education, health care and supermarkets. Residents can access Havelock by road.	Havelock and Picton are the closest locations with education, health care and supermarkets. Residents can access these by road.	Residents currently have restricted road access to opportunities in Picton. People living north of Kenepuru Head often have supplies boated in.	Picton is the closest location with education, health care and supermarkets. Residents can access Picton by road.
2.2 Community cohesion	The 2023 Sounds Survey identified the most frequently reported social impact of the weather events and their ongoing impact was a loss of connection to friends and family. This accounted for 45% of the total comments made. The second most frequent comment only account for 11% of the total responses.				
3.1 Loss of marine and road access	Following the 2022 event most roads were closed for six weeks. The road to from the Port Ligar turnoff to French Pass was closed to all vehicles for nine weeks, and heavy vehicles for 12 weeks. Marine access not yet well developed.	Following the 2022 event these roads were unassessed for four weeks, and then re-opened. Marine access not yet well developed.	Following the 2022 event Queen Charlotte Drive was closed to all traffic for four and a half weeks. Marine access not yet well developed.	Following the 2022 event Kenepuru Road was closed to all traffic for nine weeks and is still closed to non-residents and heavy vehicles (six months). Marine access not yet well developed.	Following the 2022 event Port Underwood Road south of Port Underwood was closed for 11 weeks. Marine access not yet well developed.
3.2 Alternative routes	There is no alternative road access into French Pass. There is water access, but room for improvements.	There is no viable alternative for access to/ from Kaiuma Bay	Queen Charlotte Drive provides alternative route to SH6 and SH1, in event of closure of either.	There is no alternative road access to Kenepuru. There is water access, but room for improvements.	There are no alternative routes for Tumbledown Road. There is an alternative route depending on what part of Port Underwood Road is closed.
4.1 DSIs	Between 2017 and 2021 four fatal crashes, and seven serious injury crashes were recorded.				
4.2 Travel speed gap	Mean operating speed: ≤ 60 km/h Safe and appropriate speed: 60 or 80 km/h **Difference**: -20 km/h	Mean operating speed: < 40 km/h Safe and appropriate speed: 60 km/h **Difference**: -20 km/h	Mean operating speed: < 70 km/h Safe and appropriate speed: 60 km/h **Difference**: -10 km/h	Mean operating speed: < 50 km/h Safe and appropriate speed: 60 or 80 km/h **Difference**: -10 km/h	Mean operating speed: < 40 km/h Safe and appropriate speed: 60 km/h **Difference**: -20 km/h

4.7 Alignment to Existing Strategies, Policies and Plans

It is important that the proposed outcomes for the business case contributes to, and is consistent (or at least not inconsistent) with the aims and objectives of relevant national and regional strategies and policies. Table 4-10 summarises each document and describes how the proposed outcomes for this business case align. The assessment demonstrates consistency and strong alignment with strategies, as all have a focus on ensuring access and resilience.

Table 4-16: Strategic alignment

Document	Alignment
NATIONAL STRATEGIES, POLICIES AND PLANS	
Ministry for the Environment National Adaptation Plan The National Adaptation Plan sets out what the Government will do to enable better risk-informed decisions, drive climate-resilient development in the right locations, help communities assess adaptation options (including managed retreat) and embed climate resilience in all the Government's work. The long-term adaptation goals identified by the plan are to reduce vulnerability, enhance our ability to adapt, and strengthen our resilience.	Alignment is **VERY STRONG** as the outcomes seek to address identified climate adaptation issues.
Tiro Rangi - Waka Kotahi Adaptation Plan 2022-24 Tiro Rangi is the long-term plan for adapting the land transport system to our changing climate. This involves planning and adapting to the effects of climate change to avoid ongoing disruptions and costly emergency responses. The goal is 'by 2050 our land transport system to be resilient in a changing climate to enable a system that improves wellbeing and liveability'. There are four levels of response: 1. Avoid – avoid development in an area exposed to multiple future climate hazards 2. Protect – use grey and green engineering solutions to protect infrastructure 3. Accommodate – minimise disruption through alternative routes and drainage design that allows better flood management 4. Retreat – relocate infrastructure away from hazards. Retreat may be necessary where protection and accommodation are not viable.	Alignment is **VERY STRONG**. The Marlborough Future Access PBC contributes to the overall goal of Tiro Rangi by seeking to adapt access to the Sounds so that it is resilient to climate change. Options will be structured using the four levels of adaptation response.
Government Policy Statement on Land Transport 2021 This document outlines the Government's priorities for land transport, providing direction and guidance to those who are planning, assessing, and making decisions on transport investment for the next 10 years. It identifies four investment priorities: • Developing a low carbon transport system that supports emission reductions, while improving safety and inclusive access, and alignment with the National Adaptation Plan to create a network that is resilient to climate change effects. • Improving Freight Connections for economic development. • Developing a transport system where no-one is killed or seriously injured. • Providing people with better transport options to access opportunities.	Alignment is strongest with climate change (through adaptation). There is also alignment with freight connections and safety. Overall alignment rating is **STRONG** (although ratings vary across priorities)
Arataki (2023) – Waka Kotahi's 30-year plan This is Waka Kotahi's 30-year Plan to deliver on the government's short term priorities and long term outcomes for the land transport system. Outcomes align with the MoT Transport Outcomes Framework. The overall desired outcome is for a transport system that improves wellbeing and liveability, with five outcome areas - inclusive access, economic prosperity, resilience and security, healthy and safe people and environmental sustainability. The plan recognises that future changes, including the increasing cost of infrastructure due to resource scarcity, network complexity and impacts of climate change. It anticipates that severe weather events will occur more often, and the transport sector will need to work with communities and infrastructure providers to understand the options for managing climate change impacts. This mean looking at a different mix of transport options, for example more water-based travel as network backup to minimize downtime and support system resilience. The Regional Summary for Top of the South identifies the growing risk of damage to road networks because of increased rain and storm intensity, coastal and soil erosion, sea level risk, flooding, slips and storm surges.	Alignment is strong with the climate change driver for future change, and with the resilience future outcome. The closest alignment is with the focus for the Top of the South on confirming how key resilience risks will be addressed over time, and work with communities to identify plans for when to defend, accommodate, or retreat. Overall alignment rating is **STRONG**

Document	Alignment
Waka Kotahi NZ Transport Agency Road to Zero 2020 – 2030 The vision of Road to Zero is "a New Zealand where no one is killed or seriously injured in road crashes". The Strategy focusing on actions in five key areas: infrastructure improvements and speed management; vehicle safety; work-related road safety; road user choices; and system management.	Alignment is **MODERATE**. This project is aligned to the Road to Zero vision, given that improvements to the corridor would likely also improve the overall safety.
REGIONAL PLANS	
Draft Regional Land Transport Plan 2021-2031 The six strategic objectives of Te Tauihu Regional Land Transport Plan (RLTP) are: mode choice; safety; network management; economic prosperity; resilience; and environmental outcomes.	Alignment is **STRONG**. This project is well aligned with the RLTP strategic objectives, primarily aligning with the resilience objective, but having significant alignment with environmental outcomes and economic prosperity.
Marlborough Roading Asset Management Plan (2018-21) The Plan provides a strategic approach to managing the district's roading assets to help contribute to community outcomes. While outside the indicated timeframe, this is still the current version on the website. The plan seeks the following outcomes: • Reduction of deaths and serious injuries • Integrated, reliable and fit for purpose transport choices • Achieve appropriate customer levels of service • Increase GDP and Tourism	Alignment is **STRONG**. This project aligns with achieving the appropriate customer levels of service. It has more moderate links to the GDP and tourism outcomes and safety outcomes.
Marlborough Long Term Plan This plan notes that climate change is one of the key challenges facing infrastructure, and that the increasing frequency and intensity of natural events is impacting on our vulnerable local road network, resulting in more frequent emergency events, network deterioration and subsequent network disruption. The long term plans also notes the importance of aquaculture, seafood, fishing and forestry to the local economy.	Alignment is **STRONG**. This project is directly aligned with one of the biggest challenges noted for the transport network in the LTP and access to the Sounds is a critical component for key economic drivers
Marlborough Climate Change Action Plan 2020 The Action Plan outlines the steps that will be taken in the short and medium term to manage climate change. The Action Plan outlines four key goals: 1. Reduce greenhouse gas emissions (including net carbon emissions). 2. Become more resilient to the impacts of climate change. 3. The Marlborough community is informed of climate change actions and options for response. 4. Council shows clear leadership on climate change issues.	Alignment is **STRONG**. The project is directly aligned with Goal 2 and will contribute to achieving the other three goals.
Marlborough Economic Wellbeing Strategy This strategy has a vision for a thriving economy balanced with a flourishing environment and vibrant communities. It presents three main goals: • Accelerated cross-collaboration between various industry sectors, businesses, and industry stakeholders to achieve efficiencies and increase productivity through technology and innovation. • For Marlborough to be a recognised leader in Agritech solutions in Australasia – specifically in wine, viticulture, aquaculture and the Blue Economy. • For Marlborough to develop and adopt an economic wellbeing framework in collaboration with businesses and industry sectors.	Alignment is **MODERATE**. The project enables access into areas with strong aquaculture and blue economy attributes and maintaining reliable access to these areas is essential to enabling this growth.

4.8 Issues and Constraints

Key economic, social, environmental, transport, stakeholder and other issues and constraints could influence the scope of the project outcomes and outputs. 'Issues' include uncertainties, assumptions and dependencies that the study may not be in a position to resolve but must work within the context of. 'Constraints' are limitations imposed on the investment proposal from the outset.

Table 4-17: Uncertainties, assumptions, and dependencies

Issue	Description	Mitigation
Uncertainties	Future storm or seismic events	Further damage may arise from future events. This may affect the preferred programme, which would need to be reviewed if further damage were to occur. Programmes will use data from recent events to inform development of resilient options for the future.
	Price volatility	Multiple factors have resulted in volatile prices in recent times that are impacting the cost of living, oil prices and supply chain security. This will be factored into the estimation of project delivery costs.
	Funding	Other agencies are being approached early in the business case process as there may be insufficient funding available from MDC and Waka Kotahi. In addition, the community might not want to fund the preferred programme.
	Future viability of economic and social activity	The viability of economic and social activity in the Sounds has been established through provision of access by road. If access is reduced, these activities may no longer be viable. The impact on these activities will be considered in the Economic Case and options assessment.
	Requirement to provide access to private property	The position on the requirement of road controlling authorities to provide access to private property in the face of future climate hazards is unclear, and liability has not been well tested. It may take some time for an approach to be developed.
	Viability of property insurance schemes	Insurance companies may reduce or no longer provide cover for properties. This may reduce demand for roads. It may change the demographic of people moving to the area, with appeal for people who want to be independent and 'off grid'. The business case will clarify future access, and the programme assessment will include economic and social impacts.
Assumptions	Government position	The position on 'retreat' and possible financial compensation for that is unknown.
	Recovery Plan	The business case will be used to guide the level of service that will be restored as part of the Recovery Plan.
	Future storms or seismic events	The business case assumes future events will happen and this will influence levels of service and the feasible preferred programme.
	Water infrastructure	It is assumed that marine assets and services will continue to be economically viable and available to provide access to the Sounds. Feasibility and costs associated with improving water access are uncertain. Water access will be investigated within the programme options but further investigation will be required for future business case stages.
	Maintenance	It is assumed that maintenance will be undertaken for the Preferred Programme, and this will be included in the programme costs.
	Level of service	It may not be possible to meet the community's level of service expectations for road access, within available funding streams.
	It is safe to continue living in the Sounds	It is assumed that global stability and associated safety issues related to living in the Sounds will be considered by the Council in future planning.
	Utilities	Utilities affected by the storm events will be reinstated outside this process. Options to enable servicing via different forms of access will be included.
Dependencies	Marlborough Roads Recovery Plan	The completion of the Recovery Plan is dependent on the completion of the business case and subsequent funding.
	Marlborough District Plan	There are around 1,500 currently vacant sections that could potentially be developed under the current District Plan. The proposed future access identified through this business case will affect access to the Sounds, and this will influence future development, land use including land use management practices, and population growth.

Table 4-18: Constraints

Constraint	Description
Lack of established guidance	Guidelines and policies that assist in the process of accommodating climate forced adaptation are still being developed. This means that the business case must instead rely on a balance of best practice, local knowledge, engineering judgement and 'what feels right'. There are no previous studies to lean on or learn from.
First PBC of this nature in NZ	In the Sounds, transport networks are a lifeline, and other lifelines are dependent on this access. This is the first PBC of this nature in NZ, and it will be difficult to compare this process and conclusions to other areas in similar situations.
Timeframe	The business case has been proceeding at pace in order to provide certainty to the community. However, this comes at a cost in terms of time available for community involvement.
Total project cost	Investment partners have finite funding availability. The total project cost should be realistic.
Community	Capacity of the community to pay for the preferred programme.
Rural population	Dispersed, isolated, rural population makes protecting access more difficult to achieve.

5 Investment Prioritisation [tbc]

An assessment of the GPS alignment, scheduling and efficiency factors has been completed for the investment, in accordance with the Transport Agency Investment Prioritisation Method (IPM) for the NLTP 2021-24.

The anticipated profile is VH/H/-. This means the programme is Priority X out of 12 (tbc). The rationale for these ratings is explained further below.

5.1 GPS Alignment

Overall, the GPS Alignment is **Very High** – refer to Table 5-1. The project aligns with all the Government Policy Statement for Land Transport Groupings, as shown. Alignment is Very High for Improving Freight Connections, because implementing the preferred programme will reduce the duration of unplanned road closures of more than two hours which affect freight.

Table 5-1: GPS Alignment

Grouping	Alignment	Criteria	Assessment
Improving Freight Connections Project Benefit: Economic prosperity	Very high	>31% reduction in duration of unplanned road closures/service disruptions of >2hrs	Some sections of road have been closed or had restricted access for several months following storm damage. This has affected the movement of stock and forestry products to markets, with water transport being utilised instead, subsidised through the Mayoral Relief Fund. This has required significant changes to practice and there have been economic ramifications for businesses affected.
Improving Freight Connections and Climate Change Project Benefit: Economic prosperity	Very high	>6% change in road freight mode share to coastal shipping measured as percentage change in volume of road freight AADT on corridor moved to alternate mode. Compared to 2021.	Percentage of freight vehicles (2015): • Roads to French Pass - 12% • Kaiuma Bay Road - 11% • Kenepuru Road (Linkwater-Heads) - 11% • Kenepuru Road (Heads-Raetihi) - 9% • Port Underwood Road (Picton-Port Underwood) - 13% • Tumbledown Road - 11%
Climate Change Project Benefit: Climate change adaptation	High	Addressing a known climate change adaptation issue that is forecast to occur by 2040	The problems relate to a known climate change adaptation issue that is occurring now for roads providing access to the Marlborough Sounds. This access vulnerability to increases in peak rainfall duration and intensity will get progressively worse as the climate continues to warm.

5.2 Scheduling

The scheduling factor has two criteria: interdependency and criticality. The highest rating is used to determine the priority. Criticality is concerned with the urgency for delivery of the programme, and the importance of the programme to ensuring the transport network is resilient. Interdependency is concerned with activities that are part of a wider programme or package or needed to increase the resilience and connectedness of the transport network.

Interdependency Rating = **High**. The programme meets the 'high' requirements for both timing and resilience. Delivery of the programme is urgent and needs to begin in 2021-24. For resilience, unplanned loss of service (more than 2 hours) results in most users needing to use alternative routes or modes which take more than 2 hours extra travel time.

Criticality Rating = Low. The programme is a standalone programme. Non-delivery will not affect part of a separate programme or package.

5.3 Efficiency

The efficiency rating reflects the benefit-cost ratio. The BCR for this project is expected to be in the range XX-XX, which gives a rating of XX (tbc).

Appendices

Appendix A Detailed Dwelling Occupancy

Area	Occupied	Residents Away	Empty Dwelling	Total	Percentage Empty
French Pass	**252**	**24**	**564**	**849**	**66%**
7023222	42	C	C	48	C
Okiwi Bay (SA1 7023225)	54	3	132	192	71%
7023228	93	9	228	330	72%
7023233	90	0	138	234	69%
Rangitoto ki te Tonga/ D'Urville Island (SA1 7023234)	18	3	39	60	67%
Stephens Island/Takapourewa (SA1 7023236)	C	C	C	C	C
Pelorus (SA1 7023224)	**69**	**3**	**30**	**102**	**29%**
Queen Charlotte	**324**	**24**	**300**	**648**	**46%**
7023239	30	0	6	36	17%
7023241	84	6	66	156	42%
Linkwater to Picton (SA1 7023243)	93	3	87	183	48%
Anakiwa (SA1 7023245)	87	12	69	168	41%
Ngakutu Bay (SA1 7023247)	30	3	72	105	69%
Kenepuru	**318**	**30**	**912**	**1,269**	**72%**
Moetapu Bay (SA1 7023242)	60	12	135	198	62%
Mahau to Kenepuru Heads (SA1 7023250)	129	9	558	690	80%
Beyond Kenepuru Heads (SA1 7023252)	129	9	249	381	63%
Port Underwood	**150**	**12**	**333**	**501**	**63%**
7023249	18	C	C	18	C
7023251	48	6	30	87	34%
7023253	42	3	18	63	29%
7023254	30	3	186	219	85%
Arapaoa Island (SA1 7023255)	12	0	99	114	87%
Total	**1,113**	**93**	**2,139**	**3,369**	**63%**

Appendix B Stakeholder Issues and Options Workshop

B.1 Presentation Slides

Marlborough Sounds Future Access

Workshop 1: 24 January 2023

Karakia timatanga

Agenda

Welcome and Overview

Strategic Case Context

Access Issues

Problem Evidence Summary

Break

Issue identification break out

Break

Possible solutions break out

Next Steps

Close

Introductions and Overview

- Stakeholder introductions
- Project overview
    - Governance Advisory Group
    - Scope
    - Key milestones
    - Business case process
    - Workshop purpose

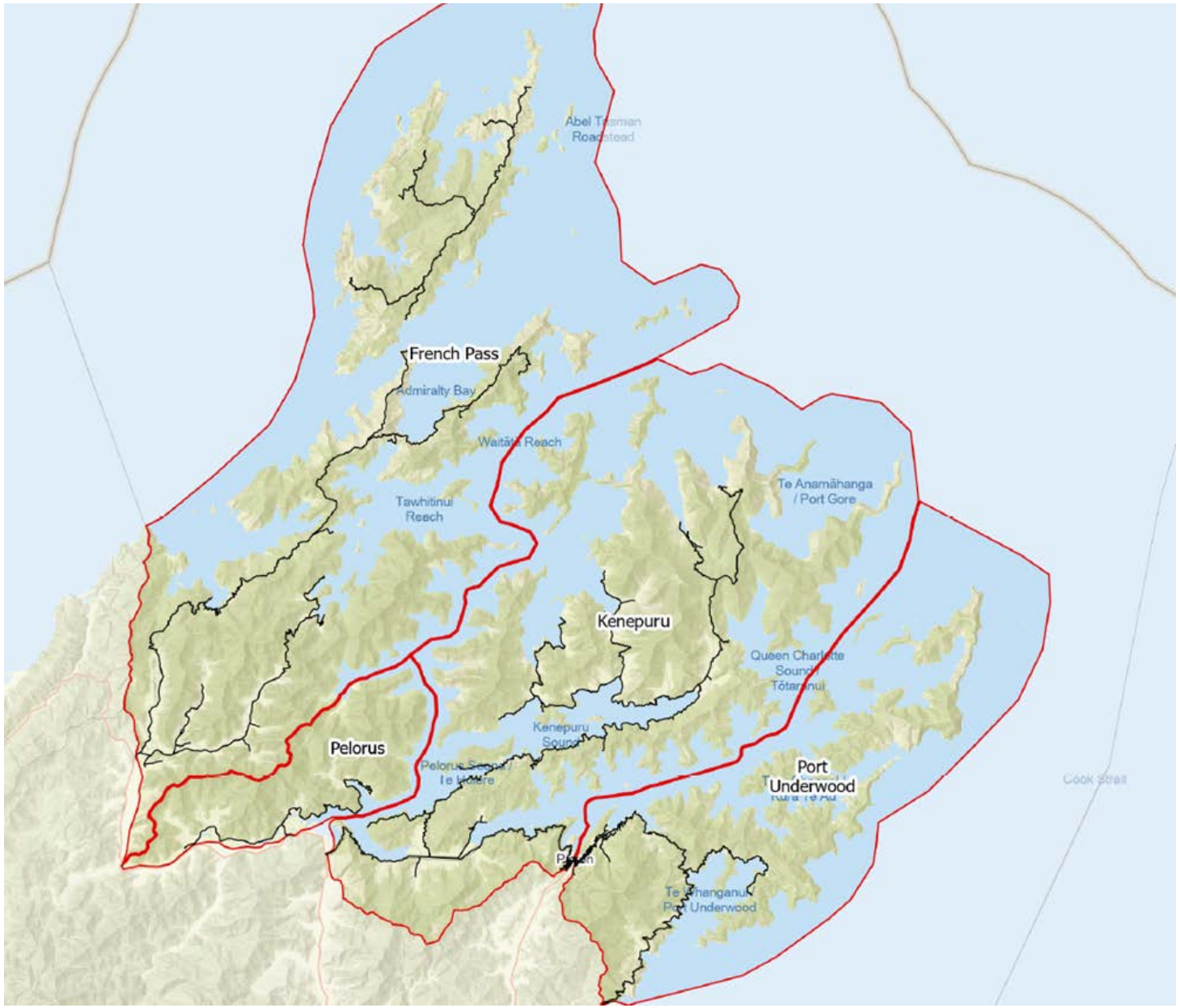
Project Governance Advisory Group

- Marlborough District Council
- Marlborough Roads
- Mana whenua and tangata whenua representative(s)
- Te Kotahi o Te Te Tauihu Charitable Trust
- Port Marlborough
- Waka Kotahi NZ Transport Agency
- Department of Internal Affairs
- National Emergency Management Agency
- Department of Conservation
- Regional Public Service Lead - Te Tau Ihu


Kenepuru

Study Scope

- French Pass
- Pelorus
- Kenepuru
- Port Underwood



Key Milestones

Milestone	Target Date
Consult with community	January 2023
Investigate options	February 2023
Consult with funders	March/ April 2023
Consult with community	May 2023
Identify preferred option and next steps	June 2023
Funding decision	TBC
Inform community of funding decision	TBC

Business Case Process

- What is the problem?
- Why do we need to solve it? Why now?
- What are the options to solve the problem?
- Evaluate and decide what is the preferred option
- Plan the next steps including:
    - Who will fund it?
    - When will it be delivered?
    - How will it be delivered?

Surveys

- Will inform the business case and final project
- Residents and business survey


Queen Charlotte Drive

Workshop Purpose

- Bring key stakeholders together
- Build common understanding of scope and study outcomes
- Study team to present their understanding of the problem
- Stakeholders to provide feedback to the study team of key issues
- Stakeholders to identify options they think need to be considered
- Discuss next steps

Marlborough Sounds Context

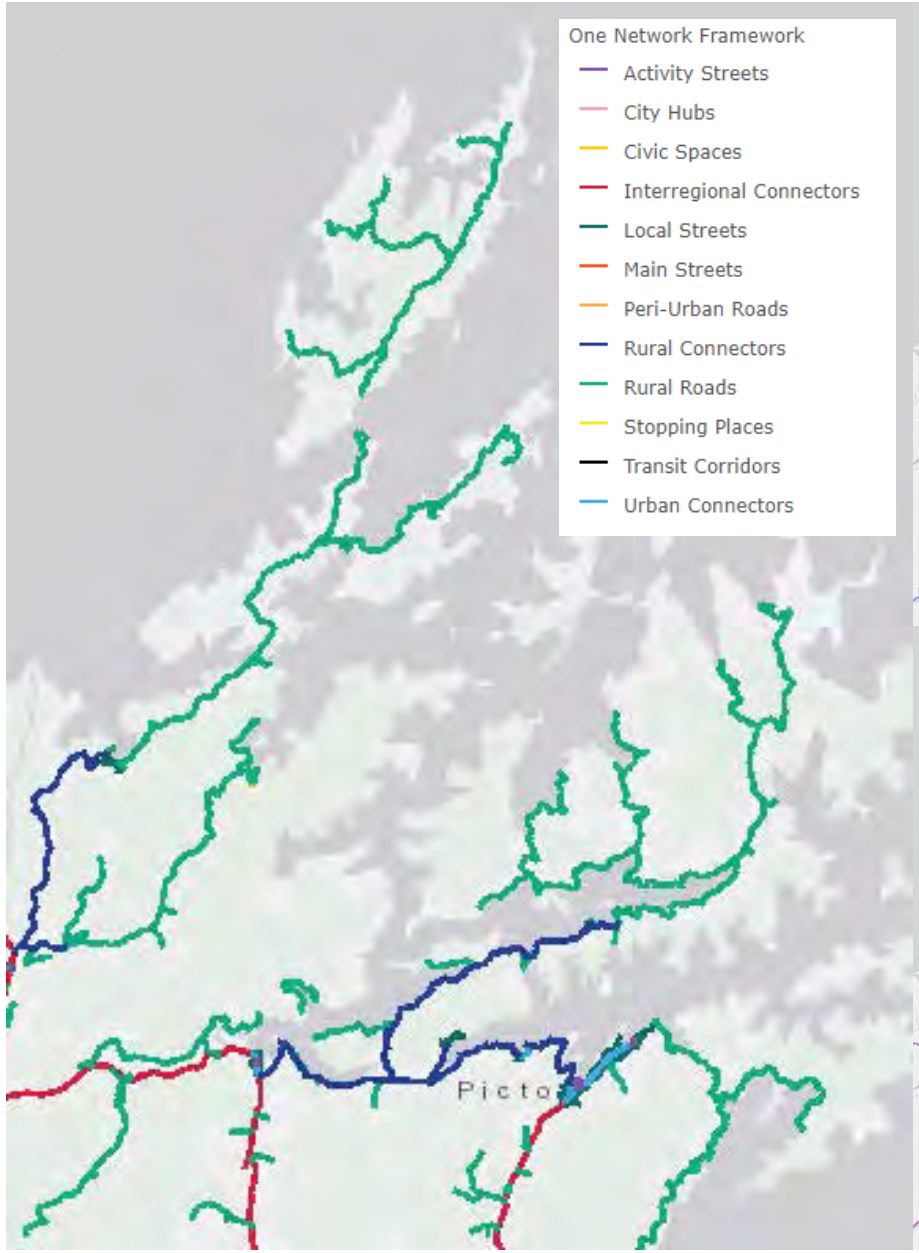
Transport

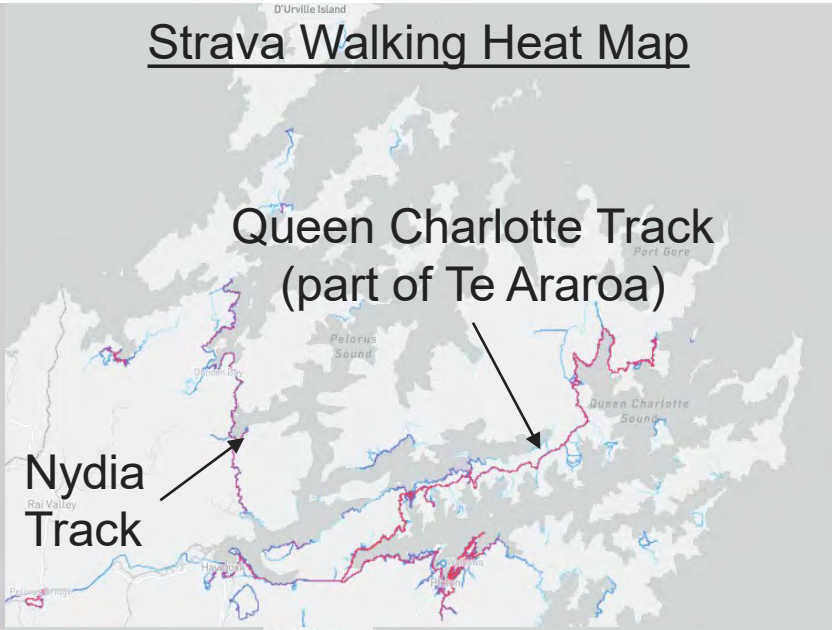
Roads

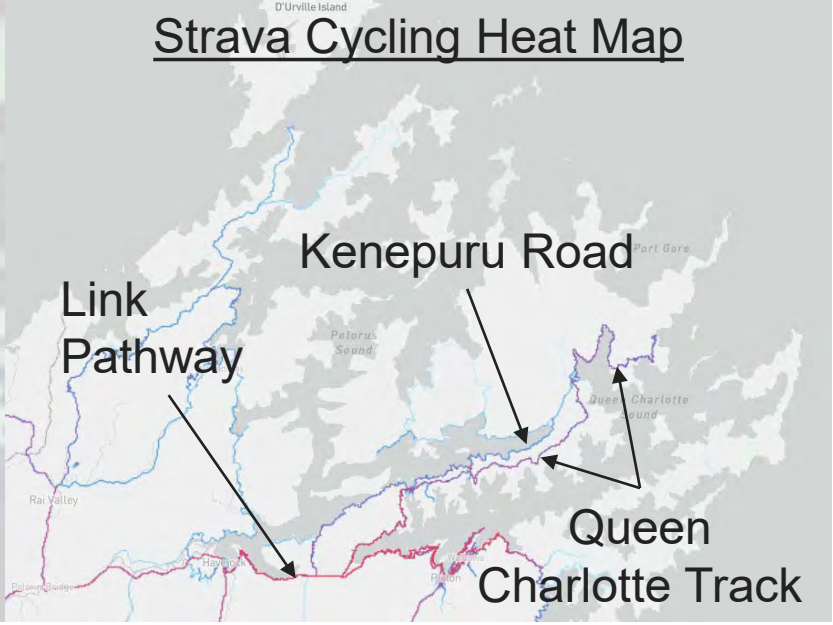
- 259 km sealed
- 266 km unsealed
- Speed limit: ~100km/h
- Operating speed: between 30 – 50km/h
- 10 – 380 vpd (9-12% heavy)
- Significant increase in traffic volumes over summer

Walking and Cycling

- Many popular recreational tracks



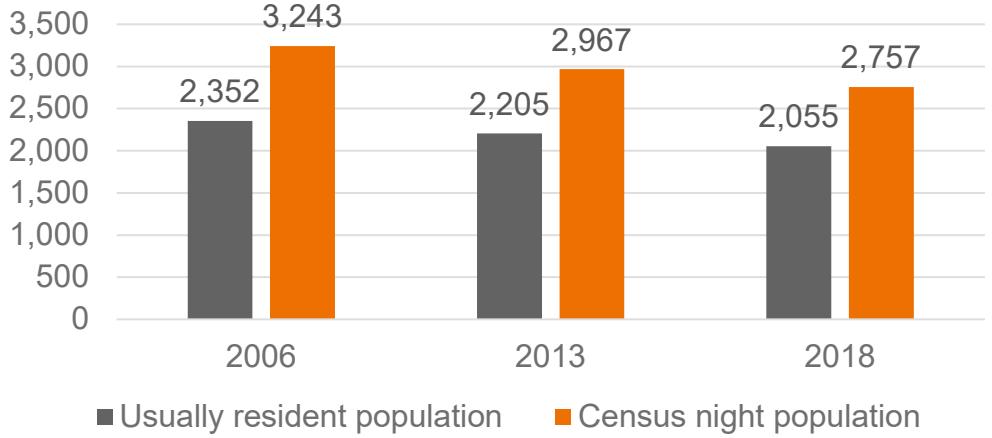




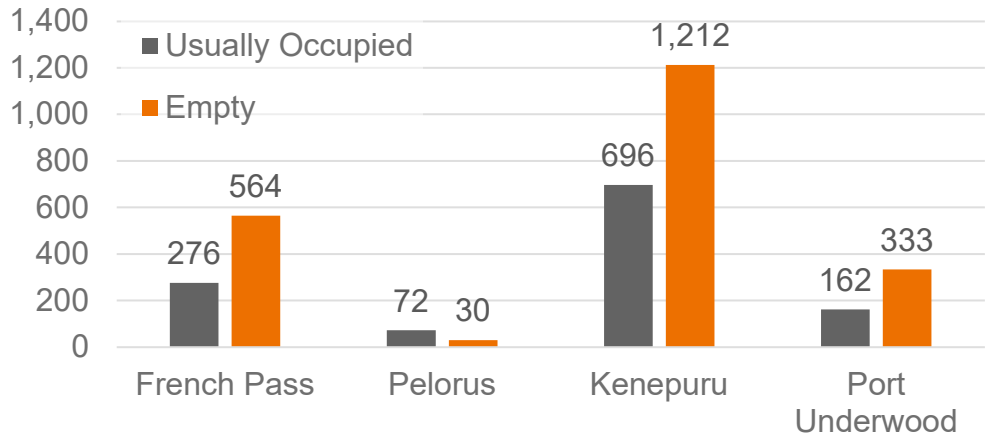
Social and Economic Context

- Population: 2,055
- Shrinking 15-64 age group
- 63% of dwellings are usually empty
- Biggest employers:
  - Agriculture, forestry and fishing (240)
  - Accommodation and food services (99)
  - Construction (75)

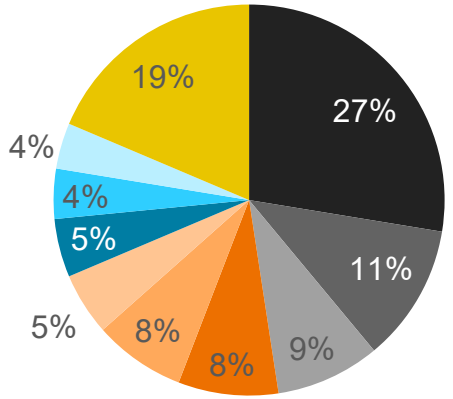
Visitor Population



Dwelling Occupancy



Employment Industries

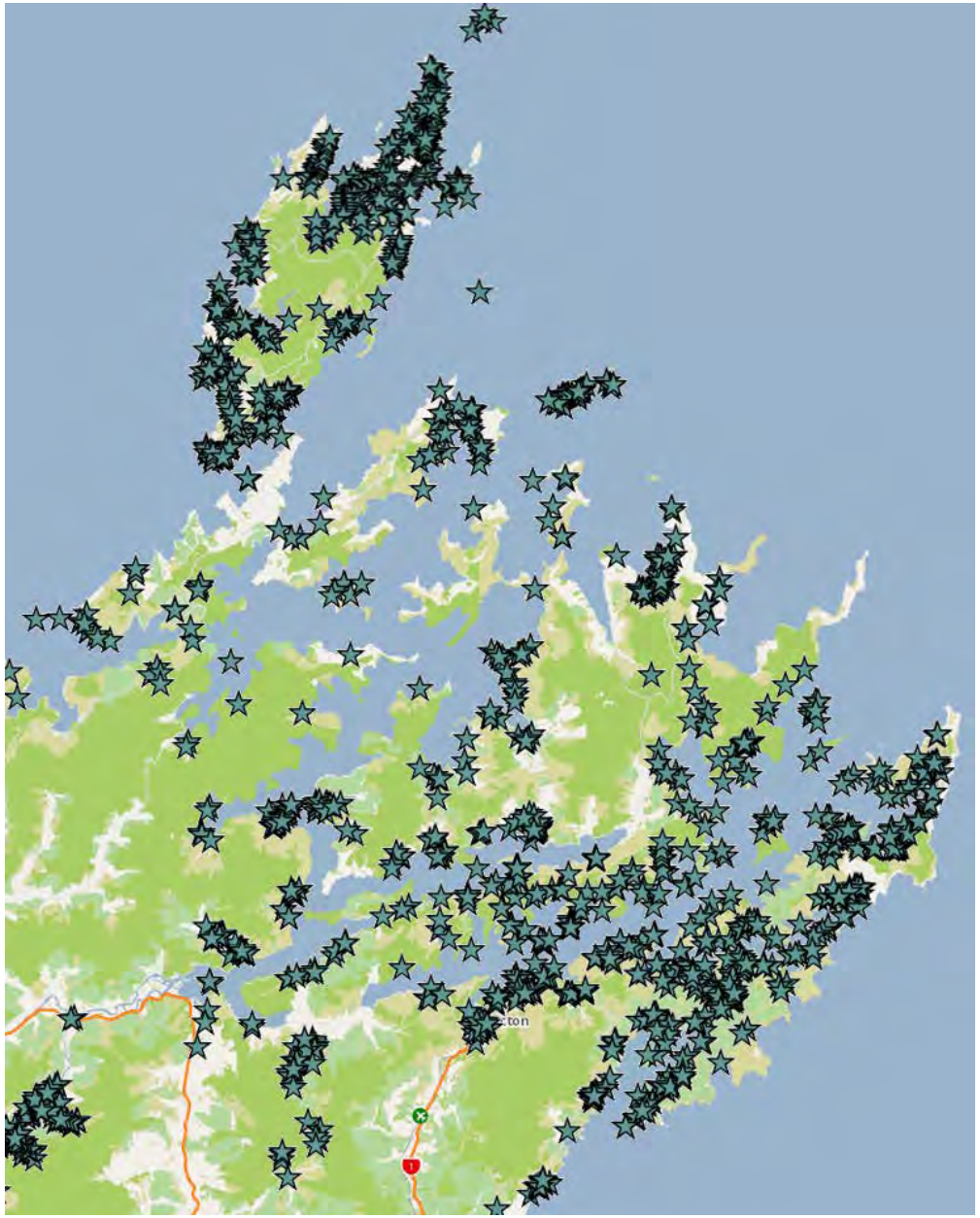


Cultural and Historical Context

Hundreds of recorded archaeological sites

Proposed Environmental Management Plan:

- 8 sites with significance to Marlborough's Tangata Whenua Iwi
- 3 Category A heritage resources
- 13 Category B heritage resources



Access Issues

Business Case Purpose

Provide access for the wellbeing of Marlborough Sounds communities *with a safe and resilient transport system*

Comments

- Agree this represents the aspiration for this project
- Any decisions will affect wellbeing
- Reflects feeling of community
- Don’t want to see this a pure financial case

Issues

- 2021 thought could restore road network
- Subsequent event within 12 months increased magnitude of damage before could recover
- Soils are poor
- Roads not built to proper standards when initially built
- Use and increasing use by heavy vehicles creating more damage
- Always expensive to maintain
- These two events far worse than previously experienced
- Almost as expensive as NCTIR (Kaikoura EQ recovery project) but only servicing 1,000 properties
- Can we affordably sustain them in Climate change more frequent intense events
- What needs to be done to make them more resilient, affordable to District and government
- Are levels of service affordable and fit for purpose
- People rely on roads as if they are in town, and expectation is that they can run down to 1 days supply, expectation road will always be open, local businesses have done the same
- Emergency access for the community following events
- Large number of visitors can be impacted if event occurs while they are there
- Main North South power cables, Port Underwood Road was to service this, and cable is buried in this road and overhead, National Grid
- Fibre optic cables Fighting Bay managed by Transpower (buried in Port Underwood, Tumbledown) interisland, cable protection zone across Cook Strait, National Grid

Issues (cont.)

- Kenepuru Road is main route for power cables, and needed for servicing, services around 1,500 properties Kenepuru Community
- Businesses rely on the roads to be kept open, higher cost for them to use alternative modes for access, particularly aquaculture (Elaine Bay example), impacts major employers
- Need fire trucks able to get in to fight fires, need roads
- Remote workers unable to access airport when needing to travel to work
- Don’t have clear picture of what an acceptable level of service is going forward
- Community has expectation that doesn’t fit with Council’s Roading Asset Management Plan and One Network Road Classification for this road
- Expectation doesn’t match available funds
- Amount of rates probably only half what road maintenance costs are excluding damage from exceptional events
- Increased frequency of emergency events and higher maintenance costs make it a bigger issue now
- Kenepuru geotechnically unstable, people don’t understand this
- Roads were sealed for amenity value, drainage was never addressed, standard was poor, causing a lot of problems now
- Don’t know volume of people, permanent versus temporary residents
- Don’t know who has alternative access, for example in boats

Issues (cont.)

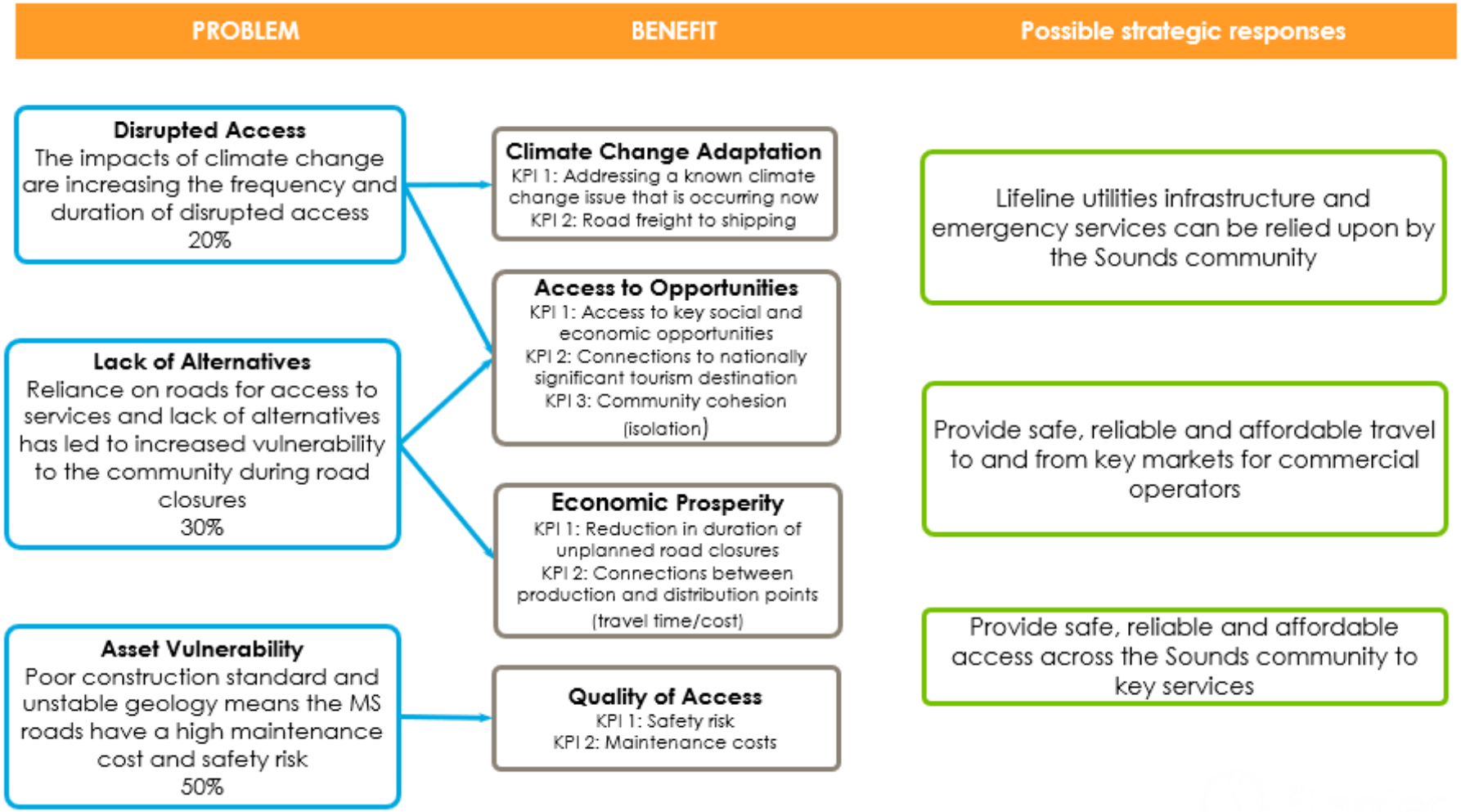
- Community isn't expecting gold plated, would be happy providing there is some sort of road, expectations may be different for different parts of the community such as farmers versus residents
- Biggest social issue, can't live lives impromptu now, biggest impact is having to plan
- Every time it rains, very worried about what impact is, creating a lot of stress for the community, lack of certainty
- Issues with coastal access: barge, jetties, etc.., limited capacity if needed
- Issues with access to coastal facilities, not everyone can get to coast if there is no road access, might need access through private properties
- Not enough providers / operators such as water taxis if demand increase
- Much of sounds are too shallow to develop new water access points
- QCD is a primary collector and is alternative route for SH6 and SH1 of this is out, Kenepuru, dairy farms etc.…
- Safety issues with road network: driving off the edge, narrow, no edge barriers, conflicts between heavy vehicles and light vehicles, increasing number of narrow areas as a result of the storm events increasing safety risk
- Visitors aren't used to roads, roads aren't suitable for different types of vehicles such as campervans, boat trailers, etc..
- Heavy vehicles cross centrelines on blind corners, not just farm servicing trucks but other businesses and development

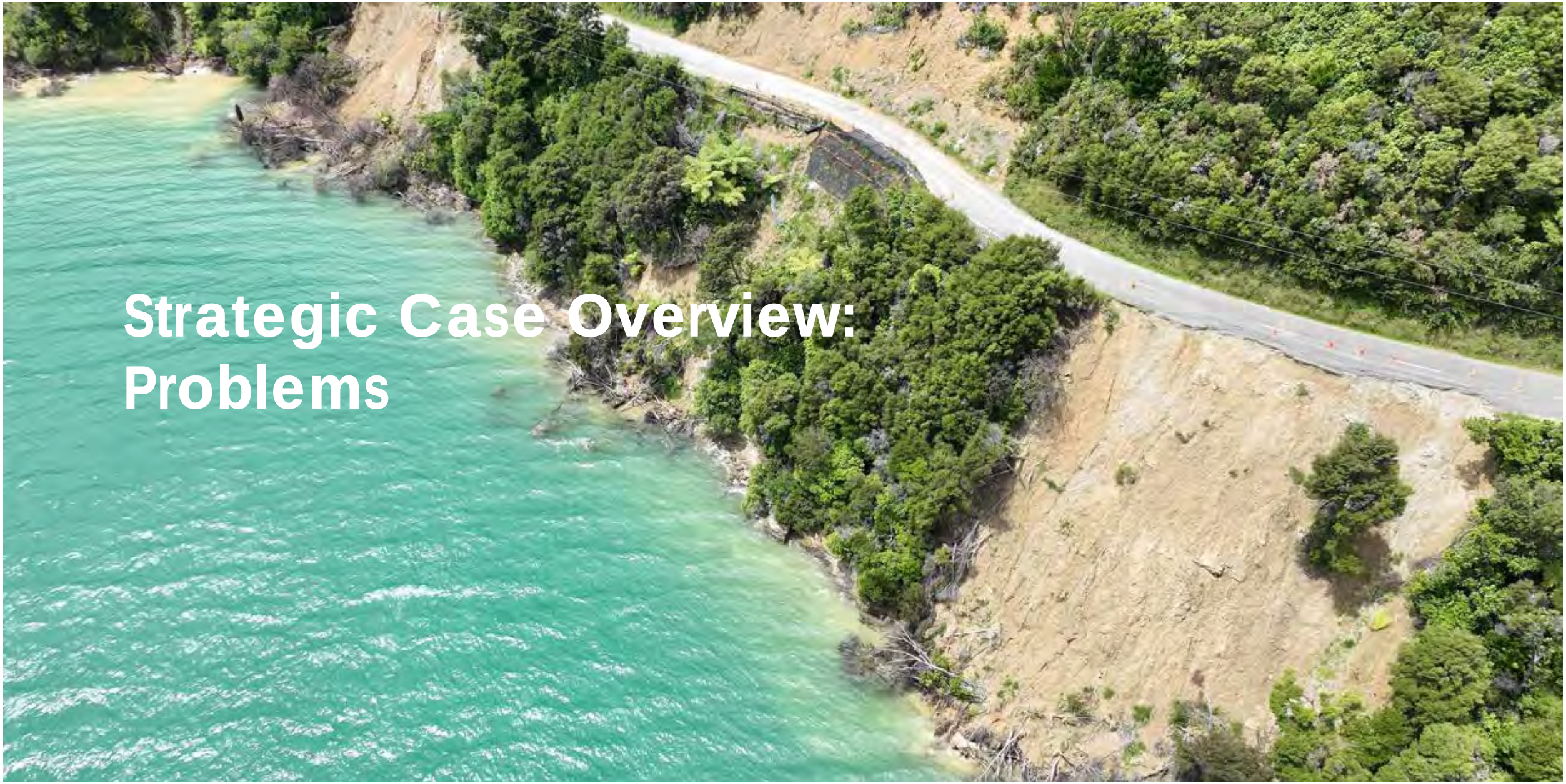
Problem theme, cause and consequence

- Climate Change – frequency of storm events
- Unstable soils and underlying geology
- Poor road construction standard (especially heavy traffic)
- Water access not set up (road reliance)
- Small number of properties (high cost to maintain road)
- Varying LoS expectations across community / sectors on access
- Deteriorating road condition
- High cost to fix road
- Ratepayers base small compared to cost
- National risk to power and fibre optic cables
- Environmental / prevailing and changing conditions (Geology and climate change)
- Road standard and level of service
- Alternative access modes
- Lifelines utilities vulnerability

Marlborough Sounds Future Access
Final Investment Logic Map

Outcome Statement: Provide access for the wellbeing of Marlborough Sounds Communities, through a safe and resilient transport system





Strategic Case Overview: Problems

Problem 1: Disrupted Access

The impacts of climate change are increasing the frequency and duration of disrupted access

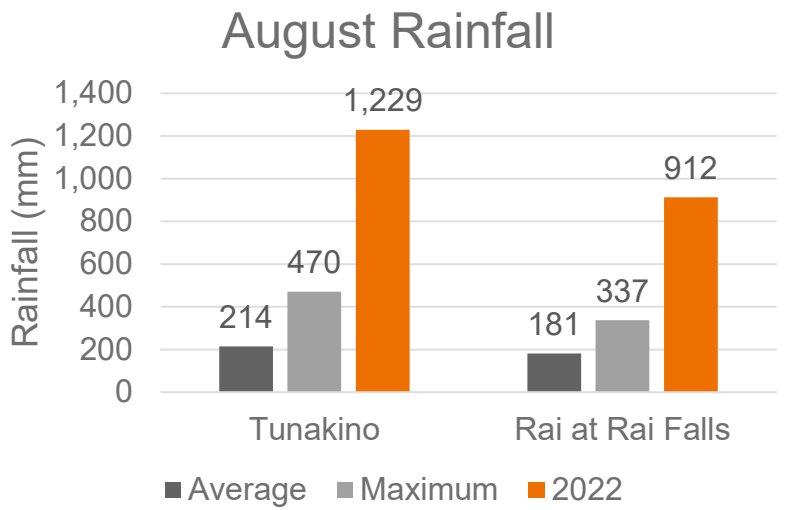

Te Hoiere Road

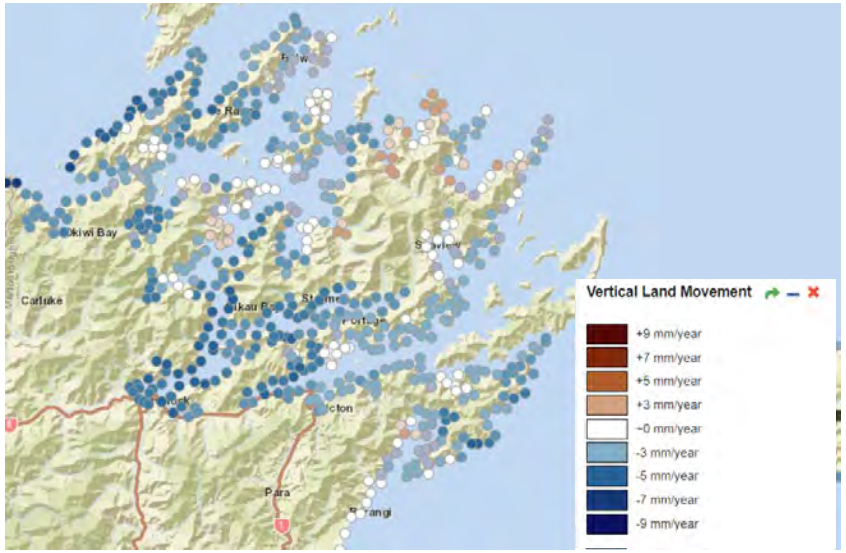

Queen Charlotte Drive

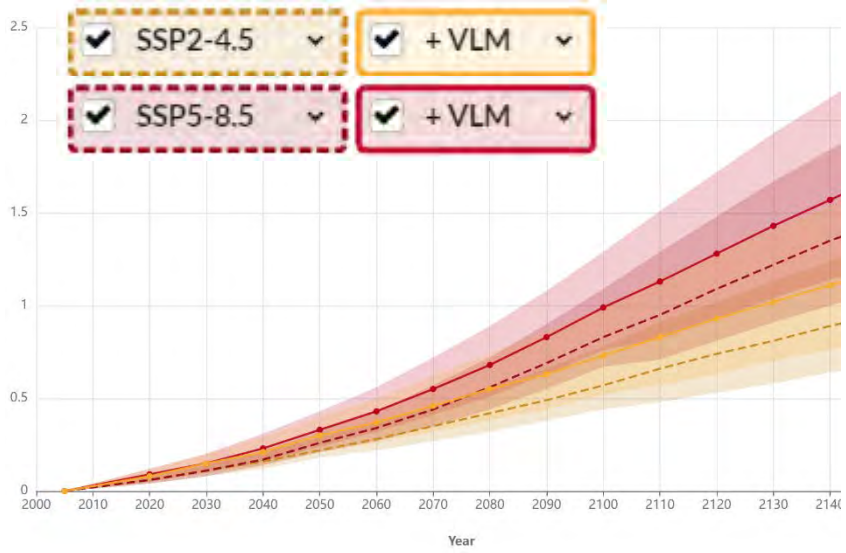

Possible solution?

P1: Causes

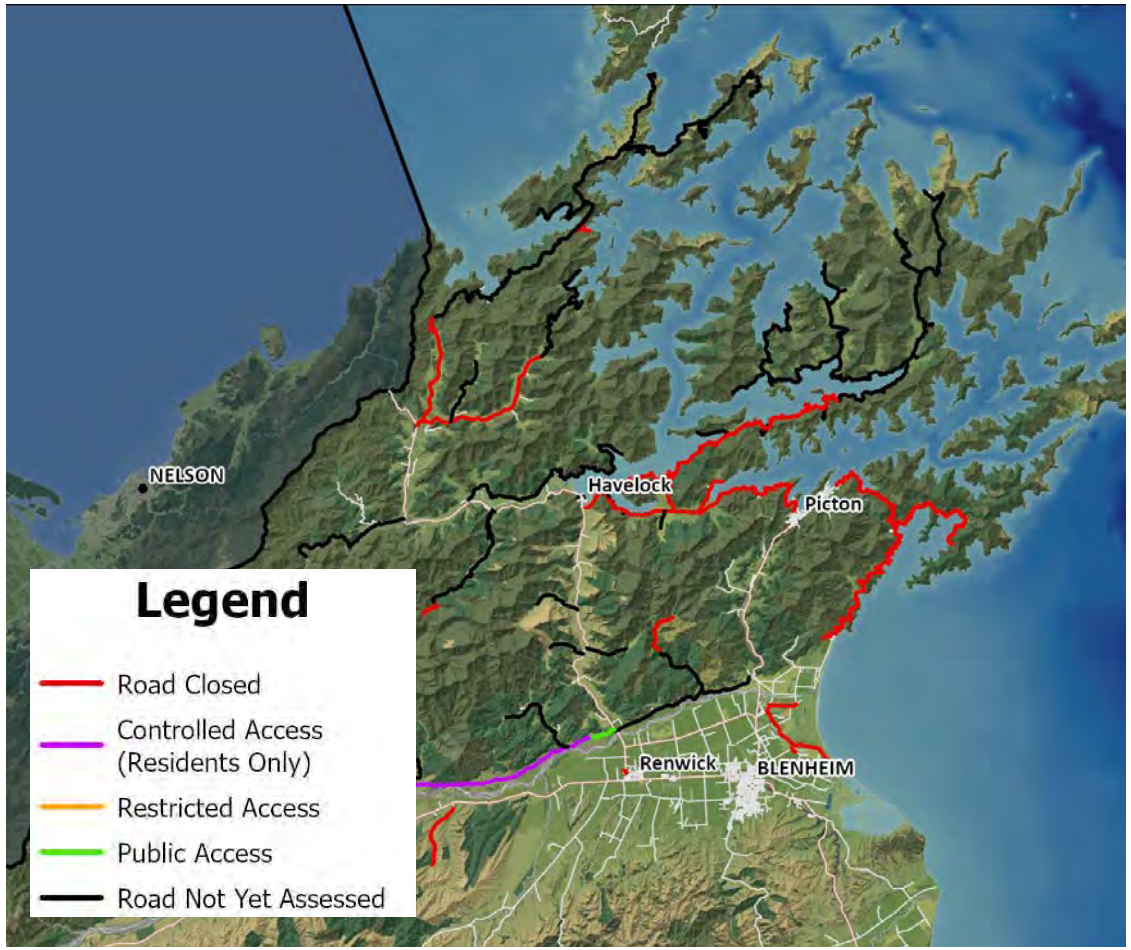
- Storm frequency and intensity changes
- Vertical land movement
- Sea level rise
- Coastal erosion
- Slips and dropouts

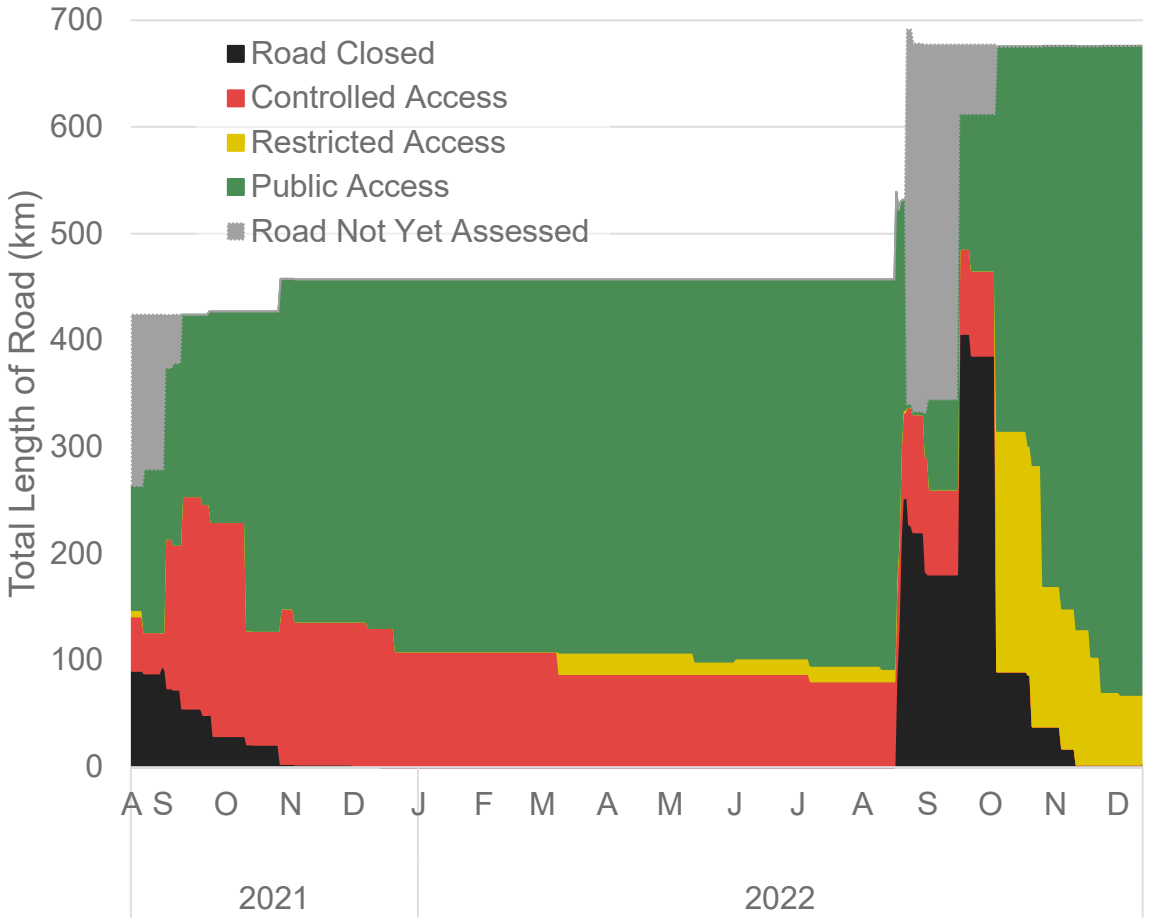






P1: Effect and Consequence



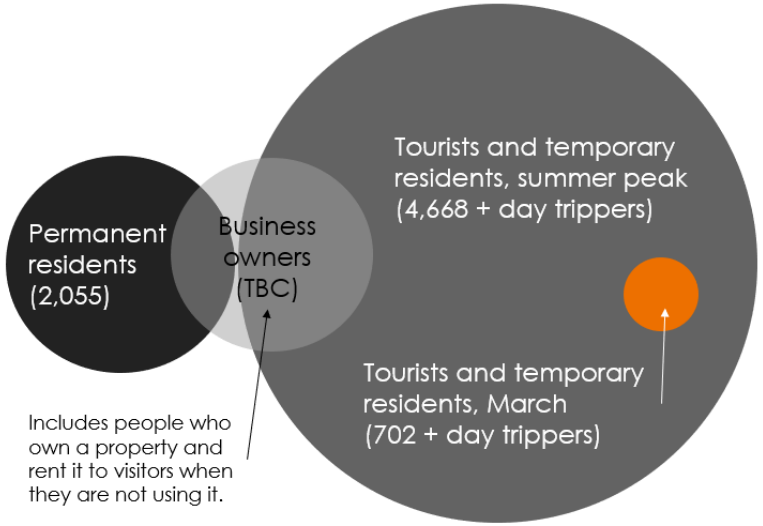


Problem 2: No Alternate Routes

Reliance on roads for access to services and lack of alternatives has led to increased vulnerability to the community during road closures.

P2: Cause

- Permanent and temporary residents live here
    - Generations of visiting/ ownership
- Businesses are established here
    - Range of accommodation
- No alternative overland routes
- Air and water poorly developed

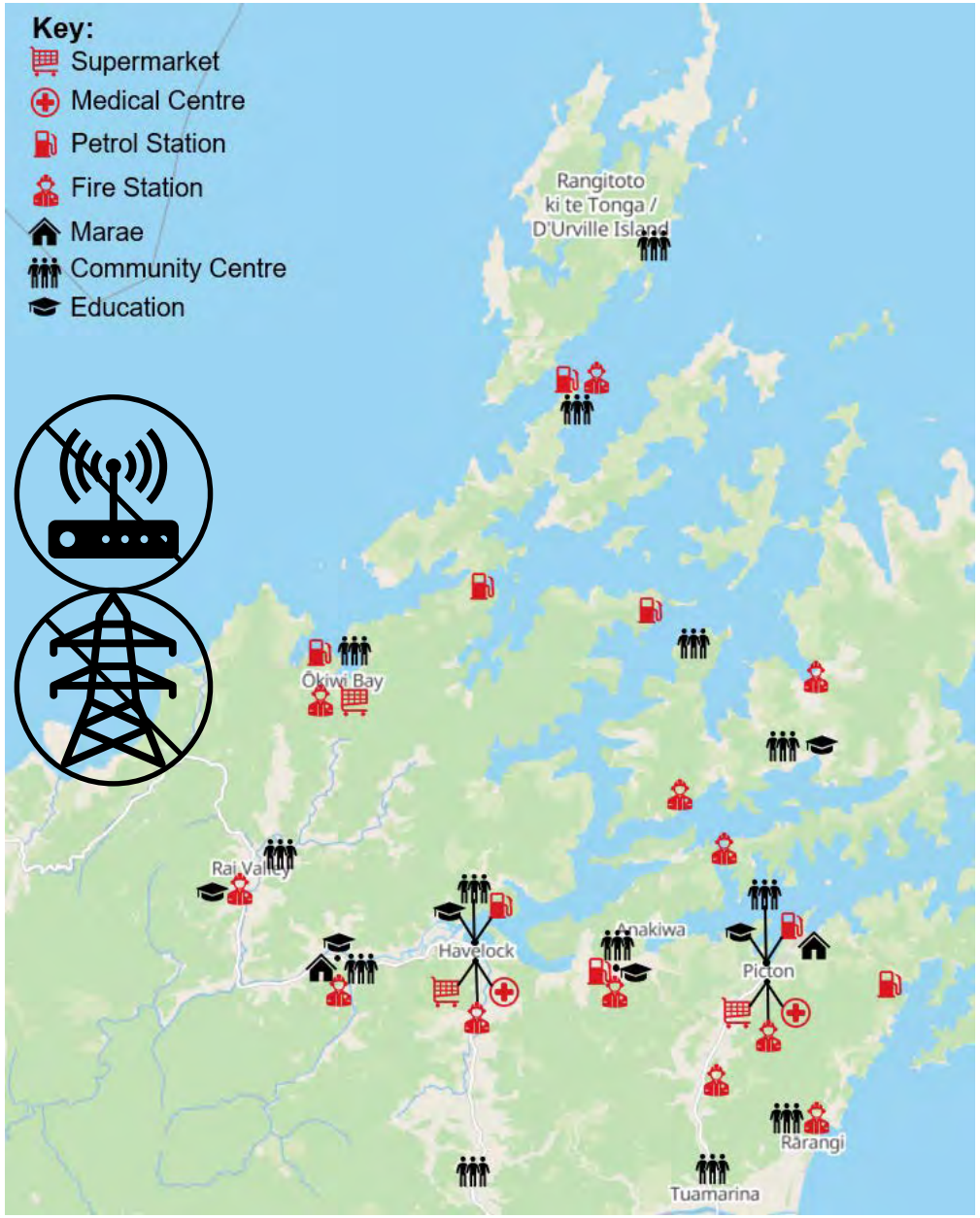


P2: Effect

Loss of access to services and markets

Loss of lifelines during events

- Interisland utilities
  - Main North South power cables (serviced by Port Underwood Road)
  - Fibre optic cables (buried in Port Underwood, Tumbledown)
- Kenepuru Road is main route for local power cables, and needed for servicing (services around 1,500 properties in Kenepuru Community)
- Emergency Services access affected when roads closed



P2: Consequence

Uncertainty:

- Every time it rains, people are very worried about what the impact might be,
- Significant social issue, the luxury of being impromptu has been take away .

Health Impacts

- “Feeling overwhelmed as often simple tasks pose a lot of logistical difficulties”
- “way more stressful as everything is difficult and complicated”
- 69% replied they are more concerned with their mental wellbeing since this weather event

Economic Impacts

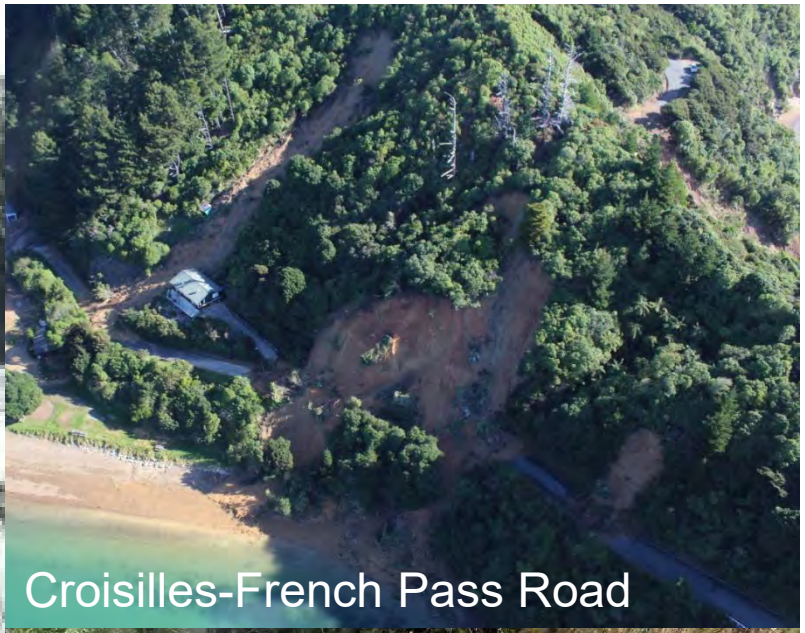
- Current alternate modes higher cost
- Reduction in holiday rental occupancy

	French Pass	Pelorus	Kenepuru	Port Underwood	Total
Population	**459**	**183**	**1,170**	**243**	**2,055**
Under 15 years	57	39	102	21	219
15 – 64 years	258	111	648	141	1,158
65 years and older	144	108	420	81	678
Median Age (years)	53.2	47.4	58.1	56.8	57.6
Median Personal Income	$22,900	$34,200	$26,300	$33,400	$26,700
Dwellings (2013 data)	**849**	**102**	**1,917**	**501**	**3,369**
Occupied	252	69	642	150	1,113
Empty	564	30	1,212	333	2,139
Percentage empty	66%	29%	63%	66%	63%

Problem 3: Asset Vulnerability

Poor construction standard and unstable geology means the Marlborough Sounds roads have a high maintenance cost and safety risk


Bill Partridge drives Gillbert Wells' bulldozer

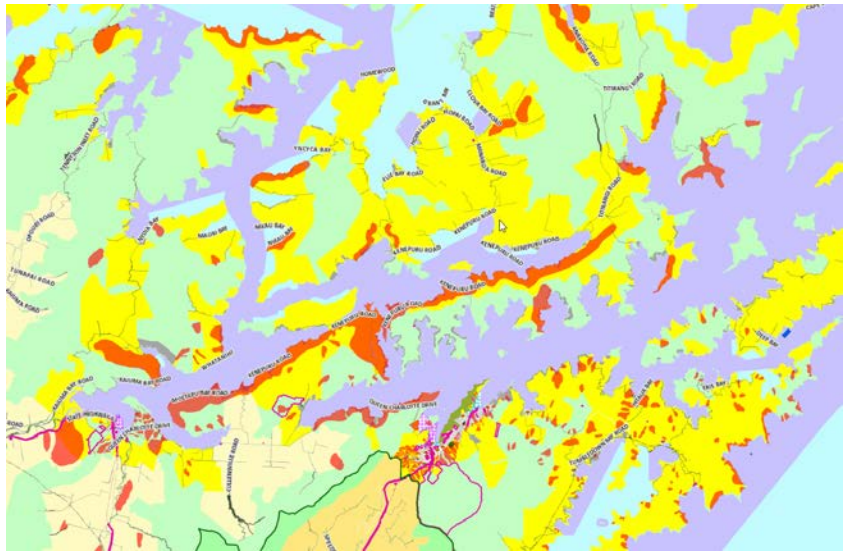

Croisilles-French Pass Road

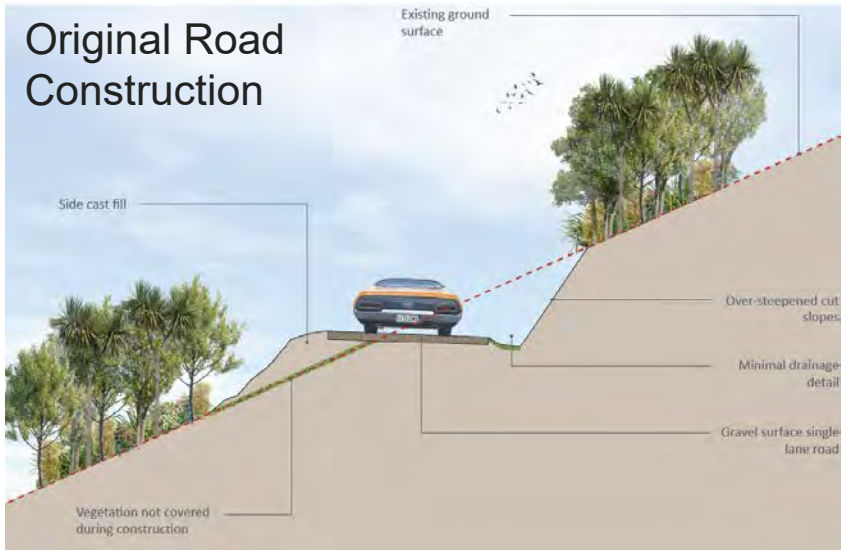

Safety risk

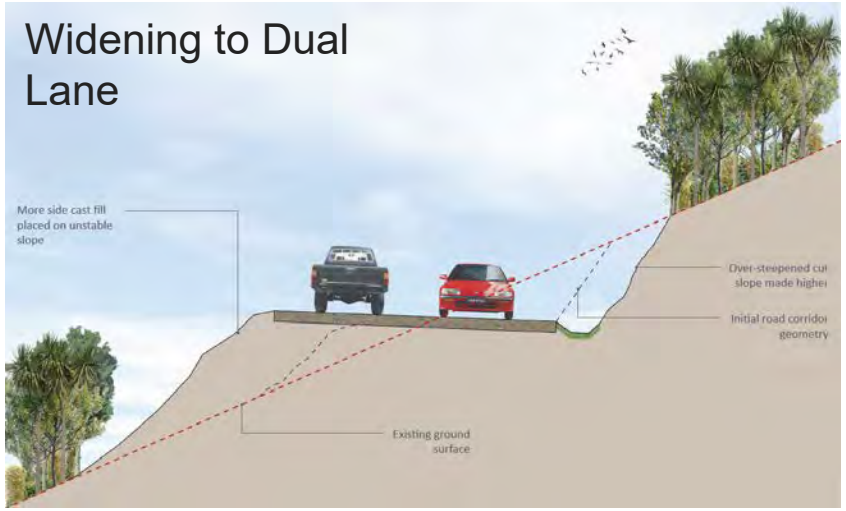
P3: Cause

Geology/ Land stability

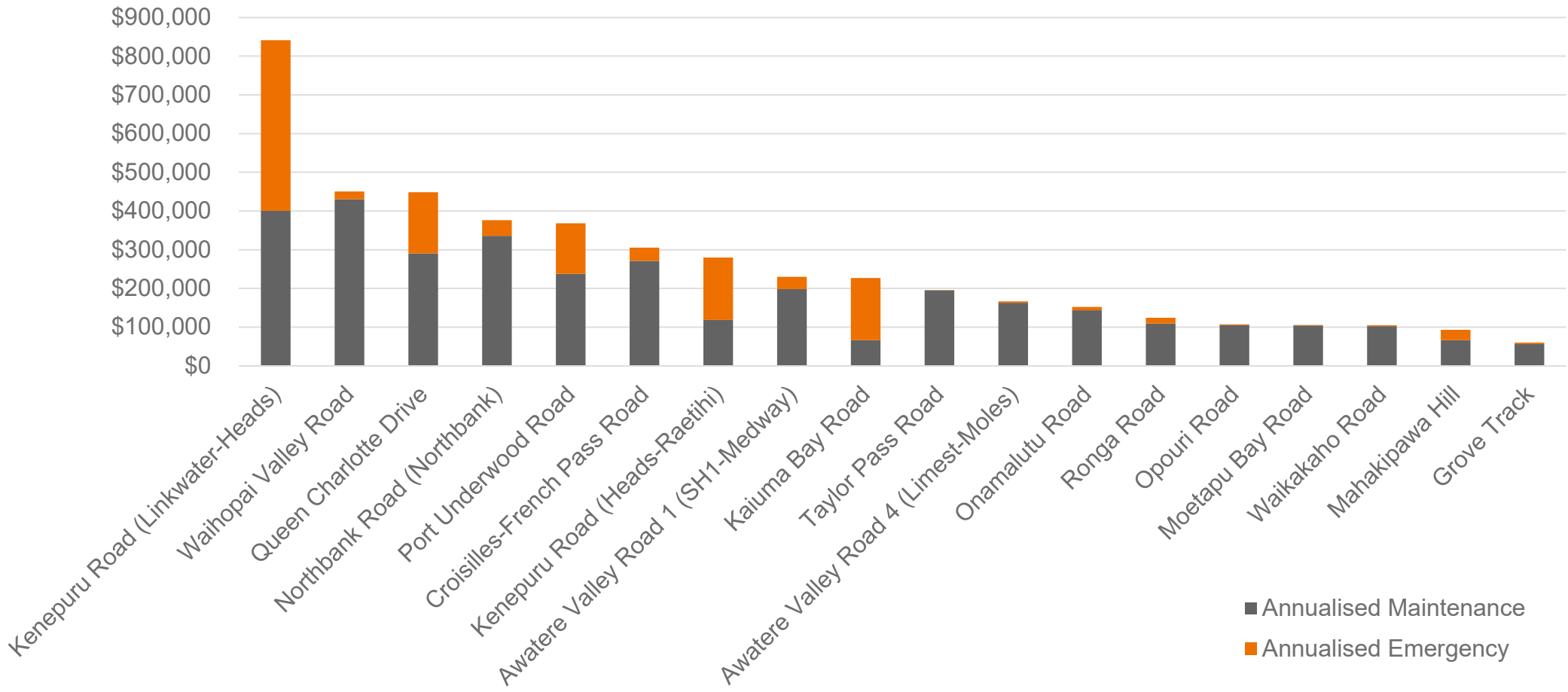
Construction standard







P3: Consequences (spending)



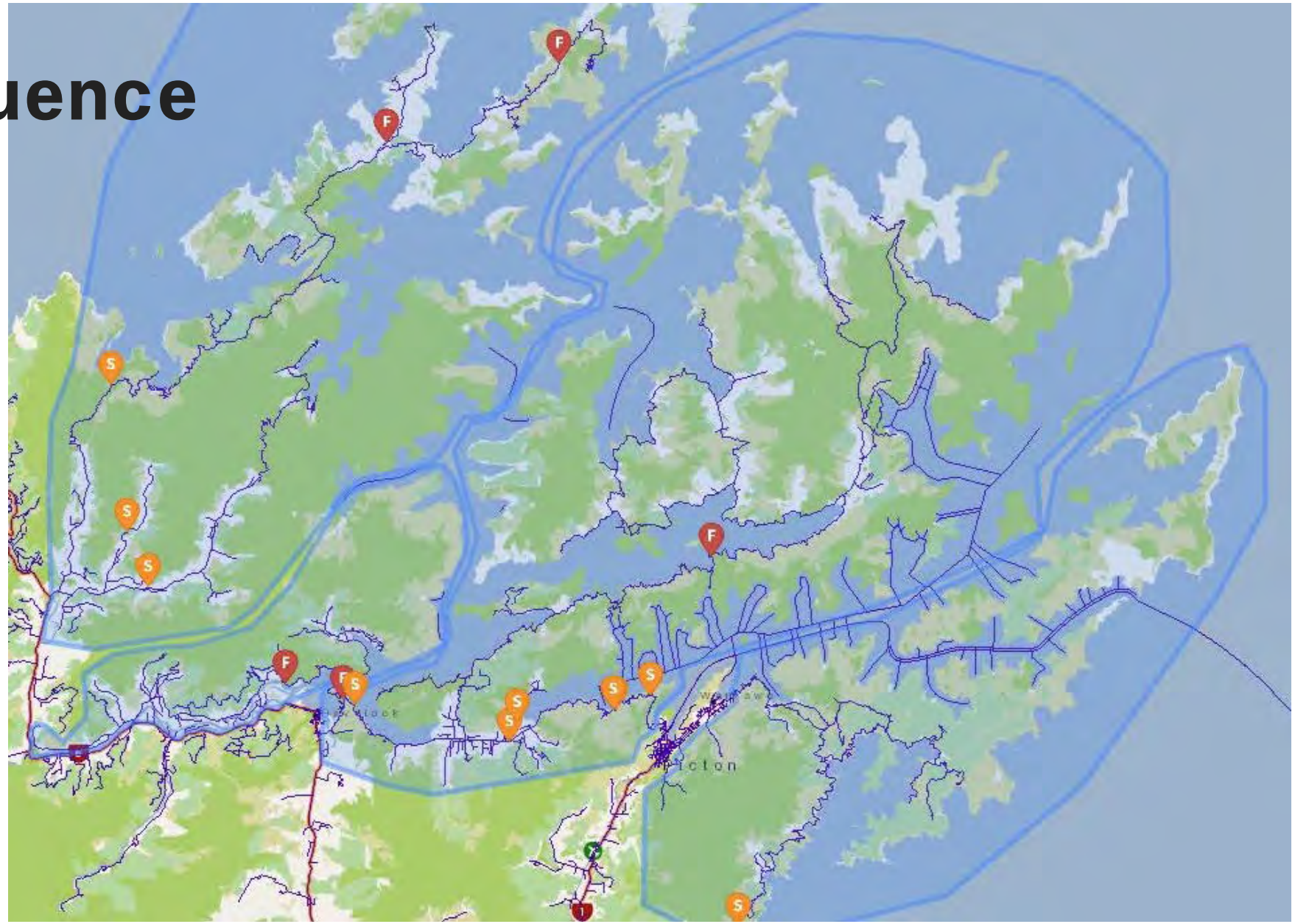
P3: Consequence (Safety)

Causes:

66% loss of control off road

5 years:

- 5 fatal crashes
- 10 serious injury crashes
- 21 minor injury crashes
- 57 non-injury crashes




Health Break
Be back in 10 minutes


Any additional issues?

Additional Issues and Evidence

- Are there additional issues you want to raise?
- Are there area specific issues we have missed?
- Do you know of additional information we can use to support the business case?

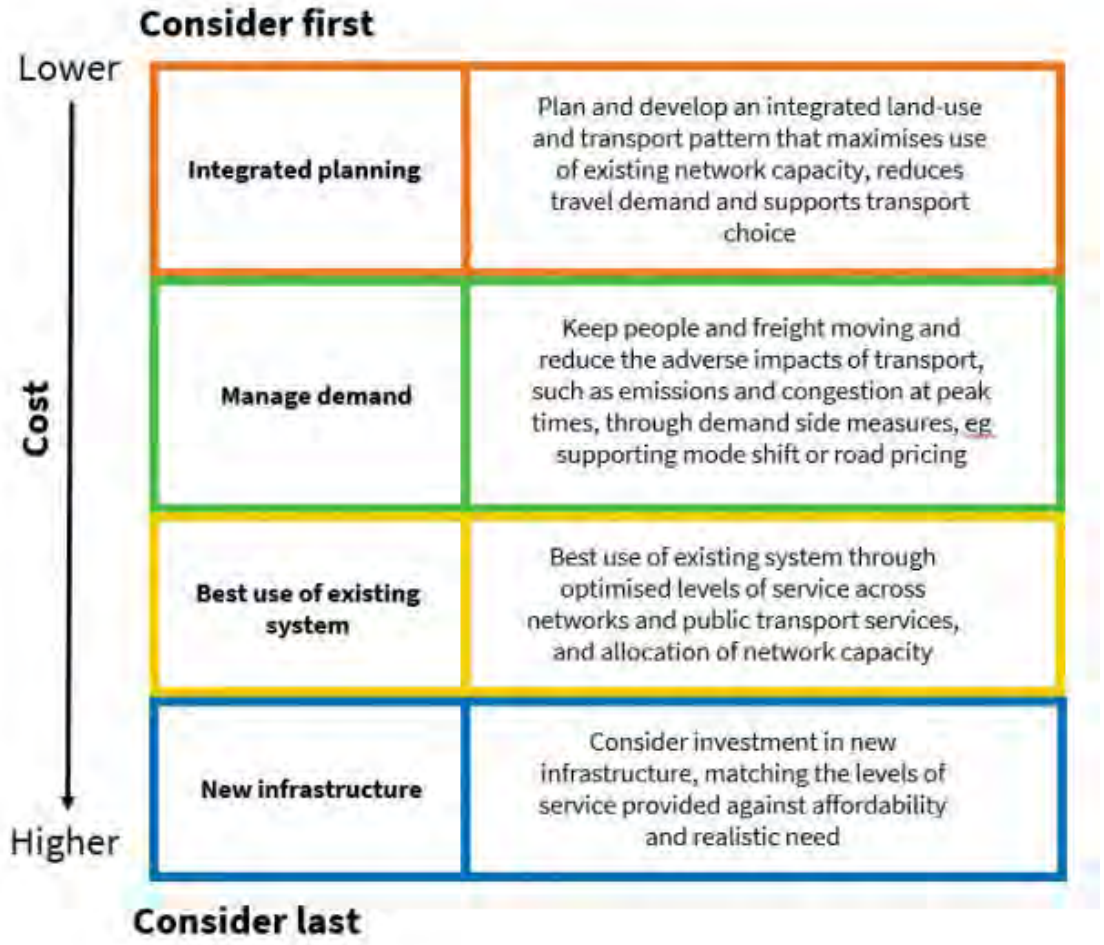
There will be 15 minutes at the end to visit other tables and contribute.


Queen Charlotte Drive

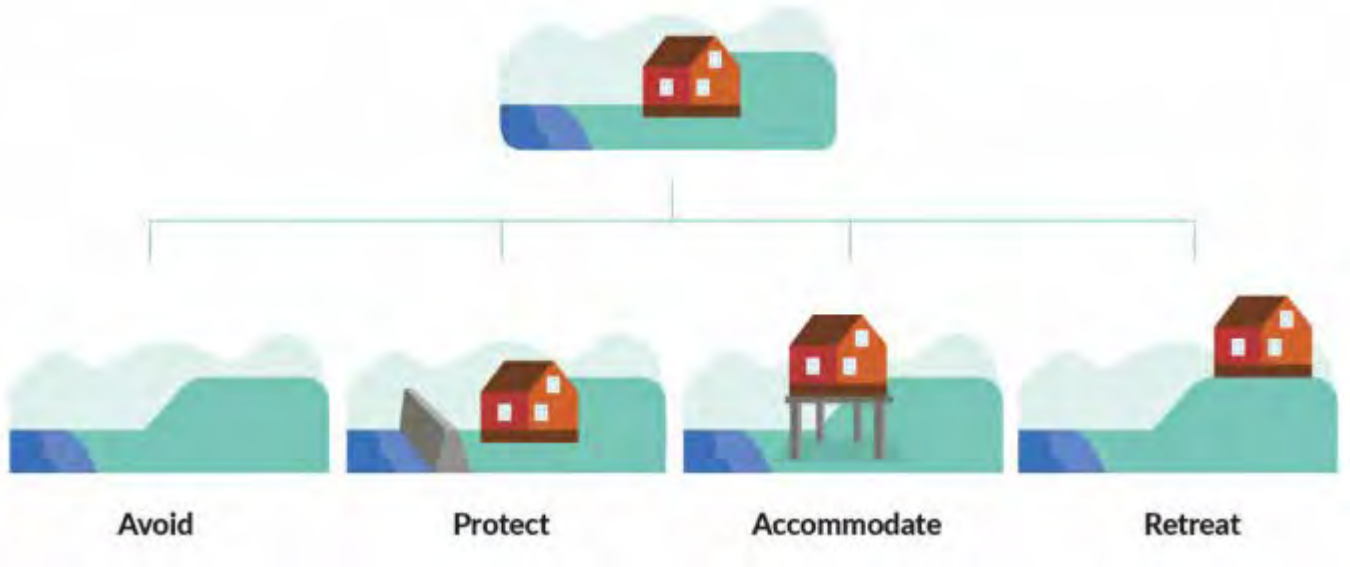

Health Break
Be back in 10 minutes

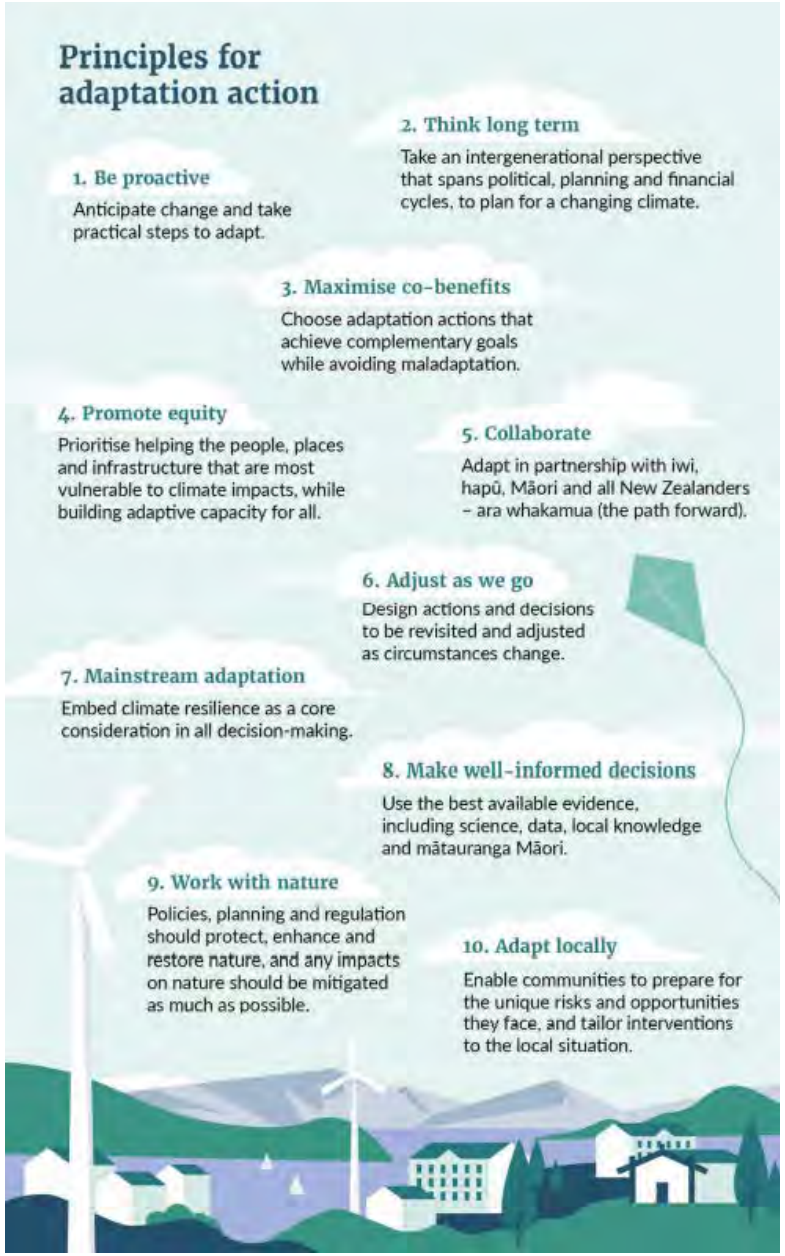
Possible Solutions

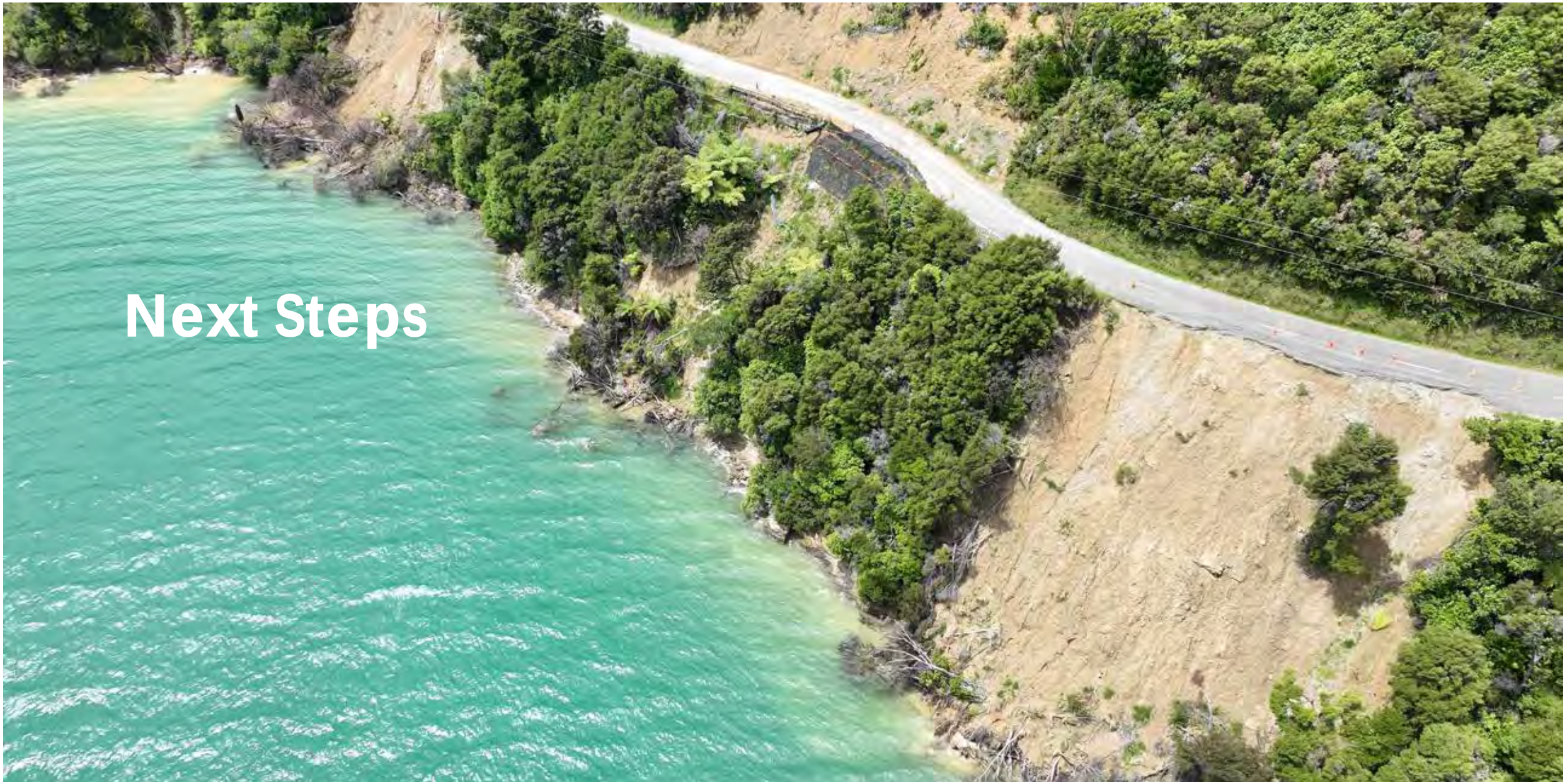
Things to consider: Waka Kotahi Investment Hierarchy



Things to consider: Adaptation Principles and Adaptation Options







Next Steps

Key Milestones/ Next Steps

Milestone	Target Date
Consult with community	January 2023
Investigate options	February 2023
Consult with funders	March/ April 2023
Consult with community	May 2023
Identify preferred option and next steps	June 2023
Funding decision	TBC
Inform community of funding decision	TBC

How you can be involved

- Survey: Launched 31 January 2023
- Feedback forms
- Community engagement sessions (next week)
- Project website: https://www.marlborough.govt.nz/services/roads-and-transport/marlborough-sounds-future-access-study
- Project email: soundsfutureaccess@marlborough.govt.nz


Kenepuru


Questions?

Karakia whakamutunga


Provide access for
the wellbeing of
Marlborough Sounds
communities

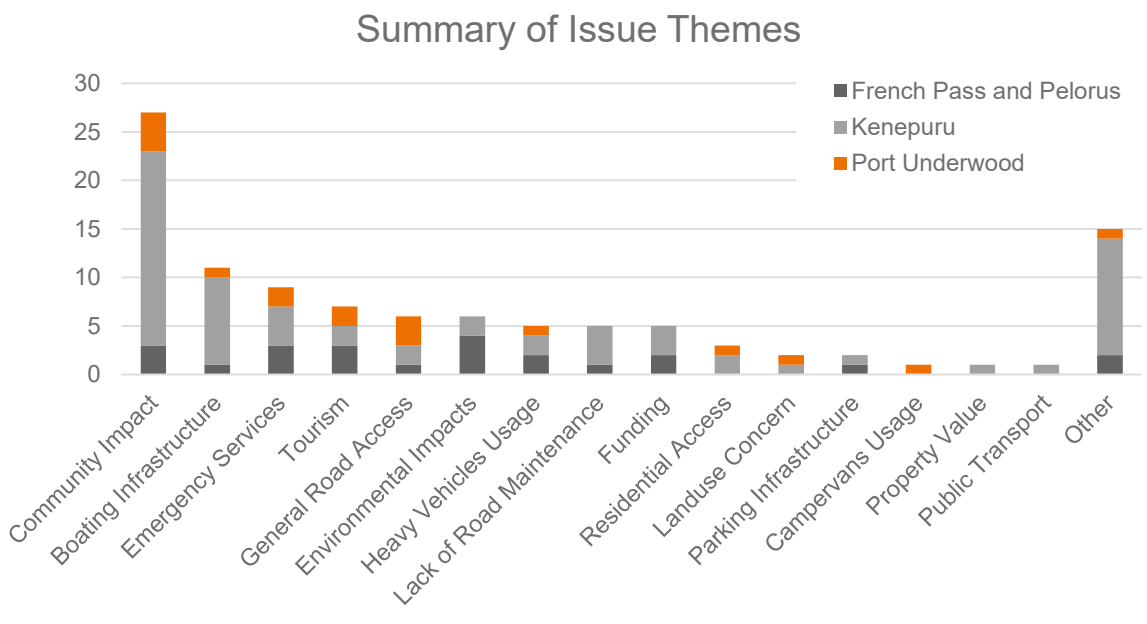
B.2 Workshop minutes

Meeting Notes

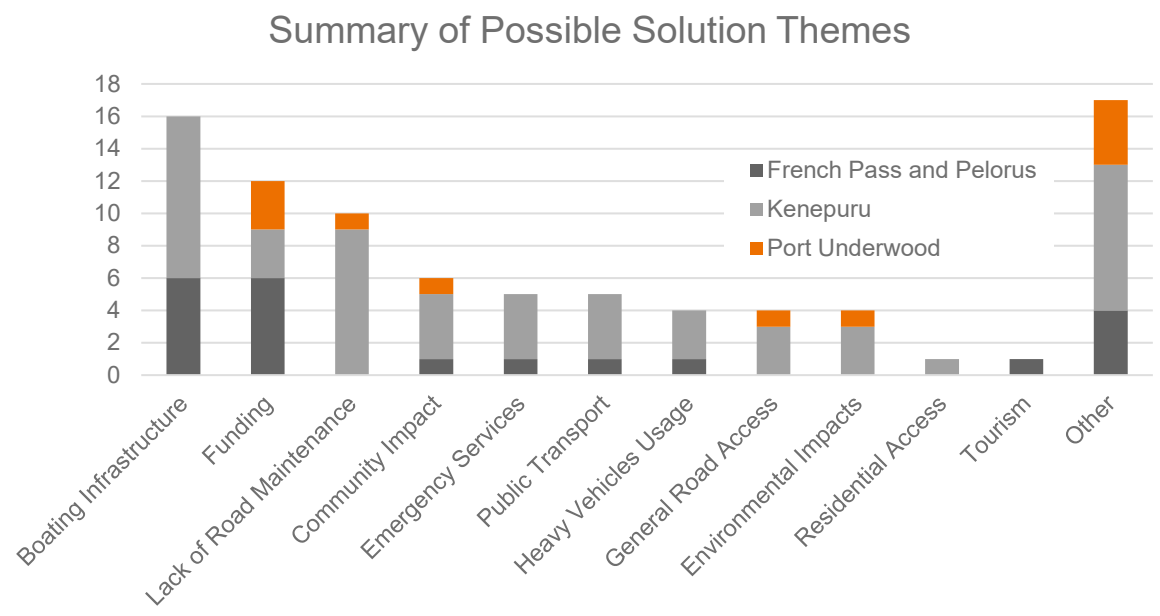
Stakeholder Workshop minutes

Project/File:	310205564 – Marlborough Sounds Future Access
Date/Time:	24 January 2023 / 10:00am
Location:	Havelock Town Hall
Attendees:	**Marlborough District Council:** Barbara Faulls, Ben Minehan, Dean Heiford, Mark Wheeler, Nadine Taylor, Neil Henry, Raylene Innes, Steve Murrin, **Ngāti Kuia:** Raymond Smith, Shannon Huntley **Waka Kotahi:** Andrew Bawden, Andrew James **Emergency Services:** Phil Black (Police), Steve Trigg (FENZ) **Ministry of Education:** Jem Pupich, Trish Morgan **Community/ Residents Associations:** Alistair Cameron (Kenepuru and Central Sounds (KCS)), Heather Mathers (KCS), Joe Roberts (Moetapu Bay), John Davison (Port Underwood), Linda Booth (Duncan Bay), Lynley Perkins (Pelorus), Trevor Offen (KCS), Richard Bake (Cissy Bay), Robbie Peat (Okiwi Bay), **Other Organisations:** Anton Wilke (Destination Marlborough), Dan Quinn (Marlborough Lines), Dave Hayes (DoC), Eric Jorgensen (Ocean Bay Farms), Gareth Parkes (truck owner), Gavin Beattie (Port Marlborough), Geoff Shand (Chorus), Glenda Robb (Federated Farmers), Helen McLean (National Public Health), James Galloway (O'Donnel Park Barging), John Crisp (Transpower), Kim Waetherhead (Johnsons Barge Service Havelock), Linda Booth (Sounds Advisory Group), Steve Chandler (Forestry), Simon Langley (MPI), Steve McKeown (Port Marlborough), Lynley Offen (Pelorus Promotions Inc), Melinda Price (Rural Women NZ) **Stantec:** Andrew Maughan, Avik Hader, Courtney McCrostie, Blake Brown
Absentees:	Chris Hayles (FENZ), Nova Mercier (MPI), Trevor Hook (Te Mahia Bay Resort)
Distribution:	Workshop Attendees
Attachments:	1. ILM Scope Questions 2. Issues Notes 3. Possible Solutions Notes 4. Workshop Slides

Item
Welcome and Overview • Introductions • Scope outline   o Confirmed that all roads in each zone were being looked at, not just the ones mentioned on the slide • Key milestones • Business Case purpose • Workshop purpose

Item
Strategic Case Context General agreement with evidence outlined in the transport, social, economic, cultural, and historic contexts.
Investment Logic Map (ILM) Discussion around removing the word ‘affordable’ from the outcomes statement. For a full list of what was discussed please refer to the attached *Scope Questions* sheet.
Problem Evidence Summary Problem 1: Disrupted Access • General agreement with evidence presented Problem 2: No Alternate Routes • General agreement with evidence presented • Noted that the number of businesses mentioned was drastically undercounted Problem 3: Asset Vulnerability • General agreement with evidence presented • Lack of drainage maintenance featured heavily in discussions • Comment made that the slide 32 graph should be changed to show annual average spending per road km instead of average annual spending per road section.
Issues Identification The full list of identified issues are attached. A summary of the themes of the comments is shown below. 
Possible Solutions The full list of possible solutions are attached. A summary of the themes of the comments is below

Item



The meeting adjourned at 1:00pm.

The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

Ngā mihi,

STANTEC NEW ZEALAND

Courtney McCrostie
Transportation Engineer
Phone: +64 4 381 5776
courtney.mccrostie@stantec.com

Attachment: Workshop Presentation, Scope Questions, Issues notes, Solutions notes

ATTACHMENT 1

1 Investment Logic Map

Original Outcome Statement: Provide affordable access for the wellbeing of Marlborough Sounds Communities, through a safe and resilient transport system

1.1 French Pass and Pelorus Table

- Affordability is an outcome.
- Does 'community' include visitors, non-resident owners – DoC estate, tourism.
  - The Sounds are nationally iconic
  - Communities of NZ
- Problem Three: Asset Vulnerability.
  - Lack of maintenance (drainage)
  - 80% issues on Ronga Road due to lack of drainage maintenance
  - Mowing and off cuts in drainage channels
  - Remoteness of the network
  - Quality of access: a lot of road is sealed – does it need to be?

1.2 Kenepuru Table

- Amend outcome statement – too much focus on affordability.
  - Practically viable vs affordable
  - Viability vs affordability
- Business Case Purpose.
  - Affordability → should this be in the same statement?
  - GDP benefit
  - Maintaining connectivity efficiency
- Some workshop participants voiced concern with the Outcome Statement/ ILM noting:
  - Should focus on transport efficacy
  - Should rank investment options primarily by how well they will serve the transport system

1.3 Port Underwood Table

- Nationally important infrastructure (power cables, telecommunication cables, microwave sites) missing from business case purpose.
- Disrupted access – access to opportunities. Nothing specific about education – add as a specific KPI

Other Discussion

1.4 French Pass and Pelorus Table

- Proj. Gov advisory.
  - Would MDC consider MPI?
  - How is MPI involved?
- Do we need to take a wider view?
  - Not just transport → enviro etc.
  - Long term (50, 100, 150 years from now)
- Look at alternative funding streams, not just Waka Kotahi?
- Need to focus on the impacts on people.
- Need clarity around roads included in the scope, presentation only mentions main road in – not any of the others.
- Areas of existing roads that aren't on legal roadways and are maintained by Council .
- Need a youth input for this process.

1.5 Kenenpuru Table

- Geographic areas: breakdown to more discrete / different communities.
- KPI Evidence:
  - Review of existing damage / stabilisation to curtail further interim damage
  - Need interim protection
- Info issues?
  - Kaikoura
  - $30m

1.6 Port Underwood Table

- Adjacent catchment land use should be included – effects on neighbouring land use.

- Regulating environment has exacerbated storm damage to the roads. Leads on to more damage to public roads.
- Funding to provide immediate funding for repairs to reduce the future repair cost.
- Maintenance – needs to be realistic around future options. Upgrades to be future proof.
- Policies – take into account Marlborough Environmental Plan – anticipated environmental outcomes.
- Active travel – walking biking, safety, electric bikes.
- Protection of national assets, power fibre optics etc.
- Better communication systems for those working from home, health, education.
- Population is incorrect metric. Many road users not residents, such as forestry and aquaculture + many tourists / campers / boating.

Stantec

ATTACHMENT 2

2 Issues/ Problems Notes

2.1 French Pass

- Tourism
- Impacts of logging trucks – poor original construction quality,
- Need to focus on the impact on people,
- Funding?

2.2 Pelorus

- Mental health of residents – ongoing care,
- Need to focus on the impact on people,
- Funding needs to be considered,
- Front wheel drive vehicles – towing boats + campervans damage the gravel road,
- Regular heavy vehicles using roads – forestry and aquaculture,
- Speed limit single lane access Opouri Saddle,
- Primary sector needs to be serviced by maintained roading network – should these sectors be levied?
- Ensure all roads are assessed in entirety,
- Speed limit single lane access Opouri Saddle,
- Less ability for police (emergency services) to attend – leads to loss of trust and confidence which leads to further issues,
- Back-up access points to main areas accessible by barge i.e. Okiwi – very shallow, additional all tide ramp here could be helpful
- If roads not reopening – is there consideration for non-public access (emergency services)
- Visitors / explorers: safety, business (tourism) viability / resilience,
- Culverts and Maintenance,
    - Opouri Saddle
    - Archers Road – Tennyson Inlet
    - Harvey Bay – Duncan Bay
- Kaiuma Bay Road at the top of Kaiuma Bay. Flooding rain events + high tides,

- Daltons Bridge (Kaiuma Bay Road end) wash out Dalton Bridge end vulnerability,
- Te Hoiere Road Flooding in weather event (between bridges),
- Alternative access issues in emergencies,
    - Eg: Okiwi Bay, Duncan Bay, French Pass, Kaiuma Bay
    - Suitable water access e.g. extend jetties in bay for all water areas/ tide levels
- Havelock Channel access: needs upgrading to ensure flood sediments are cleared allowing all tide access for commercial operations and safer boating access for locals,

2.3 Kenepuru

- Kenepuru
    - Roading access
    - tourism / hotels
    - Access → boat / road to Airbnb
    - Price point access issue
- Kids at school currently,
    - Linkwater = 63
    - Waitaria Bay = 29
- Truck
    - Empty on road (not loaded)
    - Out on barge (loaded)
    - Corners improved
    - Portage + Te Mahia
    - Road open for trucks for farmers
- Building community resilience with limited access,
- Maori landowners contact for feedback,
- 18 farmers using the Kenepuru Road. 30,000 stock units at a value of over 5 million. Problem of accommodating stock over night in Havelock from barge, and fertilisers difficulty in getting in.
- To invest or not? Long term security for businesses?
- We need a public, daily ferry service,
- Increase in rates if access by road is not returned,
- General Emergency Service access (Fire, Police, Ambulance, Electricity),
- More strategic barge sites, Fix Pudney's – make bigger, More jetties,

- Bulk fuel an issue, need for a bowser system for locals to buy fuel for household machinery, vehicles & boats
- Ewe costs 4 times the cost on barge compared with trucking them (comparing apples with oranges, potential to improve efficiencies by carting stock to barge site, lose stock on barge, and then trucks from Havelock onwards)
- the barge is not economic, not reliable and relies on one truck driver to reach the farms, and then return to the barge
- Baleage $70 cartage on barge, usually $30,
- Need more dry storage at Havelock to facilitate larger quantities of goods movement
- Evacuation of residents in isolated communities or limited access,
- Better info on value of business in Sounds,
- Use QCT as option,
- July 21 event – it's how this was managed by the programme director that was the problem. Which is now causing the issue the community faces,
- The Sounds are iconic – NZers expect to get there by road as cheaply as possible. Water transport is amazing but not available for everyone,
- Access to education: Waitaria Bay, Linkwater, Queen Charlotte Drive (Picton, Havelock) closed due to road issues,
- Havelock Channel – ensure its dredged and accessible,
- Tourism
    - Presently tourism providers loss of income
    - Wellbeing tourism for future
    - Tourism as employer
- Health access
    - Good communication systems needed
    - To get in for appointments
    - To get in for emergencies
- Looking to the future,
    - Environmentally
    - Charging stations
    - Think 50 / 100 years into the future
- Internet needs to be better,
    - Education
    - Health
    - Working from home

- Active travel/ biking/ walking.
    - Increasing
    - More environmental
    - Safety an issue
- Study objective should stop short of determining affordability & focus on transport efficacy: "Provide a safe, resilient transport system that maintains or enhances transport efficacy.
- Stakeholder costs.
    - Extra costs for farmers barging in goods (even with subsidy)!
    - Fuel, fert., stock
- They need the road to open to truck and trailer size. Impact of farms not being economic on barge – if they move out, schools goes, community goes. Some of these families have been there for generations.
- Resilience: We cannot predict the future conditions and unless you build a permanent structure from the Heads to Linkwater you cannot guarantee future proofing – quick fix is get going – when it fails fix it again – cost less, fast and gets people moving again!
- Locking people up and dictating when and how they can travel in and out of the Kenepuru while they repair the road. i.e., road closed from 7am – work doesn't start till 9am!
- Moetapu Bay Road.
    - School Children
    - School access
- Property maintenance: Septic tanks, Emergency services.
- Study needs to be based on costs that are based on actual spend, not estimated and need to be normalised for historical inefficiencies.
- Manner in which maintenance is undertaken, as well as lack of maintenance.
- Extra expenses for freight, goods, supplies, monitoring maintenance.
- The cost of getting in and out!
- Compounding effects of road closures affecting business viability, very stressful.
- Isolation
    - Mental health of residents and business owners
    - Isolation from friends, family, activities and events
    - "Alone in the world"
- The Sounds is for NZers, not just local community.
- Havelock – space at yards for stock.
- Freezing works - Ability to consistently get priority to bring stock out if road is not available.
- Maintaining adequate business connectivity.

- Visibility of Geotech finding and opportunities for peer reviews – timing.
- Mental Health & Wellbeing:
    - Of residents who have had x2 lots damage & told you pay for fixing & insurance pay you back (they may not have $$)
    - Insurance - will peeps be able to get this again?
    - Good support for recovery navigator (she can't always give answers)
    - People sunk $$ into retirement home, can they still get there etc?
    - Co-ordinate support for areas - remembering all areas of health - happy to support
    - Utilise primary health services - especially mental health & wellbeing via HIP (Health Improvement Practitioners)
    - Advocates to support people to get through bureaucracy
    - Good opportunity to encourage more care for our environments to decrease effects of weather events
- Water Taxi subsidies.
    - Still expensive
    - Tourism
    - Services
    - Groceries
    - Businesses
    - Residents
    - Peeps to holiday homes
- DoC costs on foreshore.
- Investment map KPI should have one for education. Example, school buses.
- Flexibility from people!
- Concern for farmers mental health and wellbeing.
    - The cost of living
    - Unexpected costs
    - Banks playing hard ball
    - Subsidies not enough
- Emergency resource access.
- Mental health of residents and flown on from limited access.
- Standard of the road was acceptable in the 60s 70s – currently the repairs are at our “known” acceptable standard. How do we know that things will not be different in future and the current future proofing will be any good or will we be looking back in 20 years laughing at what we considered an acceptable level of repair for future proof.

- Lack of water access infrastructure to provide alternative routes.
- Need to improve access to Havelock marina for commuting locals.
- Investigation needed into historical efficiencies of Kenepuru Road maintenance and construction.
- Coastguard out of Havelock to bolster access to Sounds.
- No roadman! No on call roadman ready to clear/ repair and gain access immediately. Need designated local central to all.
- It's how the repair work that is being carried out or the way it is being managed that is the problem.
- Cost of water access only will be more than road access. Not everyone has a boat or beach access.
- Landlocked properties – not access to beach or barge ramp without roads.
- $30m recovery cost for Kenepuru Road grossly wrong. Actual works spend $5m and only 4 sites to be completed.
- Communication
    - from residents and users
    - from businesses and farmers
- Responsibility needs to be taken for the way the recovery operation was run. The Kenepuru Ratepayers found it unbelievable.
- Independence. Not relying on water taxi/ punts. Difficulty of carting purchases and supplies in wet and windy conditions via wharf (twice). Weather dependent on water.
- Misconception that barge service wants road closed! We don't.
- Waitaria Bay Access – Barge ramp, staging/ storage area.
- Police - loss of trust & confidence of residents leads to less reported crime / less resolution which leads to further losses.
- Without road access very limited ability for police (emergency services) to provide adequate service support - lose trust & confidence of population.
- Moetapu Bay Road immediate works: Stabilisation of slips to prevent further damage over the coming winter.
- Williwars – rough sea, no access.
- Already at capacity in peak times: traffic, parking, trailer boats, barges, commercial.
- Capacity of existing marina/ port facilities to accommodate further volume.

2.4 Port Underwood

- Number of non-residents using the road (visitors, forestry).
- Environmental effects of the roading network (also think about this for solutions).

- Evacuation of residents in an emergency (if limited access, one way).
- Rarangi to Port Underwood and Tumbledown Bay Road. Access to power line tower for maintenance.
- Fighting Bay: HV power cable landing site, Assets of national significance.
- Road insufficient for heavy traffic such as log trucks with trailers. Also peak periods for tourism in summer – over 100 vehicles with caravans and trailers at Christmas in Robin Hood Bay.
- No alternate access on Port Underwood Road or Tumbledown Bay Road – no barge or water taxi service after the last storm event some residents trapped at home for 10 days.
- Access to gravel for road construction.
- Access to quarry rock for road construction.
- Road closures to allow forest companies to fell trees above and below road.
- Access to key infrastructure fibre cables for communications.
- Kahikatea: microwave site to North Island.
- Rahotia: Microwave site telecommunication site to North Island.
- If roads no re-opening is there consideration for non-public access (emergency services).
- Access to barge landing site in Picton for public – not through port operation .
- Separate cyclists from vulnerable roads if funds to ensure their safety is not available.
- Regulations need addressing to enable easier access to local metal sources.
- Build community resilience for limited access and isolation.
- Pines on the road verges are a significant problem. Most slips had a pine tree in them
- Most of the damage to the roads are caused by heavy vehicles and front-wheel drive cars, not by residents. Most residents use four-wheel drive cars.

ATTACHMENT 3

3 Possible Solutions Notes

3.1 French Pass

- Tourism: Take car on barge to end point then drive back in.
- Water taxi as public transport (needs to be affordable).
- Need to ensure all tide access to ports/ Havelock, Okiwi Bay etc.

3.2 Pelorus

- Govt funded Havelock Channel upgrades (ongoing and due to sedimentation).
- Hybrid transport options considered.
- Govt funded alternate public transport system on-water.
- Regular water taxi service – like Waiheke for residents, holiday makers, and tourists.
- Fuel depots, barge sites, community wharves, helicopter landing sites – emergency/ FENZ access.
- Access for emergency services, police GPS co-ordinates, fire, power.
- Transition forestry harvest to “skyline” harvest (see trial over Eatwell property + Bay in Pelorus) Darryn Newman operator.
- Government support to assist farmers to transition to barge (funding for loading yards) – Waitaria Bay is a worth wile investment
- Bring back toll roads.
- Marlborough roading rate levy is a lot lower than its neighbouring councils – should this be looked at now?
- Raise maintenance bond for Resource Consents – retrospectively this should be looked at now!
- Govt funded assistance for floating jetties in Marlborough Sounds
- Dredging to maintain boat access as a backup.
- Alternate transport methods (barging? Storage of cars etc.)
- Cross subsidise tourism / locals.
- Reduction of size / height of vehicles allowed on certain roads?
- Targeted rates not practical.
- Mail boat run extension / support.
- Low carbon future options, sea rise protection.

3.3 Kenepuru

- Roadmen: bring back local road repair maintenance.
- Note, barging transport time from Fish Bay is the same / similar to driving time.
- Havelock Channel entrance dredging!
- Certain days for certain services e.g., stock trucks.
- Use local contractors: qualified local contractors located centrally.
- Don't have to be sealed road everywhere – just a safe, useable road.
- Local roadies used to provide regular, ongoing localised maintenance.
- Full mail boat service.
- Regular ferry/mail boat services to the Sounds public.
- Subsidise or make berths affordable.
- How/who get exemptions.
- One way option.
- High standard Wi-Fi.
- Extend existing community jetty for deeper, less tidal dependency.
- Narrow areas, provided they are geotechnically safe, could remain one lane and instal permanent signage.
- Repair the road but keep it simple, not like the '21 event. As of today the onsite organisation is sadly lacking.
- More strategic barge and jetty sites. Budget for ongoing maintenance.
- Regular maintenance done by local contractors.
- The way the road is fixed is not working *unless you build a man made structure from Heads to Linkwater you are not going to fix it. Go to quick-fix rail irons and boards and secure roads then keep them maintained.
- One off upgrade of all culverts and ditches and maintain road to level of service commensurate with base infrastructure .
- Focus on culverts and surface water control to 500 year flood standards.
- Immediate stabilisation of existing damage / slips to prevent more damage this winter.
- Transport cost benefit analysis for varying levels of reinstatement water vs road option combination.
- Be aware of tidal and weather limitations to all boating activities. Weather can be very variable and different in each are. Can be very dirty at times even close to Havelock.
- During works progress – extend the weight and length of vehicles currently able to travel K Road. 3.5 tonne and 8 metres too light and not enough.

- Dedicated ferry and barge site at Broughton Bay and maintain truck access to Broughton Bay – challenging due to shallow water at Broughton Bay
- More barge sites (Waitaria Bay), better access for farmers.
- Dedicated ferry based in Kenepuru for north side – south side community in event road closed and also for vehicles that cannot use the road due to restrictions.
- Installation of self-maintained micro generation.
- Remove power supply out to the Sounds from main arteries.
- Community resilience for power and emergency services.
- Community truck / livestock trailer to shift gear within Kenepuru.
- Council roads vs community roads.
    - Paid for by community that live there
    - Main road in by Council
- Havelock Facilities: Launching ramp, berths, parking.
- Improve services: Internal, Communication.
    - This could be a short term use for working from home and education while roads are out
- Fire services: actions to make community more resilient:
    - Community resilience plan in event of wildfire
    - Build community resilience, fire resistant etc
    - Ability to get people out
    - Support to and connection with community
- Outer sounds scheduled barge run for outer residents supporting road access.
- Waitaria Bay: Farming staging site / storage for livestock, farming supplies, etc.
- Emergency sites for evacuation.
- Additional barge ramps to support future roading.
- Waitaria Bay needs barge ramps and storage / access site.
- Barge subsidy based on access on roading ability of vehicle.
- Barge service / vehicle ferry for residents' transport / holiday visitors / tourists etc. Note, time taken driving is same to Fish Bay as if you took barge.
- Maintain and improve road, ultimately to fix to class one. Provide more facilities at Havelock including more room for livestock and fertilisers.
- Reinstate wharves and a barge ramp at Waitaria. Council funds a livestock truck to be based in Kenepuru to cart stock to barge.
- Power and phone cell tower site access.
    - What do they require?

    - Any quirky sites?
- Coastguard / police vessel based in Havelock to be able to respond to emergencies / needs.
- Investigate more efficient maintenance systems and policies. E.g., portfolio of spoil sites, water carriage upgrade and regular policy of retreat for under slips etc.
- Improved water access infrastructure: Barge points, Jetties.
- Get road up to standard to carry empty truck and trollies unit, then come out on barge. Make it quicker and easier.
- Discuss targeted rate for certain roads.
- Guarantee of water taxi subsidies.
    - How long?
    - We need plan!

3.4 Port Underwood

- Culvert upsizing and maintenance.
- Ridgeline road under public works act.
- Spray young pine trees above road before they grow too big.
- Road closures to fell pine trees above Port underwood Road. Stop them falling onto road.
- User groups ongoing by road network to ID and implement opportunities and improvements.
- Back door barge site into Opua for emergency access to power.
- Work with utility providers to design effective solutions.
- SLTF (Sustainable land transition fund) – review of land use.
- If roads are retired – forestry may help bach owners with barge point infrastructure investment.
- Publicly access water facilities to/from Picton.

Appendix C Iwi Engagement

Stantec

Meeting Notes

Sounds Future Access - Iwi Hui

Project/File: 310205564
Date/Time: 14 March 2023 / 11:00am
Location: Waikawa Marae

Item
Welcome and Introduction • Welcome • Introductions • Project background (as per attached slides) • Initial cost estimate at $200 - $400m

Key Themes
• Don't create inequalities for Māori
• Iwi/ Māori association with areas in business case
• Assessment to ensure there remains road access to multiple owned Māori lands, along the roading network
• Importance of utilisation of our whenua re cultural identity (wānanga held there) and reconnection to that identity
  o taonga tuku iho[1]
  o Access is pivotal for this
• Landless natives
• Okoha to Havelock walking trail historically took 2-3 weeks, then horse and cart, and eventually taken over as road
• Some whenua have never been accessible by road
• Mahinga kai across the rohe
• Concerns around heavy vehicle use of compromised road – future proofing
• Ease of access to medical services, kai and other essentials
• Better utilising the skills and expertise of local communities to support short/ medium/ long term recovery (preparing those as first responders)
• Importance of factoring in climate change in planning
• Archaeological/ koiwi/ wāhi tapu protection (any works)
  o Wāhi tapu 'general' site identification needed re future works
• Planning permission for land use and housing needs assessed
  o Papakāinga provisions MDC policy needs urgently reviewed
• Opportunities to improve access to:

[1] heirloom, something handed down, cultural property, heritage

Item
o Kai moana trails o All weather access to heritage commemorations at different times of year ▪ Treaty signing at Horahora Kākahu Island o Access to Māori land holdings for economic/ social development
Location Specific Comments • Kenepuru o Access to Queen Charlotte Sounds walkway – may end up with only vessel access which provides barriers (financial/ time) o Commercial interests (organically qualified kanuka) – access is pivotal. o Marlborough Lines ▪ have access to pylons on land – they have to cut in access tracks ▪ Land owner needs to make sure fire hazard is managed o Existing road restrictions should not apply to land owners in the Kenepuru ▪ Local residents have prevented Māori land owners from accessing their land previously o Cultural sites around the coastlines, and some near Waitaria o Urupa at Okoha o Desire to build marae on some of the land blocks? • Port Underwood o Customary access vs commercial balance o Consider restricting big truck/ heavy vehicle access

The meeting adjourned at 2:00pm.

The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

Ngā mihi,

STANTEC NEW ZEALAND

Courtney McCrostie
Transportation Engineer
Phone: +64 4 381 5776
courtney.mccrostie@stantec.com

Attachment: [Attachment]

Appendix D Community Engagement January 2023 Summary

Summary of Marlborough Sounds Community Workshop Feedback

French Pass

There were 90 individual comments received from this workshop, with three that were emailed through and incorporated into this summary. The most common topics raised were related to road maintenance (35) and having general road access (10). Other topics discussed were community, environmental and tourism impacts, and landuse concerns.

In terms of road maintenance, most of the comments noted a need for better and more frequent maintenance, citing issues such as its inconsistency, the reactive rather than proactive approach, and the time needed for repairs. Commenters also specified culverts as needing regular maintenance and having local contractors to do this as well as other maintenance jobs. Budgets for maintenance was also discussed, with commenters concerned about where money is allocated and how it should be levied.

Comments about road access were stating the importance of keeping roads open for accessing the community and medical services. Commenters also stated having road access is important for the residents and visitors, and for emergency services and utilities.

Picton

There were 78 individual comments received from this workshop, with 53 commenters from Port Underwood, 15 from Kenepuru, and four from French Pass/Pelorus. The most common topics raised were related to road maintenance (25), heavy vehicle usage (16) and landuse concerns (10). Other topics discussed include boat access, environmental impacts, and community impacts.

In terms of road maintenance, most of the comments stated a need to do regular maintenance, particularly clearing culverts and trimming encroaching vegetation. Commenters also suggested using local residents for culvert maintenance.

Port Underwood Road and the impact of heavy vehicles on this road is a common concern raised by commenters. Suggestions to mitigate this include diverting/removing heavy vehicles by introducing barging to transport goods.

Rai Valley

There were 78 individual comments received from this workshop, with 55 commenters from Rai Valley, 21 from French Pass/Pelorus, and two from Kenepuru. The most common topics raised were related to road maintenance (15), road clearing/clean-ups (7), and general road access (6). Other topics discussed include council communications, heavy vehicle impacts and use of local contractors.

In terms of road maintenance and clean-ups, most of the comments stated more frequent maintenance is needed and clearing of debris caused by roadside vegetation and forestry. Commenters also cited using locally based contractors to provide more regular maintenance and oversight of remote areas.

Comments about road access were stating the importance of keeping roads open to access the community and essential services. Commenters also stated having road access is important for accessing emergency services and utilities. There were also some comments about restricting vehicle access, particularly heavy trucks on the Ronga Road (until it is fixed).

Havelock

A total of 193 individual comments were received from this workshop, with 82 of the commenters coming from the Havelock zone, 71 from French Pass and Pelorus, 38 from Kenepuru, and two from Port Underwood.

For French Pass/Pelorus commenters, the main topics raised were concerns with road maintenance, road access, and heavy vehicle/forestry impacts. Lack of routine maintenance and issues such as slips and road washouts (particularly on Okiwi Bay/Elaine Bay) are ongoing problems. The ongoing impact of heavy vehicles and the local forestry industry are also exacerbating road issues and deteriorating conditions. Some commenters have also noted the importance of having road access for the local community, visitors to the region, and the forestry industry.

Havelock commenters mainly raised issues around road maintenance and road access. The maintenance of culverts were particularly mentioned, with commenters wanting more culvert cleaning and unblocking and increasing the capacity. Having road access is also important, with commenters particularly noting access to Moetapu Bay as crucial and the road needing urgent work.

Kenepuru commenters raised issues around road maintenance, road access and community impacts. Commenters want local road maintenance reinstated and roads maintained to a good standard (doesn't have to all be sealed). Kenepuru Road is also cited as a road that needs repairs and access maintained including to other parts such as Mahua Road.

Port Underwood commenters noted Queen Charlotte Drive as needing repairs urgently and that heavy vehicle access into Oyster Bay is important for the mussel industry.

Waitaria

There were 71 individual comments received from this workshop, with 44 commenters from Waitaria and 27 from Kenepuru. The main topics raised were related to boating infrastructure (15), road maintenance (14), and road access (11). Other topics raised relate to funding and community impacts.

For boating infrastructure, commenters expressed concerns about the cost of boating and the difficulty for less abled people to use them. Commenters also suggested barges at different locations such as Summerbys and Torea.

Commenters noted a lack of ongoing road maintenance as an issue, as well as the management of the maintenance programme. Commenters also recommended using local contractors to deliver the work.

Portage

There were 43 individual comments received from this workshop, with some received as written submissions. The most common topics raised were related to community impacts (14) and road access (10). Other topics raised included boating infrastructure/access, heavy vehicle impacts and council communications.

Commenters were particularly concerned with the impacts on the community if road access was taken away. They need access to schools, social networks and healthcare which relies on having road access and not just water access, which is not accessible to everyone and is weather dependent. Having a road is also important for the community to have access to emergency services and utilities.

Zoom Webinar

There were nine individual comments received from the webinar engagement session, with three commenters from Kenepuru, one from French Pass, and five unknown. Road maintenance was raised the most, with some noting the lack of it and issues such as blocked culverts and lack of gravel. Road access and environmental impacts were also other concerns raised, with commenters questioning how to access health provisions and noting erosion effects.

Appendix E Community Survey January 2023 Results Summary

Marlborough Sounds survey summary

Background

The main survey was available electronically on the website from 31 January to 22 February 2023. A total of 919 surveys were completed as of 22 February. Of the 919 respondents 733 (80%) were residents, 29 (3%) were businesses, and 157 (17%) were residents and businesses. Farmers/Farm operators are examples of respondents who fall into the category of both resident and business).

The survey was developed to gain a full understanding of the access issues and concerns in the project's four geographical areas as identified earlier in this document:

1. Rai Valley / French Pass
2. Pelorus
3. Kenepuru / Queen Charlotte Drive
4. Port Underwood

The survey was split into two components, one set of questions for residents and one set of questions for businesses. The data was analysed for the transport, economic, social and community benefits of the identified geographical areas.

The survey results demonstrate that a reliable road underpins key elements of the local economy, including commuting and business travel and the integrity of local supply-chains. The outcomes of potential solutions will be presented to stakeholders and the community in July 2023.

Survey methodology

The Resident Survey was split into several sections; seeking to profile the resident and their household, asking about their use of the road, understanding their priorities for road investment, and seeking to understand the impact that the recent storm events have had on them.

The Business Survey was split into several sections; asking about the business, staffing and finances; the businesses ability to access markets and issues that it has faced in doing so; and the priorities for future investment based on the state of future access. Furthermore, the survey seeks to capture resident / household related information from business owners that reside in the sounds.

The evidence gathered and presented in the reporting highlighted how essential the local road network is to the community in supporting their movement, and the movement of goods and people. Critically, it also highlighted the impact of the recent storm events on community and business wellbeing, including their finances, and physical and mental health.

Economic analysis

83.5 % of respondents were aged 50+ years, retired, living with on average with one other person living in the home and identify as NZ European / Pākehā.

The summary statistics key findings about the physical health score, mental health score, and business confidence score reported by the respondents are:

- Mental health score decreased (2.3 for residents and 3 for business & residents) more significantly than physical health score (0.9 for residents and 1.6 for business & residents).
- Business owners' level of confidence in their business going concern dropped from 8.8 (prior to the storm events) to 6.1 (post to the storm events), indicating strong negative impacts on business confidence and future outlook.

The industries with the largest representation in the Marlborough Sounds was identified at 22% of the market share for agriculture, forestry and fishing. Accommodation and food services, and professional,

scientific and technical has the second largest representation at 12% each. These figures identify the three key industries in which people work.

Social impact

388 people responded to this question and the leading social impact key theme was the inability to see friends and family during the course of the weather events, with 173 (45%) responding as such. Those whose responses were ranked the highest were from Kenepuru / Queen Charlotte Drive 26%, followed by Rai Valley / French Pass at 19%, Pelorus 13% and Port Underwood with 8%.

It is noted there was a large number of no responses across all regions for this question with 50% from Rai Valley, 41% from Kenepuru, 67% for Rai Valley and 73% for Pelorus.

Mental Health

There were a total 237 respondents to the mental health impact question that asked about the effects the storm had on the quality of their mental health. The question asked them to rank their mental health prior to the weather events and afterwards. The results were consistent across all regions that the perceptions that their quality of mental health was significantly decreased with an increase in feelings of stress and anxiousness.

In Kenepuru / Queen Charlotte Drive – 70% said the weather events had a negative impact on the quality of their mental health. Of that 70% - 20% noted that the reduction the of quality of their mental health was perceived to be as high as 30%.

In Rai Valley / French Pass – 67% noted a reduction in the quality of their mental health. 17% noted as much as a 30% reduction in the quality of their mental health.

In Pelorus – 50% of respondents noted a negative impact on the quality of their mental health. 17% of these people said the negative impact was as high as 50%.

In Port Underwood – 53% noted a reduction in the quality of their mental health. 13% said the reduction was as high as 50% and 27% said the reduction was as high as 20%.

Physical Health

There were a total 236 respondents to the physical health impact question that also asked about the effects the storm had on the quality of their physical health prior to the weather events and afterwards. Some of the key themes identified were an increase in the amount of physical activity required that normally they would have others do for them resulting in increased physical stress and risk of injury. There also mentions of lack of sleep, and lack of freedom to get out and exercise.

In general, of all respondents 54% noted no difference in the quality of their physical health, 40% noted a decrease and 5% noted an increase in the quality of their physical health.

In Kenepuru / Queen Charlotte Drive – 46% said the perceived quality of physical health had decreased. Of that region, 16% noted the reduction was as high as 20%

In Rai Valley / French Pass – 21% noted a negative impact on the quality of their physical health. 17% noted that impact to be as much as a 40% reduction.

In Pelorus – 67% of respondents noted a negative impact on the quality of their physical health. 17% of these people said the negative impact was as high as 50%.

In Port Underwood – 25% noted a reduction in the quality of their physical health. 13% said the reduction was as high as 20% and 6% said the reduction was as high as 60%.

Business key findings

As noted earlier, the economic analysis, identified three key industries as having the largest representation in the Marlborough Sounds and their responses / key findings are reflected below. They are:

1. Agriculture, forestry and fishing.
2. Accommodation and food services, and
3. Professional, scientific and technical.

Question: On a scale of 1-10, please indicate your level of confidence in your business's survival following the recent storm events

There were 187 respondents to the business question regarding their perception of the ability for their business to survive after the storms. If this figure, 121 (65%) noted a negative impact on their business and 55 (29%) said there was no noticeable change.

31 respondents (17%) said they noticed a 50% reduction in their perception of the businesses' viability to survive, 40 respondents (22%) said they noticed a 20–30% reduction and 11 people (6%) said they noticed a 40% reduction and another 6% noted a 10% reduction. 9 people (5%) noted a 70% reduction in their confidence of their business survival.

11 people or 6% noticed a positive effect on their business.

Question: Please indicate how much your business costs have increased, if any, as a result of the recent storm events?

There were 182 respondents to this question regarding increased costs of which 78 (43%) said there was an increase in costs between 10-25%, 48 businesses (26%) said there was no noticeable change. Whereas 17 business or 9% said there was in increase in costs of 25-50% and 6 businesses (3%) said the increase in cost was from 0-10%.

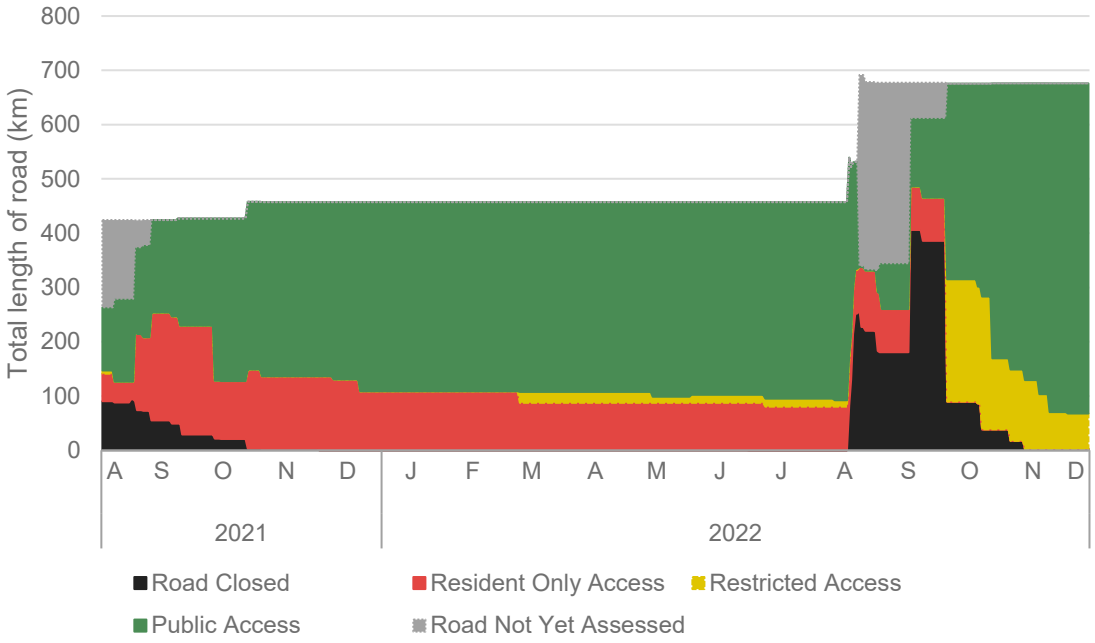
It is noted that the non-response rate for this question was 25 businesses or 14%.

Question: When the local road network is inaccessible, what activities are you prevented from doing which have large consequences for your business?

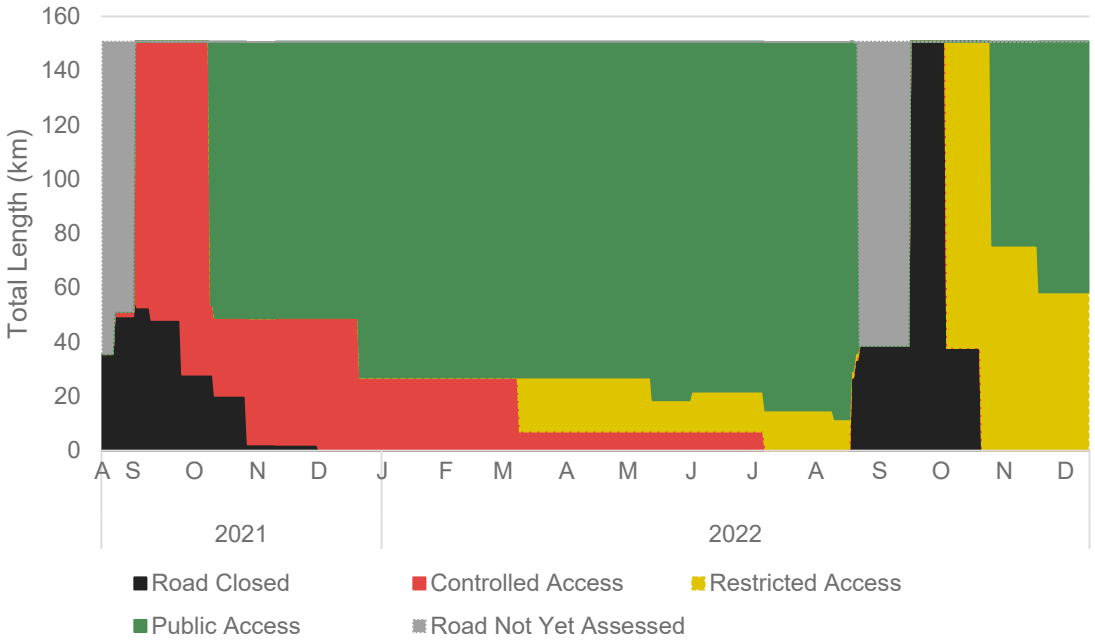
There were 186 responses to this question of which 116 businesses (62%) said they couldn't access supplies. 113 businesses (61%) reflected that their visitors / guests/ customers could not access the business. 80 businesses or 43% had difficulty delivering outputs – getting their product to market and 65 business (35%) said their staff could not access the business.

Appendix F Road Status Graphs Following 2021 Event

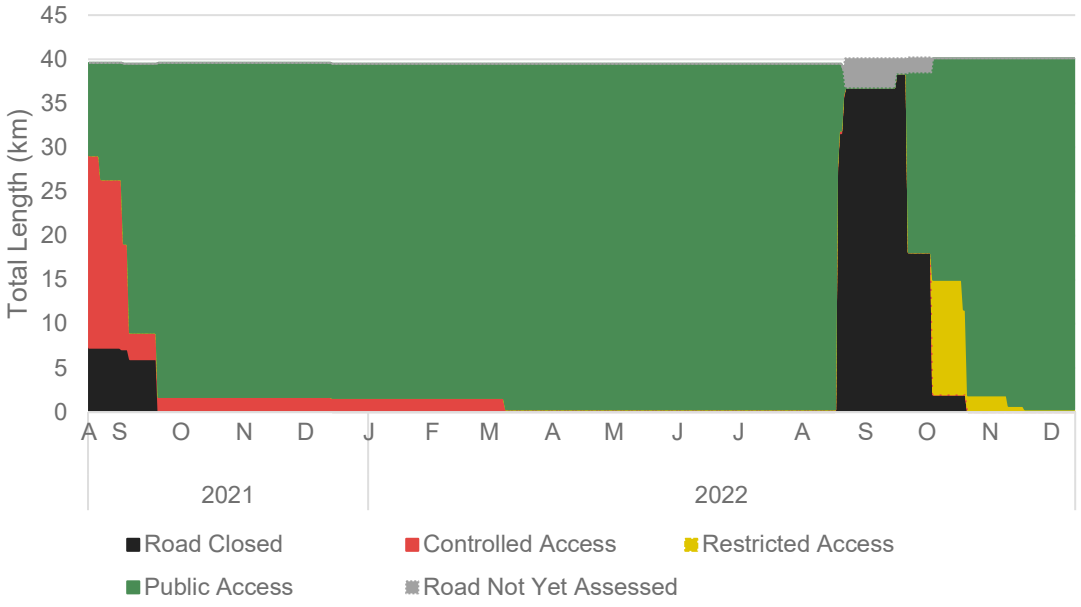
F.1 All Marlborough



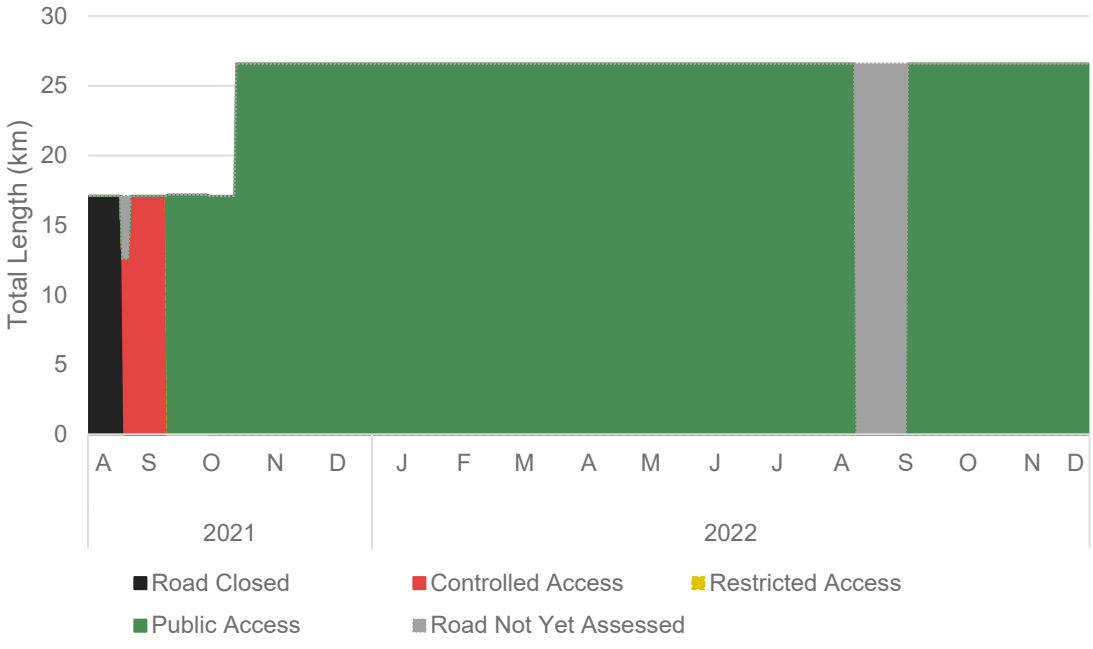
F.2 Kenepuru



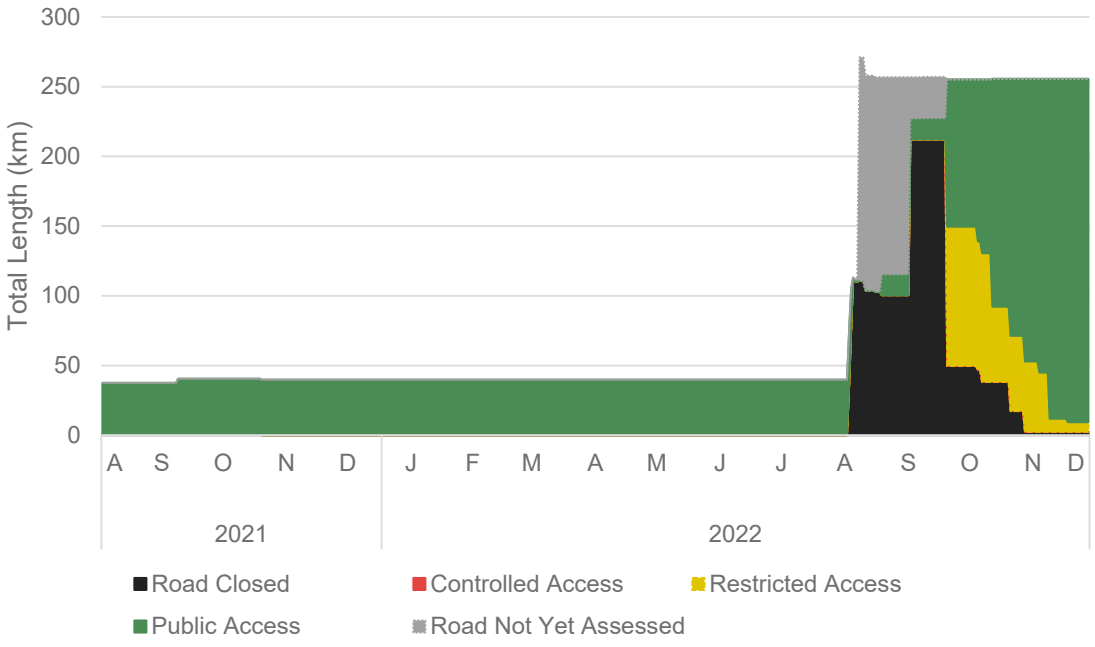
F.3 Queen Charlotte



F.4 Pelorus



F.5 French Pass, Port Underwood and the rest of Marlborough



Appendix G Social Health and Impact Assessment

Sounds Future Access Study

Social and Health Impact Assessment Technical Note

	Name	Position	Signature	Date
Prepared by:	Yadi Wang	Economist	YW	03/04/2023
Reviewed by:	Kyle Barrie	Practice Leader – Economics	KB	05/04/2023
Approved by:	Kyle Barrie	Practice Leader – Economics	KB	05/04/2023

Revision	Date	Description	Prepared	Reviewed	Approved

1 Introduction

1.1.1 This technical note sets out an applied methodology for conducting an initial streamlined social and health impact assessment (SHIA) of the proposed infrastructure options set out in the Sound Future Access Programme Business Case (PBC). It then goes onto set out the results of applying that methodology.

1.1.2 The approach is as follows:

- **Methodology:** We have reviewed key SHIA guidance documents including from the World Health Organisation (WHO) and the New Zealand Ministry for Health to extract key methods, criteria, and processes that has informed a 'streamlined' SHIA methodology that can be applied to each of the proposed options.
- **Initial Assessment:** The streamlined approach, at a high-level, has enabled a streamlined assessment of the potential impact on social and health related outcomes of each option. The focus of this assessment will be to inform one part of the multi-criteria assessment (MCA) conducted for each of the proposed options.
- **Detailed Assessment:** Following the MCA, it is expected that a preferred option will be selected, allowing for a more in-depth assessment of the social and health impact of that option i.e., rather than applying the streamlined approach.

1.1.3 This technical note helps provide a transparent assessment in the timescales available to progress the PBC.

1.1.4 While it is defined as part of the process in the guidance, no additional community consultation has been undertaken as part of this study to avoid 'consultation fatigue'. In addition to limited time available to complete the initial assessment, there is sufficient information gathered to date – from the consultations and survey – that can help inform the initial and detailed assessments.

1.1.5 However, it may be useful as part of the detailed assessment to engage with key Council staff and health representatives to discuss the anticipated effects of the preferred option on the community.

1.2 Methodology Description

1.2.1 The NZ Ministry of Health's Guidance on Health Impact Assessment (the *Guidance*) specifies that "health impact assessments draw on the concepts of determinants of health and health outcomes", where understanding the range of determinants and their influences on different health outcomes on communities is important in understanding the impacts.

1.2.2 A total of 9 Social and Health determinants were identified to derive 4 Social and Health Impacts that are:

- Family/community wellbeing
- Mental wellbeing
- Spiritual wellbeing
- Physical wellbeing

1.2.3 A matrix identifying the connection of determinants of social & health and social & health outcomes is presented in

1.2.4

1.2.5 Table 1-1 SHIA Matrix

Health Determinants	Health Determinants Specific to policy	Social and Health Impacts/Outcomes			
		Family/ Community wellbeing	Mental wellbeing	Spiritual wellbeing	Physical wellbeing
Social and cultural factors	Social support, social cohesion	√	√		
	Social isolation	√	√		
	Participation in community and public affairs	√			
	Family connections	√	√		
	Cultural and spiritual participation			√	
	Reputation of community area	√			
Individual/ behavioural factors	Physical activity				√
	People's belief in the future and sense of control over their own lives	√	√		
	Stress levels		√		√

1.2.6 overleaf.

Table 1-1 SHIA Matrix

Health Determinants	Health Determinants Specific to policy	Social and Health Impacts/Outcomes			
		Family/ Community wellbeing	Mental wellbeing	Spiritual wellbeing	Physical wellbeing
Social and cultural factors	Social support, social cohesion	√	√		
	Social isolation	√	√		
	Participation in community and public affairs	√			
	Family connections	√	√		
	Cultural and spiritual participation			√	
	Reputation of community area	√			
Individual/ behavioural factors	Physical activity				√
	People's belief in the future and sense of control over their own lives	√	√		
	Stress levels		√		√

1.2.7 To understand how the local communities social and health wellbeing was impacted by the recent storm events, the Sounds Future Access Survey proposed 10 scoring and 19 open questions covering four

topics including social impacts, physical health, mental health, and business confidence. The four survey topics are closely aligned with the four health outcomes outlined in the *Guidance.* Therefore, the observations and insights drawn based on the responses to the scoring and open questions are used to support the SHIA in two ways:

- enable the establishment of the base case upon which the impacts of proposed interventions (i.e., road-focus, marine-focus, etc.) could be reliably gauged and compared.
- allow to determine and adjust weights assigned to the four Social and Health Impacts (specified by the *Guidance)* in an evidence-based manner.

1.2.8 Responses to the scoring survey questions are readily available for quantitative analysis, where the summary statistics about the physical health score, mental health score, and business confidence score reported by the respondents are summarised in Appendix A

1.2.9 Regarding the open questions, responses to these questions are in provided in the form of free texts. Content analysis enabling quantitative analysis about the qualitative responses were adopted. This is achieved by analysing word frequency, enabling insights and inferences to be drawn based on signal words' appearance frequency.

1.2.10 The key findings drawn from the survey score and responses are:

- Mental health score decreased more significantly than physical health score (see Appendix A and Appendix B).
- Business owners' level of confidence in their business going concern dropped from 8.8/10 (prior to the storm events) to 6.3/10 (post to the storm events), indicating strong negative impacts on business confidence and future outlook.
- Words with strong negative connotations (isolation, separation, etc.) appeared frequently in survey responses regarding social impacts.
- Words related to social relationships (parents, partners, friends, council, neighbourhood, etc.) showed high word frequency, indicating that social relations carried heavy weights when respondents described social impacts.

1.2.11 Based on those findings, the 4 Social and Health impacts are prioritised as: 1) mental wellbeing, 2) family and community wellbeing, 3) spiritual wellbeing, and 4) physical wellbeing. The weighted factor assigned to them (in Table 1-2) are calculated using the following equation:

$$w_i = \frac{\frac{1}{P_i} \times 100\%}{\sum_{N=4}^{i} \frac{1}{P_i} \times 100\%} \times 100\%$$

Where:

w_i is the weight factor of Social and Health impact i

P_i is the ranking of Social and Health impact i

Table 1-2 Weight Factors for Social and Health Impacts

	Ranking	Weight Factor
Family/Community wellbeing	2	24%
Mental wellbeing	1	48%
Spiritual wellbeing	3	16%
Physical wellbeing	4	12%

1.2.12 Based on the Multi-Criteria Analysis User Guidance by Waka Kotahi, a 7-point score system was employed to score the Social and Health impacts of proposed interventions depending on the level of approach planned in each road segment or marine area. The scoring system is presented in Appendix B .

1.2.13 Finally, the social and health impact scores of candidate interventions are calculated for each study area, which are summarised in Appendix C .

Appendix A Summary statistics for survey scores by study zones

Residents (n=735)	Physical Health Score											
Zones	Count	Score Prior				Score Post				Score Drop (Prior - post)			
		Mean	Stdev	Max	Min	Mean	Stdev	Max	Min	Mean	Stdev	Max	Min
Kenepuru and Queen Charlotte Drive	167	8.29	1.74	10	2	7.30	1.95	10	3	0.97	1.66	7	-4
Pelorus	6	8.50	1.22	10	7	6.83	1.94	9	4	1.67	1.63	4	0
Port Underwood	16	8.31	1.70	10	3	7.50	2.42	10	2	0.81	1.68	6	0
French Pass	47	8.28	1.38	10	5	7.72	2.20	10	1	0.55	1.53	7	-2
Grand Total	236	8.29	1.65	10	2	7.39	2.03	10	1	0.89	1.64	7	-4

Business and Residents (n=186)	Physical Health Score											
Zones	Count	Score Prior				Score Post				Score Drop (Prior - post)			
		Mean	Stdev	Max	Min	Mean	Stdev	Max	Min	Mean	Stdev	Max	Min
Kenepuru and Queen Charlotte Drive	47	8.87	1.73	10	0	6.89	2.34	10	0	1.98	2.15	7	-1
Pelorus	3	9.33	0.58	10	9	8.00	1.00	9	7	1.33	1.15	2	0
Port Underwood	4	8.25	2.36	10	5	8.75	1.50	10	7	-0.50	3.32	3	-5
French Pass	8	8.88	1.55	10	6	7.38	3.07	10	2	1.50	1.85	4	0
Grand Total	62	8.85	1.69	10	0	7.13	2.37	10	0	1.73	2.20	7	-5

Residents (n=735)	Mental Health Score											
Zones	Count	Score Prior				Score Post				Score Drop (Prior – post)			
		Mean	Stdev	Max	Min	Mean	Stdev	Max	Min	Mean	Stdev	Max	Min
Kenepuru and Queen Charlotte Drive	168	8.62	1.78	10	0	6.23	2.23	10	0	2.41	2.35	10	-3
Pelorus	6	7.50	2.43	10	4	6.00	1.67	8	4	1.50	2.59	5	-1
Port Underwood	16	8.06	2.52	10	0	6.69	2.36	10	0	1.38	1.75	5	0
French Pass	48	8.81	1.18	10	5	6.79	2.36	10	2	2.02	2.14	8	0
Grand Total	238	8.59	1.76	10	0	6.37	2.25	10	0	2.24	2.28	10	-3

Business and Residents (n=186)	Mental Health Score											
Zones	Count	Score Prior				Score Post				Score Drop (Prior - post)			
		Mean	Stdev	Max	Min	Mean	Stdev	Max	Min	Mean	Stdev	Max	Min
Kenepuru and Queen Charlotte Drive	47	8.87	1.92	10	0	5.61	2.12	10	0	3.26	2.27	8	0
Pelorus	3	9.33	0.58	10	9	7.00	1.00	8	6	2.33	0.58	3	2
Port Underwood	4	9.50	1.00	10	8	9.00	1.15	10	8	0.50	1.00	2	0
French Pass	8	9.13	1.36	10	7	6.00	2.56	10	2	3.13	1.46	5	0
Grand Total	62	8.97	1.76	10	0	5.95	2.24	10	0	3.02	2.16	8	0

Business and Residents (n=186)	Business confidence Score											
Zones	Count	Score Prior				Score Post				Score Drop (Prior - post)			
		Mean	Stdev	Max	Min	Mean	Stdev	Max	Min	Mean	Stdev	Max	Min
Kenepuru and Queen Charlotte Drive	94	9.06	2.06	10	0	5.98	2.72	10	0	3.12	2.87	10	-2
Pelorus	12	8.17	2.29	10	3	6.75	2.56	10	2	1.42	1.73	5	0
Port Underwood	13	8.92	2.81	10	0	8.31	2.10	10	5	0.62	2.50	5	-5
French Pass	34	8.38	2.37	10	1	6.38	2.63	10	1	2.00	2.06	8	-1
Grand Total	153	8.83	2.22	10	0	6.33	2.70	10	0	2.52	2.71	10	-5

Appendix B Intervention scores based on 7-point scoring system

	Code	Approach	Vehicle Restrictions	Lane width	Score Point
ROADS	Ai	Build back stronger (protect)	No additional restrictions (from current)	Retain existing	3
	Aii	Build back as was	Additional restrictions on vehicle size/weight	Increasing number of one lane sections	3
	Bi	Build back with targeted improvements (accommodate)	No additional restrictions (from current)	Retain existing	2
	Bii	Build back as was but with isolated one lane sections	Additional restrictions on vehicle size/weight	Increasing number of one lane sections	1
	C	Build back with essential repairs only (accommodate/retreat)	Additional restrictions on vehicle size/weight	Increasing number of one lane sections	1
	D	Build back roads that provide access to marine hubs (retreat others)	Additional restrictions on vehicle size/weight	Increasing number of one lane sections	-1

	Code	Approach	Operations		Services		Score Point
			Protect	Increase	Freight	Passenger	
MARINE	X	Existing - maintain and protect (resilience)	X				0
	Yi	Existing - protect and upgrade facilities for pax	X			X	0
	Yii	Existing - protect and upgrade facilities for freight	X	X	X		1
	Yiii	Existing - protect and upgrade facilities for all users	X				2
	Zi	New - emergency ramp	X	X	X	X	2
	Zii	New - local marine hub	X	X			3
	Ziii	New - arterial marine hub	X	X			3

Appendix C Social and Health scores by intervention and study areas

Score Results	Road Focus					Road Access				
	Mental	Physical	Family/Community	Spiritual	Total	Mental	Physical	Family/Community	Spiritual	Total
French Pass	0.59	0.15	0.30	0.20	1.23	0.66	0.17	0.33	0.22	1.38
Queen Charlotte Drive	0.96	0.24	0.48	0.32	2.00	0.96	0.24	0.48	0.32	2.00
Kenepuru	0.96	0.24	0.48	0.32	2.00	0.69	0.17	0.35	0.23	1.44
Pelorus	0.60	0.15	0.30	0.20	1.25	0.48	0.12	0.24	0.16	1.00
Port Underwood	0.84	0.21	0.42	0.28	1.75	0.60	0.15	0.30	0.20	1.25
Average	0.79	0.20	0.40	0.26	1.65	0.68	0.17	0.34	0.23	1.41

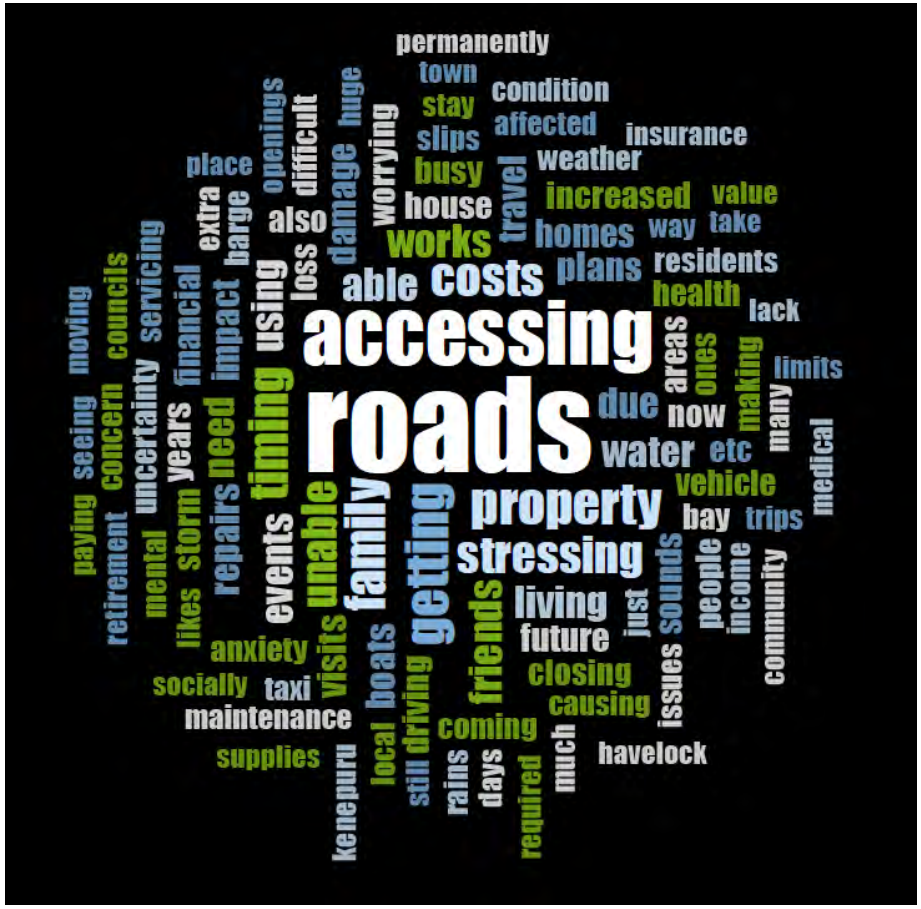
Score Results	Balanced					Marine Access				
	Mental	Physical	Family/Community	Spiritual	Total	Mental	Physical	Family/ Community	Spiritual	Total
French Pass	0.66	0.17	0.33	0.22	1.38	0.70	0.18	0.35	0.23	1.46
Queen Charlotte Drive	0.64	0.16	0.32	0.21	1.33	0.96	0.24	0.48	0.32	2.00
Kenepuru	0.72	0.18	0.36	0.24	1.50	0.54	0.14	0.27	0.18	1.13
Pelorus	0.72	0.18	0.36	0.24	1.50	0.72	0.18	0.36	0.24	1.50
Port Underwood	0.54	0.14	0.27	0.18	1.13	0.42	0.11	0.21	0.14	0.88
Average	0.66	0.16	0.33	0.22	1.37	0.67	0.17	0.33	0.22	1.39

Score Results	Marine Focus				
	Mental	Physical	Family/Community	Spiritual	Total
French Pass	0.59	0.15	0.30	0.20	1.23
Queen Charlotte Drive	0.80	0.20	0.40	0.27	1.67
Kenepuru	0.30	0.08	0.15	0.10	0.63
Pelorus	0.48	0.12	0.24	0.16	1.00
Port Underwood	0.42	0.11	0.21	0.14	0.88
Average	0.52	0.13	0.26	0.17	1.08

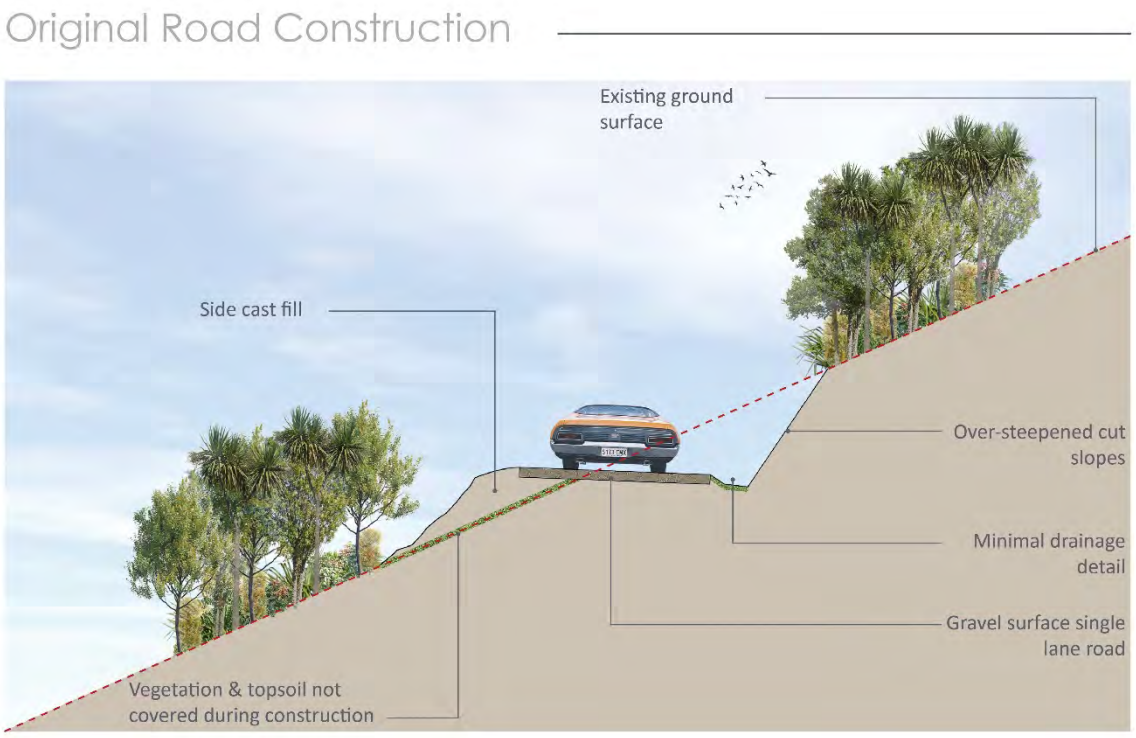
Appendix D 7-point scoring system by Waka Kotahi's Multi-criteria analysis user guidance

7-point scoring system		
Point	**Magnitude**	**Definition**
3	Large positive	Major positive impacts resulting in substantial and long-term improvements or enhancements of the existing environment.
2	Moderate positive	Moderate positive impact, possibly of short-, medium- or longterm duration. Positive outcome may be in terms of new opportunities and outcomes of enhancement or improvement.
1	Slight positive	Minimal positive impact, possibly only lasting over the short term. May be confined to a limited area.
0	Neutral	Neutral – no discernible or predicted positive or negative impact
-1	Slight negative	Minimal negative impact, possibly only lasting over the short term, and definitely able to be managed or mitigated. May be confined to a small area.
-2	Moderate negative	Moderate negative impact. Impacts may be short, medium or long term and are highly likely to respond to management actions.
-3	Large negative	Impacts with serious, long-term and possibly irreversible effect leading to serious damage, degradation or deterioration of the physical, economic, cultural or social environment. Required major rescope of concept, design, location and justification, or requires major commitment to extensive management strategies to mitigate the effect.

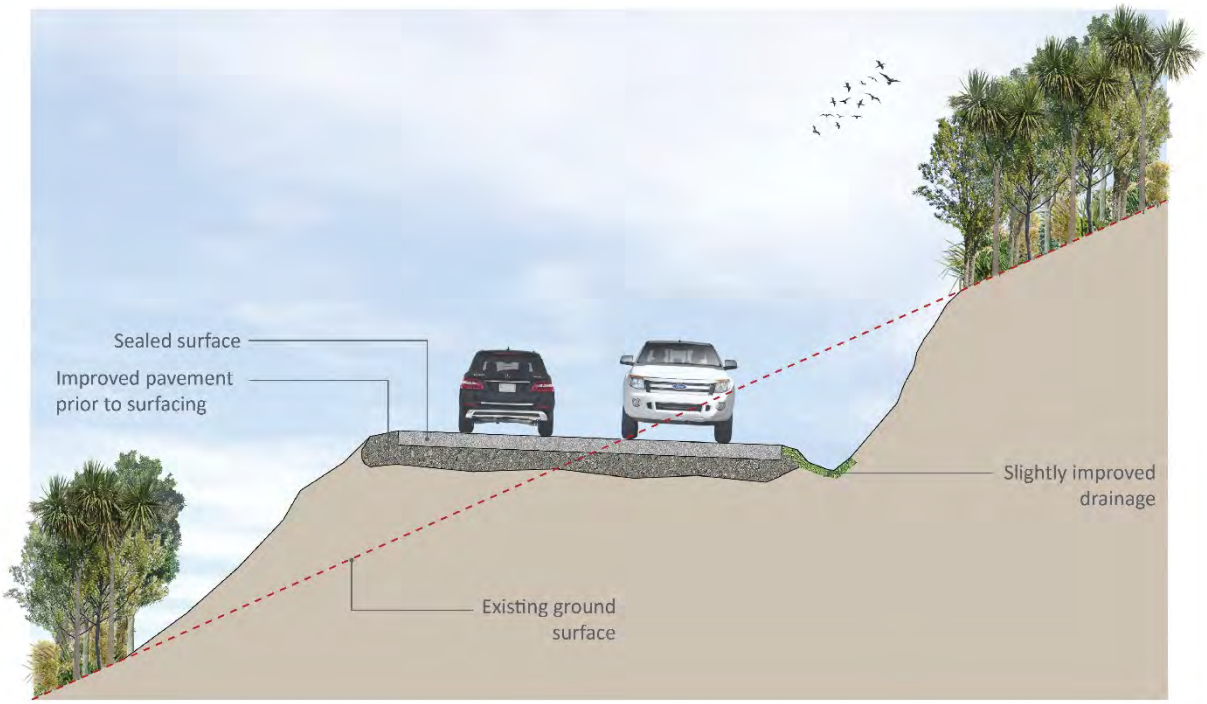
Appendix E Word Cloud for all the qualitative responses collected in the survey



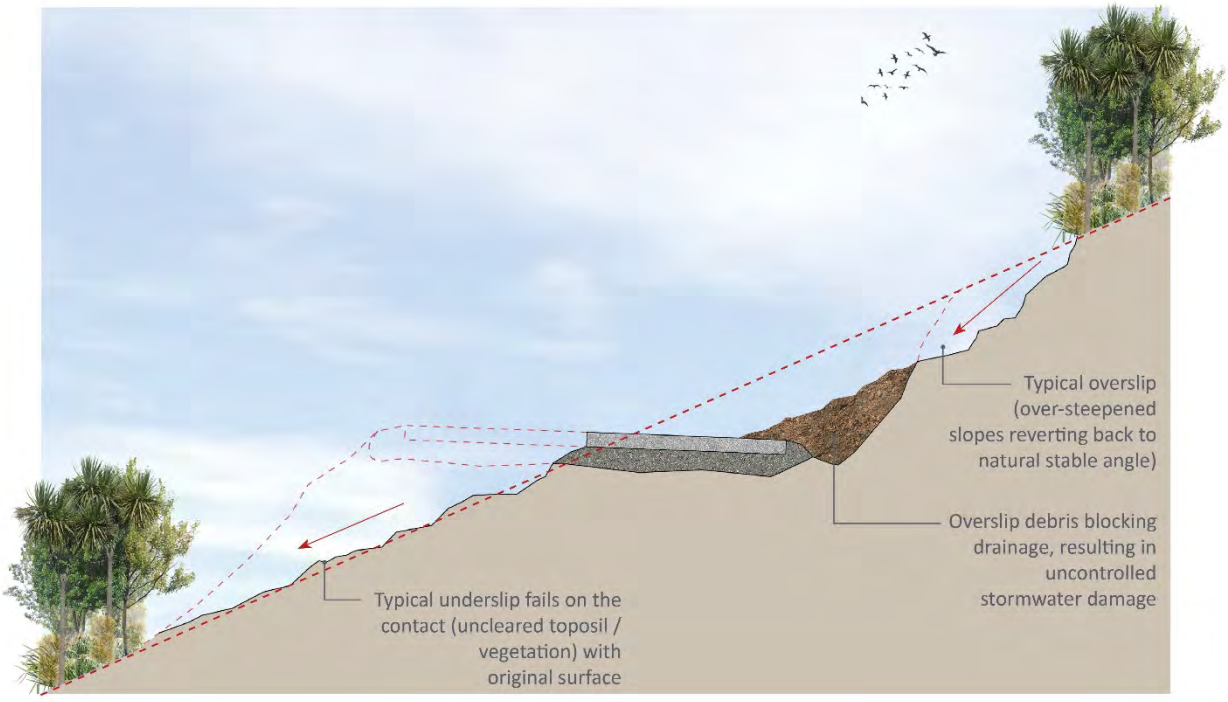
Appendix H Changing Construction Standards



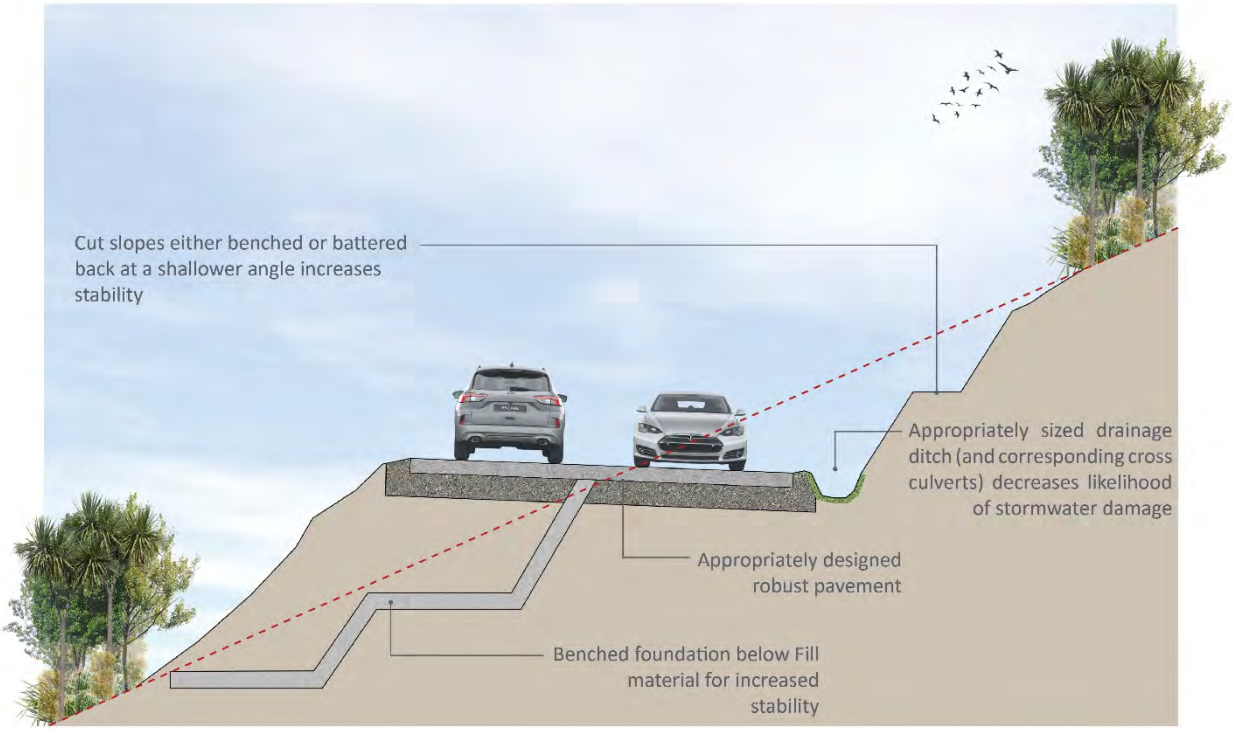
Road Sealed



Post Storm/Earthquake Event (typical failure scenario)

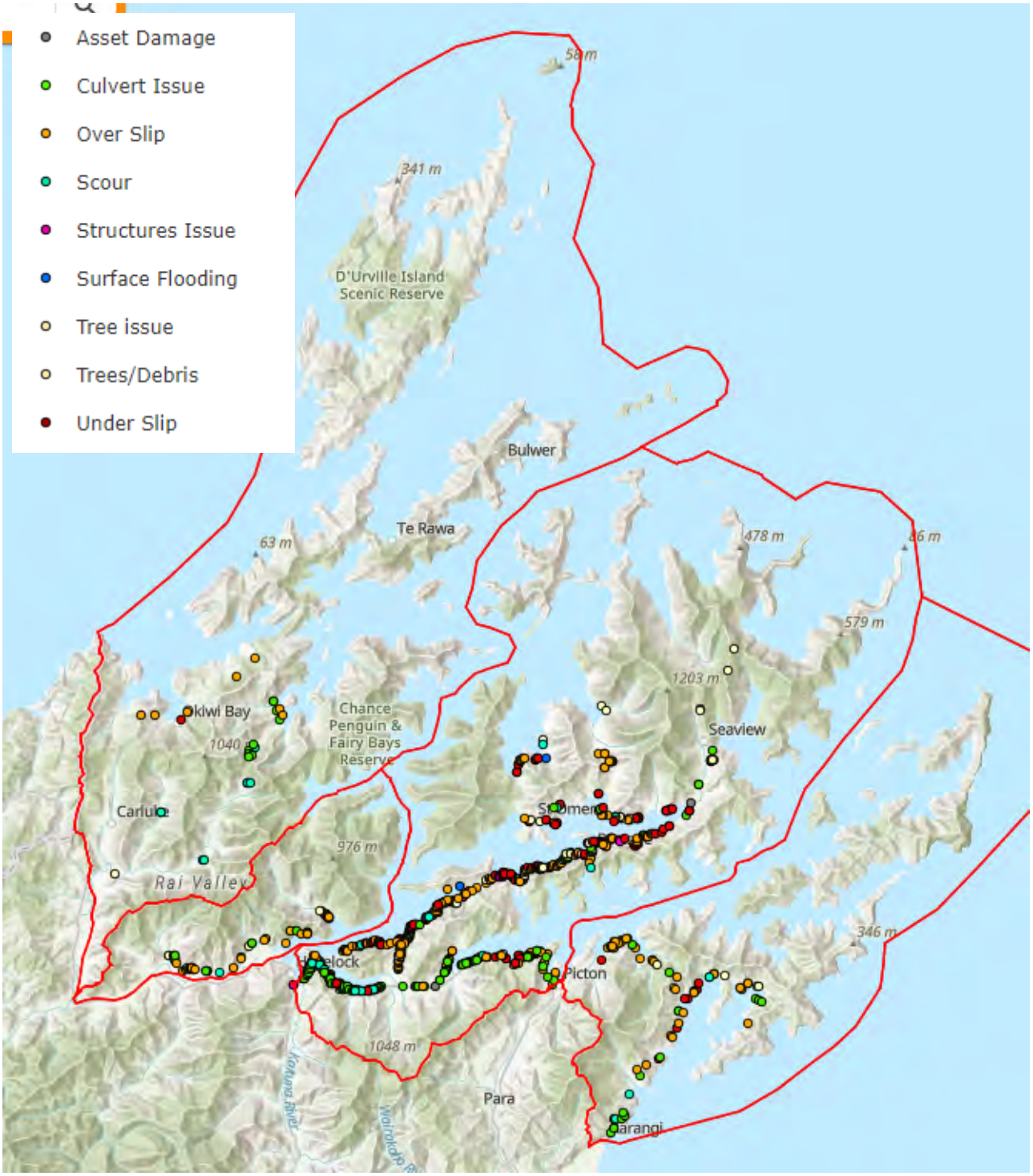


Modern Road Design Features

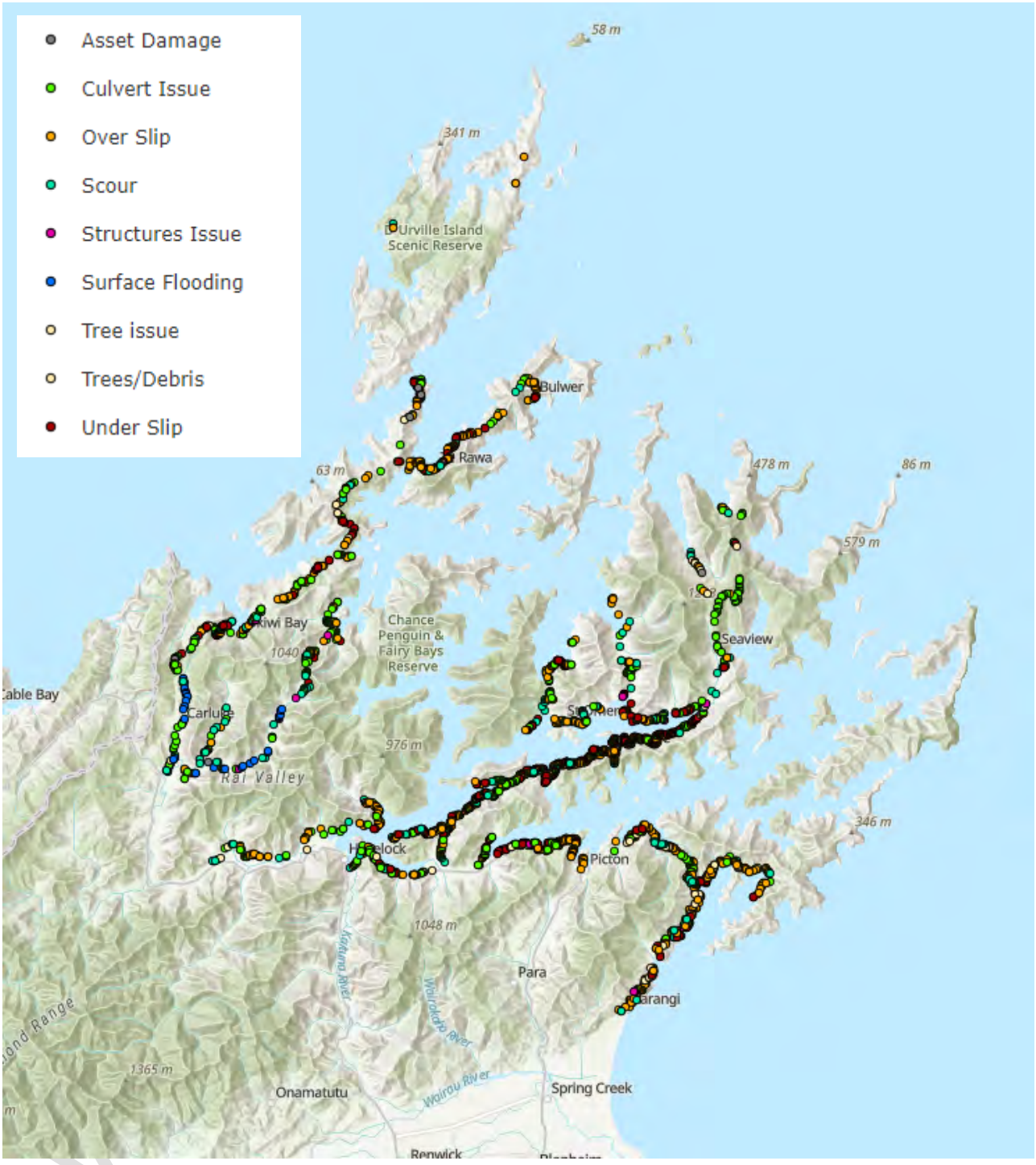


Appendix I Event Fault Maps

I.1 2021 Event Fault Map



I.2 2022 Event Fault Map



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