Chapter 13

Part G

VOLUME 2

Traffic and Transportation

Overview

The Project will have significant positive transport effects at a local, regional, and national scale, including:

- Improved safety and reduced road accident risk, due to:
  - the separation of local traffic from State highway traffic travelling through the Kāpiti district, which will address the very poor current performance of the intersections of local roads with SH1;
  - improved road standards, due to the geometric design of the Expressway (including continuous median separation of north- and south-bound traffic); and
  - an enhanced traffic environment on the local road network (which will include the current SH1), with benefits for motorists, cyclists, and rail users due to:
    - fewer vehicles using the current SH1;
    - the provision of grade-separated local road connections across the Expressway and NIMT; and
    - the removal of five of the eight level crossings of the NIMT in the Project area;
- Enhanced connections between communities in the Kāpiti district, through:
  - the provision of the Expressway as an alternative route; and
  - the continued availability of the existing SH1 as part of the local road network, with a safer, improved transport environment (as discussed above);
- Reduced and more reliable travel times along key routes and reduced traffic congestion, which in turn will improve efficiencies in freight movement;
- Improved access to Wellington's key facilities such as the port, international airport, hospital, and central business district; and
- Improved route security and resilience of the road network in the event of a significant earthquake, road accidents, or other disruption; and
- Grade separated connections instead of level crossings at five of the eight existing NIMT road crossings (this removes all the public level rail crossings in the Project area); and
- Safeguard the future ability to extend rail double tracking through the Project area.

During construction, there will be localised, short-term, adverse traffic effects, including delays or inconvenience arising from increased HCV construction traffic and the need to do work on some local roads adjacent to the Expressway. These effects will be managed through a comprehensive Construction Traffic Management Plan, a draft of which is provided with the AEE report.

Overview (cont.)

There will be additional HCV and light vehicle traffic during construction and it is necessary to take measures to ensure the safe operation of the existing SH1 during this period. Measures that will mitigate the effects of construction traffic, have been identified through the development of a CTMP and include:

- advanced warning of turning traffic;
- temporary speed limits;
- controls on the routing of construction traffic;
- temporary access changes;
- measures to address any temporary effects on public transport users;
- measures to address any temporary effects on local traffic; and
- early construction of overbridges associated with the Project.

13 Traffic and Transport

13.1 Introduction

This Chapter summarises the key findings of the assessment of traffic and transport effects undertaken for the Project. This assessment is based on demographic and transport data collected for the Project and traffic modelling as described in Section 13.5. The key traffic and transport effects from the operation and construction of the Project are described in the Sections 13.7 to 13.12.

The full report detailing the effects of the Project on traffic and transportation is:

- Integrated Transport Assessment (Technical Report 6).

This technical report is included in Volume 3 of this AEE.

13.2 The Expressway Alignment

The Project extends from Te Kowhai Road in the south to Taylors Road just north of Ōtaki, an approximate distance of 13km. The Project is one of eight sections of the Wellington Northern Corridor which has been identified by the Government as a RoNS.

The Expressway will provide two lanes of median separated traffic in each direction. Connections to existing local roads, new local roads and access points over the Expressway to maintain safe connectivity between the western and eastern sides of the Expressway are also proposed as part of the Project. There is an additional crossing of the Ōtaki River proposed as part of the Project, along with crossings of other watercourses throughout the Project length.

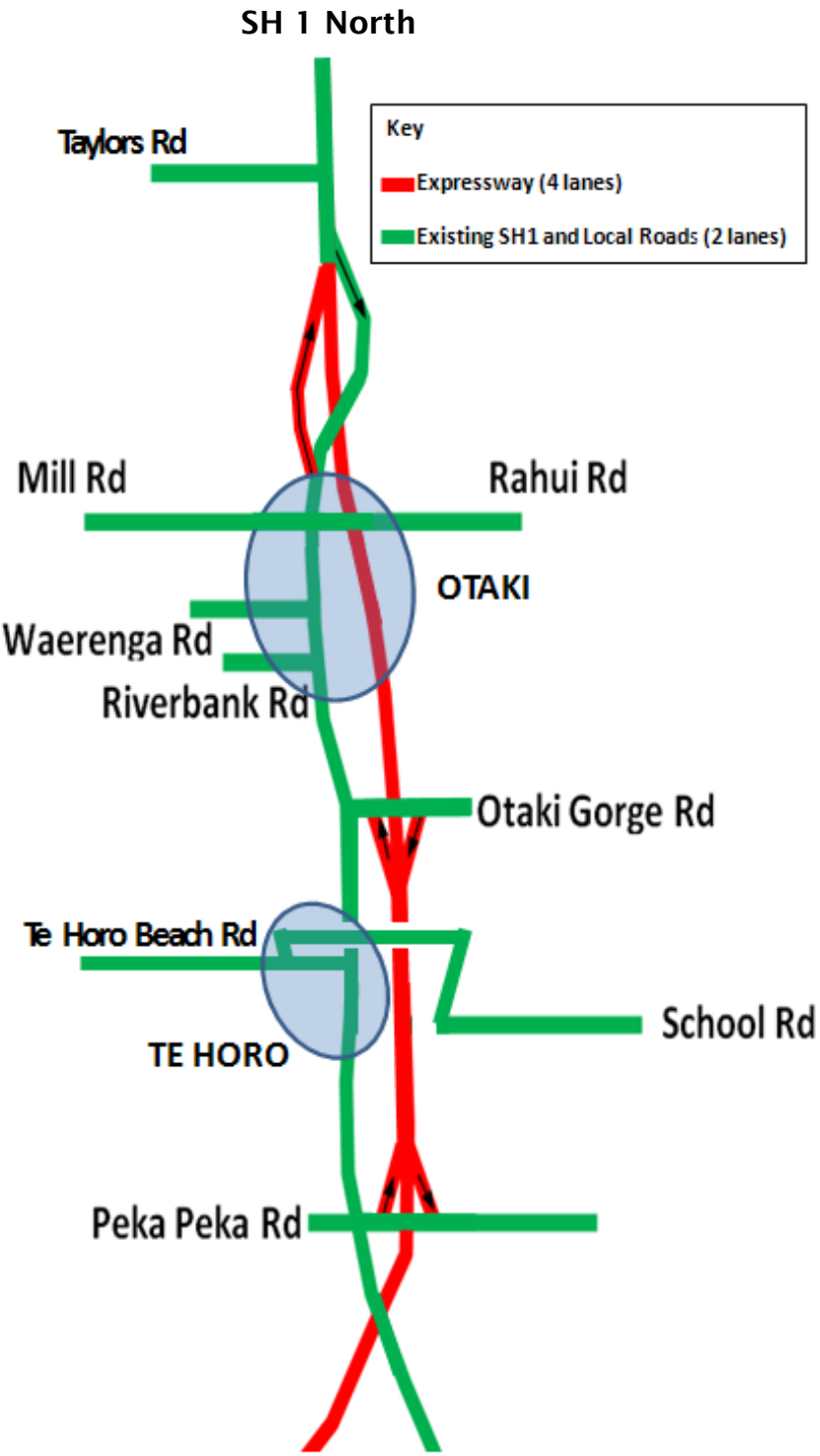
On completion, it is proposed that the Expressway become SH1 and that the existing SH1 between Peka Peka and Ōtaki will become a local road, allowing for the separation of local and through traffic.

To facilitate the Expressway alignment, approximately 1.2km of the NIMT will be realigned.

As part of the Project, a section of the existing SH1 at Mary Crest is required to the relocated. In effect, a new section of the existing SH1 will be built on the western side of the Expressway, connecting to the existing SH1 south of the Project area. The old section of the existing SH1 will be either removed or will have the Expressway built on top of it.

The Project is shown schematically in Figure 13-1, below.

Figure 13-1: Schematic of the Expressway and Interchanges



13.3 The existing Transportation and Traffic Environment

The Project area includes two main townships of Te Horo and Ōtaki. Ōtaki is the northernmost urban centre of the Kāpiti district and the Wellington region. The existing transportation network comprises the SH1, rail, local road, bus, walking and cycling networks.

13.3.1 State Highway 1 and North Island Main Trunk Line

SH1 and the NIMT are part of the national transport network. They pass north-south through the Kāpiti district approximately midway between the coast to the west and the hills to the east. Other than these strategic connections there is limited opportunity for north-south travel within the Kāpiti district.

SH1 through the Kāpiti district is the major route in and out of Wellington and for the lower North Island, linking the centres of Palmerston North, Whanganui and Levin with Wellington. Key parts of the route are (from north to south):

- Taylors Road to Ōtaki Township (100km/h speed limit);
- Ōtaki Railway Retail area (50km/h speed limit);
- South Ōtaki Railway Retail area to Ōtaki Bridge (70km/h); and
- Ōtaki Bridge to Peka Peka (100km/h speed limit – except for a section through Te Horo 80km/h).

The existing SH1 and NIMT rail bridges across the Ōtaki River provide the only transport network connections across the river between the north and the south of the Project area.

The lack of local roads providing north-south connectivity and the reliance on one primary river crossing means that SH1 effectively functions as a local road for travel within the district as well serving regional and national strategic traffic, including freight.

The Ōtaki Railway Station is located to the east of the Ōtaki Railway Retail area, behind and to the east of the shops that front the existing SH1. Currently the station is served by the Capital Connection, which operates a commuter service with limited stops between Palmerston North and Wellington in the morning, with a return service in the evening. Rail freight services also pass through the Project area.

Currently SH1 passes directly through the Ōtaki Railway Retail area. Delays caused by pedestrians crossing and motorists manoeuvring into on-street car parks or side roads slow traffic and make travel times unreliable and create safety effects.

13.3.2 Local Road Network

Local roads in this part of the Kāpiti district branch out from the east and the west sides of SH1. Key local roads (from north to south) include:

- Taylors Road;
- Mill Road (Ōtaki);
- Rahui Road (Ōtaki);
- Waerenga Road (Ōtaki);
- Riverbank Road (Ōtaki);
- Ōtaki Gorge Road;
- Te Horo Beach Road (Te Horo);
- School Road (Te Horo); and
- Peka Peka Road.

Except at the Ōtaki Roundabout intersection with Mill Road and Rahui Road, the existing SH1 has priority over traffic (including cyclists) joining from side roads. Travel between

the east and west of the district involves crossing both SH1 and the NIMT at-grade. Road bridges across the NIMT are provided at Ōtaki Gorge Road and for SH1 immediately north of the Ōtaki Railway Retail area. At other locations railway level crossings are provided. Although at-grade connections across the strategic transport corridor are provided, SH1 and the adjacent NIMT create physical and perceived severance between the east and west sides of the Kāpiti district.

13.3.3 **Bus Network**

Bus route 290 runs between Ōtaki Beach and Waikanae Railway Station via Mill Road and the Ōtaki Railway Retail area. The service allows passengers to transfer to/from rail services at Waikanae Railway Station. Bus route 290 provides five services a day in each direction. Two of the southbound services extend to Paraparaumu. Two of the northbound services start in Paraparaumu, allowing residents of Ōtaki to access Paraparaumu facilities including the Coastlands shopping centre.

There are also a number of longer-distance bus services to other centres in the North Island that stop at Ōtaki. There is one school bus route servicing Te Horo Primary School.

13.3.4 **Walking and Cycling Network**

Pedestrian footways are provided within the road corridor in Ōtaki. Pedestrian build-outs, central refuges and a signalised pedestrian crossing are provided within the Ōtaki Railway Retail area to cross the existing SH1. Cycle lanes are provided in each direction along Mill Road between Ōtaki Town and the Ōtaki Railway Retail area.

Outside Ōtaki, in the rural area, there is little or no provision for non-motorised road users. A footway is provided on the southern side of School Road in Te Horo.

13.4 Existing Traffic and Transport Issues Within the Project Area

13.4.1 **Increased Vehicle Movements**

Daily traffic volumes on SH1 have increased over the past 35 years from close to 8,000 Average Annual Daily Traffic (AADT) volume in 1975 to over 14,000 AADT in 2011. A small decline in traffic volume has been observed since 2009, likely due to fuel price increases and a slow-down of economic activity following the financial crisis. However, in the medium growth scenario a 26 percent growth in the vehicle kilometres travelled in the region is forecast over the next 30 years.

Traffic volumes can be expected to vary by about 1,000 vehicles per day in each direction and increase significantly during weekends and holidays. Within Ōtaki significant delays and queuing are commonly experienced in southbound traffic following long weekend public holidays. SH1 is susceptible to significant fluctuations in traffic flow (i.e. holiday weekends).

13.4.2 **Pedestrian and Cycle Movements**

Current pedestrian and cyclist demand is low, especially within the rural sections of the study area. This is most likely related to the large distances between potential origins and destinations, lack of formal pedestrian and cyclist facilities outside Ōtaki and traffic volumes and speeds on the existing SH1.

13.4.3 **Poor Road Safety and Crash History**

In the Project area SH1 has a poor crash history, with 164 crashes including 14 serious injury or fatal crashes occurring over the past 5 years[19]. Approximately 30% of the crashes in the 100km/h speed zone occurred at intersections and another 10% occurred at property access points. Approximately 14% of the 100km/h crashes were head-on. The KiwiRap[20] assessment undertaken for the section of SH1 from Paraparaumu to Levin has a collective risk (or crash density) rating of high and personal risk rating of medium. The risk ratings are based on fatal and serious injury crashes for the five-year period 2002-2006. Collective risk is a measure of the total number of fatal and serious injury crashes per kilometre over a section of road. Personal risk is a measure of the danger to each individual using the State highway. The high collective risk rating and medium personal risk rating shows that there are a high number of crashes currently occurring on the existing SH1 within the Project area.

13.5 Methodology for Assessing Effects

The modelling approach taken for the AEE incorporates the use of a multi-modal strategic transport model as well as a Project-specific traffic model, in accordance with the approach taken for the assessment of other major projects in the Wellington region. Intersections have also been individually modelled for concept design purposes. The models used are listed below:

- Multi-modal strategic model: Wellington Transport Strategy Model (WTSM)[21], 2011 and forecast years for 2021, 2031 and 2041;
- Project-specific model: Kāpiti Traffic Model (KTM) SATURN model[22] for the 2011 base year, and 2021 and 2031 forecast years; and
- Key intersection Sidra models[23].

Traffic modelling compares:

- The baseline in 2011;
- The 'Do Minimum' scenario in 2031; and
- The Expressway scenario option in 2031.

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[19] 5 year period between 1st of January 2007 and 31st December 2011.

[20] The KiwiRap rating tool is an assessment program to assess risk and identify safety shortcomings on New Zealand's state highways. There are two components to KiwiRap: the star rating and risk mapping. The star rating is an assessment of the level of 'built-in' safety provided on State Highways through engineering features such as lane and shoulder widths or safety barriers. 1-star is the least safe roads while 5-star roads are the safest roads. The southern part of the project area has a 3-star rating, while the northern portion has a 2-star rating.

[21] Multi-modal strategic model: Wellington Transport Strategy Model (WTSM) is used to forecast the change in travel demand both in terms of number of trips that are made and also the form of transport taken (i.e.. car or public transport)

[22] Project-specific model: KTM SATURN model is used to forecast future traffic performance and how motorists will re-route in response to the Project.

[23] Key intersection Sidra models allow a more detailed assessment of traffic performance of individual intersections.

13.5.1 **Do Minimum Transport Network**

Development of other Wellington RoNS results in increased capacity on wider network which can influence people's travel decision and result in changes to demands within the Project area. Therefore when assessing the effects of the Expressway, comparison of the Expressway Scenario to a scenario with the same assumptions but with no Expressway needs to be made. The scenario used for the comparison is known as the "Do Minimum" since it represents what would happen on the network in the future if the Project was not constructed.

Table 13-1 shows which projects are assumed to be completed on the wider network in 2021, 2031 and 2041 in the Do Minimum scenario. A check (✓) indicates where a project is complete while an "X" indicates that the project has not been constructed.

Table 13-1: Wellington Region RoNS Projects in the "Do Minimum"

RoNS Traffic Scheme	2021	2031	2041
Ōtaki to north of Levin	×	✓	✓
Peka Peka to Ōtaki (PP2O)	×	×	×
MacKays to Peka Peka (M2PP)	✓	✓	✓
Linden to MacKays (Transmission Gully)	×	✓	✓
Ngauranga to Aotea Quay (NtAQ)	✓	✓	✓
Terrace Tunnel Duplication	×	✓	✓
Basin Reserve	✓	✓	✓
Airport to Mt Victoria Tunnel	×	✓	✓
Other	**2021**	**2031**	**2041**
Petone to Grenada Link Road	×	✓	✓

The inclusion of the RoNS projects in the do minimum removes pinch points on the wider network which will result in more traffic being able to reach the Project area.

13.5.2 **WTSM Model Assumptions**

The land use matrices used for this assessment have used what is known as the composite growth scenario, which includes medium growth from the WTSM model and the inclusion of the Riverbank Road development and those trips associated with additional development in Paraparaumu town centre, Waikanae North and the Kāpiti Coast Airport development. This will ensure the design has sufficient capacity to accommodate the forecast demand as development occurs.

Other assumptions used for modelling the trip matrices in WTSM are consistent with those identified in the "Do Minimum" scenario.

13.5.3 KTM[24] Model Assumptions

When developing a traffic model and using it to test the effects of future changes there are two key inputs:

- Assumptions about land use changes and population growth which influence the number of trips on the road network and where they are travelling to or from (known as the trip matrices); and
- Assumptions about what changes will occur on the network i.e. which roads will be built.

When assessing the effects of changes to the road network generally two network models are needed for each forecast year. These are called the Do Minimum scenario and option scenario. In this case the option scenario is known as the Expressway Scenario since it contains the Expressway. For these two scenarios consistent land use and population growth assumptions have been used. In terms of networks, the difference between the scenarios is that the Expressway is not included in the 'Do Minimum' scenario but included in the Expressway scenario. This enables the effects of the Expressway on traffic patterns to be evaluated.

The assumptions used for the modelling are consistent with the changes to the network as described in the "Do Minimum" scenario, plus the Expressway. The influence of the other Wellington Northern Corridor RoNS projects on the traffic demands are included in the trip matrices since the matrices are derived from WTSM, which covers a larger geographic area.

13.6 Traffic Demands

13.6.1 Future Motor Vehicle Trip Origins and Destinations

By 2031, approximately 34,000 vehicle-trips to or from Kāpiti district each day are forecast. Most, if not all of these trips would use some part of the Kāpiti Expressway:

- 10,000 trips per day between SH1 north of the model area (north of Taylors Road) and Kāpiti district.
- 24,000 trips per day between SH1 south of the model area (at Paekakariki) and Kāpiti district.

By 2031, about 4,000 trips per day (of the 10,000 trips per day above) are forecast between SH1 north of the model area and SH1 south of the model area all the way through Kāpiti district. All these trips would be made using the Expressway. It is also expected that there will be around 6,000 vehicle-trips per day between Ōtaki (Main Street and Retail Area) and southern parts of the district (in and around Waikanae or Paraparaumu), many of which would use the Expressway. Therefore, about 90% of vehicle-trips made using the Kāpiti Expressway would have a beginning or an end in Kāpiti district.

Around 13,600 vehicle-trips each day are forecast to have either an origin or destination in the Ōtaki Retail Area or Main Street. In comparison, 4,900 are forecast to begin or end in Te Horo and the rural part of the Project area.

[24] An updated version of the KTM has been used. The updated model is called KTM2.1. This is an updated version of the model which was used to assess the traffic effects of the M2PP Expressway proposal. The traffic modelling was undertaken by the M2PP team. This was intended as a way to provide consistency between the two assessments.

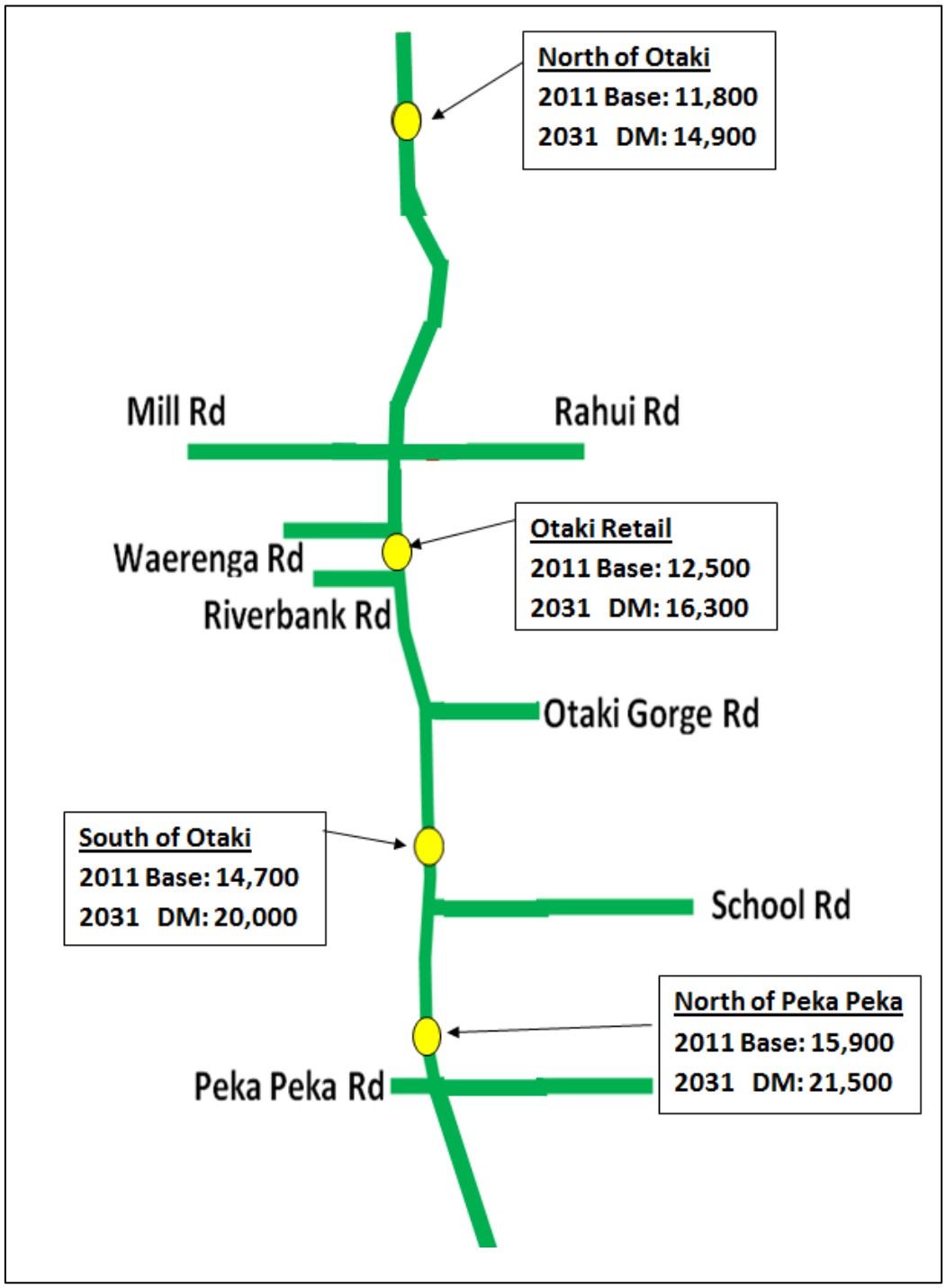
13.6.2 **Existing and Future Traffic Flows**

Figure 13-2, below, summarises the two-way Annual Average Daily Traffic (AADT) for 2011 base and 2031 Do Minimum on SH1. Traffic volumes are lowest at the northern end of the Project area and increase as you head south along SH1. By 2031, traffic volumes on SH1 are expected to increase by between 3000 and 5600 vehicles per day. This corresponds to a growth rate of 1.3 to 1.8 percent per year.

In 2031, if the Expressway is not constructed, motorists trying to turn onto existing SH1 from the side roads would experience extensive delays. The delays would be of a magnitude which could result in motorists changing their trip making patterns or taking increased risks when turning.

The Project provides a superior route for motorists that do not have trip origins or destinations in Te Horo or rural parts of the Project area, with shorter and safer trips with more reliable travel times. The introduction of the Expressway is forecast to reduce the numbers of vehicles on the existing SH1, providing a significant safety improvement for local access to, and safety along, the existing SH1. Motorists leaving or passing through the Project area would instead use the Expressway.

Figure 13-2: Existing and Future Traffic Volumes on SH1 (Two-way AADT)



Note: *2011 Base* = Existing Average Annual Daily Traffic Volume

2031 DM = Do Minimum. This scenario represents what would happen on the network in the future (2031) if the Expressway was not constructed.

(Modelled in the Kapiti Traffic Model (KTM2.1))

13.7 Forecast Traffic Reassignment and Travel Time Effects

Traffic flow re-routing (reassignment) resulting from the introduction of the Expressway was forecast using the KTM 2.1. The effect on journey times for travel by motor vehicle has also been assessed.

13.7.1 Annual Average Daily Traffic

Comparing the 2011 base with the 2031 Do Minimum shows the forecast growth of traffic on the existing SH1 at the following locations:

- 26% increase in AADT on SH1 North of Ōtaki;
- 30% increase in AADT on SH1 in Ōtaki Railway Retail area; and
- 36% increase in AADT on SH1 in Te Horo.

13.7.2 Heavy Commercial Vehicle Traffic

Currently the daily proportion of HCVs on SH1 at Ohau (north of the Project area) is 8%. There is a strong correlation between economic activity and vehicle-kilometres travelled by HCVs. Since 1989 HCV traffic in New Zealand has doubled. The number of HCVs using this part of SH1 is forecast to grow more quickly than the number of light vehicles. This means that by 2031, HCVs will make up a higher proportion of the daily traffic flow than at present.

HCV proportions are forecast to increase from between 12% and 14% in 2011 to between 17% and 22% in 2031. This suggests that daily HCV flows will double again in the coming 20 year period.

The Project allows HCV drivers making inter-regional or inter-district trips to use the Expressway rather than the existing SH1. Overall, the Project relieves the existing SH1 of HCV traffic. The reduction is most noticeable in Te Horo where the Project results in lower HCV flows using the existing SH1 in 2031, than were experienced in 2011. In 2011 the two-way HCV AADT passing Te Horo on the existing SH1 is 2,200. In 2031 there are 4,700 HCV forecast to pass Te Horo per day with 3,900 of these HCVs using the Expressway and 800 using the existing SH1. This means despite a total increase of 2,500 HCVs per day, there are 1,400 fewer HCVs on existing SH1.

On the existing SH1 south of the Ōtaki Railway Retail area, HCV flows in 2031 are forecast to be similar to 2011 levels as HCV drivers leave the Expressway to access destinations in Ōtaki or the Riverside Development.

13.7.3 State Highway Performance – Level of Service

The Level of Service (LOS) experienced by motorists using rural highways is affected by the capacity of the road, the traffic flows on the road and ratio of flow (volume) to capacity. As the traffic flow approaches the capacity of the road, the LOS deteriorates. As traffic flow increases, motorists using the road experience slower vehicle speeds. When the road capacity is reached, flow breakdown occurs and queuing forms.

The Highway Capacity Manual (HCM) provides guidance for assessing the LOS of highway links.

The LOS definitions used for this assessment are presented in Table 13-2.

Table 13-2: HCM LOS Definitions

Volume / Capacity %	LOS	Description
< 25%	A	Free flow operations. Vehicles are almost completely unimpeded in their ability to manoeuvre within the traffic stream.
< 40%	B	Reasonably free flow operations. The ability to manoeuvre within the traffic stream is only slightly restricted.
< 60%	C	Flow with speeds near the free flow speed of the freeway. The ability to manoeuvre within the traffic stream is noticeably restricted.
< 80%	D	Speeds begin to decline with increasing flows. Ability to manoeuvre within the traffic stream is seriously limited.
< 100%	E	Operation is at capacity. Operations are highly volatile with little room to manoeuvre within the traffic stream.
> 100%	F	Flow breakdown or unstable flow.

The level of service assessment for weekday traffic indicates that the existing rural sections of SH1 currently perform at Level of Service (LOS) B ("reasonably free flow operations") and are expected to degrade to LOS C ("the ability to manoeuvre within the traffic stream is noticeably restricted") in the "Do Minimum" scenario, while the reduction in traffic on the existing SH1 resulting from the construction of the Expressway will result in level of service A ("free flow operations, unimpeded manoeuvres") for both the 2031 medium and high growth scenarios.

The 2011 holiday peak hour flows on rural sections of the existing SH1 are forecast to perform at LOS C, which is slightly worse than the morning peak hour for either the medium or high growth scenarios (LOS B). By 2031, the roads are approaching capacity and operating at LOS D ("speeds decline and the ability to manoeuvre is seriously limited").

The Project provides substantial relief to the existing SH1 which will continue to perform at LOS A ("Free flow operations". Vehicles are almost completely unimpeded in their ability to manoeuvre within the traffic stream") or B ("reasonably free flow operations the ability to manoeuvre within the traffic stream is only slightly restricted"). Holiday traffic travelling through the Project area is expected to use the Expressway. The Expressway is forecast to operate at LOS A at peak hours on an average weekend day. With the construction of the RoNS on the wider network, there is the potential for holiday traffic profiles to change. However, there is still limited capacity north of the Project area as SH1 remains a two lane highway. As is currently the case, people will adjust when they travel to minimise the congestion they experience to the north of the Project. Therefore this will have the effect of minimising the potential for extreme peaks in holiday traffic flows.

13.7.4 Travel Time Forecast

Journey times for seven key origin and destination pairs have been extracted from the model. The forecast travel times for these journeys in the PM peak hour for the 2011 base, 2031 Do Minimum and Project are shown in Table 13-3.

From the 2011 base to 2031 Do Minimum the travel times for some journeys are reduced. This is due to the M2PP section of expressway not being constructed in 2011, but included in the 2031 Do Minimum.

Table 13-3: 2031 PM Peak Travel Time Comparison

Travel Time Route		Northbound				Southbound			
		2011 Base	2031 Do Min	2031 Expressway	Difference: 2031 Expressway – 2031 Do Min	2011 Base	2031 Do Min	2031 Expressway	Difference: 2031 Expressway – 2031 Do Min
(a) Between SH1 at MacKays Crossing and SH1 north of Ōtaki	Time (m:s)	26:27	20:32	18:44	*-01:48*	23:17	20:25	18:41	*-01:44*
	Dist (km)	31.2	30.7	31.1	*0.4*	31.2	31.0	31.1	*0.1*
(b) Between SH1 at MacKays Crossing and Arthur St in Ōtaki Retail	Time (m:s)	24:20	18:24	18:19	*-00:05*	21:11	18:19	18:22	*00:03*
	Dist (km)	29.0	28.6	29.0	*0.4*	29.0	28.8	29.1	*0.2*
(c) Between SH1 north of Ōtaki and Arthur St in Ōtaki Retail	Time (m:s)	02:06	02:08	02:03	*-00:05*	02:06	02:06	02:03	*-00:03*
	Dist (km)	2.1	2.1	2.4	*0.3*	2.1	2.1	2.4	*0.3*
(d) Between Te Horo at School Road and SH1 at MacKays Crossing	Time (m:s)	20:18	14:27	18:23	*03:56*	17:07	14:13	17:28	*03:15*
	Dist (km)	23.5	23.5	23.9	*0.4*	23.5	23.5	23.8	*0.3*
(e) Between Te Horo at School Road and Paraparaumu Town Centre	Time (m:s)	14:05	13:32	12:52	*-00:40*	13:01	13:37	13:18	*-00:19*
	Dist (km)	17.0	17.2	17.3	*0.1*	16.99	17.14	17.32	*0.2*
(f) Te Horo at School Road and Waikanae at Elizabeth Street	Time (m:s)	06:42	07:25	07:01	-00:24	06:53	07:25	07:19	-00:06
	Dist (km)	9.9	10.2	10.2	0.0	9.9	10.2	10.2	0.0
(g) Te Horo at School Road and Arthur Street in Ōtaki	Time (m:s)	04:03	03:58	04:07	+00:09	04:04	04:06	04:05	-00:01
	Dist (km)	5.5	5.5	5.5	0	5.5	5.5	5.5	0

Overall, motorists driving through the Project area are expected to experience shorter travel times with the Expressway constructed compared to the "Do Minimum" with savings of up to 1 minute and 48 seconds. Local trip travel time between Te Horo and Paraparaumu and Waikanae are also improved.

Journeys between Te Horo and MacKays Crossing will take longer after the Expressway is constructed when compared to the "Do Minimum" for the same year. However, in the "Do Minimum", motorists making these journeys have relatively direct access to the M2PP Expressway. This is a temporary benefit resulting from unimpeded access to the M2PP Expressway. When the Peka Peka to Ōtaki section is complete, this access will be removed and the fastest route to the Expressway will be via the South Ōtaki Interchange (north of Te Horo). For most journeys, it will be quicker to drive south using the existing SH1 whereas in the "Do Minimum" these journeys could be been made using the M2PP Expressway.

13.7.5 **Travel Time Reliability**

Motorists currently experience variable travel times when travelling through the Project area, particularly on weekends and holidays. This variability is generally caused by delays which occur as a motorists travel through the Ōtaki Railway Retail area.

With the Expressway constructed, motorists will be able to bypass this area. Motorists who choose to stop in Ōtaki will also experience improved performance of the existing SH1 due to the reduction in traffic. These improvements in journey time reliability will also benefit Heavy Commercial Vehicles. The Ōtaki bypass also means HCVs do not need to accelerate or decelerate for intersections or when travelling through the Ōtaki urban area which will improve their operating efficiency.

There is the potential for some journey time variability to occur on holiday weekends as a result of constraints to the north of the Project area where the Expressway and SH1 becomes a single lane in each direction.

13.7.6 **Summary of Forecast Traffic Reassignment and Travel Time Effects**

In 2031 with the construction of the Expressway the volume of traffic using the existing SH1 is significantly reduced. For example on existing SH1 through Te Horo the volume of traffic in 2031 is forecast to drop from nearly 21,500 vehicles per day in the Do Minimum scenario to nearly 3,000 vehicles per day with the Expressway. The volume of traffic passing through Ōtaki with the Expressway is higher (around 7,000 vehicles per day) but this is still a significant reduction compared to the Do Minimum flow which is forecast to be 16,300 vehicles per day. These reductions in the traffic volume result in improvement in the link LOS on the existing SH1. The Expressway will also operate with a link LOS of A.

The Expressway is forecast to result in an approximate 2 minute travel time saving for motorists travelling through the Project area. This is largely due to the bypass of Ōtaki. Journey time reliability will also improve since motorists will not be subject to delays within Ōtaki as currently occurs on weekends and holidays.

North of Ōtaki the merge with the existing SH1 is expected to perform well with a LOS of C or better. However, if there are significant changes to holiday travel patterns as a result of the elimination of other downstream constraints due to the wider RoNS package delays could be experienced. As is currently the case, motorists will most likely adapt to this by adjusting their travel patterns.

13.8 Expressway and Local Road Traffic Connectivity

The performance of the local roads and interchanges has been assessed using Sidra.

Sidra is a software package used for modelling intersection capacity, level of service and performance analysis. The Sidra models have been built on the traffic volumes extracted from the KTM SATURN model. Since the Sidra models are for concept design of new intersections they are not calibrated and use default Sidra settings.

The Sidra analysis focused on the AM and PM peak 2031 medium growth "Do Minimum" and Expressway option scenarios. The average delays presented here incorporate both

the intersection delay (time waiting for a gap in traffic) and geometric delay (time associated with completing turning manoeuvres). Sensitivity tests were also performed to take in to account the impact of higher than typical traffic flows such as those which may be experienced on holiday weekends. For the analysis of the local road and interchange performance the Project area has been divided into three general areas: Ōtaki, Ōtaki Gorge and Te Horo.

13.8.1 Ōtaki

The Rahui Road, Mill Road, and SH1 roundabout (at the northern end of the Ōtaki Railway Retail area) performs well in both the "Do Minimum" and Expressway scenarios with each movement having an average delay of 13 seconds or less, which corresponds to LOS of A or B. The intersection of the existing SH1 and the new northbound on-ramp also performs well with a LOS of A for all movements in both the AM and PM peak periods.

In 2031 traffic turning out of Riverbank Road, immediately north of the Ōtaki River, experiences extensive delays without the Expressway. With the Expressway constructed the volume of traffic on the existing SH1 is significantly reduced, which results in a considerable improvement for traffic exiting Riverbank Road.

13.8.2 Ōtaki Gorge

Traffic exiting either Ōtaki Gorge Road or Old Hautere Road (to the south side of the Ōtaki River) in the 2031 "Do Minimum" scenario experiences extensive delays while waiting for a gap in the through traffic on SH1. With the Expressway built, the road network layout in the vicinity is completely different. North facing ramps to the Expressway are provided along with a bridge across the Expressway for local traffic. In the Expressway scenario all intersections operate well with average delays of 20 seconds or less.

13.8.3 Te Horo

Similar to the other locations, traffic will experience long delays when accessing SH1 from School Road in the "Do Minimum" scenario. The construction of the Expressway results in significantly less traffic on the existing SH1 which means there is less delay for motorists turning to or from the existing SH1.

13.8.4 Summary of Expressway and Local Road Traffic Connectivity

With the construction of the Expressway the volume of traffic on existing SH1 is significantly reduced which results in the intersections of the local roads and existing SH1 performing much better. In locations where the Expressway severs the link between a local road and existing SH1 an underpass is provided to maintain the connection. All of the Expressway on and off ramps also perform well with a good level of service.

Sensitivity tests regarding the effects of peak holiday traffic show that with the Expressway constructed all intersections will have a good level of service.

The provision of the Expressway in addition to the existing SH1 means there is an alternative, higher standard route should there be an incident on either corridor. This improves the resilience of the transportation network.

13.9 Effect on Other Transport Modes

13.9.1 Passenger Transport Services

Generally, the Expressway has minimal effect on passenger transport users. The bus route can continue to use the existing SH1 or switch to using the Expressway. The Expressway will have minimal effect on the roads currently used by school bus services, as most of the existing local road to State highway connections will be maintained.

The Ōtaki Railway Station will be shifted slightly but this will not affect access to the station or its operation. The design of the NIMT realignment allows for double tracking of the railway should there be a desire to do this in the future.

13.9.2 Effect on Pedestrians, Cyclists and Equestrians

Very few people currently cycle or walk within the Project area, except within Ōtaki. The existing SH1 is a high-volume, high-speed road with no dedicated facilities for pedestrians or cyclists. The Project will significantly reduce the traffic flow on the existing SH1 south of Ōtaki Gorge Road. This will:

- Reduce the exposure of pedestrians, cyclists and equestrians to motorised traffic, reducing the risk they are involved in a crashes;
- Create gaps in the traffic noise, reducing the sense of a car-dominated environment; and
- Make it easier to cross the existing SH1.

Construction of the Project will mean that a pedestrian or cyclist travelling alongside SH1 through Te Horo in 2021 would see 5 vehicles each minute rather than 26 per minute. This is fewer vehicles than one would expect to see on Mill Road today.

The bicycle level of service (BLOS) was assessed using The Highways Capacity Manual method. The resulting BLOS for the 2021 Do Minimum were predominantly D and E[25]. The results for this assessment appeared to be most affected by the shoulder widths. In the Expressway 2031 Do Minimum scenario the traffic reduction on the existing SH1 changes the BLOS from D/E to B. The reduction of speed below 80kmph would further lift the BLOS to A.

13.9.3 Across the Transport Corridor

The existing SH1 and NIMT railway create an impediment to movement between the east and west sides of the transport corridor. The factors contributing to this severance are the:

- Physical barrier formed by the NIMT railway;
- Time needed to wait for adequate gap in traffic flow to cross the existing SH1;
- The distance people would walk or cycle to cross the existing SH1;
- Risk of involvement in a road traffic accident; and
- The perception of danger.

The Project provides connections across the NIMT railway and traffic flows on the existing SH1 and Expressway. At some locations it also introduces additional deviation and increased travel distances for some journeys.

For the Do Minimum scenario, the severance caused by traffic volumes on the existing SH1 is severe. This means people are deterred from making trips which require crossing SH1. In the rural parts of the Project area, traffic flow on the existing SH1 is reduced by between 60% and 80% once the Expressway is constructed. The ability for pedestrians to cross the existing SH1 at-grade is greatly improved due to the substantial reduction in traffic flow.

Table 13-4 shows that overall there is a reduction in severance for pedestrians crossing the transport corridor. Cyclists and equestrians are likely to perceive relief from severance

[25] BLOS uses the same ranking system as vehicular LOS with BLOS A representing the best conditions and BLOS F representing the worst conditions

(i.e. reduced traffic flows) in much the same way as pedestrians in terms of gaps in the traffic. The assessment of journeys to and from School and Old Hautere Roads would therefore be more positive overall for these users.

Table 13-4 summarises the assessment of pedestrian severance.

Table 13-4: Pedestrian Severance Assessment

Route	Comments	Relief from Existing Severance	New Severance	Result
School Road	• Grade-separated crossing of the transport corridor • additional 1.7km for some trips	Substantial Positive	Substantial Negative	Neutral
Old Hautere Road	• grade separated crossing of the transport corridor via South Ōtaki Interchange • minimal increase in length for trips to/from Ōtaki	Substantial Positive	Slight Negative[26]	Moderate Positive
Ōtaki Gorge Road	• 60% reduction in traffic flows on existing SH1 • negligible change in trip length	Substantial Positive	Negligible	Substantial Positive
Rahui Road	• 50% reduction in traffic flows on existing SH1 • negligible change in trip length	Moderate Positive [27]	Negligible	Moderate Positive
The Ōtaki "Ramp"	• 50% reduction in traffic flows on existing SH1 • negligible change in trip length	Moderate Positive [28]	Negligible	Moderate Positive

13.9.4 **Amenity in Ōtaki Retail/Railway Precinct Area**

The Expressway will greatly reduce the traffic flow through the Ōtaki Railway Retail area. This will have a positive effect for the retail area.

New Zealand Standard 4404:2010 (Land Development and Subdivision Infrastructure) advises the traffic volumes appropriate for different types of road. It suggests that a road providing for urban retail activity should have an AADT volume of less than 8000 vpd.

The 2011 base model predicts an AADT of 12,500 vpd and the 2031 Do Minimum model an AADT of 16,300 vpd.

[26] Assumes most trips are to/from Ōtaki.

[27] Assumes built-up areas are less sensitive to traffic reduction.

[28] Assumes built-up areas are less sensitive to traffic reduction.

With the Expressway in place, AADT volumes through the Ōtaki Railway Retail precinct in 2031 are predicted to reduce to 6,900 vpd, which is less than the flows suggested in NZS 4404:2010 for a road providing for urban retail activity and therefore better than the vehicles per day suggested by NZS 4404:2010.

13.10 Road Safety Effects

Due to the reduction in traffic on the existing SH1 the crash costs for existing SH1 are expected to reduce by 75 percent. However, there is a risk of some, generally low severity, crashes occurring on the Expressway or the new intersections associated with the on and off ramps. Therefore, the construction of the Expressway is expected to result in an overall 60 percent savings per year in crash costs compared to the existing situation.

The Project also means that five of the eight existing rail level crossings within the Project area will be closed. They are:

- School Road; grade separation provided;
- Property access opposite Te Waka Road; alternative access provided;
- Stevens property access; alternative access provided;
- Old Hautere Road; alternative access provided; and
- Rahui Road; grade separation provided.

Three existing level crossings will be retained. They are Sampson property access, Mary Crest and the Winstone's crossing. As at present, the Winstone's crossing will only be used for oversized loads.

All of the level crossings on public roads will be closed as part of the Project. The remaining level crossings are private access and therefore carry lower traffic flows. The changes will therefore significantly reduce the risk of crashes occurring between trains and road traffic, pedestrians or cyclists.

13.11 Property Access Effects

After the Expressway is constructed, there will be no physical change to many residents' access to the existing SH1, although access will be easier and safer due to reduced traffic volumes. However, there are some locations where residents' access to existing SH1 will be severed by the Expressway. In these situations alternative access arrangements have been developed, resulting in an increase in travel distance for some journeys. However, the traffic volumes on the existing SH1 in the future will be much lower which will make this manoeuvre safer and easier.

New local roads planned for provision of alternative access include:

- From Gear Road to School Road – no distance change for northward trips; southward trips - increases the travel distance by 1.5km;
- Ōtaki Gorge Road and Old Hautere Road – access is provided by new local road parallel to the Expressway – no distance change for northward trips; southward trips - increases the travel distance by 2.5km;
- Between Te Horo and Old Hautere Road - provide access to properties via a new local road which otherwise become landlocked; and
- From Mary Crest to a point opposite Te Hapua Road – Access to SH1 will be via an underpass beneath the Expressway at Mary Crest.

Although there are a number of locations in which access distances will increase, this will be offset by the significant improvement in safety and reduced delay for vehicles turning in or out of these locations.

The effect of the Expressway on emergency services access is dependent upon the specific location from which they are responding. For access to properties within the study area

the effects are generally similar to those noted above. Special access, for emergency services only, from the Expressway to Gear Road in Te Horo has been provided for. This enables emergency vehicles travelling in either direction to access Ōtaki.

13.12 Construction Traffic Effects

Given the stage of Project development (i.e. a Contractor has not yet been appointed), the approach has been to assume the worst case scenario with regards to the number of vehicles.

13.12.1 Assumptions

The types of construction activity that could affect transport activities are:

- Arrival and departure of construction workers in light vehicles or buses;
- Delivery of plant or materials using HCV movements;
- Movement of overweight and / or over-dimension loads; and
- Construction activities close to a live highway.

This Project will predominantly be constructed off-line, that is without the need for temporary road closures, although some traffic diversions will be experienced. For the purposes of this assessment, the main assumptions are that:

- Construction activity is 6 days a week;
- Construction occurs across an 8 hour day (this may vary slightly across the year);
- Construction workers arrive at site in the hour starting 07:00;
- Construction workers leave site in the hour starting 16:00;
- All trucks importing pavement material or water will leave the site empty; and
- All trucks exporting earthworks material will arrive at the site empty.

In addition to access along internal haul routes, each construction section may be accessed from the public road network. The following routes are assumed between:

- SH1 and Section 1 via Rahui Road;
- SH1 and Section 2 via Ōtaki Gorge Road;
- SH1 and Section 3 via Old Hautere Road; and
- SH1 and Section 4 via School Road.

13.12.2 Worker Arrival and Departures – Light Vehicles

Additional trips will be generated by construction staff travelling to and from the site. There will be approximately 150 workers on site each day. The movements identified are small compared to the flow on the existing SH1, and analysis has shown that the effect of the additional worker light vehicles on the operation of the intersections will be negligible. The assessment has shown that the additional worker vehicles did not noticeably increase delays for motorists travelling from side roads onto SH1, as significant delays are already experienced by motorists making these movements.

The most significant delays are forecast for motorists turning right out of side roads on to SH1 in the evening peak hour where delays of more than 3.5 minutes per vehicle are forecast. The queues of motorists waiting to turn right onto the northbound direction for SH1 will also create delays for those wishing to turn left.

13.12.3 Movement of Construction Materials – Heavy Commercial Vehicles

HCVs will be used to move materials and large loads such as bridge beams. The majority of truck and trailer movements will be associated with:

- Earthworks (cut and fill);

- Import of materials for pavement construction; and
- Water cartage for dust management.

Most of the pavement materials will be needed following completion of earthworks. These materials will need to be imported. Until there is more certainty regarding the construction programme, it has been assumed that the movement of cut and fill, pavement materials and water will occur at the same time.

By 2021 it is forecast that SH1 will be carrying just under 1500 vehicles per hour in the morning peak period through its intersection with Ōtaki Gorge Road.

Approximately 16% or around 240 are forecast to be HCVs. Construction of the Project will add 26 HCVs per hour at Ōtaki Gorge Road, which would increase the HCV proportion to 18%.

The additional HCV traffic will affect the operation of the at-grade intersections between the existing SH1 with Ōtaki Gorge Road, Old Hautere Road and School Road. The additional HCV traffic will result in increased average delay, particularly for turns from the side roads onto the existing SH1. The intersection turning delay will affect construction traffic using these site accesses as well as motorists travelling to and from properties to the east of the transport corridor. The increased delay and the associated safety hazard is the main issue that needs to be addressed in the construction traffic management plan (refer Volume 4 AEE).

The current separation between the existing SH1 and the NIMT railway at Old Hautere Road and School Road does not allow much room for truck and trailer units to wait to cross the railway or join the existing SH1 when undertaking turning manoeuvres. Minor changes to the road layout Old Hautere Road, as provided for in the Project design, will avoid this issue. More substantial measures are provided for in the design at School Road.

Options for minimising the risk of truck and trailers blocking back include:

- Temporarily re-locate the School Road level crossing further to the south where the required storage space can be provided;
- Limit the movement of truck and trailer units to left in a left out only from this intersection - this would allow for deliveries from the north with trucks using the Peka Peka interchange (4km to the south) to turn back towards the north;
- Using trucks without trailers - this would double the numbers of HCV movements at the intersection; or
- Staging of bridge construction to minimise traffic effects.

13.12.4 Construction Traffic Mitigation

There are numerous options for mitigating the intersection efficiency and road safety effects during construction, including:

- Limiting truck and trailer units to left in a left out only (substantially increase the length of the haul routes);
- Using trucks without trailers (doubling the number of HCV movements at the intersections);
- Temporary warning signs on the SH1 approaches to intersections;
- Temporary speed restrictions on the SH1 approaches to intersections; and
- Staging of bridge construction to minimise traffic effects.

Of these, the following mitigation for construction traffic effects are proposed:

- A construction traffic management plan will be developed for all construction activities, including the movement of over-dimension components (e.g. bridge spans);

- To minimise journey distances and reduce transport costs, every effort will be made to source bulk materials from locations / settlements within the Kāpiti district or adjoining districts;
- Transportation of over-dimension components shall be undertaken in accordance with the appropriate operational approvals;
- The use of internal haul routes will be maximised (e.g. earthworks will be moved within the site rather than via public roads);
- A self-contained drive-through wheel wash will be provided for each site access;
- Workers and bulk goods suppliers will be briefed about the poor crash record of at-grade intersections on the existing SH1 before their first visit to the site;
- Advance warning signs will be provided for SH1 approaches to site access roads used for construction site access;
- Temporary speed restrictions will apply on the SH1 approaches to Ōtaki Gorge Road, Old Hautere Road and School Road;
- Temporary traffic signal control will be introduced during the construction of the Rahui Road bridge;
- Measures will be introduced, such as diverting pedestrians and cyclists along a safe route past the construction area using temporary directional signage, to ensure the safety of non-motorised road users of side roads, particularly at School Road and Rahui Road; and
- In order to minimise the risk to child pedestrians using the School Road site access/HCV drivers will be warned of school bus arrival and departure times SH1 and instructed to take additional care when using the route. Other measures such as temporary speed limits, signage and regular communication with the School will also be implemented. All mitigation measures will be documented in the CTMP.

With the adoption and implementation of these recommendations, it is considered that construction will have minimal and acceptable effects upon the safe and efficient operation of the road network. The detail of the above options will be detailed in the CTMP and certified in accordance with the processes outlined in the CEMP.

13.13 Mitigation

The Project, by its nature, avoids the significant adverse road safety effects that are forecast in future if no changes to the road hierarchy are introduced. This will benefit not only people travelling through the study area, but also people that make trips within as well as to and from the Project area.

Particular care has been taken in the urban design and landscaping at Gear Road and School Road in Te Horo. This has been necessary to minimise the (already small) risk of pedestrians attempting to cross the Expressway and NIMT at grade.

The transport effects of construction activities will be appropriately mitigated. The successful contractor will work with the road controlling authorities to develop the most appropriate mitigations measures in the development and agreement of a construction traffic management plan, which will adopt a range of well-established, proven measures such as those documented in Section 13.12.4 above.