

Puhoi to Wellsford Four Laning: Business Case Statement



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Contents

1. Executive Summary	1
2. Strategic Context	2
2.1 NLTP and the GPS	3
2.2 Contribution to LTMA Objectives	5
2.3 Strategic Investment Direction	6
Activity Class	6
Increased focus on ...	6
Maintain focus on ...	6
New and improved infrastructure	6
State highways and local roads	6
2.4 Land Use and Modal Integration	7
2.5 Auckland RLTP	7
3. Corridor Assessment	8
3.1 Background	8
3.2 Corridor Option Selection	8
3.2.1 Stakeholder Consultation	10
3.3 Possible Route Alignments	11
3.3.1 Options 1 and 2 Discussion	11
3.3.2 Options 3 and 4 Discussion	11
3.3.3 Option 5 Discussion	12
3.3.4 Option 6 Discussion	12
3.3.5 Costs	13
3.4 Determination of Assessed Route	13

4.	Network Assessment	15
4.1	Introduction	15
4.2	Improved Transport Connections to Areas of Economic Growth Potential	16
4.3	Increasing Access to Markets and Wider Economic Benefits	21
4.3.1	Dairy	21
4.3.2	Forestry	22
4.3.3	Meat	23
4.3.4	Aggregates	23
4.3.5	Retail and Manufactured Goods	24
4.3.6	Tourism	24
4.3.7	Potential Wider Economic Benefits	25
4.3.8	Alternative Modes	27
4.4	Improvements to Journey Time Reliability	28
4.5	Easing of Severe Congestion	29
4.6	Improving Transport Efficiency	30
4.6.1	Travel Time Benefits	30
4.6.2	Vehicle Operating Cost Benefits	31
4.7	Improvements in Road Safety	32
4.7.1	Puhoi to Warkworth	32
4.7.2	Warkworth to Wellsford	33
4.7.3	Accident Summary	34
4.8	Network Assessment Summary	34
4.9	Wider Economic Benefits	35
5.	Funding Breakdown	37
5.1	Tolling	37

6. Programme	41
7. Overall Assessment	42

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1. Executive Summary

This business case sets out the quantum and justification for funding of the Investigation and Reporting, Specimen Design and Project Documentation stages of the Puhoi to Wellsford four laning project. This route was recently identified by the Government as being one of the seven routes of national significance. This highlights the importance of this route to New Zealand as a country and identifies that work is required to reduce congestion, improve safety and reliability and support economic growth. The revised Government Policy Statement (GPS) requires NZTA to advance projects on these routes when allocating funds in the NLTP.

The business case demonstrates how the project measures against the strategic investment directions being developed by NZTA and will contribute to economic growth and productivity, the objectives and goals of the LTMA and GPS, and deliver regional development and transportation benefits. As part of this an initial assessment has been made about the potential wider economic benefits of the project with a focus on specific industries, including agriculture, forestry and tourism. Improving SH1 between Puhoi and Wellsford will reduce transport costs and make Warkworth, Wellsford and Northland more accessible from the larger population and economic centres and markets in Auckland and further to the south.

A preliminary assessment of the timeframe for delivering the project suggests that a 10 year timeframe for the substantial completion of the four laning between Puhoi and Warkworth is a reasonable expectation. This allows 5 years for the development of the route, consenting, property purchase and procurement followed by 5 years of construction.

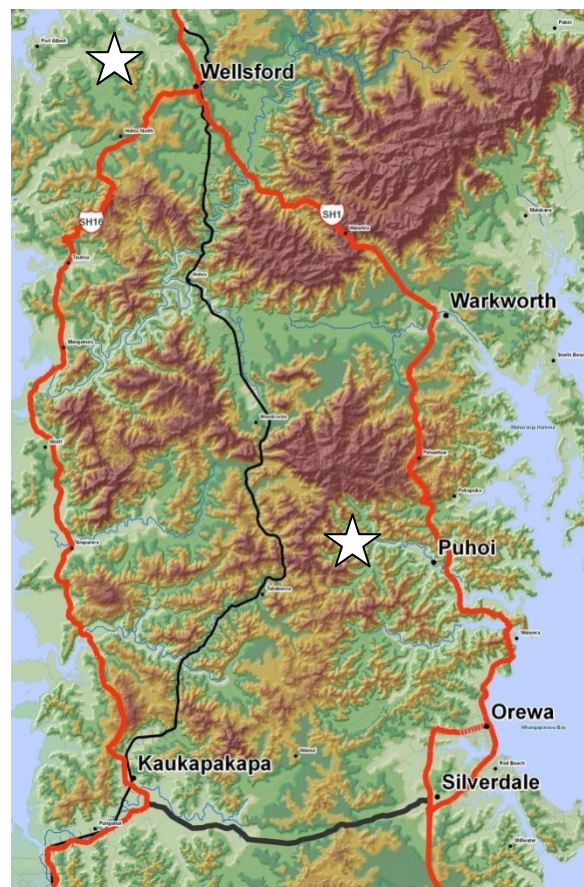
A further 10 years until 2030 is a reasonable expectation for completion of the remaining section of four laning between Warkworth and Wellsford, allowing NZTA to optimise funding and delivery against other routes of national significance. However there could be a number of opportunities to deliver the whole alignment in a shorter timeframe. All these opportunities will be considered as part of the next stage of the project.

A preliminary economic evaluation of the project has been undertaken to give an indication of the benefits of four laning the route. Traditional benefit / cost assessments do not include a range of benefits such as the effects of improving transport efficiency and increasing access to markets on regional economic growth potential. These benefits are likely to be significant for a project of this scale. Therefore an initial assessment of the source and magnitude of the wider economic benefits has been included.

2. Strategic Context

The government recently identified seven 'routes of national significance', with SH1 between Puhoi and Wellsford being one of these routes. These routes are the most essential in the country "that require work to reduce congestion, improve safety and support economic growth".¹ The route between Puhoi and Wellsford is shown in Figure 2-1: below.

■ Figure 2-1: Locality Map



These roads are listed as 'nationally significant' to allow the government to have input into the development of the land transport programme and the National Infrastructure Plan from a nationwide perspective. The desire of identifying them was to signal to NZTA through the Government Policy Statement (GPS) their significance to the country as a whole.²

¹ Press release from Transport Minister Steven Joyce

² Press release from Transport Minister Steven Joyce

The Minister has asked NZ Transport Agency, as part of the recently released GPS, to develop plans to substantially advance these roads over the next ten years, alongside other state highway projects in the National Land Transport Programme.

2.1 NLTP and the GPS

The GPS is a key government document for influencing the planning and funding of land transport. The revised GPS was released on 18 May 2009 and reflects the priorities of the current government of national economic growth and productivity.

The GPS outlines the government's objectives and funding priorities for the land transport sector for a 10-year period with detail for the first 3 to 6 years. The GPS signals to both the NZ Transport Agency and regional transport committees what type of activities or combinations of activities should be included in Regional Land Transport Programmes (RLTP) and the National Land Transport Programme (NLTP).

The NLTP is a statutory document prepared by the NZ Transport Agency that describes transport activities or packages of activities expected to be considered for funding for the 3 years from 2009/10. Whilst the RLTP is required to be consistent with the GPS the NLTP must give effect to the GPS.

The revised GPS aims to support the government's priority of achieving economic growth and productivity in New Zealand through directing investment towards high quality infrastructure projects that support efficient movement of freight and people. There is particular focus on the State Highway network, which is critical to the efficient movement of freight and people. There is also a strong emphasis on value for money, and the economic efficiency of projects.

The revised GPS includes a significant increase in State Highway construction in order to bring benefits for national economic growth and productivity, particularly given that State Highways carry most inter-regional freight and link major ports, airports and urban areas. In particular it is envisaged that the NLTP will help address strategic 'bottlenecks' and allow new economic growth areas to be better connected into the national network.

Within the revised GPS the Minister proposes a number of 'Routes of National Significance (RONS) in the vicinity of our five largest urban centres. The Puhoi to Wellsford project is one of those RONS. There is an expectation from the Minister of Transport that the NZ Transport Agency should have regard for the need to advance the routes of national significance when allocating funds in the NLTP and to this end the Puhoi to Wellsford project has been prioritised third in the State Highway programme behind Victoria Park Tunnel and the Western Ring Route, two other RONS.

The GPS states that (paras 25 to 27):

"The government's priority is for land transport investment to support national economic growth and productivity. The GPS will ensure the use of land transport funding does so by directing investment into high quality infrastructure projects and transport services that encourage the efficient movement of freight and people.

Of particular importance to this priority are:

- *Investing in the State highway network, as a key to the efficient movement of freight and people*
- *Generating better value for money from the government's investment across all land transport activity classes and enhancing the economic efficiency of individual projects.*

Investing in land transport is particularly important at this time. In the short to medium term, the most pressing challenge facing New Zealand is the current global and domestic economic situation, which is contributing to a period of negative or slow economic growth for the country and for other international economies. Well-targeted land transport investment will keep people in employment, improve productivity and lay the groundwork for robust economic growth in the future.

Investing in the State highway network is important as there are significant constraints on its current capacity to efficiently move freight and people, leading to congestion in New Zealand's major cities. Unless investment in State highway is addressed, congestion will continue to negatively impact on economic growth and productivity. Investment in State highways will also make some of our busiest roads safer. "

The proposed scheme to upgrade SH1 between Puhoi and Wellsford is one of the identified routes of national significance and is therefore a priority for funding.

The key impacts the GPS seeks to achieve in relation to economic productivity and growth are:

- Improvements in journey time reliability;
- Easing of severe congestion;
- More efficient freight supply chains
- Better use of existing transport capacity
- Better access to markets, employment and areas that contribute to economic growth
- A secure and resilient transport network

Journey time reliability will be greatly enhanced along the route and between Auckland and Northland with the proposed scheme. The new route will provide a safer, more resilient and more efficient link thus improving the mobility of users and the reliability of travel times along the route. Freight traffic will gain significant improvements in journey time reliability from improved gradients and a higher quality route, thereby improving productivity and reducing costs.

The existing road is prone to **severe congestion** particularly during holiday peak periods. The new route will significantly reduce the impacts of the severe congestion by increasing capacity and providing a more resilient route.

The improved accessibility provided by the upgraded route will support economic development in the north of the Auckland Region in centres along the route (such as Warkworth) as well as promoting economic

development in Northland. The improved connections achieved by the upgrading of SH1 would link the main producing activities in Northland, particularly dairying, the forestry industry and the mining industry and the major markets for these products either for domestic consumers and industries in areas to the south of the region or international markets accessed via the ports of Auckland and Tauranga, so providing **more efficient supply chains** and **better access to markets**. In addition, improved travel times and travel time reliability will tend to reduce the costs of commodities transported to Northland from the south for consumption or for input to the manufacturing industries in the area. This will make Northland a more attractive place to live and to develop employment activities, as will reduced journey times and improved travel time reliability for business and personal trips to and from Auckland. Furthermore making the tourist destinations in Northland more accessible to the large market and population in the Auckland region will assist that industry. Both Auckland and Northland are identified as areas of economic growth potential with Northland currently having a relatively low level of economic development.

The proposed strategy will improve **transport efficiency** as compared to the existing network through the provision of a high standard motorway or expressway environment for long-distance traffic. The improved design features including gradients and length, will lead to shorter journey times and consequent increases in the efficiency of the use of transport equipment. They will also lead to significant reductions in emissions particularly in relation to truck movements which are forecast to increase significantly within the State Highway 1 corridor.

The improved motorway or expressway will be a significant improvement to the current route, which has notable safety problems in locations such as Schedewys Hill and Dome Valley. An upgraded route will have improved vertical and horizontal alignments, which will provide considerable **safety benefits for motorists, passengers and goods and a more secure route**.

2.2 Contribution to LTMA Objectives

The Land Transport Management Act (LTMA) gives effect to the New Zealand Transport Strategy (NZTS) objectives and principles. Under the LTMA, NZTA's objectives and functions include preparing and controlling a programme for the State Highway system that contributes to an integrated, safe, responsive, and sustainable land transport system. In doing so NZTA must consider how it will:

- Assisting economic development
- Safety and personal security
- Access and mobility
- Protecting and promoting public health
- Ensuring environmental sustainability

The LTMA objectives are similar to the GPS targets as outlined above. The LTMA also includes an objective related to environmental sustainability. The proposed new route offers a quicker, safer, more resilient route for travel between Puhoi and Wellsford which will reduce vehicle emissions that impact on the environment. The construction of the new offline route will impact on the environment, but through sustainable engineering and design, **adverse environmental effects from land transport will be managed** where they cannot be eliminated.

2.3 Strategic Investment Direction

As part of the NZTA’s revised Investment and Revenue Strategy, the strategic investment direction provides the background against which assessment is required for inclusion into the NLTP and for funding approval. This calls for:

Activity Class	Increased focus on ...	Maintain focus on ...
New and improved infrastructure		
State highways and local roads	Investment in state highways and local roads where greatest economic growth and productivity impacts can be achieved through: <ul style="list-style-type: none"> ○ Investing in Roads of National Significance (RONS) to improve access through, in and out of the major urban areas ○ Investing in key freight and tourism routes to lift productivity and improve access to markets ○ Investing in infrastructure on local road networks that support RONS. 	<ul style="list-style-type: none"> ○ Improving journey time reliability on key routes ○ Easing severe congestion ○ Better use of existing capacity ○ Increasing capacity on key routes ○ Reducing the risk and number of fatal and serious injuries ○ Reducing risk from natural hazard or other transport operations disruptions ○ Managing adverse environmental effects from land transport.

In terms of the “**Increased focus**” issues, the new route clearly meets the defined criteria:-

- The route is one of the RoNS and will improve access in and out of the major urban area of Auckland
- The route provides additional capacity on a key freight route typically carrying more than 1000 HCVs per day
- The route provides access to the major tourism area of Northland, which had total tourist visits of 4.3 million in 2007 and carries about 6 million tourist trips per year (including outbound movements by Northland residents)

In terms of the **Maintain focus** criteria, most of the key impacts have been discussed above in terms of the GPS and LTMA criteria. The provision of the new connections will supplement the existing route and provide **enhanced network resilience and reduced risk of disruption** compared to the base position where SH1 is the only realistic option for the majority of the traffic on the route and for the movements between Northland and the areas further south in New Zealand. Although in theory SH16 could provide an alternative to SH1, this is a very slow and circuitous route and traffic forced to use this because of planned or unplanned disruption on SH1 would face substantially increased costs and journey times. The low flows currently experienced on SH16 of about 1100–1200 vehicles per day south of Wellsford, compared to about ten times this number on SH1 are testament to this,

2.4 Land Use and Modal Integration

The Auckland Regional Growth Strategy (ARGS) and the Rodney District Plan both anticipate significant growth occurring in that part of the region served by the Puhoi to Wellsford section of SH1. Populations in this area are expected to grow from approximately 20,000 in 2006, to more than 60,000 by 2051. Furthermore, the implication of present growth rates is that Rodney District's projection for growth as required under the ARGS and the Northern Sector Agreement will be met well prior to 2051.

Particular areas identified for growth within the Auckland region include Warkworth and Wellsford. Further north, Whangarei is identified as an area suitable for economic growth and a significant increase in commercial and residential development is anticipated.

These identified growth areas in the vicinity of SH1 need good and reliable local and longer distance access to support development. Increased conflict between long distance travel as far north as Northland and local movements particularly for the towns along the route in the south acts as a barrier to this and hinders these local centres becoming successful economic hubs. Improving SH1 will then provide the longer distance connectivity, improve safety and efficiency of the State Highway and relieve the local road network for Warkworth and Wellsford.

These transport benefits arising from the proposed scheme provide considerable support for the land use provisions proposed for the area. The improved transport links should enable economic activities at these growth centres to become more integrated, enabling them to operate more effectively and efficiently. Because of the limited access points on the new route development would be encouraged to focus in these designated areas rather than becoming more dispersed across the region. This concentration would also encourage the use of the existing infrastructure within these already established urban areas, whereas alternative more dispersed residential and employment patterns would potentially require a more substantial investment in infrastructure. Denser development would also support higher levels of travel by modes other than private cars, particularly walking and cycling and also local public transport services.

In the SH1 corridor itself, the option to toll the route would help manage the traffic flows in the corridor and could provide greater opportunities for the efficient movement of public transport and freight. The reduction of flows on the existing SH1 would also make this more attractive as a long-distance cycling route.

2.5 Auckland RLTP

ARTA released the Regional Land Transport Programme for 2009/10 – 2011/12 earlier in 2009. NZTA HNO now submits its State Highway programme to ARTA for inclusion in the RLTP.

The final Auckland RLTP was released in July 2009. Within Activity Class 13, Infrastructure for State Highways, funding for investigation and property costs has been allocated over the three year period, with a further allocation of design costs for the Schedewys Hill Deviation (which potentially forms part of the route).

3. Corridor Assessment

3.1 Background




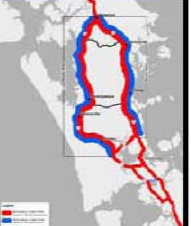
A state highway strategy study between Auckland and Wellsford was completed in 2008. Set against the background of increasing traffic volumes, poor safety record and the need for better interregional links, the study determined that SH1 required a high standard route between Auckland, Wellsford and on to Northland. Also, it would be desirable to continue the standards adopted for ALPURT, namely a four lane dual carriageway designed for high speed, long distance journeys.

Given the function of SH1 as the highest national function within the state highway hierarchy, and also as a method of controlling land use development, it was determined that access to adjacent land uses would be restricted to key connection points only. The most effective policy to achieve this goal is to designate new routes as motorways, to ensure appropriate access controls to state highways. Hence an off-line route for the state highway would be necessary, with the current route used to provide local access.

3.2 Corridor Option Selection

As part of the SH1 /16 Strategy Study, three different corridors were investigated as possible route options. These included the existing SH1 and SH16 corridors as well as an inland route which followed the approximate alignment of the existing rail corridor from Kaukapakapa to Wellsford. Four options were comprehensively assessed in these corridors, with various functionality combinations evaluated against a number of criteria. The likely costs of each option were also incorporated and a summary of this option evaluation is shown below in Figure 3-1: overleaf.

■ **Figure 3-1: Evaluation Framework Summary**

Summary of Initial Option Evaluation				
	Option 1	Option 2	Option 3	Option 4
Routes satisfying highway function				
National	SH1	Inland Route	SH16	SH1/SH16
Regional	SH16	SH1	SH1	SH1/SH16
Local	-	SH16	-	-
	<i>Score</i>	<i>Score</i>	<i>Score</i>	<i>Score</i>
Support for Economic Development	●●	●●●	●●	●●
Regional Integration and Agglomeration	●●	●●●	●●	●
Assists Safety and Personal Security	●●	●●	●	●●
Access and Mobility	●●	●●	●	●●
Network Resilience	●	●●●	●●	●●
Integration	●●●	●●	●	●●
Responsiveness	●●	●●	●●	●●●
Sustainability of Transport Network	●●	●●	●	●
Environmental Sustainability	●●	●●	●●	●●
Climate Change	●	●	●	●
Overall Effectiveness (Rank)	2	1	4	3
State Highway Functionality				
Costs/Efficiency				
Cost (\$Bn 2006 prices)	4-6	5-8	7-10	5-8
Overall Assessment (Rank)	1	2	3=	3=

Scoring Legend

● Beneficial Impacts

● Adverse Impacts

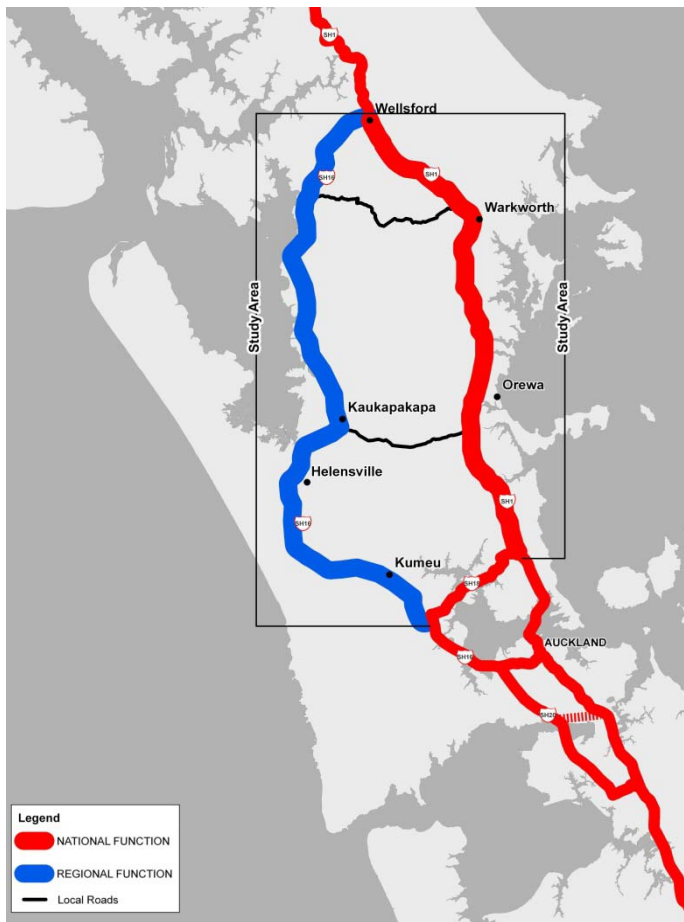
* More symbols = larger impact

Figure 3-1: shows that exclusive of cost, Option 2 (a new inland route serving a national function) would be the optimal solution in terms of functionality. However, such a route would have very high construction costs, be difficult to stage and implement as a number of smaller construction projects, not provide direct access to Warkworth and restrict the realisation of the full benefits until completion. Option 1, which places the national function on the SH1 corridor, building on current investment and placing the regional function on the SH16 corridor, was therefore determined to be the highest ranked option.

Based on the evaluation outlined above, Option 1 was selected for the recommended functionality for State Highways 1 and 16. This places the national function within the SH1 corridor and the regional function within the SH16 corridor. While the evaluation was undertaken on a transparent basis, another key advantage to this

outcome is that the strategy maintains continuity with previous transport planning and land use development decisions that have been made for the region. Figure 3-2: summarises the recommended strategy following the assessment carried out in the SH1/16 Strategy Study.

■ **Figure 3-2: Recommended Strategy**



3.2.1 Stakeholder Consultation

Following the completion of the strategy study, consultation was undertaken with stakeholders and feedback was broadly supportive of the strategy with the following key themes:

- Respondents agree that there are uncertainties surrounding the rate and distribution of future land use growth in the region which will impact on the timing and affordability of future transport investment.
- There is general consensus that SH1 should continue as the key National Strategic Route with SH16 as a Regional Strategic Route. More urgent programming of these works than envisaged by the study is desired, particularly in relation to the existing accident areas of Schedewys Hill and Dome Valley.
- Stakeholders have differing views on the relative merits of the strategy in particular relating to the justification for off-line improvements to SH1 between Puhoi and Wellsford.

Ongoing stakeholder consultation will need to occur during the next stage of project development to address the relevant issues including the justification for the project.

3.3 Possible Route Alignments

Based on the justification established in the SH1 /16 Strategy Study, that SH1 should provide the national function, a number of options for progressing from Puhoi to Wellsford were established within the existing SH1 corridor. These different options allow for the four laning of the route and included the following:

- Option 1: Offline Motorway, 100km/hr, moderate gradients, grade separated access.
- Option 2: Offline Motorway (eastern side only). 100km/hr, moderate gradients, grade separated access.
- Option 3: Offline Expressway, 100km/hr, steeper gradients, at grade access.
- Option 4: Offline Expressway, 80km/hr, steeper gradients, reduced design speed, at grade access.
- Option 5: Existing State Highway 4 laned, 70km/hr (at locations), steep gradients, significantly reduced design speed, at grade access.
- Option 6: Offline inland Motorway, 100km/hr, moderate gradients, grade separated access, heading inland from Puhoi to then follow the existing railway alignment to Wellsford.

These options have not been assessed in detail as part of this business case, but a discussion of each option and the likely associated positives and negatives of each is provided below.

3.3.1 Options 1 and 2 Discussion

The Motorway options (1 and 2) provide the best level of service from a motorists perspective and could potentially be tolled as an alternative route will be available. The restricted access to the route will also allow the integrity of the road to be managed into the future more effectively. As the Motorway options provide a primary movement function with limited access, the existing SH1 route would be required to serve the local community, providing access to existing land use. Due to the necessary quality and alignment of the Motorway options, the cost for options 1 and 2 is the highest of those assessed.

These options would have the greatest environmental impact as the land required for the construction of a Motorway standard route is larger than the other options. Studies of potential impacts to susceptible flora and fauna along the route would be undertaken as part of the project investigation, from which appropriate mitigation measures will be developed.

These options are generally within currently undeveloped or farm land, providing relative easy and flexible methods of construction as no existing infrastructure would act as constraints. There would be relatively little disruption to traffic during construction.

3.3.2 Options 3 and 4 Discussion

The Expressway options (3 and 4) provide a lower level of service to the motorist with reduced design standards and reduced access constraints. This implies a reduced movement function when compared with the

Motorway options. They also allow changing speed environments along the length of the route making them more flexible and open to potential land use development along the route. The costs for the Expressway options are less than those of the Motorway options.

The Expressway options are similar to the Motorway options in regard to construction and environmental impacts. An expressway option would likely benefit from being closer to the existing road in order to allow for useful connections along the route. The desire for these connections may constrain portions of the alignment, but may also reduce the number of lengthy additional links to the existing road network that would need to be constructed.

3.3.3 Option 5 Discussion

The four laning of the existing State Highway (option 5) would have a significantly reduced design speed in sections and have a lower level of service both in the horizontal and vertical alignment compared to the other options. Using the existing alignment is unlikely to realise the same level of safety improvements that the other options offer. Of all the options, four laning the existing SH1 has the lowest associated costs, but these cost savings come at the expense of potential benefits, such as safety and network resilience that the other offline options offer.

Widening the existing alignment would create some significant challenges relating to construction. There would be substantial disruptions to traffic during construction which would span a number of years. There are a number of sections with difficult terrain, such as Schedewys Hill and Dome Valley, where widening the existing road would be difficult and potentially problematic when trying to maintain a reasonable level of service for existing traffic.

Existing intersections would likely remain, maintaining access to existing land use. Safety at these intersections would become an important consideration as entry and exit movements must traverse a greater width of road in a likely greater speed environment. During construction there would be disruption for traffic due to the proximity of construction activities to the existing road.

3.3.4 Option 6 Discussion

A new offline inland motorway would provide similar benefits to options 1 and 2 as discussed above. The topography of this route, as it follows the railway, would allow a high quality road alignment to be constructed, providing the safety and travel time benefits similar to options 1 and 2.

The route location suggests that access along the route will be easier to control. However this option could not be constructed in stages. The benefits of the scheme would therefore only begin to be realised once the entire route was constructed which has significant impacts on the economic efficiency of the project.

The inland route provides good inter regional movement through the corridor, but does not address the high level of intra regional demand. This demand would be required to use the existing SH1, meaning there would be minimal benefit for travel from Auckland to Warkworth and out to the eastern beaches, which is a significant proportion of the traffic on this route.

As this route only caters for inter regional demand, the traffic volumes using it will be lower due to the lack of connection at Warkworth. This will reduce the associated project benefits meaning the economic efficiency of this option will be lower. If a connection to Warkworth was to be provided, an additional link of approximately 9 – 10 km would need to be constructed to join the inland motorway option with the Warkworth town centre. This would create additional costs to the project.

This option is a slightly longer distance than the existing SH1. However, there would still be travel time benefits with this option, as the higher standard of road, improved alignment and overtaking opportunity that is provided by the inland motorway would allow a higher average speed and therefore shorter travel time than on the existing route.

The offline inland motorway option is the most expensive of all the options.

3.3.5 Costs

An assessment of the indicative costs for each of the options has been developed and represented as a range below:

■ Table 3-1: Option Costs

Options	Cost Range \$(000,000's)
Option 1: Motorway	\$900 – \$1,600
Option 2: Motorway (eastern side)	\$1,000 – \$1,500
Option 3: Expressway 100km/hr	\$800 – \$1,100
Option 4: Expressway 80km/hr	\$700 – \$1,000
Option 5: Existing route 4 lanes	\$600 – \$800
Option 6: Inland Motorway	\$1,700 – \$2,250

Note: All cost estimates are in 2008 dollars.

3.4 Determination of Assessed Route

Based on the discussions above, and for the purposes of providing a basis for the development of this business case, a hybrid option of options 1 and 3 above has been used to indicate the potential outcomes of an upgrade to the State highway corridor between Puhoi and Wellsford. The hybrid option involves the construction within the existing SH1 corridor of an offline 100km/hr 4-lane motorway between Puhoi and Warkworth changing to an offline 4-lane expressway between Warkworth and Wellsford. Both sections have been assumed to lie approximately within the existing SH1 corridor as opposed to the offline inland route following the railway.

Some of the reasons that the hybrid option has been chosen as the basis for this high level assessment include:

- Meets the targets and objectives of the GPS,
- Maintains the integrity of the corridor long term between Puhoi and Warkworth by limiting access;
- Does not eliminate the opportunity to toll sections of the route;
- This option can deliver the route in stages; and
- Increasing the ease of construction by working offline.

A Motorway from Puhoi to Warkworth caters for the large volume of traffic through this section. There is a high demand between Auckland and the areas east of Warkworth, such as Omaha and Matakana and to cater for this demand, a Motorway provides a potential solution. The ability to limit access through this corridor whilst providing significant safety benefits through a high quality new alignment are two reasons why a Motorway has been assessed for this section.

Demand between Warkworth and Wellsford is somewhat lower and the extension of a Motorway option for this section was not considered to be representative of the best solution for this section. A high quality expressway will offer the majority of the same benefits to this section for a much reduced cost. By assessing an Expressway for this section, it provides an indication of the difference in likely benefits when compared with the motorway. These factors led to an Expressway being assessed for this section as part of this business case.

This hybrid option of a Motorway from Puhoi to Warkworth and then Expressway to Wellsford provides a balance of cost and benefit. This hybrid option of motorway and expressway does not preclude the opportunity to resolve the safety and capacity points along the route first, releasing the benefits to road users prior to completing the entire four laning project. For these reasons it is seen as an appropriate option to assess as part of this business case to establish a high level indication of the economic efficiency of the overall project.

This hybrid option has a likely cost range of \$900M – \$1,500M and these are the costs that have been assumed for this assessment.

Notwithstanding the discussion above, the hybrid option has not been confirmed as a preferred option for upgrading SH1 between Puhoi and Wellsford. A full Scheme Assessment investigation and option selection process in accordance with the RMA and NZTA's planning procedures will be undertaken in the next stage of the project development to determine a preferred option.

The hybrid option only provides an illustrative basis for obtaining funding for the next stage of project investigation to take place.

4. Network Assessment

4.1 Introduction

The recently updated GPS includes objectives for supporting economic growth and productivity, through investment in projects to improve RONS, including SH1 between Puhoi and Wellsford. The scheme will contribute to national and regional economic growth by providing a financial stimulus to the area and by reducing business costs and providing better connectivity between Northland, Auckland and areas to the south.

In principle there are alternatives to the use of SH1 as a connection between Northland and the northern parts of the Auckland region and the main urban centres within the region via either SH16 or the rail line. However, the ability of these to handle the significant volumes of traffic within the corridor is very limited, particularly taking into account the substantial growth expected in the movement of passengers and freight.

SH16 provides a slow and circuitous connection away from the main centres of economic activity and traffic forced to use this because of planned or unplanned disruption on SH1 would face substantially increased costs and journey times. The low flows currently experienced on SH16 of about 1100–1200 vehicles per day south of Wellsford, compared to about ten times this number on SH1 are testament to its very limited attractiveness to longer distance traffic.

While rail currently plays a useful role in the movement of freight, the volumes carried are relatively small and the capacity of the line is severely limited by a number of constraints including a large number of tunnels. Although these constraints are recognised by KiwiRail, there are no firm plans to address these. As a result, the role of rail within the corridor is likely to remain very limited and it would not provide a significant alternative to the use of road for the majority of commodity movements or for the movements of passengers. Given these limitations on the alternative routes, the key linkage between Northland and Auckland will therefore remain via SH1

The potential impacts arising from improving SH1 to a high standard motorway / expressway route are highlighted below. Economic development issues associated with improving SH1 are also discussed in more detail in the following sections.

SH1 between Puhoi and Wellsford currently caters for a large volume of traffic with a 2008 AADT of approximately 15,500 vehicles between Puhoi and Warkworth and 10,000 between Warkworth and Wellsford. During busy holiday periods these daily volumes can increase by up to 50% and large queues and delays are common occurrences during the peak travel times. It is not uncommon for traffic to crawl the entire way from Warkworth to Puhoi on popular summer weekends due to the high volume of traffic. Discussions with transport operators have suggested that this congestion is being experienced over longer periods both within the day and over an increasing number of days per year not only at weekends.

Future predicted traffic volumes³ indicate 2026 AADTs of approximately 21,500 vehicles between Puhoi and Warkworth and 18,500 vehicles between Warkworth and Wellsford. This is considerable growth, particularly on the northern section. The forecast 2051 AADTs are 31,000 and 29,000 vehicles respectively, indicating that traffic volumes are likely to grow by 200% – 300% over the next 40 years.

Heavy commercial vehicle movements are also likely to grow significantly in future. Figures from the National Freight Demands Study suggest that road freight traffic between Northland and Auckland will increase by over 250 per cent over the 25 year period from 2006–07 to 2031 with particularly high growth in forest products, aggregates and other building materials and retail and other manufactured products. The current numbers of HCVs crossing the regional boundary is about 1000 vehicles per day.

The consequential effects of increasing congestion on the network will therefore be significant both for freight vehicles and for general traffic flows, particularly for tourism. A new route would assist in supporting and managing the future demand for travel along this corridor to ensure that sufficient high quality capacity is available to support economic development in Northland and in the northern parts of the Auckland region.

4.2 Improved Transport Connections to Areas of Economic Growth Potential

Improved transport links enable economic activities within different areas to become more integrated within and across regions, encouraging development and enabling them to operate more effectively. Delay and congestion on the network and journey time unreliability disrupts this process and reduces the ability of areas to act as an integrated economic entity. This is a particularly important issue since the Northland Region suffers from relatively low levels of economic development as manifested in low wage rates and participation in the workforce and relatively modest levels of economic growth. One of the factors underlying this is the relatively poor accessibility to the concentrations of population and economic activity lying to the south of the Region

The improvement of SH1 between Puhoi and Wellsford will reduce journey times and increase journey time reliability between the main urban areas within Auckland and Northland, including Warkworth, Wellsford and Whangarei. As a result, the improved connections between these northern areas and the main Auckland urban area will assist economic integration and support and encourage development in the poorer areas to the north.

The impacts and improved economic integration which could arise with the upgrading of SH1 between Auckland and Northland include:-

- Better connectivity between the main producing activities in Northland, particularly dairying, forestry and mining, and the major markets for these activities in areas lying to the south of the region and overseas accessed by the ports at Auckland and Tauranga
- Reducing the costs of commodities transported to Northland from the south for consumption or for input to the manufacturing industries in the area, so making Northland a more attractive place to live and to develop employment activities.

³ SH1 /16 Strategy Study

- Making tourist destinations in Northland more accessible to the large market and population in the Auckland region

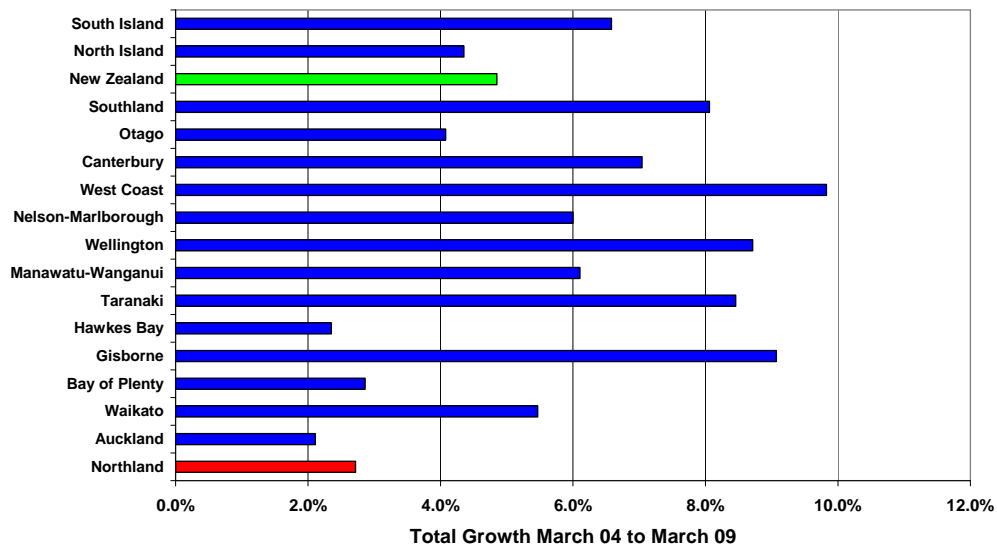
Improved linkages between the Auckland CBD and areas further north will encourage the development in these areas of service based industries and other economic activities which require a degree of interaction with the Auckland urban core. This may include the development of specialised or support activities which can take advantage of the lower costs and different lifestyle options in the north of the Auckland region or in Northland. For example, improving SH1 to a high standard limited access route will assist the key satellite towns and regional centres such as Orewa, Warkworth and Wellsford in Auckland and Whangarei in Northland in becoming successful economic hubs.

As well as improved longer distance linkages, Warkworth and Wellsford need good local access to support development. This will require planned connections to SH1, supported by an effective local road network, so that traffic can move safely and efficiently between these developments and the State Highway. With the construction of a high quality transport route, further development will be induced in the area over and above that which is currently forecast. The provision of a limited access strategic route will help focus activity on these centres rather than leading to more dispersed growth. This focus should enable and support additional commercial development leading to an overall population increase at the designated growth centres within the northern part of the Auckland region. This desirable growth further meets the objectives outlined in the NZTS and the ARGS.

Supporting development further north is also important because the economy of Northland is relatively weak. In part this is indicated by the low regional GDP per capita and a low historic growth rate.

Figure 4-1 illustrates relative growth rates in the Northland economy compared with the rest of New Zealand.

■ **Figure 4-1: Growth in Composite Regional Economic Activity Levels March 2004 to March 2009**



Source: National Bank

This relatively poor economic performance is also reflected in the average earnings of the Northland region and its constituent TLAs. This is set out in Table 4-1.

■ **Table 4-1: Average Per Capita Annual Earnings 2006**

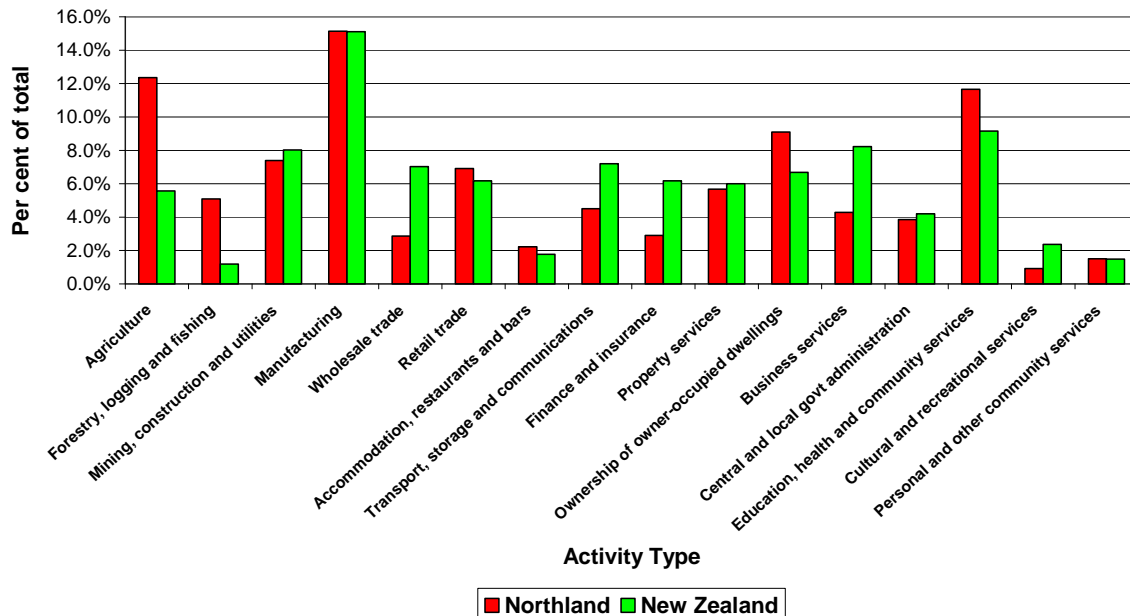
Area	Average Earnings	
	\$ pa	Per cent of national totals
Far North District	25300	81%
Whangarei District	28800	93%
Kaipara District	26200	84%
Northland	27200	87%
Rodney District	33800	109%
North Shore City	35800	115%
Waitakere City	30800	99%
Auckland City	36100	116%
Manukau City	29300	94%
Papakura District	31200	100%
Franklin District	34400	111%
Auckland	33600	108%
Waikato	30400	98%
Average New Zealand	31100	100%

Notes (1) Based on total earnings and the total population aged 15 or over

Average earnings are low relative to the national averages, both for Northland as a whole and particularly for the more rural areas with their relatively high dependence on agriculture or tourism.

To some extent, this dependence is illustrated in the breakdown of regional GDP by activity which is set out in Figure 4-2. This sets out the position for 2003, the latest year for which this information is available. Although this information is somewhat dated, the analysis of employment data for which more recent information is available indicates that the broad conclusions identified still hold.

■ Figure 4–2: Breakdown of Regional GDP by Activity



The regional economy has a relatively high concentration of activities in the agriculture and natural resources sectors, areas where significant demands may lie overseas rather than elsewhere in New Zealand. Good access to international ports (both sea and air) is important to assist economic development of these industries into the future.

SH1 provides a vital freight route between Auckland and Wellsford and on to Northland. However the poor standard of the existing route imposes significant costs on freight transport. Road freight costs are more expensive in NZ than they are in Australia, US and Canada despite truck drivers in Australia being paid 30% more. Improvement in the national road system, including SH1, would be a contributing factor in bringing these costs down.

While providing better access to industrial and commercial activities in Northland is one of the outcomes of upgrading SH1 from Puhoi to Wellsford, it will also improve the connectivity of Northland to other parts of New Zealand, thereby contributing to wider economic growth and sustainable development. SH1 is a key component in the national transport network and improving the route between Auckland and Northland will provide national benefits.

One of the activities most likely to benefit from the improvement of SH1 from Puhoi to Wellsford is tourism. This industry has seen significant gains in recent years, as evidenced by developments in centres such as Warkworth, Matakana, Snells Beach and the Bay of Islands etc. However further development is likely to be hindered by increasing access problems, which may put these areas at a disadvantage compared to other areas to the south and east of Auckland where improvements to the transport links are being progressed. Therefore improving the capacity, reliability and safety of SH1 will be of significant benefit to this industry.

4.3 Increasing Access to Markets and Wider Economic Benefits

Freight traffic is increasingly becoming impeded by traffic growth across the network and the increased journey times and travel time unreliability which results. Most movements are serving sites within the SH1 area and need road access. Long distance freight movements are smaller in number but also need to be able to move along the route unimpeded.

Four laning SH1 between Puhoi and Wellsford will improve the accessibility of Northland by significantly reducing journey times and costs between the economic centres of Auckland and Whangarei. It will also improve productivity by improving access to markets, for the key commodities produced in the area. The key commodities carried within the road corridor are set out in Table 4-2.

■ Table 4-2: Estimated Breakdown of Inter-Regional Highway Movements by Commodity

Commodity	Estimated Flow (million tonnes pa)	Percentage of total
Milk and Dairy Products	0.22	7.4%
Forestry products	0.64	21.5%
Meat	0.10	3.2%
Horticultural Products	0.03	1.1%
Aggregate	1.56	52.6%
Other Commodities	0.12	3.7%
Total Retailing and Consumer Products	0.31	10.3%
Courier Movements	0.01	0.2%
Total Identified Commodities	2.97	100%

Source: National Freight Demands Study 2008

Of the commodities set out in the table milk and dairy products, forestry products, meat, aggregates and retail and consumer products account for about 95 per cent of the identified flows. The effects of improvements in accessibility and the travel conditions on SH1 are summarised below for each of these market sectors.

4.3.1 Dairy

Dairy farming is a major activity in Northland. The region contains two dairy factories at Kauri near Whangarei and Maungaturoto. The region as a whole produces about 200,000 tonnes of dairy products per year. This output is almost all sent south either to markets in New Zealand or to overseas markets via the ports at Auckland or Tauranga.

Maungaturoto is not rail served and so road carries the total output. In addition the factories are also supplied by milk produced by farmers in the north of the Auckland region. For dairy products travelling south and liquid milk travelling north, improvements to SH1 would help to reduce the costs of transport and more importantly increase the reliability and responsiveness of the transport system. This should help the area to compete more effectively in national and international markets.

4.3.2 Forestry

The total forestry output of Northland in 2006–07 amounted to about 1.9 million tonnes or about 10 per cent of the national total. While large volumes of unprocessed logs and woodchips are directly exported via Marsden Point, there is considerable production of value added products such as sawn timber and engineered timber and boards. These are either sold on the domestic market or are exported in the general cargo vessels calling at Auckland and Tauranga. While rail does carry some of this traffic its share of the market is relatively small and there is a heavy dependence on movement by road.

The potential to add value to the log harvest can range from the simple conversion of the logs to sawn timber to the production of sophisticated engineered timber products. As a result the unit values of the timber can vary significantly. For the basic products exported through Marsden Point the unit values are typically low at about \$200 per tonne whereas for the range of more sophisticated timber products exported through Auckland, the average value is much higher at about \$1200 per tonne of the commodities exported or about \$600 per tonne of the original logs allowing for processing losses. This is therefore a measure of the potential value added which might be achieved with increased processing of the log harvest.

In 2006–07, wood used in value added products was estimated to account for about 53 per cent of the total log harvest in the region with the rest being exported directly in the form of logs or woodchips. This represented a relatively low share of the total output for the region and compares with an average of about two-thirds for the country as a whole. Other relatively remote regions such as Gisborne, Tasman and Taranaki also had relatively low shares, supporting the contention that this is a function of the difficulty of access to major markets within New Zealand or the major general cargo exporting ports. If the value added share of Northland had been similar to that for the country as a whole, and a unit price equivalent to that for the range of exports through Auckland achieved, this would have increased the earnings from the forestry sector in Northland by about \$250–300 million per year in 2006–07. The multiplier effect would mean that the value of this to the economy would be greater. Work undertaken by BERL for Industry Capability Network, Updated Manufacturing Multipliers from 2007/08 Data, indicates that the Value Added Multiplier for Wood taking into account all the effects identified is relatively high at 3.4 compared to an average for all manufacturing of 2.5.

While to some extent these increased earnings would be offset by reduced earnings for other log producing areas, the relative underdevelopment of the Northland region suggests that increases in earnings by activities in the region would have a particularly high weight and would allow more productive use to be made of the labour force and other resources available. To the extent that the increase in value added products could be translated into a net increase in the volumes and values of New Zealand exports, this would represent a clear benefit to the country.

Discussions with the forestry industry have indicated that good and in particular reliable freight links are essential for the maintenance and development of wood processing at more peripheral locations such as those

in Northland. If the quality of these links deteriorates, as would be likely if there were no improvements to the route between Puhoi and Wellsford and the route suffered from increasing journey time unreliability, there will be pressure to move the existing processing facilities closer to the point of use of the timber which could be overseas. Exports from New Zealand would therefore consist of a higher proportion of relatively low value logs rather than more valuable processed timber products. Following the same logic, while achieving a higher value added proportion depends on a number of factors. Improved links giving better access to the available markets for the more sophisticated products would be important. The local market in Northland is small, reflecting the relatively low population and the lower level of economic development. As a result, any expansion of the volumes of higher value products produced by the forestry sector would require access to markets either elsewhere in New Zealand to the south or overseas also accessed by the route to the south and the upgrading of SH1 between Puhoi and Wellsford would form a key part of this.

Very substantial growth in the log harvest in the Northland Region is forecast for the future as existing forests mature. The production of logs is forecast to grow from its current level of 1.9 million tonnes to 4.3 million tonnes per year by 2031 a rate of increase substantially higher than that forecast for the country as a whole of 85 per cent. This largely represents the harvest from trees that are already growing and while the timing of the harvesting is to some extent variable, the total volume is broadly fixed. By this date it is forecast that the share of logs being processed into value added products could fall to about 38 per cent of the total harvest. Given the size of the total harvest, even relatively small increases in the volumes diverted to value added uses would result in a significant increase in the earnings generated in the region.

There are a number of uncertainties associated with forecasting the effects of upgrading the route. However as an indication of the increased earnings that might be achieved, simply maintaining the current share of value added products and assuming current price levels would increase earnings in Northland by over \$0.5 billion per year. While this position may be challenging to achieve in the light of the substantial increase in the harvest, even relatively small shifts in the balance between basic exports and value added products can generate very substantial differences in the value of the forestry products originating in Northland. Good quality transport links giving good connections to markets would be a very important component of this. Possible estimates of the value of this change in output are set out in Section 4.3.7 below.

4.3.3 Meat

Northland is the source of about 12 per cent of the export meat produced in New Zealand, and the output is mainly exported through Auckland and Tauranga. Road is almost exclusively used for the transport of the product to the port. It is likely that the volumes transported will not grow significantly over the future, although growth in the dairy sector may result in some small increases in meat production. Again, reducing the costs of transport by road will enhance the competitiveness of the product on world markets and will allow greater returns to be obtained for the Northland producers.

4.3.4 Aggregates

Aggregate production is a key input to the construction industry which plays a major part in the economies of both Auckland and Northland. Currently, more than 1.5 million tonnes of aggregate are transported by truck between the two regions. The demand for aggregates from Northland and the north of the Auckland region is likely to grow as resources further south in the region become exhausted and are not replaced. Reducing the

costs of aggregate would help the economies of Auckland and Northland, where significant demand for these resources is anticipated in future.

4.3.5 Retail and Manufactured Goods

The costs associated with the movement of retail and semi-manufactured goods affect the prices both faced by consumers and by manufacturers in the region. Reductions of these costs would improve the standard of living of Northland residents and make manufacturing more competitive.

In addition a better transport link would provide a better foundation for more urgent and frequent deliveries, which typically is given a high weight by the owners of goods and transport operators. The proposed improvement in SH1 would support efficient, demand responsive and cheaper transport for these commodities and so help address the needs and aspirations of consumers and manufacturers and make the area a more attractive location to live and work.

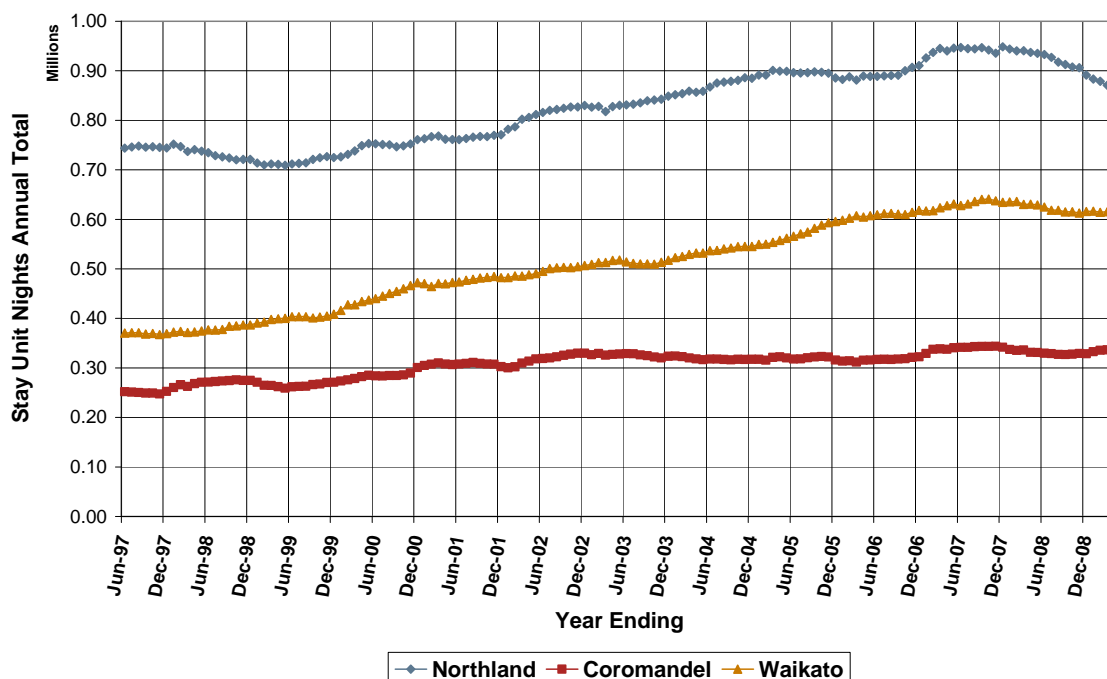
4.3.6 Tourism

Tourism forms an important part of the Northland economy. In 2004 total visitor expenditure in the region was estimated at about \$650 million and the industry employed over 10 per cent of the work force. The sector has a heavy dependence on the Auckland market for which the conditions on SH1 are likely to be particularly significant.

The importance of these conditions is demonstrated by the analysis of the position when the section of the Northern Motorway between Greville Road and Orewa (ALPURT B1) opened in late 1999. This indicated that the opening of the new section of motorway coincided with a shift from a falling level of tourist activity in Northland, to one that was growing. This contrasts with the position for the Coromandel and Waikato, where growth occurred more or less continuously over this period and suggests that the difficulty of reaching Northland before the improvement of the route was suppressing growth.

This position is set out in Figure 4-3.

Figure 4–3: Changes in Tourist Stay Unit Nights in Northland, Coromandel and Waikato 1997 – 2009



The sharp declines experienced in 2007 and 2008 may also reflect the effects of increased congestion on SH1, although for the later part of this period the impact of the economic slowdown may also be becoming apparent.

In 2007 the Auckland region was the source of about 45 per cent of the all the international and domestic tourist nights spent in Northland and of about 63 per cent of nights spent in the region by domestic tourists. Because of this heavy dependence on the Auckland market for overnight stays, and for day trips, high quality linkages with Auckland are very important. A falling level of accessibility as SH1 becomes more congested is likely to result in reduction in the numbers of tourists to Northland especially for relatively short visits and to some replacement of its attractiveness as a holiday destination by other more accessible areas, especially as connections to the regions to the south and east are being improved. Given the importance of the tourist sector in Northland, a decline or low growth in this would have an impact on the local economy.

4.3.7 Potential Wider Economic Benefits

Considering the impacts on the different market sectors and types of economic activity described above together, it is likely that improving SH1 to a high standard facility will have significant regional economic benefits. Overall, it is expected that economic improvements arising from the project will lead to increased employment in a number of sectors, including construction arising from direct and indirect involvement in the project itself.

Quantifying these benefits is challenging. As one example, tourism in the Northland area generated annual earnings of \$650 million in 2004 and employed about 10 per cent of the work force and this puts into perspective the scale of benefits and job creation possible. If the improved road was to achieve an increase of 5 per cent in tourist expenditure, broadly in line with the position observed when ALPURT B1 opened, this would generate increased expenditure in Northland of the order of about \$35–\$40 million per year and a possible increase in earnings for Northland businesses of \$20 million per year after an allowance has been made for transfers elsewhere. While some of the benefit to Northland would be reflected in reduced expenditure elsewhere, the relatively underdeveloped nature of the Northland economy means that these increased earnings would have a high weight. The evidence from the opening of ALPURT suggests that this adjustment could be made fairly quickly and the increase in economic benefits is likely to continue growing over time.

For the forestry industry, increasing the share of value added products can yield very substantial benefits, and while this is likely to reflect a number of factors, travel times to potential markets from the sources of the logs appear to play a part. Looking at a movement between Whangarei and the port of Auckland, currently a round trip can typically be achieved twice within a standard working day within the winter. However within the summer period with increased congestion, especially within the urban centres along SH1 between Whangarei and Puhoi, this cannot be achieved and the reliability of the route is compromised. With the continuing forecast growth in traffic in the corridor, this congested period is likely to extend further through the year and act as an increasing barrier to the reliable movement of higher value products to the key markets and may act as a constraint on the expansion or at worst the continued existence of the plants processing timber. Upgrading SH1 will help to avoid this position so helping to maintain or expand value added processing in Northland.

Forecasting the exact value of the changes is subject to very considerable uncertainty. However, if the upgrading of the road allowed only a modest 3 to 5 per cent of the potential increase in value added output of \$0.3 billion at current output levels to be achieved, this would represent a value of \$10–15 million per year. It is likely that that this would at least double by 2031 as existing forests mature, implying an increased value of output of \$20–30 million. The effects would be very much greater if the upgrading of the route and the consequent improvement in transport reliability avoided the closure or downsizing of existing timber processing plants in the region and their relocation possibly overseas, and the forecasts are therefore fairly conservative.

Taking these two components tourism and forestry into account, an indicative estimate of the value of increased economic activity that might result from the improvement of SH1 between Puhoi and Wellsford would be of the order of \$30–35 million per annum and possibly doubling by 2031. Because of the uncertainties surrounding this figure it has not been included in the main quantified economic appraisal but it provides one indication of the potential wider economic benefits which would be generated by the project.

There would be impacts for other types of freight activity using the route and growing problems of unreliability are likely to affect the movement of products bound for the ports to the south as well as markets elsewhere in New Zealand. However while these effects would exist, their evaluation in monetary terms would be more speculative. Therefore, they have not been included in the quantitative appraisal described in Section 4.9.

Alternative more broadly based approaches to the estimation of wider economic benefits have been developed as part of separate work for NZTA concerned with appraisal of the RoNS in general. Two alternative approaches

have been developed, one the estimating the wider economic impacts of the road using a general equilibrium (GE) model and one using an approach based more directly the impact of the road on employment levels in the area affected.

The results from these two approaches in terms of benefits in 2106/2020 are set out in Table 4–3.

■ **Table 4–3: Possible Alternative Estimates of Wider Economic Benefits – Annual impacts (\$millions in 2008 prices) in 2016/2020**

Approach	Estimate of WEB (\$mill)
Specified impacts as discussed above	40–45
GE Model (2020)	150
General assessment of employment impacts (2016)	40–45

The more general approaches reflect the effects that the construction of the improved road would have on general patterns of activity and on employment within the area of influence of the road. While there is a considerable range in these figures, the assessment of employment impacts produces wider economic benefits of a similar order of magnitude to the components of the more sector specific approach discussed above. In all three cases, the wider economic benefits are significant in relation to the traditional economic benefits of the project.

4.3.8 Alternative Modes

Although the analysis of the current position has mainly concentrated on the movement of freight by road, both rail and coastal shipping are also used for the movement of goods to and from Northland. The NFDS estimated that for inter-regional movements between Auckland and Northland, rail had about 3 per cent of the total freight market; coastal shipping 11 per cent and road had about 86 per cent.

Coastal shipping is mainly confined to cement and petroleum products from Whangarei and Marsden Point and for these with the exceptions of the movement of petroleum products by pipeline to Auckland it handles almost all the products transported.

The potential for a significant shift of freight to rail is limited for a number of reasons including the capacity of the track, reflecting the limitations caused by physical constraints, the nature of the products transported and the origins and destinations of the commodity movements. The physical constraints on the North Auckland Line have been recognised by KiwiRail, but given the pressures for investment elsewhere in busier parts of the network there are no firm and funded proposals to upgrade the route within KiwiRail's current planning horizon. Work is proceeding on gaining a designation for a rail link to Marsden Point, but again there are no firm proposals or timetable for undertaking the construction of this route. While growth in rail traffic is forecast, this is mainly associated with expansion of the types of flows currently carried and without substantial interventions not currently anticipated it is not expected to extend to any substantial degree into markets currently served by road.

A recent study of freight transport between Auckland and Northland by Northland Regional Council found that although rail has a fairly small share of the overall inter-regional freight market, over half of freight which

could potentially be transported by either rail or road is already moving by rail. Long haul road freight that is likely to be potentially contestable by rail consists of approximately 50 trucks per day between Auckland and Whangarei. Rail currently transports the equivalent of 86 trucks per day, indicating that the potential to move more freight from road to rail is limited. This highlights the importance of the state highway for freight movement in the area. Any improvements to the geometrics, travel time and trip reliability will greatly enhance this important component of society's transport needs.

Truck movements are likely to grow significantly in future. Figures from the National Freight Demands Study suggest that road freight traffic between Northland and Auckland will increase by over 250 per cent over the 25 year period from 2006–07 to 2031 with particularly high growth in forest products, aggregates and other building materials and retail and other manufactured products. The consequential effects of increasing congestion on the network will therefore be significant. If SH1 is not improved, the impact of increased congestion on freight will be disproportionately greater, thereby reducing the competitiveness of regional and local industries by comparison with other regions.

The Port of Whangarei at Marsden Point has undergone significant development in the last 10 years, developing three deep water general/bulk cargo berths, with a fourth berth to be constructed when economically viable. The increased capacity and functionality of this Northland port has the potential to impact on freight haulage using SH1 in two ways;

- By having a bulk cargo facility in Northland, particularly for basic forest products such as logs and woodchips it potentially reduces the need for cargoes to use Auckland or Tauranga, with a resulting reduction of freight between the two centres. Increasing the volumes of these cargoes would result in a reduction in potential truck movements moving south on SH1, but this has been taken into account in the forecasts of the potential growth in freight movements.
- On the other hand, the development of this port provides a greater level of resilience to the overall North Island, which could see an increase in freight being moved by rail and road between Northland and the rest of the North Island (via the Puhoi – Wellsford route), the majority of which would use SH1.

Overall, the remoteness of Marsden Point from the main market areas within New Zealand and likely patterns of port rationalisation by international shipping lines are likely to limit any significant growth, particularly for general cargo traffic.

Air transport also provides an important, but small, contribution to movement between Northland and the rest of the country. Regular air services operate between Whangarei and Auckland and Wellington and there are popular services from Auckland and the Bay of Islands. However, air services will not make any significant difference to the demand for land transport between Auckland and Northland into the future.

4.4 Improvements to Journey Time Reliability

SH1 serves a dual function of serving long distance travel and local access. As the network comes under pressure from traffic growth and nearby development, both these functions will be served less effectively and journey time reliability will reduce significantly. This is seen as a particular problem in relation to the potential movements of freight along the route.

The proposed scheme offers a travel time saving between Puhoi and Wellsford and provides much needed resilience to the route and greater certainty of travel times. The immediate economic benefits of this trip reliability improvement for existing traffic patterns have been calculated at approximately \$1,490,000 per annum. However over the longer term the effects are likely to be larger as travel and freight distribution patterns adjust to the new situation and take advantage of the opportunities offered.

As part of this assessment, the following assumptions have been made:

- Rolling terrain with 80% no passing opportunity.
- 100% adjustment factor as the modelling is carried out at a regional level.

The overall journey time reliability benefits for the project, in 2008 dollar value, are approximately **\$8,460,000** over the 30 year evaluation period. This assumes that the first section from Puhoi to Warkworth is operational in 10 years, with the next section to Wellsford opening 10 years after that.

4.5 Easing of Severe Congestion

Increased tourism activities and development around the Matakana and East Coast beaches are likely to extend the periods over which severe congestion occurs. The Lincoln University tourism model was used to forecast tourism numbers between Auckland and Wellsford in 2012, which showed an increase of approximately 10% from 2005 numbers. Approximately 97% of tourists travelling in this area, some 8,000,000 per year, use SH1 as the preferred route highlighting the important function it plays for tourism in the region.

Tourists and holiday makers will continue to suffer long delays until significant bottlenecks on the network are improved during the peak holiday periods, for example between the Johnstone Hill Tunnels and Warkworth. During these holiday peak periods, delays at these bottlenecks can be up to hours in duration. Travel time savings at these peak times have been assessed with the following assumptions:

- There are 5 peak holidays per year, each with 2 days of peak travel meaning 10 days per year when this severe congestion is evident;
- Each vehicle would save an average of 30 minutes during the holiday peaks when the new route is available. This is considered a conservative estimate given that actual delays can be over an hour;
- On average, holiday traffic volumes have been assumed to be 20% higher than normal daily traffic after assessing daily 2008 traffic counts in each of the sections.

The travel time benefits from the peak holiday periods due to the easing of the severe congestion are estimated to be in the order of **\$3,380,000** per year. The overall project benefits due to the easing of the severe congestion, in 2008 dollar value, are approximately **\$19,880,000**.

Severe congestion along the route is not only a problem that is restricted to these peak holiday periods or the increasing number of other times when traffic flows are particularly high. When there is an accident on the route, the resulting congestion can exceed that experienced during the peak holidays periods. There is a lack of suitable detour routes meaning that people are forced to wait for the road to open again. The high incidence of crashes along the route, and in particular fatal and serious crashes which result in much longer delays,

mean that an additional route carries two key justifications. Firstly it provides the necessary network resilience to better cope when these incidents occur and secondly the new route is expected to significantly reduce the incidence and severity of crashes as discussed below in Section 4.7. By providing a much safer alignment and reducing crashes, accident related congestion will considerably decrease. The easing of accident related congestion has not been quantified as part of this assessment.

While not as severe, congestion at various times during normal days also has an impact on travel along the existing SH1. This is particularly evident on weekends, when traffic due to day trippers can cause noticeable levels of congestion. While not as severe as during the holiday peaks, this congestion results in some increases in travel time, vehicle operating costs and driver frustration. This type of congestion typically occurs most weekends during the afternoon as people begin to head home from their day trips around the wider region, although discussions with transport operators have suggested that there is increasing congestion throughout the weekends and also during weekdays in the holiday periods.

The number of HCVs using the route, which is only forecast to increase, combined with the challenging topography of a number of sections along the route is also a source of localised congestion. There are only limited passing opportunities, as the volume of traffic on the road severely hinders overtaking outside of passing lanes, meaning that vehicles are often restricted to speeds that are often much lower than desired. This congestion would effectively be eliminated on the new route, as overtaking can occur almost unimpeded on the four lane motorway / expressway. The additional capacity provided will more effectively cater for the traffic volumes through the corridor, both currently and into the future as demand increases.

4.6 Improving Transport Efficiency

A preliminary economic assessment of improving SH1 has been undertaken, using the EEM procedures relating to transport efficiency. These areas of tangible benefits include the following:

- Travel Time Benefits (taken from the recently completed state highway strategy study)
- Vehicle Operating Cost Benefits

4.6.1 Travel Time Benefits

The opening year for the Puhoi to Warkworth section has been adopted as 2019. The opening year of the Warkworth to Wellsford section has been assumed as 2029, 10 years after the first section opens. Using future traffic volume predictions⁴, linear growth of 4% per year from 2006 to 2026 is indicated and then growth reduces to approximately 1.5% per year until 2051. Traffic flows for the opening years of each section⁵ have been used in conjunction with these growth rates when assessing project life benefits over the 30 year economic assessment period. The traffic growth on these routes is based on the 'expected' land use growth forecasts and takes into account the induced traffic growth due to the inclusion of the new routes.

⁴ Taken from the SH1/16 Strategy Study

⁵ Taken from the SH1/16 Strategy Study

The current alignment standards of SH1 between Puhoi and Wellsford vary considerably. Delays are caused by various sections of difficult terrain, high likelihood of being forced to slow down due to following HCVs, lack of overtaking opportunity and other operational factors are impede traffic speeds. The traffic signals in Warkworth and the high side friction evident when travelling through Wellsford are also significant.

To account for the delays on the existing SH1 as discussed above, an average speed of 60 km/hr has been taken as representative of the current route. Assuming that the standard of road discussed in Section 4 are achieved, travel times resulting from the project would result in a saving of 8 minutes from Puhoi to Warkworth and 7 minutes from Warkworth to Wellsford, giving a total travel time saving of 15 minutes along the whole route. The results of this analysis using these travel time savings are reported below in Table 4-4.

Both interpeak hour and PM peak hour models were used with a factor of 10 applied to the interpeak flows and a factor 4 applied to the PM flows to establish an approximate daily benefit. It has been assumed that while the AM flows would have different directional proportions, the magnitude is similar to the PM. This is why a factor of 4 is applied to the PM flows in the absence of AM information. An inspection daily 2008 traffic counts in each of the sections has shown that daily weekend flows are of a very similar magnitude to the weekday flows. A total of 250 weekdays and 105 weekend days have been used, with the remaining 10 days having holiday flows as discussed above. Values of time have been taken from the EEM for rural strategic roads and adjusted to 2008 values using the appropriate factors. Table 4-4 below summarises the travel time benefits likely as part of the project for each section. The annual benefits shown have been calculated based on opening year flows.

■ **Table 4-4: Summary of Travel Time Benefits**

Section	Annual Benefits	Project Benefits
Puhoi to Warkworth	\$29,680,000	\$236,320,000
Warkworth to Wellsford	\$28,960,000	\$115,650,000
TOTAL	\$58,640,000	\$351,970,000

4.6.2 Vehicle Operating Cost Benefits

The vehicle operating cost (VOC) benefits have been assumed as 10% of the travel time benefits as experience has shown that this is generally a sufficient approximation, particularly at a high level. Adopting this assumption, Table 4-5 below summarise the VOC benefits which have been incorporated for each of the sections, both yearly and over the project economic assessment period of 30 years in 2008 dollar values.

■ **Table 4-5: Summary of VOC Benefits**

Section	Annual Benefits	Project Benefits
Puhoi to Warkworth	\$2,970,000	\$23,630,000

Section	Annual Benefits	Project Benefits
Warkworth to Wellsford	\$2,900,000	\$11,570,000
TOTAL	\$5,870,000	\$35,200,000

4.7 Improvements in Road Safety

Current crashes are concentrated within two sections of SH1, Schedewys Hill and the Dome Valley, south and north of Warkworth respectively. Crash rates in these locations far exceed the national average and if no significant improvements are made, crash numbers are likely to generally grow with increasing traffic volumes.

An assessment of the likely road safety benefits of the two sections has been undertaken. Each section has been assessed and is discussed separately below.

4.7.1 Puhoi to Warkworth

NZTA's accident database, Crash Analysis System (CAS), was used to determine the accidents that have occurred on this section in the last 5 years, from 2004 – 2008, as shown in Table 4-6.

■ Table 4-6: Puhoi to Warkworth Crashes 2004 – 2008

Crash Severity	Number of Crashes (2004 – 2008)
Fatal	5
Serious Injury	19
Minor Injury	52
Non Injury	174
TOTAL	250

An accident by accident assessment was carried out and it was found that 4 out of the 5 fatal accidents were head on crashes. The crash types for the fatal and serious injury accidents are summarised in Table 4-7.

■ Table 4-7: Fatal and Serious Injury Crash Summary

Crash Type	Fatal	Serious
Head On	4	5
Overtaking		3
Loss of Control		5
At Intersection / Turning		5
Pedestrian	1	1

Crash Type	Fatal	Serious
TOTAL	5	19

Given that the preferred option for this section is a motorway, this would eliminate the possibility of most of these types of accidents. A reduction of 100% for head on, at intersection/turning and pedestrian accidents has been assumed as these are eliminated on this type of road. A 50% reduction in loss of control and rear end accidents has been assumed as the alignment of the motorway standard road will be significantly better than existing.

Using the procedures in the EEM for accident cost savings, the estimated savings per year (in 2008 dollars) for the section from Puhoi to Warkworth is approximately **\$9,240,000**.

4.7.2 Warkworth to Wellsford

NZTA's accident database, Crash Analysis System (CAS), was used to determine the accidents that have occurred on this section in the last 5 years, from 2004 – 2008 as shown in Table 4–8.

■ Table 4–8: Warkworth to Wellsford Crashes 2004 – 2008

Crash Severity	Number of Crashes (2004 – 2008)
Fatal	14
Serious Injury	12
Minor Injury	66
Non Injury	169
TOTAL	261

An accident by accident assessment was carried out and it was found that 10 out of the 14 fatal accidents were head on crashes. The crash types for the fatal and serious injury accidents are summarised in Table 4–9.

■ Table 4–9: Fatal and Serious Injury Crash Summary

Crash Type	Fatal	Serious
Head On	10	5
Loss of Control	3	5
At Intersection / Turning	1	1
Pedestrian		1
TOTAL	14	12

Given that the preferred option for this section is an expressway, this would eliminate the possibility of most of these types of accidents. A reduction of 100% for head on and pedestrian accidents has been assumed as these are eliminated on this type of road. A 50% reduction in loss of control, rear end and at intersection/turning accidents has been assumed as the alignment of the motorway standard road will be significantly better than existing.

Using the procedures in the EEM for accident cost savings, the estimated savings (in 2008 dollars) for the section from Warkworth to Wellsford is approximately **\$14,980,000 per annum**.

4.7.3 Accident Summary

The annual and project accident cost savings for each of the sections are summarised in Table 4-10 below and are shown in 2008 dollar values.

■ **Table 4-10: Summary of Accident Cost Savings**

Section	Annual Cost Savings	Project Cost Savings
Puhoi to Warkworth	\$9,240,000	\$73,550,000
Warkworth to Wellsford	\$14,980,000	\$59,850,000
TOTAL	\$24,220,000	\$133,400,000

Over the life of the project, accident cost savings in the order of **\$133,400,000** are likely over the 30 year economic assessment period. This is a considerable level of accident savings and indicates the current safety problems with the existing road.

4.8 Network Assessment Summary

The potential benefits of the new route, as discussed in this section, are summarised in Table 4-11 below.

■ **Table 4-11: Summary of Benefits: Conventional Economic Appraisal and Wider Economic Benefits**

Criteria	NPV Benefits (\$millions)		
	Puhoi – Warkworth	Warkworth – Wellsford	TOTAL
Journey time reliability	\$5.0	\$3.4	\$8.4
Travel time benefits (including holiday periods)	\$236.3	\$115.7	\$352.0
Vehicle operating cost benefits	\$23.6	\$11.6	\$35.2
Accident cost savings	\$73.6	\$59.8	\$133.4
Total Conventional Economic Benefits	\$339	\$191	\$530
Wider Economic Benefits	\$122	\$37	\$159

Criteria	NPV Benefits (\$millions)		
	Puhoi – Warkworth	Warkworth – Wellsford	TOTAL
Total Including Wider Economic Benefits	\$461	\$228	\$689

Using these traditional benefit streams, the BCR for each section is summarised below in Table 4–12.

■ **Table 4–12: Economic Summary using the Conventional Economic Appraisal**

Project	BCR
Puhoi to Warkworth (including Bypass)	0.7
Warkworth to Wellsford (including Bypass)	1.2
Overall Scheme	0.8

A sensitivity test has been carried out on the economic evaluation to determine the impact of the discount rate, which in the discussion above has been taken as 8%, as set out in the EEM. Table 4–13 summarises the BCRs for discount rates of 8%, 6% and 4%.

■ **Table 4–13: Economic Discount Rate Sensitivity – Conventional Economic Appraisal**

Project	BCR for Varying Discount Rate (DR)		
	8% DR	6% DR	4% DR
Puhoi to Warkworth (including Bypass)	0.7	0.9	1.2
Warkworth to Wellsford (including Bypass)	1.2	1.7	2.3
Overall Scheme	0.8	1.1	1.6

4.9 Wider Economic Benefits

The potential wider economic benefits of improving SH1 from Puhoi to Wellsford are discussed in Sections 4.2 and 4.3 and summarised in Table 4–3. These potential impacts lie within a fairly wide range, but could be a significant proportion of direct tangible benefits, a finding that is in line with overseas research. Given these uncertainties, estimates of the potential impacts and their impact on the economic performance of the project should be regarded as primarily illustrative.

The impact on the overall BCRs of the wider economic benefits for the project would be as set out in Table 4–14 below. For the purpose of this appraisal it has been assumed that these benefits build up over 10 years, in line with the approach taken elsewhere. However, given the observed speed of response to improved connectivity in the tourism sector, this assumption of an extended response may be conservative, and the total discounted benefits may therefore be underestimated to some extent.

■ **Table 4–14: Economic Summary including Wider Economic Benefits**

Project	BCR
Puhoi to Warkworth (including Bypass)	1.0
Warkworth to Wellsford (including Bypass)	1.4
Overall Scheme	1.1

Table 4–15 below summarises the sensitivity to the discount rate when these wider economic benefits are included in the economic evaluation.

■ **Table 4–15: Economic Discount Rate Sensitivity – Including Wider Economic Benefits**

Project	BCR for Varying Discount Rate (DR)		
	8% DR	6% DR	4% DR
Puhoi to Warkworth (including Bypass)	1.0	1.3	1.7
Warkworth to Wellsford (including Bypass)	1.4	2.0	2.9
Overall Scheme	1.1	1.5	2.0

The impact of including the wider economic benefits would therefore be significant.

5. Funding Breakdown

The funding application is broken down into two phases. Phase 1 is for investigation and specimen design including designation, consenting, consultation and option selection. Phase 2 is for detailed design and construction. The cost for each phase for each section is summarised below in Table 5-1.

■ **Table 5-1: Cost Summary**

Phase	Costs (\$M)								
	Puhoi to Warkworth			Warkworth to Wellsford			TOTAL		
	Base	Expected	95th %ile	Base	Expected	95th %ile	Base	Expected	95th %ile
Phase 1	\$23	\$35	\$39	\$22	\$25	\$38	\$45	\$60	\$77
Phase 1 (Property)	\$27	\$33	\$37	\$27	\$43	\$51	\$54	\$76	\$88
Phase 2	\$601	\$751	\$841	\$275	\$426	\$509	\$876	\$1,177	\$1,350
TOTAL	\$650	\$819	\$917	\$324	\$494	\$598	\$975	\$1,313	\$1,515

The cost estimates above for Phase 1 (Property) and Phase 2 will be confirmed during Phase 1.

A summary of the net present values of the benefits, both with and without the wider economic benefits and the project costs for varying discount rates is included in Appendix A.

5.1 Tolling

We have undertaken an approximate tolling assessment and it is based on broad assumptions that would need further investigation to give a more accurate picture of the viability of tolling each of these sections. This assessment has been undertaken to understand the likely quantum of potential tolling benefits for the scheme.

From discussions with NZTA, there is an approximate diversion of 70% of traffic to ALPURT, with 30% remaining on the free route. As a high level assessment, this 70/30 split has been adopted for the new four lane offline option. Tolling levels consistent with the travel time savings experienced on ALPURT have also been used. ALPURT is approximately 7.5km long and offers an approximate 7 – 10 minute travel time saving, with a \$2 toll for cars and \$4 for HCVs. Each of the sections, from Puhoi to Warkworth and Warkworth to Wellsford are estimated to offer an approximate 5 minute travel time saving under normal operating conditions. Using the toll rates from ALPURT, appropriate toll levels for these sections would be approximately 75% of the toll paid to travel on ALPURT.

Assuming a \$0.50 transaction cost per vehicle, the following net revenue per vehicle has been assumed on each of the two sections:

- \$1.00 per car; and
- \$2.50 per HCV.

It is also recognised that while the travel time savings between Puhoi and Warkworth and Warkworth and Wellsford may be similar to ALPURT, they are longer distances and the amenity value of the improved SH1 may result in a higher level of attraction, or a greater willingness to pay. Therefore, for illustrative purposes, a higher tolling scenario has also been tested, with net revenues per vehicle as follows:

- \$2.50 per car; and
- \$4.50 per HCV.

An approximate AADT has been derived from volume predictions in the area and assuming a 2019 opening year for the Puhoi to Warkworth section and a 2029 opening year for the Warkworth to Wellsford section as follows:

- 2019 AADT Puhoi to Warkworth: 18,600 vehicles
- 2029 AADT Warkworth to Wellsford: 20,300 vehicles

HCVs have a higher willingness to pay the toll, partly as they are likely to experience an even greater time saving, meaning they are likely to make up a higher proportion of the 70% of vehicles on the toll road. The total traffic stream is forecast to contain 5–10% HCVs, with it likely to be closer to 10% given the increase in freight movements predicted. This translates to between 7–15% HCVs using the toll road. Taking into account the higher willingness to pay, HCVs have been assumed to make up 12% of the traffic using the toll road for the purpose of this high level assessment.

Using the assumption that 70% of the traffic would use the new sections of road if tolled and the toll charges per vehicles from above, the following revenue could potentially be expected on each section in their opening year:

Section	Opening Year Revenue
Puhoi to Warkworth (2019)	\$5,600,000
Warkworth to Wellsford (2029)	\$6,100,000

In the higher toll scenario, the opening year revenues would be as follows:

Section	Opening Year Revenue
Puhoi to Warkworth (2019)	\$13,050,000
Warkworth to Wellsford (2029)	\$14,240,000

The contribution that net toll revenue makes to fund a project is through supporting construction debt. In broad terms, the construction debt that can be serviced by a toll road is approximately 23 times the annual net toll revenue. The factor of 23 reflects the prevailing cost of capital (7.5%), the period over which the debt is repaid (35 years), the escalation rates of construction cost and the toll tariff (3.5% and CPI +1% respectively) and the 5 year construction period of the project.

Allowing for the net toll revenue to grow at 1–2% per annum in line with traffic growth, these calculations suggest a construction debt in the order of \$129,300,000 could be supported for the Puhoi to Warkworth section. A construction debt in the order of \$141,100,000 could likely be supported for the Warkworth to Wellsford section. The debt that could be supported on the section from Warkworth to Wellsford is higher because of the opening year being 10 years later than Puhoi to Warkworth, so traffic volumes are higher.

If these values are subtracted from the estimated construction costs and the benefits are reduced by 30% to reflect the amount of traffic using the toll road (70%), the BCR becomes 0.6 for the Puhoi to Warkworth section or 0.9 if the wider economic benefits are also included. The BCR for the Warkworth to Wellsford section becomes 1.2 or 1.5 if the wider economic benefits are included.

In the higher toll case, using similar assumptions about toll revenue growth these calculations suggest a construction debt in the order of \$300,200,000 could be supported for the Puhoi to Warkworth section. A construction debt in the order of \$328,000,000 could likely be supported for the Warkworth to Wellsford section.

If these values are subtracted from the estimated construction costs and the benefits are reduced by 30% to reflect the amount of traffic using the toll road (70%), the BCR becomes 0.8 for the Puhoi to Warkworth section or 1.2 if the wider economic benefits are also included. The BCR for the Warkworth to Wellsford section becomes 2.5 or 3.2 if the wider economic benefits are included.

The overall scheme BCR becomes 0.7 when this tolling analysis is included and 1.0 if the wider economic benefits are further included. If the higher tolling scenario is used then the BCR becomes 1.0 or 1.5 if the wider economic benefits are included.

The economic evaluation of the tolling analysis is summarised below in Table 5–2 and Table 5–3. The BCR for each section and the overall scheme are summarised for the varying discount rates when tolling is included. Table 5–2 reports the evaluation when wider economic benefits are not included. Table 5–3 includes the wider economic benefits and represents the most optimistic tolling scenario overall.

■ **Table 5–2: Economic Discount Rate Sensitivity – Excluding Wider Economic Benefits**

Project	BCR for Varying Discount Rate (DR)		
	8% DR	6% DR	4% DR
Puhoi to Warkworth (including Bypass)	0.6	0.8	1.0
Warkworth to Wellsford (including Bypass)	1.2	1.6	2.3
Overall Scheme	0.7	1.0	1.4

■ **Table 5–3: Economic Discount Rate Sensitivity – Including Wider Economic Benefits**

Project	BCR for Varying Discount Rate (DR)		
	8% DR	6% DR	4% DR
Puhoi to Warkworth (including Bypass)	0.9	1.2	1.6
Warkworth to Wellsford (including Bypass)	1.5	2.1	3.0
Overall Scheme	1.0	1.4	2.0

In the higher toll case, the sensitivity of the discount rate is also tested and summarised below in Table 5–4 excluding the wider economic benefits and Table 5–5 including the wider economic benefits.

■ **Table 5–4: High Toll Economic Discount Rate Sensitivity – Excluding Wider Economic Benefits**

Project	BCR for Varying Discount Rate (DR)		
	8% DR	6% DR	4% DR
Puhoi to Warkworth (including Bypass)	0.8	1.0	1.3
Warkworth to Wellsford (including Bypass)	2.5	3.4	4.9
Overall Scheme	1.0	1.4	2.0

■ **Table 5–5: High Toll Economic Discount Rate Sensitivity – Including Wider Economic Benefits**

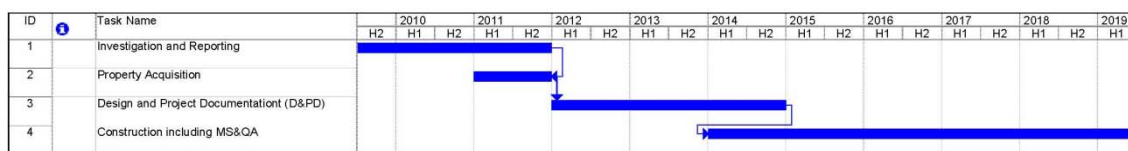
Project	BCR for Varying Discount Rate (DR)		
	8% DR	6% DR	4% DR
Puhoi to Warkworth (including Bypass)	1.2	1.6	2.2
Warkworth to Wellsford (including Bypass)	3.2	4.5	6.5
Overall Scheme	1.5	2.1	3.0

6. Programme

Currently development of four laning between Puhoi and Wellsford has not progressed past the corridor and alignment selection process described above. There is still significant work required to deliver the four laning between Puhoi and Wellsford from this point even before construction can begin on the ground.

The NZTA believe that a 10 year timeframe for the completion of the four laning between Puhoi and Warkworth could be a reasonable expectation. This allows approximately 3 years for the development of the route, consenting, property purchase of the entire route from Puhoi to Wellsford, assuming that the revisions to the current call-in procedures of the RMA are used. Thereafter, procurement, design and construction of the first section from Puhoi to Warkworth will take approximately 7 years. An approximate programme is indicated below in Figure 6-1.

■ Figure 6-1: Indicative Programme – Puhoi to Warkworth



Investigation and reporting and property acquisition for the second section from Warkworth to Wellsford would occur at the same stage as the first section. Following completion of the Puhoi to Warkworth section, a further 10 years until 2029 would be a reasonable expectation for completion of the design and construction of the remaining section of four laning between Warkworth and Wellsford, allowing NZTA to optimise funding and delivery against other routes of national significant. Figure 6-2 below outlines an indicative programme for this section.

■ Figure 6-2: Indicative Programme – Warkworth to Wellsford



7. Overall Assessment

SH1 between Puhoi and Wellsford is affected by emerging traffic growth, congestion and travel time unreliability issues. This route forms the key link connecting Northland and the northern part of the Auckland region to the main Auckland urban area and other areas further south in New Zealand. Although in principle alternative routes exist for traffic between these, SH16 further west and the rail line, the capacity and attractiveness of these are very limited and in both cases there are no plans to change this position to any significant extent. The proposed upgrading of SH1 to alleviate congestion and travel time unreliability will have a significant impact on travel conditions and on the level of economic integration of the main communities lying in its area of influence. In particular this will provide better connections and improved supply chains between producing areas in Northland and markets further south, either for domestic users and consumers or via the ports of Auckland and Tauranga for international markets. Reductions in freight transport costs resulting from the improvements will also make the movement of goods to industries and consumers in Northland and the northern parts of the Auckland region from the main manufacturing and distribution centres in Auckland.

Aiding the economy of Northland is important because of its relatively underdeveloped nature. On a number of economic measures Northland can be seen to be at a disadvantage compared to other parts of the country and improving transport links and potentially boosting economic activity can help redress this balance and make better use of the resources, including the labour force within the region.

The upgrading of SH1 as a limited access road should also help to manage development along the line of the route focussing new growth at the existing centres of Wellsford and Warkworth, where advantage can be taken of infrastructure and facilities already in place.

The upgrading of SH1 performs well against the criteria for strategic investment directions being developed by NZTA and against standard effectiveness criteria. With allowance for the potential wider economic benefits of the project, the BCR would be in excess of 1, but even if these are not included, the benefits of the project in terms of its strategic importance and its impact on economic development would have sufficient weight to offset the low BCR value.

Appendix A Net Present Values and Discount Rates

■ **Table A-1: Net Present Value of Benefits and Costs – 8% Discount Rate**

Section	NPV Benefits	NPV Benefits (including Wider Economic Benefits)	NPV Costs
Puhoi to Warkworth	\$338,530,000	\$460,340,000	\$472,480,000
Warkworth to Wellsford	\$190,500,000	\$227,840,000	\$159,120,000
TOTAL	\$529,030,000	\$688,180,000	\$631,600,000

■ **Table A-2: Net Present Value of Benefits and Costs – 6% Discount Rate**

Section	NPV Benefits	NPV Benefits (including Wider Economic Benefits)	NPV Costs
Puhoi to Warkworth	\$494,470,000	\$691,370,000	\$538,730,000
Warkworth to Wellsford	\$340,170,000	\$413,090,000	\$205,170,000
TOTAL	\$834,640,000	\$1,104,460,000	\$743,900,000

■ **Table A-3: Net Present Value of Benefits and Costs – 4% Discount Rate**

Section	NPV Benefits	NPV Benefits (including Wider Economic Benefits)	NPV Costs
Puhoi to Warkworth	\$745,320,000	\$1,073,110,000	\$616,840,000
Warkworth to Wellsford	\$629,350,000	\$776,590,000	\$269,930,000
TOTAL	\$1,374,670,000	\$1,849,700,000	\$886,770,000