Before a Board of Inquiry
MacKays to Peka Peka Expressway Proposal

under: the Resource Management Act 1991

in the matter of: Notice of requirement for designation and resource consent applications by the NZ Transport Agency for the MacKays to Peka Peka Expressway Proposal

applicant: **NZ Transport Agency**
Requiring Authority

Statement of evidence of **Andrew Murray** (Transportation) for the NZ Transport Agency

Dated: 6 September 2012

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STATEMENT OF EVIDENCE OF ANDREW MURRAY FOR THE NZ TRANSPORT AGENCY

QUALIFICATIONS AND EXPERIENCE

1 My full name is Andrew Peter Murray. I have a Bachelor of Engineering Degree (Civil) from Auckland University. I am a member of the Institute of Professional Engineers New Zealand (IPENZ) Transportation Group and a committee member for the New Zealand Modelling User Group.

2 I am a Technical Director of Transportation in Auckland at Beca Infrastructure Limited (Beca) and have 21 years of experience in traffic and transportation engineering both in New Zealand and overseas. I have extensive experience in traffic engineering, traffic modelling, transport planning and project evaluation, and specialise in forecasting and evaluating the effects of large transport infrastructure projects as well as land development proposals. I have worked on many significant transport projects in New Zealand including the following:

2.1 Western Ring Route (Waterview) (transport planning, forecasting, expert evidence for Board of Inquiry);

2.2 Britomart Interchange (patronage forecasting);

2.3 SH1 ALPURT realignment (traffic/transport planning);

2.4 SH20 extension in Manukau (transport planning and traffic forecasting);

2.5 East Tamaki Corridor Arterial (Te Irirangi Drive: traffic forecasting, transport planning);

2.6 SH1 to Waiouru Peninsula connection (forecasting);

2.7 PENLINK Toll Road Whangaparaoa (transport planning, forecasting, evaluation and inputs to the business case);

2.8 The North Shore Busway (planning, patronage forecasting);

2.9 Tauranga Eastern Link (transport planning, traffic and toll forecasting); and

2.10 Tauranga Harbour Link (transport planning, forecasting, traffic engineering).

3 I have given evidence as an expert witness in the Environment Court and before a Board of Inquiry for previous projects including the Waterview Project, Omaha Plan Change Appeal, Silverdale Park

and Ride Appeal and the Applefields Section 293 Appeal (Christchurch).

4 My evidence is given in support of the Notice of Requirement (*NoR*) and applications for resource consent lodged with the Environmental Protection Authority (*EPA*) by the NZ Transport Agency (*NZTA*) for the construction maintenance and operation of the MacKays to Peka Peka Expressway (*the Project*).

5 I am familiar with the area that the Project covers and the State highway and local roading network in the vicinity of the Project.

6 I am the reviewer of the Assessment of Transportation Effects technical report[1] that formed part of the Assessment of Environmental Effects (*AEE*) lodged in support of the Proposal. The report was written under my supervision, by my colleagues Graham Bell, Brian Wolfman, Eric Whitfield and Reena Solanki at Beca.

7 I have read the Code of Conduct for Expert Witnesses as contained in the Environment Court Consolidated Practice Note (2011), and I agree to comply with it as if this Inquiry were before the Environment Court. My qualifications as an expert are set out above. I confirm that the issues addressed in this brief of evidence are within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

SCOPE OF EVIDENCE

8 My evidence will deal with the following:

8.1 Background and role;

8.2 Strategic transportation issues;

8.3 Regional transport planning documents;

8.4 Existing traffic environment;

8.5 Traffic modelling methods;

8.6 Projected travel patterns;

8.7 Operational traffic effects of the Project;

8.8 Proposed mitigation measures;

8.9 Sensitivity tests;

[1] Technical report 32.

8.10 Response to submissions;

8.11 Response to section 42A report(s); and

8.12 Conclusions.

EXECUTIVE SUMMARY

9 A comprehensive assessment of the transport effects of the Project has been undertaken, including assessment on cyclists, pedestrians, general traffic, property access and public transport. This has included detailed modelling of future conditions, along with sensitivity testing of critical inputs and assumptions.

10 The existing transport network in this area has poor north-south connectivity (especially between Waikanae and Paraparaumu), requiring a mix of local, arterial and strategic functionality on SH1 and resulting in congestion, unreliable journey times, unsafe conditions for pedestrians and cyclists, a high crash rate (an average of 1 fatal crash and 4 serious-injury crashes per year) and a lack of resilience to accommodate incidents on the existing route.

11 The assessment of the various transport modes and issues identified the following:

11.1 Existing cycling and pedestrian routes will be retained and a new shared facility will be provided alongside the Expressway between Poplar Avenue and Peka Peka. This new facility, along with the substantial reductions in traffic expected on many local roads (especially the existing SH1 corridor), are expected to enhance cycling and walking facilities in this area.

11.2 The reduced congestion (especially around the rail stations and Waikanae and Paraparaumu town centres) is expected to retain or improve bus journey times and reliability, while the new crossing of the Waikanae river will provide an opportunity to provide improved bus services between these two communities. A small increase in travel time for buses is expected on Kāpiti Road due to the new traffic signals. However, improved journey times are expected on other routes (especially those using or near the existing SH1 corridor). The significantly reduced congestion in this study area for general traffic and the improved accessibility between Waikanae, Paraparaumu and Wellington is however expected to reduce public transport usage to/from Kapiti by some 7%. While reduction in public transport usage is not desirable, I do not consider this expected reduction to be significant within the context of the overall improvements which the Project will make to the transport system.

11.3 Access to property has been retained (albeit in some locations in an altered form), although further design work is progressing on the provision of property access on Kāpiti Road in the vicinity of the proposed interchange.

11.4 Traffic flows on the existing SH1 and on many local roads are expected to reduce substantially (compared to a 'No Project' scenario), due to both through traffic and a proportion of local traffic diverting to the Expressway. Traffic flows are expected to increase on some roads, for which mitigation is proposed (especially Park Avenue and Tutanekai Street).

11.5 The costs associated with road crashes in this area are expected to reduce by approximately $3 million per year (38%).

11.6 Journey time efficiency and reliability is expected to increase significantly, both for through traffic and local traffic.

12 I consider that the Project Objectives match the existing and expected future transport issues and that the Project achieves both its defined Objectives and the guiding design objectives developed by the Alliance of NZTA and KCDC. I consider that alternative options to meet the project objectives have been appropriately considered.

13 I have considered the public submissions and the Key Issues Report prepared by KCDC. From that, I have clarified and extended the proposed mitigation, including draft conditions related to transport operations.

14 I have considered additional Project elements suggested by submitters (including additional Expressway Connections), and while some would offer additional transport benefits, I do not consider that they are required to mitigate effects nor to meet the Project Objectives.

15 There are some areas of technical disagreement for which I welcome further discussion in witness conferencing. However, I have not identified any issues which have caused me to alter my conclusions.

BACKGROUND AND ROLE

16 My role on the Project commenced with the formation of the Alliance and involves providing technical advice, direction and review to the team undertaking the detailed transport designs and assessments. I also directed the development of the modelling methodology and verified the resulting analysis and reporting. I have technically

verified Technical Report 32 (*TR32*) (Assessment of Transport Effects) and Technical Report 34 (*TR34*) (Traffic Modelling Report).

17 While I was not directly involved in the development or selection of alignment options or designs, I was involved in developing the appropriate traffic assessment methodologies, had regular discussions with the trasport team undertaking that work and reviewed the associated transport analysis that informed those processes.[2]

18 There have been extensive discusions on transport issues between Mr Eric Whitfield of the Alliance and Mr Don Wignall as adviser to Kāpiti Coast District Council (*KCDC*), and I have been party to some of those discussions.

19 My role and evidence focusses on the effects of the Proposal when in operation (post construction). The assessment of traffic effects during construction is covered in the evidence of **Mr Stephen Hewett**.

20 The AEE includes a detailed Assessment of Transport Effects (the *Transport Assessment*) which is documented in TR32. The transport assessment has involved extensive transport modelling, which is described in detail in TR34. I support the assessment and conclusions in those technical reports. In this evidence, I discuss the approach and key outcomes, rather than repeating the full assessment.

STRATEGIC TRANSPORTATION ISSUES

21 This Project is located on the main route (*SH1*) accessing the Wellington Region from the north. In the general location of the Project, SH1 carries of the order of 20,000-24,000[3] vehicles per day (vpd), of which 1,600-1,900 (8%) are heavy vehicles. The only other road access to the Wellington Region is SH2, which at an equivalent northern location (Rimutaka Hill), carries some 5,700 vpd. The SH1 corridor therefore has critical importance for access to the Wellington Region.

22 In the vicinity of this Project, SH1 is a mixture of 100 km/h rural open-road, 80 km/h peri-urban and 50-70 km/h urban road environments. There is a mixture of one and two lanes in each direction. The overall capacity of the route is constrained by both the single lane rural sections and the urban intersections. These sections are already at or approaching their practical capacities during typical weekdays, meaning that growth is constrained in this

[2] Transportation planning and traffic engineering inputs to this project were led by my colleague Mr Eric Whitfield in Wellington.

[3] 2011 Year data.

corridor.[4] During holiday/weekend periods, the demands exceed capacity at various locations on the route, resulting in significant queues and delays during those periods.[5] During peak flow periods traffic flows heading for Kāpiti are constrained by 'bottlenecks' elsewhere in the SH1 corridor, such as at Pukerua Bay.

23 SH1 forms the north-south backbone of the roading network through Kāpiti, with various side roads accessing directly onto SH1. There are practically no other north-south routes through the Project corridor and SH1 has the only traffic bridge crossing of the Waikanae River.

24 This means that the existing SH1 has to perform a wide range of transport functions, including a strategic freight and through-traffic movement function, a regional arterial function connecting local communities, a local road function providing direct property access, and an access/activity function where it passes through the urban commercial centres at Waikanae and Paraparaumu. The road needs to cater for a wide range of road users, namely heavy freight vehicles, general traffic, commuter traffic, buses, pedestrians and cyclists.

25 These conflicting functions result in a compromise for all road users, with delays and stop-start conditions for freight and through traffic, delays and safety risks for local traffic having to use the highway and a generally hazardous and intimidating environment for pedestrians and cyclists due to the high traffic flows and numbers of heavy vehicles.

26 In the five-year period between 2006 and 2010 a total of 409 crashes were recorded on SH1 between MacKays Crossing and Peka Peka. Four of these involved fatalities and 17 involved serious injuries. I discuss the crash problems in greater detail later in my evidence; however I note that the frequency and pattern of crashes demonstrates the conflicts in functionality inherent in this section of highway.

27 I expect the existing transport issues to worsen in the future due to general land use growth both locally and regionally. KCDC has significant land use growth plans within the urban areas that this Project traverses, as explained in the evidence of **Mr Marc Baily**. The extra congestion, safety issues and travel time variability impose additional costs on all traffic, and especially time-sensitive activities such as inter-regional freight and business trips.

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[4] This is based on the rural sections with estimated capacities of 1700 passenger car equivalents per hour (see TR34 Figure 6.8) and 2010 model flows of up to 1510 passenger car equivalents per hour (see 2010 flows of 1400 vehicles per hour in TR 34 Table 6.3, which is equivalent to some 1510 passenger cars per hour after allowing for heavy vehicles).

[5] See TR34 Appendix C.

28 In summary, there are existing congestion, accessibility and safety issues in this corridor which are expected to increase in the future, and are likely to constrain local and regional growth. The key cause of these issues is the inherent conflict of trying to accommodate local, regional and strategic trips across a range of travel modes, all within a single constrained corridor. These strategic issues are reflected in the Government Policy Statement (*GPS*) that identified the whole SH1 route from the Wellington Airport to Levin as one of the Roads of National Significance (*RoNS*).

NATIONAL REGIONAL AND LOCAL TRANSPORT PLANNING DOCUMENTS

29 Relevant guiding transport planning documents for both the development and assessment of this Proposal include:

29.1 The GPS, which describes Government investment priorities and the purpose of the RoNS;[6]

29.2 The Wellington Regional Land Transport Strategy 2010-2040 (*RLTS*)[7], which outlines the key transport objectives for the region and contains the Western Corridor Plan. The Draft Western Corridor Plan 2012 identifies this Project along with the other RoNS projects in the Wellington Northern Corridor. Public consultation of this Draft Plan closed on 27 July 2012;

29.3 The Regional Freight Plan[8] which describes the need for the transport network to accommodate growing freight volumes, especially in this SH1 corridor;

29.4 The KCDC Sustainable Transport Strategy, which describes the overall objective for the transport system in Kāpiti and outlines desired Outcomes; and

29.5 The KCDC Cycling, Walking and Bridleways Strategy, which contains an overall vision for those modes and its core features.

30 An assessment of this Project against these documents is set out later in my evidence.

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6 The GPS is discussed in the evidence of **Mr Rod James**.

7 This is a statutory document adopted by the Greater Wellington Regional Council.

8 This was adopted by the Greater Wellington Regional Council in June 2011.

EXISTING TRAFFIC ENVIRONMENT

Road Network

31 SH1 provides the sole north-south road through the entire Project corridor, to which a number of east-west roads are connected. The North Island Main Truck Railway (*NIMT*) also provides a north-south linkage through the area, running generally immediately adjacent to the existing SH1 corridor. The KCDC road hierarchy and the proposed route for the Project are each shown in **Annexure 1**.

32 SH1 through this corridor traverses generally flat terrain but has six distinct environments, summarised from south to north as follows:

32.1 MacKays Crossing to Poplar Avenue: 3.6 km of 4-lane divided highway with 100 km/h speed limit with rural adjacent land use to the west and the NIMT railway immediately to the east;

32.2 Poplar Avenue to Ihakara Street: 2.2 km of 100 km/h 3-lane highway (1 northbound, 2 southbound lanes), with intermittent property access and give-way controlled side-road intersections on the west (providing access to Raumati) and the NIMT railway immediately to the east;

32.3 Ihakara Street to Ventnor Drive: 2.1 km through the Paraparaumu urban area with a mix of 70 km/h and 50 km/h speed limits. The number of lanes varies and SH1 passes through a signalised intersection with Kāpiti Road. North of the Kāpiti Road traffic signals, SH1 crosses the NIMT railway via an overbridge (road over), which has no effective shoulders and a narrow footpath on the eastern side;

32.4 Ventnor Drive to Otaihanga: 2.1 km of recently imposed 80 km/h 2-lane (1 each way) highway through a predominantly rural environment. There is a major stop-controlled intersection with Otaihanga Road at the northern end of this section;

32.5 Otaihanga Road to Waikanae River Bridge: 3.0 km of 80 km/h rural highway with a single-lane in each direction (the 100 km/hr speed limit and passing lanes previously in this section were removed recently for safety and operational reasons). SH1 crosses back to the western side of the NIMT railway via a bridge (rail over) just south of the Waikanae River Bridge;

32.6 Waikanae River Bridge to Hemi Street: 1.35 km through the Waikanae Town Centre urban area with a mix of 70 km/h and 50 km/h speed limits. Lane numbers vary and SH1 passes through signalised intersections with Te Moana Road and Elizabeth Street. Elizabeth Street has a railway level crossing

of the NIMT immediately adjacent to the SH1 intersection. The Waikanae River Bridge has no shoulders and a narrow footpath on the western side.

32.7 Hemi Street to Peka Peka Road: 3.81 km of 100 km/h rural highway with 1 lane each way except for a recently installed southbound passing lane through part of this section. The NIMT railway is again immediately to the east.

Pedestrian and Cycle Network

33 The flat terrain of the Kāpiti Coast area is conducive to walking and cycling and such modes are regularly used and encouraged. The KCDC Coastal Cycleway Guide includes a main cycle route through this whole area running generally along or close to the coast, via a mix of local roads, and paths through parks and reserves.

34 The KCDC Sustainable Transport Strategy 2008 includes a Network Hierarchy for cycling and walking, which is included as **Annexure 2** of this evidence. That network includes two key cycle routes, as follows:

34.1 The Wharemauku Trail, which runs roughly east-west to connect Paraparaumu (near Coastlands shopping centre) to Raumati Beach via the Wharemauku Stream,

34.2 The Waikanae River Trail, involving east-west cycle paths running along both sides of the Waikanae River, including pedestrian/cycle bridges over the river at Otaihanga Domain and near Jim Cooke Park.

35 There are no specific cycle facilities along SH1, and while cyclists use the road shoulders, there are two 'pinch' points at the Paraparaumu Rail overbridge and Waikanae River Bridge, where there are no road shoulders (although fairly narrow footpaths are provided).

36 There are footpaths on some sections of SH1, generally in the urban and peri-urban sections. Grade-separated crossings of SH1 are provided via a pedestrian underpass at the Paraparaumu Railway Station and via a path under the Paraparaumu rail overbridge.

37 Surveys of pedestrian and cycle movements were undertaken by the Project Team on Tuesday 14 June 2011, as summarised in **Table 1** below. These surveys show that the cycle and walking routes are well utilised, even in winter.

Table 1 Cycle and Pedestrian Survey Results

location	Pedestrians		Cyclists	
	7:30-9:30 am	1:30-4:30pm	7:30-9:30 am	1:30-4:30pm
Kāpiti Road at Proposed interchange	45	66	20	24
Te Moana Road at Proposed interchange	8	23	34	38
Wharemauku Trail at Expressway corridor	16	50	13	13
Waikanae River Crossing (Otaihanga Domain)	12	68	90	107

38 In summary, while there are good and well–utilised cycling and walking paths within the Kāpiti Coast area, there are limited facilities on SH1. SH1 is generally a hazardous and intimidating environment for cyclists and pedestrians due to the high traffic flows (including heavy vehicle traffic) and high speeds.

39 There are also existing bridleways in the Project area, which are discussed in the evidence of **Mr Noel Nancekivell**.

Public Transport

40 The Kāpiti Coast is serviced by buses and the NIMT railway. The public transport network involves east-west bus services connecting the urban communities to the railway, which provides the primary north-south connectivity both locally (between the Paraparaumu and Waikanae Stations), as well as to the rest of the region (mostly south to Wellington City). This public transport network is shown in **Annexure 3**.

41 The 'Kāpiti line' rail service between Waikanae (and Paraparaumu) and Wellington operates 7 days per week with off peak services every half-hour. Extra services run during weekday peaks, generally at 20-25 minute intervals. That service previously only ran to Paraparaumu, but was extended to Waikanae in February 2011.

42 Both the Paraparaumu and Waikanae railway stations are located immediately to the east of SH1 with direct access from SH1, with dedicated park-and-ride facilities as well as on-street parking.

43 As I indicated above, the bus services generally run east-west to connect the townships with the train stations. Bus frequencies typically match the train frequencies. Although coverage and frequencies are good for travelling from the Kāpiti Coast to or from Wellington, public transport travel within the Kāpiti Coast (especially between Paraparaumu and Waikanae) generally requires the use of buses *and* trains with one or two transfers between them, which is unattractive to users. Greater Wellington Regional Council recently added a 'shopper' service between Paraparaumu and Waikanae, which runs once per day.[9] This service pattern is partially influenced by the current road network, with its single crossing of the Waikanae River, meaning a bus service between Waikanae and Paraparaumu would pass by both railway stations anyway.

44 Based on the 2006 WTSM[10] model, approximately 6,100 passengers use public transport to/from or within Kāpiti each day. The model indicates that 38% of those trips are internal to the Kāpiti area, with 62% to or from external areas to the south.

Traffic Patterns

45 The 2011 recorded daily traffic flows on SH1 through the Project corridor are:[11]

45.1 15,600 vpd and 10% heavy vehicles at Marycrest, north of Peka Peka

45.2 20,200 vpd and 8% heavy vehicles in Waikanae

45.3 24,300 vpd and 8% heavy vehicles in Paraparaumu

45.4 24,100 vpd and 8% heavy vehicles south of MacKays Crossing.

46 I present data on other parts of the network later in my evidence, along with the expected changes due to the Proposal.

47 In my view, the traffic levels show a fairly typical 'urban' profile throughout a typical weekday, with distinct commuter peaks in the morning (predominantly southbound) and evening (predominantly

9 This service did not exist when the Transport Assessment was undertaken.

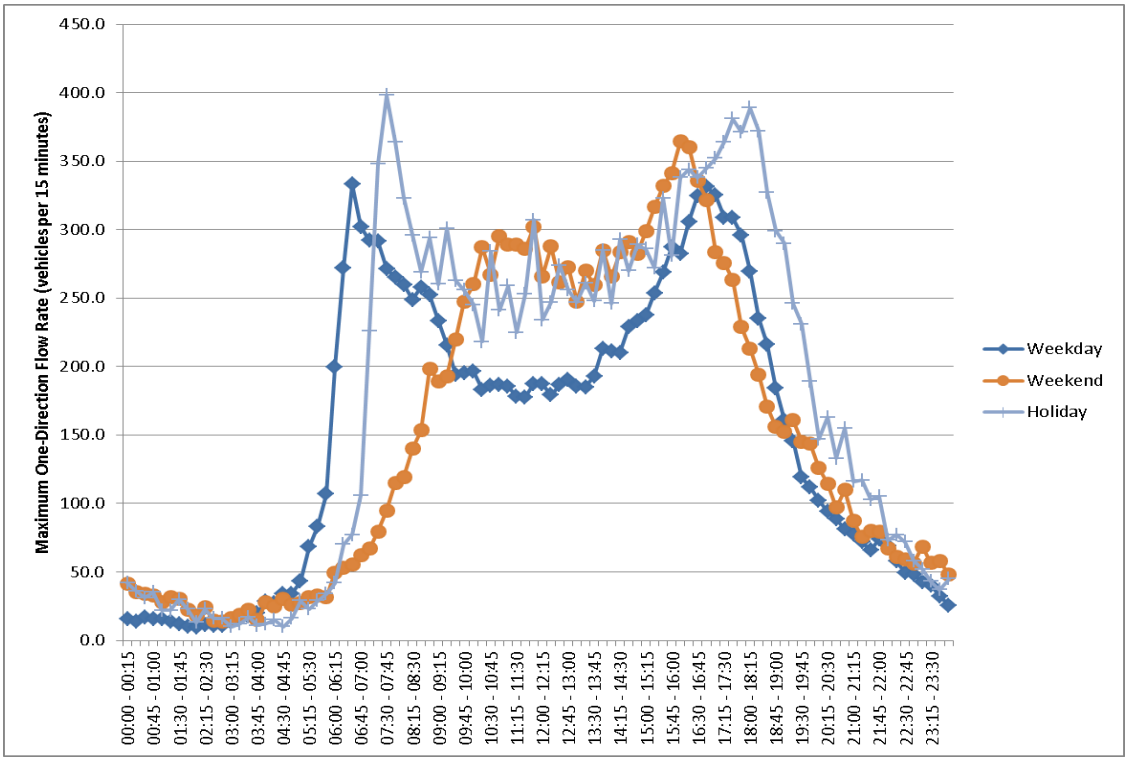
10 Wellington Transport Strategy Model. Although Greater Wellington Regional Council have recently completed an update to this model with a year 2011 base, that update was not available for the transport assessment so the 2006 base model is reported here.

11 TR32 contains the 2010 figures that were available at the time of preparing the technical reports (Table 3.4, page 10).

northbound) periods. The high level of local trips and the strategic function of the route means that flow rates are also high throughout most of a weekday daytime period.

48 However, this area also has very high weekend and holiday-period traffic flows, being the main route north for the Wellington Region. This is shown in **Figure 1** below, where I present the maximum one-direction traffic flows from data collected on SH1 in 2009 (north of Ihakara Street). The holiday data was from a Saturday and Sunday of Easter weekend 2009, while the weekend data was taken from weekends in April, May, July and October.

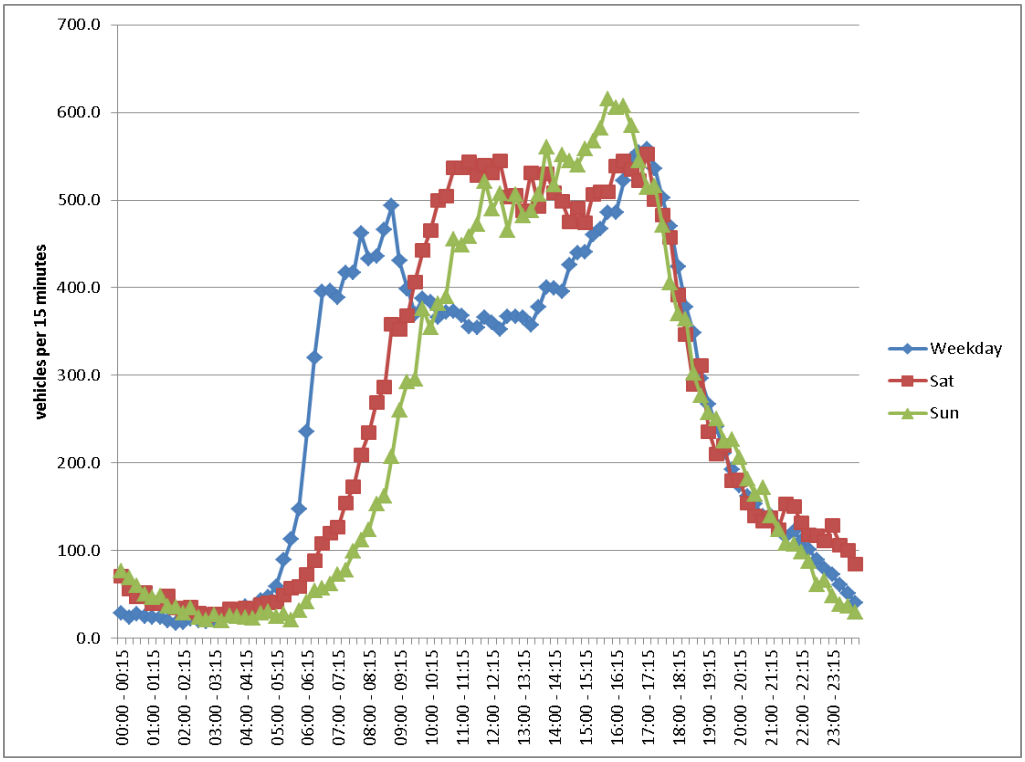
Figure 1: Maximum One-Direction Flow Rates on SH1



49 This graph shows typical weekday commuter peaks as well as very high flow rates during weekends. The flows on holidays are highly variable depending on the particular holiday, with the data shown being just one example of the high flow rates during such periods. In **Figure 2** below, I show the combined 2-way flows for a typical weekday, Saturdays and Sunday (I have not shown holiday flows, as these are so variable).

50 This graph shows the very high traffic flows during weekends, which often exceed those during weekday commuter peaks.

Figure 2 Two-Way Flow Rates on SH1



51 The high traffic flows on SH1 throughout much of the day means that turning onto (or from) SH1 at the give-way or stop-controlled intersections can be very difficult and can result in significant delays and queues on the side roads.

52 Congestion is apparent on SH1 during the peak-flow periods. However, it is currently fairly short-lived during weekday peaks (typically less than 30 minutes duration), but can last for extensive periods on weekends and holiday periods.

53 Surveys undertaken to help build the traffic and transportation models showed that a significant proportion of traffic crossing the Waikanae River Bridge is 'local' to the study area. I have analysed that data and found that of the traffic crossing the Waikanae Bridge on a typical weekday:

53.1 25% is 'through' traffic from north of Peka Peka to/from south of MacKays Crossing;

53.2 43% is internal traffic between Waikanae and Paraparaumu;

53.3 13% is between Waikanae and south of MacKays Crossing; and

53.4 19% is between Paraparaumu and areas north of Peka Peka.

54 Overall, this shows that 75% has at least one end of the trip starting or ending within the corridor between MacKays Crossing and Peka Peka (this value is incorrectly reported as 70% in the AEE). This demonstrates the extent to which SH1 functions as both a strategic through route and a critical local arterial.

Travel times and variability

55 Travel time data collected for this project indicated average weekday travel times between MacKays Crossing and Peka Peka varying between 12.1 minutes when uncongested and 16.6 minutes during 'typical' congested peaks (not including holiday periods). Outside of the weekday peaks, the time, extent and duration of congestion is variable and hard to predict. Those surveys use relatively small samples of travel times. These are suitable for estimating average times, but are not adequate for estimating the variability in travel time.

56 To estimate the variability of travel time, I have obtained and analysed data collected from EROAD, a company providing a GPS-based system for vehicles paying Road User Charges.[12] That data is predominantly collected from trucks, and hence is unlikely to reflect the additional variability of the travel time for light vehicles (who will be affected by slower-moving trucks). However, it provides a significantly larger sampling of movements through the corridor than is otherwise available, and I consider it suitable to indicate the level of variability of travel time through the corridor.

57 I obtained this GPS data for the month of March 2012 and summarised the data in **Table 2** below. The data includes weekends, although the sampling was less during those periods due to the lower truck volumes. In processing this data, I removed those vehicles which appeared to have stopped off on route, and hence were not reflective of actual travel time through the corridor. Here I present the following key indicators:[13]

57.1 The minimum and maximum travel times and the range between these.

57.2 The mean travel time.

57.3 The 95 percentile travel time. This is the travel time exceed by only 5% of observations, and is used in preference to the

[12] This travel time data, stripped of vehicle identification data, was provided by EROAD, a company providing GPS management of Road User Charges.

[13] In this analysis I have assessed the travel times across the whole data set. Some assessments of journey time variability only include variability within a certain time period (such as the weekday morning peak). That kind of assessment is appropriate for typical urban environments where commuter movements dominate, however as this data is for longer-distance 'through' traffic I have used the whole data set.

maximum value because the maximum observations may involve non-typical movements (e.g. a brief stop).

57.4 The 'buffer' time. This is the difference between the 95 percentile time and the mean time, and is an indicator of the extra time travellers can expect.

57.5 The 'buffer index'. This is the buffer time presented as a percentage of the mean travel time.

Table 2 EROAD Journey Time Data

Indicator	Northbound	Southbound
Observations	1414	1412
Minimum time, minutes	12.4	11.7
Maximum time, minutes	23.8	22.3
Range	11.5	10.6
95%ile time, minutes	17.6	16.3
Mean time, minutes	15.4	14.6
Buffer time	2.2	1.7
Buffer index	14%	12%

58 This data shows that there is a range of up to 11 minutes between the fastest and slowest times, which is between 72% and 75% of the average travel time. The buffer index suggests that travellers can expect travel times to be up to 14% higher than the average time. This data does not include holiday periods, when the variability and congestion can be much higher. The mean travel times are higher than those from the weekday surveys of light vehicles. This is due to this GPS data having slightly different start and end points, including periods outside the weekday peaks and is reflective of truck speeds rather than light vehicles speeds.

59 The above data is for vehicles passing directly through the study area on SH1. Although specific data is not available, the variability for those turning onto or from SH1 is likely to be much greater due to the high level of variability at priority controlled intersections accessing SH1.

60 The source of the variability in travel times is likely to be due to the following:

60.1 The traffic lights in Kāpiti and Paraparaumu;

60.2 The variable traffic flows on single-lane carriageways which means that vehicle speeds are often controlled by the slowest-moving vehicle;

60.3 The high level of traffic turning to or from SH1, causing interference to through traffic; and

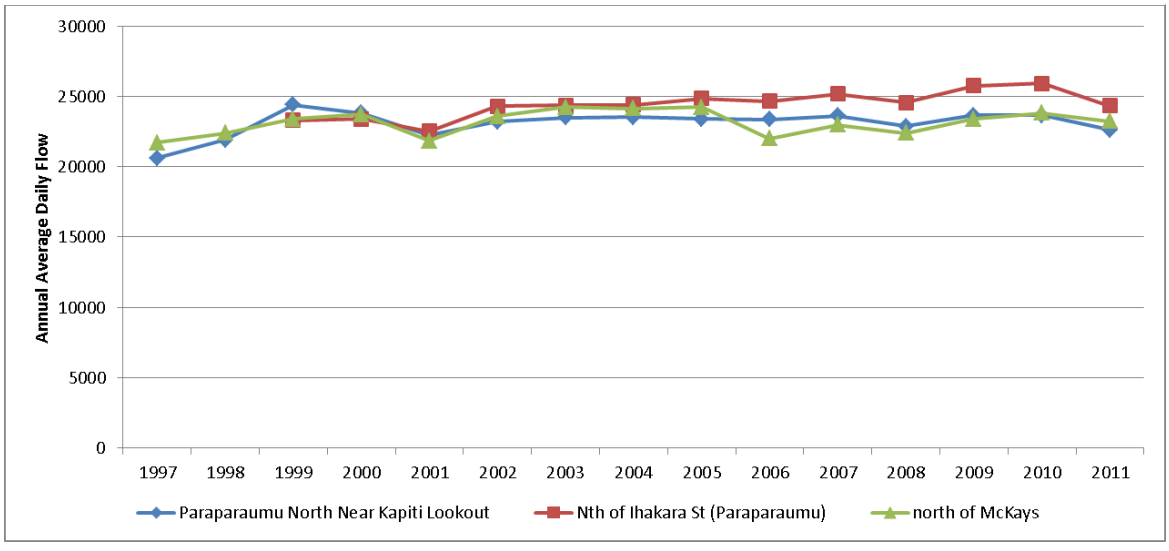
60.4 The lack of alternative north-south routes through the study area, meaning the network has little resilience to accommodate incidents on the existing SH1 route.

61 I discuss how this travel time variability is likely to be affected by the Project later in my evidence.

Historic and Forecast Traffic Growth

62 Although not explicitly covered in the Transport Assessment, I have assessed the historic traffic growth trends from the readily available data published by NZTA. Collating consistent data on long-term trends is difficult due to changes in the location and methodologies for undertaking the data collection. However, I have collated some trend data on SH1 in **Figure 3** below for three locations on SH1.

Figure 3 Historic Traffic Growth on SH1



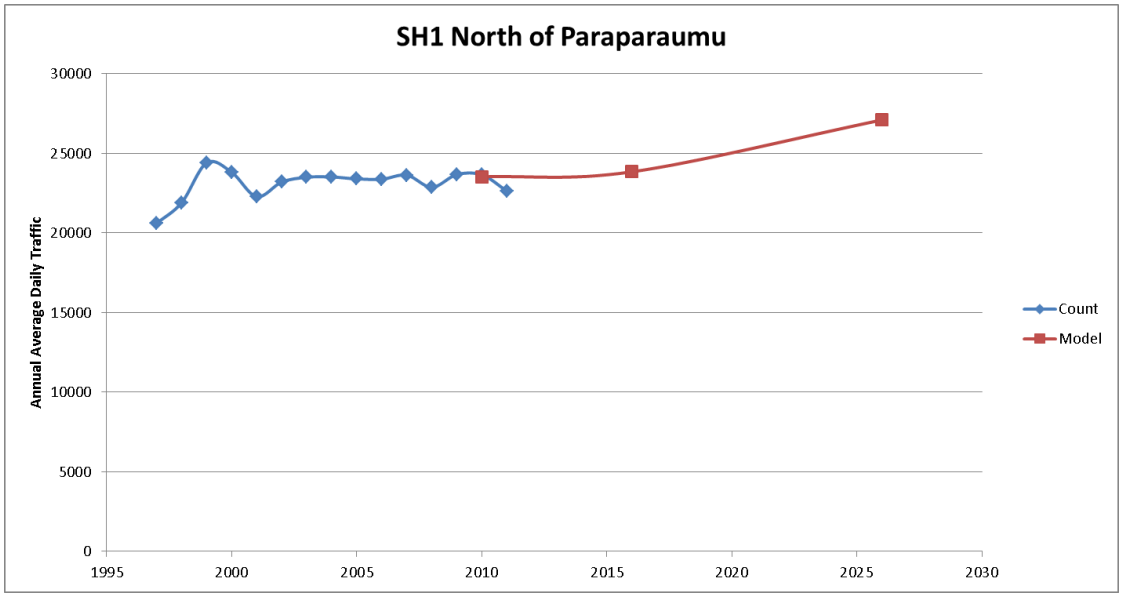
63 Similar trends are shown across all three sites, with general growth between 1997 and 2002, followed by fairly static flows until 2008. This was followed by increases in 2009 and 2010 but a decrease in 2011. Overall the historic growth has been modest, averaging at

between 0.3 and 0.8% per annum for these three locations (using linear growth on the 2011 flow values).

64 It is worth noting that, because of the traffic 'bottlenecks' further south on SH1 (such as at Pukerua Bay), the growth in this study area is somewhat constrained. Those bottlenecks will be removed with the recently consented Transmission Gully Project.

65 In **Figure 4** below, I show this historic growth within the context of the predicted future growth. This shows a continuation of the modest growth through until 2016, followed by a period of higher growth between 2016 and 2026. On the same 2011 base, this growth is equivalent to 0.2% per annum up to 2016, or 1% over the full period between 2010 and 2026.

Figure 4 Historic and Forecast Growth on SH1



66 It should be noted that this predicted growth rate of 1% per annum only relates to traffic using a section of SH1 in the study area. The overall increase in traffic for the whole study area is closer to 2% per annum between 2010 and 2026.[14] This shows that a significant growth in local traffic is predicted, only a portion of which would use the State highway network.

Traffic Crash History

67 As described in the Transport Assessment,[15] the recorded crash history on SH1 was researched via NZTA's Crash Analysis System (*CAS*). As is standard practice for this kind of analysis, the most recent 5-year period was used to identify crash rates and trends

[14] See TR34, Table 5.8 where total growth in all movements is between 32% and 35% for the 16 year period.

[15] TR32, page 17.

which, at the time of the analysis, was the 2006 to 2010 period. Since that work was done I have also reviewed the more recent 2011 (and available data from 2012) crash records and comment on this later in this section. The analysis of the 2006 to 2010 crash records showed the following key features for SH1 between MacKays Crossing and Peka Peka:[16]

67.1 A total of 409 recorded crashes, varying between 74 and 93 per year;

67.2 4 involved fatalities, 17 involved serious injury, 81 involved minor injury and the remaining 307 were non-injury crashes;

67.3 The crash types reflect the mix of urban and rural environment, with the main crash types being:

(a) Crossing/turning (35%);

(b) Rear end/obstruction (28%);

(c) Lost control/head on (23%); and

(d) Overtaking crashes (11%).

67.4 The minor and non-injury crashes were dominated by rear-end and crossing/turning type crashes, while the serious and fatal injury crashes were dominated by lost control, head on, and crossing/turning crash types.

67.5 Overall, 43% occurred in the urban (50 km/h) sections, 11% in 70km/hr sections and 46% in rural sections (80 or 100 km/h). All of the fatal crashes occurred in the 80 or 100 km/hr rural sections.

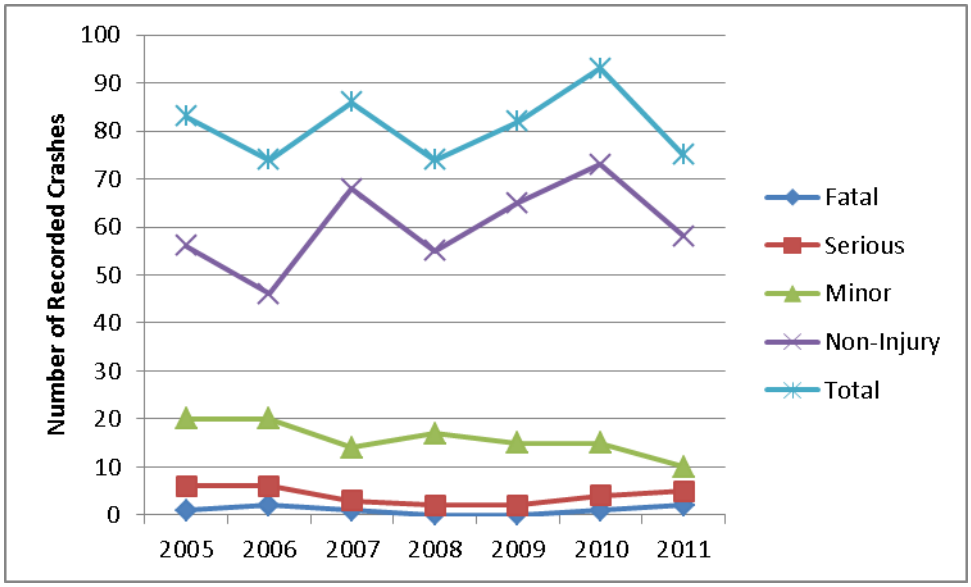
68 In addition to the 2006-2010 data, I have extracted the 2005, 2011 and the available data from 2012 to assess trends. The data for 2012 included crashes up until July 2012. However, some crashes from earlier months may not yet be in the database, meaning this may not fully reflect the first 6 months of 2012. This data is shown in **Table 3** and **Figure 5.**

[16] Because the details of some recorded crashes are corrected over time (such as the location or severity of the crash), the crash database can return slightly differ results when queried at a later date. This is why the values for the period 2006 to 2010 presented here differ slightly from those presented in TR32.

Table 3 Reported Crash Data by Severity

Year	Fatal	Serious	Minor	Non-Injury	Total
2005	1	6	20	56	83
2006	2	6	20	46	74
2007	1	3	14	68	86
2008	0	2	17	55	74
2009	0	2	15	65	82
2010	1	4	15	73	93
2011	2	5	10	58	75
2012 (part)	0	3	6	21	30

Figure 5 Recorded Crashes on SH1



69 This analysis indicates a possible trend of a reduction in minor-injury crashes, but continuation of the fatal and serious-injury crash trends. In addition, a fatal crash 280 metres north of Peka Peka Road was recorded in 2009 but was not included in the above analysis. It is arguable that this Project will address that fatal crash.

70 The above analysis categorises crashes by the most severe injury, rather than by the number of casualties. The 155 injury crashes recorded between January 2005 and July 2012 resulted in injuries to

225 people, being 8 fatalities, 40 serious injuries and 177 minor injuries.

71 The crash rates for similar sections of highway in New Zealand have been estimated using the crash prediction models in NZTA's Economic Evaluation Manual (*EEM*). That analysis showed that, for the section of SH1 from MacKays Crossing to Peka Peka, about 16.6[17] injury crashes per year could be expected, whereas on average 20.4 injury crashes were recorded each year.[18] This indicates that the actual crash rate on this section of highway is higher than that for similar sections of State highway elsewhere in New Zealand.

Future Transport Network Plans

72 Changes to the transport network that have been planned or are likely irrespective of the Project, have been included in the modelling of future years. This is standard transport modelling practice. The future projects agreed with KCDC to be included in the future year models are indicated in **Annexure 4** and described as follows:

72.1 Extension of The Drive: This is a 450m long extension of a local road (The Drive) to connect to Otaihanga Road. It provides improved east-west connectivity between the coastal parts of Paraparaumu and the community of Otaihanga.

72.2 Ihakara Street Extension: This is an approximately 3km long new local/connector road extending Ihakara Street at its current end point west of the Paraparaumu town centre around the south and western side of the airport to connect to Kāpiti Road in the vicinity of Magrath Avenue. It is proposed as part of development plans for the Paraparaumu airport precinct.

72.3 Paraparaumu Town Centre links: These include two new links as part of development plans for the Paraparaumu Town Centre, namely:

(a) A new north-south link connecting Kāpiti Road to the Ihakara Street Extension; and

(b) A new east-west link connecting Rimu Road to the new north-south link.

72.4 Kāpiti Road Intersection Changes: These include likely upgrades to key intersections to accommodate expected growth, including:

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[17] Further detail is provided in **Annexure 6.**

[18] Based on the 102 injury crashes recorded over 5 years between 2006 and 2010.

(a) A roundabout where the Ihakara Street Extension connects to Kāpiti Road;

(b) A roundabout at Langdale Avenue for an upgraded access to the Airport; and

(c) Traffic lights at the Arawhata Road intersection, which would become a cross-road with the Paraparaumu Town Centre north-south link.

73 Specific sensitivity tests of the effects of some of these assumed changes were undertaken, which I describe later in my evidence.

74 Subsequent to the detailed traffic modelling and transport assessment presented in TR32 and TR34, an upgrade to the Kāpiti Road / Milne Drive intersection is now proposed as part of recently approved consent conditions for a new Bunnings hardware store off Milne Drive. I discuss the assessment undertaken of this by the Alliance later in my evidence.

TRANSPORT ASSESSMENT METHODOLOGY

75 The Transport Assessment was prepared in accordance with the NZTA Integrated Transport Assessment Guidelines (November 2010) and considers the following key matters:

75.1 How the Project meets general and specific transport planning and policy objectives including the specific Project Objectives;

75.2 The opportunities provided by the Project in contributing to the development of the future transport network; and

75.3 The effects of the operation of the Project on the existing and future transport network, together with the nature and scale of any changes to the transport network required to mitigate these effects.

76 The Project Objectives and their relationship with the objectives for the wider RoNS corridor are described in full in the AEE.[19] For the purpose of section 171 of the Resource Management Act 1991,[20] the Project Objectives are:[21]

[19] Section 2.6, Chapter 2, page 36.

[20] Section 171 of the RMA requires an assessment of whether the work and designation are reasonably necessary for achieving the objectives of the requiring authority for which the designation is sought.

[21] The Project Objectives are further discussed in the evidence of **Mr Rod James**.

1. *To:*

   (a) *enhance inter-regional and national economic growth and productivity;*

   (b) *enhance efficiency and journey time reliability from, to and through the Kāpiti District, Wellington's CBD, key industrial and employment centres, port, airport and hospital;*

   (c) *enhance safety of travel on SH1;*

   (d) *appropriately balance the competing functional performance requirements of inter-regional and local traffic movements, recognising that modal and route choice opportunities need to be provided that enable local facilities and amenities in the Kāpiti District to be efficiently accessed;*

   by developing and constructing a cost optimised new State highway alignment to Expressway standards between MacKays Crossing and Peka Peka.

2. *To manage the social, cultural, land use and other environmental impacts of* the *Project on the Kāpiti Coast District and its communities by avoiding, remedying or mitigating any such effects through route and alignment selection, Expressway design and conditions.*

3. *To integrate the Expressway into the urban form of Kāpiti Coast District by taking into account current and future planned settlement patterns in route and alignment selection and Expressway design [and conditions].*

77 In addition to the Project Objectives, the NZTA and KCDC developed a set of Guiding Objectives for the Project Alliance Board (*Alliance Objectives*).[22] The Transport-related Alliance Objectives are attached as **Annexure 5.**

78 The assessment of effects and how the Project performs against relevant objectives is described later in my evidence. To assist the assessment of the effects of the Project on the transport environment, and against general and specific objectives and policies, detailed traffic modelling was carried out, which I now describe.

[22] The Alliance Objectives are further discussed in the evidence of **Mr Andrew Quinn**.

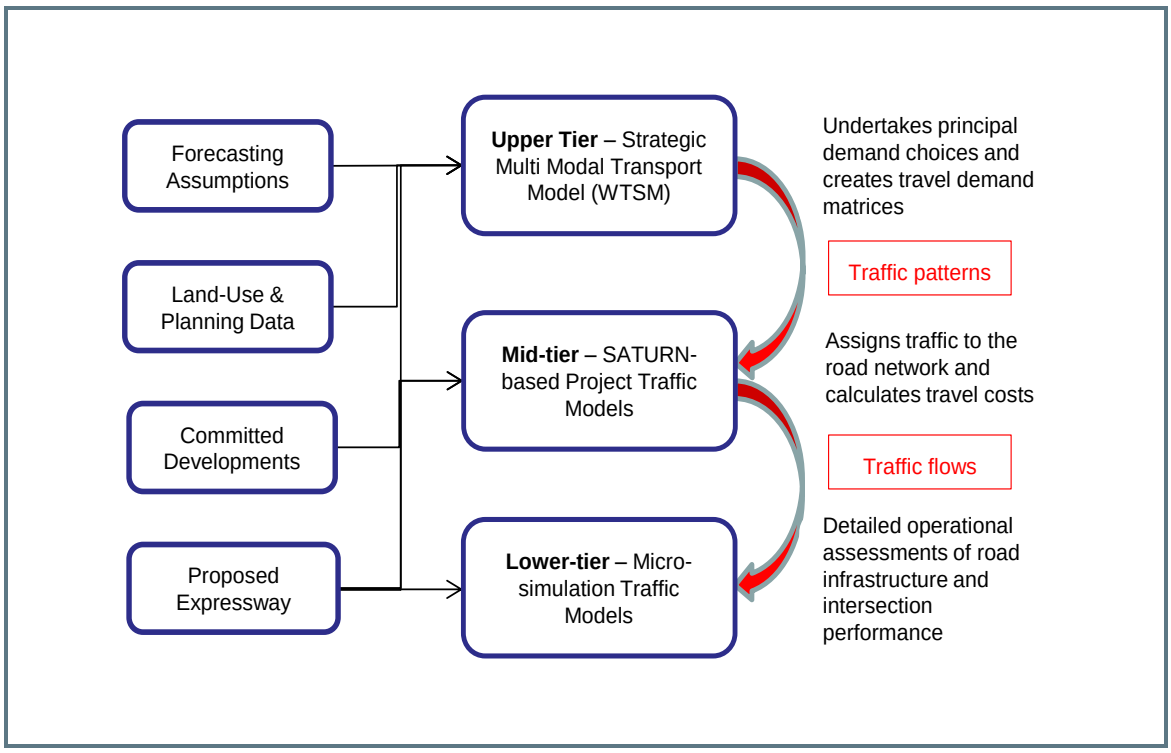
TRAFFIC MODELLING METHODOLOGY

79 The scale of the Project required assessment of the long-term, multi-modal effects over the wider RoNS corridor, assessment of traffic effects on the local network and detailed operational and design issues for specific intersections proposed as part of the Project.

80 It is not technically practical to develop a single model to cover everything from the strategic demand issues across the wider region down to the detailed local intersection effects. This is primarily because there is generally a loss in local precision and accuracy of models as the area they cover is extended.

81 This limitation was addressed by using a series of linked models, which progressively included greater detail, but less spatial coverage. This is referred to as a *hierarchical* modelling structure and is commonly used both internationally and nationally, including for other projects in this area such as the Transmission Gully section of the Wellington RoNS. The hierarchy of models includes three key components, shown in **Figure 6** below. Those components are the Wellington Transport Strategy Model (*WTSM*), the project assignment model (*KTM2* SATURN model) and a series of design/operational micro-simulation models. Each of these models is described below in more detail.

Figure 6 Hierarchical Model Structure



82 At the top of the model hierarchy is the WTSM, which is a multi-modal transportation model built and operated by the Wellington Regional Council. The WTSM model uses land use data and calibrated trip behaviour models to estimate the number of trips made by mode (private vehicle, public transport or cycling/walking), origin and destination, and time of day. It covers the greater Wellington Region and has the most sophisticated components for predicting when and how people travel, but it has the lowest level of detail in terms of representing traffic issues on local roads.

83 The key inputs to the WTSM model are the predicted future year land use patterns (such as the location and type of households, jobs and education facilities), economic variables (such as fuel and parking costs), and assumptions about future improvements to the transport system. The outputs from the WTSM model are the predicted numbers of trips by mode, origin and destination and time of day.

84 The second level of modelling involves the project traffic assignment model, which covers the whole Kāpiti Coast study area but only considers travel in motor vehicles (cars and trucks).[23] It represents the road network within the study area in significantly greater detail than the WTSM model, including detailed assessment of intersection delays. This model was used to test various options and investigate the traffic effects at a more detailed and precise level than is possible in the WTSM model. This model does not estimate the number of vehicle trips itself, rather it takes the vehicle trips estimated by the WTSM model and refines them for use at a greater level of detail.[24] This model utilises the SATURN traffic modelling software (which is commonly used in New Zealand and internationally for this kind of project) and is an updated version of the Kāpiti Traffic Model originally developed by KCDC and NZTA some years earlier. It is referenced as the KTM2 model in the technical reports.

85 The third level of traffic and transportation models involves detailed design/operational models. These models focus on the traffic operation of the Proposal in more detail than can be achieved in the WTSM or KTM2 models. For example, the Kāpiti Road interchange operational model used the VISSIM micro-simulation software to consider the complex traffic signal operation (including signal phasing and phase timing) and associated interaction of queuing between closely-spaced intersections.

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[23] Buses are included as vehicles on fixed paths in the model, however bus or train passengers are not included in KTM2.

[24] The demands for the future Option scenarios are taken directly from WTSM, however elasticity methods are used to modify these within KTM2 to create demands for the Baseline (no proposal) scenario.

86 Some isolated intersections were assessed using the SIDRA software to check operational performance and refine design parameters; however the main operational model is a micro-simulation model covering the section of Kāpiti Road where the new Expressway interchange is proposed. The operational models use input traffic flows from the KTM2 model and produce detailed outputs on the expected queue lengths and delays.

87 The WTSM regional model was originally developed and calibrated to 2001 data and conditions but was later comprehensively updated to use year 2006 census and land use data. The year 2006-based version of the WTSM model has been used for this assessment, including forecasts for the years 2016 and 2026.

88 In 2011 and 2012, the Greater Wellington Regional Council (*GWRC*) undertook a further update of that model to rebase it to 2011 conditions and prepare new regional forecasts. However, that update had not been completed at the time the Transport Assessment was undertaken.

89 The KTM2 model used inputs from the WTSM model as well as traffic counts, origin-to-destination and travel time surveys to develop and calibrate a year 2010 base model. It covers three time periods on a typical weekday, namely the morning (7:00-9:00am) and evening (4:00pm-6:00pm) commuter peak periods and the interpeak period (an "average" hour representing the 9:00am to 4:00pm period).

90 Weekends and holidays are not explicitly modelled; however the effects during those periods is represented through the annualisation process that converts the weekday model outputs to annual results.

91 All three levels of model represent cars and trucks separately, so separate assessment of those two broad categories can be used where necessary.

92 Future year models for KTM2 were created for the years 2016 and 2026. Those two years were selected as they match the readily available forecast years from the WTSM model, and because they provide predictions close to the expected opening year of the Project (2016) and for the period 10-years post-opening (2026). Assessments of both the opening and 10-years post opening years were required to assist the assessment of potential environment effects related to traffic, such as noise and vehicle emissions.

93 Scenarios were created both 'with' and 'without' the Project. The expected effects on the transport system were then assessed in the following manner:

93.1 The expected effects on public transport demand were assessed directly in the multi-modal WTSM model;

93.2 Traffic diversion (changes in roads used) on the local Kāpiti network was assessed from the KTM2 model;

93.3 Changes in traffic flows, delays and speeds were generally assessed using the KTM2 model;

93.4 Delays and queues at new interchanges were assessed in the operational models; and

93.5 Induced traffic (changes in the number and pattern of car trips at an origin-to-destination level) was assessed in the KTM2 using an elasticity[25] method calibrated to broadly replicate such changes in WTSM.[26]

94 Using this hierarchical assessment approach, the existing and future transport environment has been considered, both within the Project area and across the wider region, where appropriate. This enables both the positive and adverse effects of the Project to be assessed in the context of this transport environment.

95 The technical information relating to the traffic modelling undertaken for the Project is the subject of a separate report (TR34: Traffic Modelling).

96 The KTM2 traffic model used in the Transport Assessment was calibrated and validated[27] to match observed traffic flow and travel time data collected in 2010. It was subject to an independent peer review by Sinclair Knight Merz Ltd. Similarly, the WTSM model was subject to an independent peer review by Steer Davies Gleave (London) when it was first developed in 2002 and later by Arup Pty Ltd at the time it was updated in 2007. There has also been extensive liaison with KCDC over the modelling, including discussions on land use growth, detailed comparisons with KCDC's own local model on Kāpiti Road and provision of the KTM2 model to KCDC.

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25 This is a method where the number of trips between an origin and destination are adjusted in proportion to the change in travel costs. The amount of proportional change is referred to as the elasticity, and is generally determined from observations of actual changes at similar projects.

26 Inconsistencies in how WTSM and KTM2 represent travel costs means that using WTSM to predict induced traffic directly led to some counter-intuitive results (see Section 5.5 of TR34 for further discussion on this issue).

27 Calibration is the process where a parameter is directly adjusted so that the model matches observations, where validation is a check of the model predictions against independent data (i.e. compared to data not used in the calibration).

Sensitivity Tests

97 Traffic forecasting is subject to uncertainty, especially in terms of key inputs such as growth predictions and assumed network changes. A series of sensitivity tests was undertaken to identify the sensitivity to such key inputs and assumptions.

98 The key test included in the Transport Assessment was consideration of a higher level of growth in key development areas. The main modelling assumed a certain level of development by the year 2026 in the key areas of Paraparaumu Town Centre, Paraparaumu Airport, Waikanae North and Ngarara. The sensitivity tests involved increasing the expected traffic flows in those areas to the full amount anticipated with full build-out of those areas. As such, these tests effectively represent a faster rate of growth rather than a different level of ultimate growth. I discuss the results of these tests later in my evidence.

99 A test was also undertaken of providing an additional northbound off ramp from the Expressway to the Ihakara Street Extension.

100 Additional tests and analysis was undertaken subsequent to the Transport Assessment during liaison with KCDC on technical issues, including:

100.1 The effect of not having the Ihakara Street Extension and associated airport development traffic assumed to be in the main models;

100.2 The effect of not having the assumed traffic signals at the Kāpiti Road/Arawhata Road intersection; and

100.3 The effect of the proposed Bunnings development on Milne Drive on the operation of the Kāpiti Road interchange. This included detailed analysis to understand differences between the modelling undertaken by the Alliance and that commissioned independently by KCDC.

101 The outcome of these tests is described later in my evidence.

Local growth forecasts

102 A key input into the models was the predicted level and location of development in the KCDC area. The original KCDC model (the precursor to KTM2 that was used for assessment of previous alignment options by both KCDC and the Alliance team) included extensive growth assumptions in the local area. In developing the KTM2 model, that growth was reviewed in liaison with KCDC and the NZTA, taking into account the lower growth forecasts within the WTSM model.

103 The starting point for the growth assumptions was those contained in the WTSM regional model, which is also the model used as a basis for other components of the Wellington RoNS corridor. That model indicated an 18% increase in traffic to/from or through the study area between 2010 and 2031.[28] However, we identified that that model did not reflect local growth plans by KCDC, especially in the following areas:

103.1 Paraparaumu Town Centre (residential, retail and other mixed uses);

103.2 Paraparaumu Airport precinct (retail, office and warehousing/distribution);

103.3 Waikanae North (residential); and

103.4 Otaki (mixed use near Riverbank Road).

104 Based on KCDC's estimated traffic levels,[29] this development would represent a 50% increase in traffic in the KCDC area over the base (2010) model. We did not consider this level of growth likely to occur by 2026, especially if new transport capacity was not provided. Therefore a 'composite' growth scenario was created that retained broad consistency with the WTSM forecasts but also included a component of the local growth predicted by KCDC. The method used is specified in the Traffic Modelling Report (TR34, Appendix 34.G), and broadly involved the following process:

104.1 In the areas with specific local development plans, use traffic generation in 2026 equivalent to 50% of its full potential; and

104.2 In other Kāpiti areas without specific local growth, take only half the growth included in the WTSM model.

105 This process effectively meant that local growth was more focussed in the KCDC's specified areas than was forecast at the regional level. This approach was agreed between NZTA and KCDC for the Transport Assessment. However, KCDC requested specific sensitivity tests using the 'full growth' in the specified areas. I discuss those tests later in my evidence.

106 This 'composite' growth forecast resulted in predicted traffic growth of between 33% and 35% between 2010 and 2026 (depending on the peak period).[30] By comparison, the 'full growth' sensitivity test I

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28 See TR34 (Traffic Modelling), Table 5.7, page 28.

29 Based on traffic assessments undertaken for those specific developments and as detailed in Appendix 34.H of TR34.

30 TR34, table 5.8, page 28.

describe later has growth rates of between 60% and 74%[31] between 2010 and 2026.

107 I note that, to assess the effects of the Project, it was deemed necessary to use the same land use for both the 'with' and 'without' Project scenarios. It is likely that a higher level (or at least faster rate) of growth would occur with the Project than without, however no such differences have been included in the Transport Assessment. This is firstly because predicting such differences is difficult to do with any certainty, and secondly because including them would mean that the predicted changes in traffic flows and conditions would include the effects of that land use difference, rather than just the effects of the Project.

108 Higher (and/or more rapid) growth is a likely consequence of the Project, so this was addressed through the sensitivity testing described later.

Projected travel patterns

109 The effects of the Project have been assessed against a future year Baseline (which does not include the Proposal). That future year Baseline includes changes to the network and traffic growth compared to the current conditions, including:

109.1 About 32% increase in total traffic demands between 2010 and 2026;

109.2 New road links in and around Paraparaumu and Otaihanga (as described earlier);

109.3 Constrained growth in traffic flows on SH1 between 2010 and 2026, varying between 15% and 21%;[32]

109.4 Higher growth in traffic flows on local roads, varying between 8% and 150% between 2010 and 2026;[33]

109.5 A 20-23% increase in travel times in peak directions on SH1 and increases of between 1% and 13% on local roads;[34]

109.6 26% increase in public transport demands between 2010 and 2026;[35] and

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31 These values are not recorded in TR34 so were extracted directly from the models.

32 TR32, Table 3.5.

33 TR32, Table 3.6.

34 TR32, Tables 3.7-3.8.

109.7 Increases in delays and queues along and accessing SH1. The biggest impact is expected for vehicles trying to turn right onto SH1 from give-way or stop-controlled intersections, with the models predicting such delays reaching from 3-10 minutes.[36]

110 In the following section, the effects of the Project are assessed in reference to that future Baseline. Where possible, the current (2010) results are provided for context.

OPERATIONAL TRAFFIC EFFECTS OF THE PROPOSAL

111 The details of the Project are detailed within Part D of the AEE. As summarised in the AEE, the Project would include the following principal design features:

111.1 A four lane median divided Expressway (two traffic lanes in each direction);

111.2 Partial interchange at Poplar Avenue;

111.3 Full interchange at Kāpiti Road;

111.4 Four lane bridge over the Waikanae River;

111.5 Full interchange at Te Moana Road;

111.6 Partial interchange at Peka Peka Road;

111.7 Grade separated overbridges and underbridges to cross some local roads and watercourses and parts of the proposed Expressway;

111.8 Stormwater treatment and attenuation facilities;

111.9 Provision of a shared cycleway/walkway, alongside but separate to the proposed Expressway; and

111.10 Provision of a bridleway over sections of the corridor.

112 The existing section of SH1 between Poplar Avenue and Peka Peka Road would likely become a local arterial road (subject to the Chief Executive at Ministry of Transport revoking its current State highway status).

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[35] The 2026 public transport demands are in TR34, Section 6.23. However the 2006 values were not previously reported but have since been extracted from the WTSM model for this purpose.

[36] TR34, Table 6.8.

Pedestrians and Cyclists

113 The Project includes a new dedicated facility for pedestrians and cyclists along the Project corridor from Poplar Avenue to Peka Peka Road (an overview of the proposed route and connections is in TR5, Figure 113, page 70). In general terms, this off-road facility runs along the western side of the Expressway except for the section between Otaihanga Road and Ngarara Road where it runs along the eastern side.

114 The new facility will have connections across the proposed Expressway at most local road crossings (Poplar Avenue, Kāpiti Road, Mazengarb Road, Otaihanga Road, Te Moana Road, Ngarara Road, a new access road east of Ngarara Road, Smithfield Road and Peka Peka Road).

115 A cycle/pedestrian bridge is proposed over the Expressway approximately 600 metres north of Poplar Road, to connect the shared path on the west to the existing SH1 on the east. An additional connection will also be provided by a cycle/pedestrian bridge over the Expressway approximately 600 metres north of Kāpiti Road, to connect the shared path on the west of the Expressway to the local road network (Makarini Street) on the east. The Expressway will bridge over the existing Wharemauku Trail and the Waikanae River Trail and the new cycleway will connect directly to them.

116 In addition to this new facility, the current proposal is for cyclists to be able to use the Expressway itself (utilising the road shoulders).[37] The substantial reduction in traffic on the existing SH1 route will also make that a more attractive route for cyclists. Overall, cycling and pedestrian facilities will be at least maintained, but generally significantly enhanced as a result of the Proposal.

Public Transport

117 The Project is not expected to have a direct effect on bus routes or facilities, other than two bus stops that will require minor relocation (on Kāpiti Road and Peka Peka Road). Buses accessing and using the existing SH1 will however experience reduced delays as a result of the substantially reduced traffic flows in that corridor. Some extra delay (estimated as up to 0.7 minutes)[38] is, however, expected for buses on Kāpiti Road where they pass through the new signalised interchange.

118 The significant reduction in traffic on the existing SH1 would also mean that capacity (available green time) at the signalised intersections in the Paraparaumu and Waikanae urban areas can be

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[37] Issues have been raised about this in the most recent Road Safety Audit and the NZTA's intended response is addressed by **Mr Quinn** and **Mr Nancekivell**.

[38] TR32, Table 6.7.

reallocated to side-roads and pedestrian movements. This would improve access to both the Paraparaumu and Waikanae railway stations. This reduced congestion could improve the timetable reliability of buses, and provide an opportunity to include bus-priority measures.

119 Although not included as part of the Proposal, the additional connectivity proposed between Waikanae and Paraparaumu will provide an opportunity to provide a direct local bus service for trips between these two communities that currently require transfers between buses and rail for these relatively short trips. GWRC is responsible for the provision of such services.

120 Although the travel times and reliability of the public transport system are expected to be improved due to the removal of traffic from the existing routes, the significantly reduced traffic congestion makes public transport appear marginally less attractive relative to private cars. This is reflected in the regional modelling that showed a reduction in public transport demand as a result of the Project. The 2026 WTSM multi-modal model indicates that the total public transport demand associated with the study area will reduce by approximately 6% overall.[39] 60% of this change is associated with trips to/from external areas (i.e. Wellington), with the rest associated with internal movements. The highest reduction in internal movements is between Waikanae and Paraparaumu, where the Project most significantly reduces travel times for cars and other modes.

121 The overall mode share of public transport for the study area is currently 6% and this is expected to remain at this level at least until 2026 without the Project. This is expected to reduce to 5% with the introduction of the Project. The biggest reductions in public transport share due to the Project is expected between Waikanae and areas south (Paraparaumu and Wellington), with the share predicted to reduce from 25% to 19% (Waikanae to Wellington) and from 18% to 9% (Waikanae to Paraparaumu).

122 In summary, the Project is expected to reduce travel times for buses and improve accessibility to the railway stations as well as provide an opportunity to provide more direct bus services between the Waikanae and Paraparaumu communities. However, the significantly reduced congestion and improved accessibility for private cars means that a reduction in overall public transport demand is expected. This is predicted to be in the order of 6% for trips between the Study area and Wellington, and 7% for trips within the Study area.

[39] TR34, Tables 6.24 and 6.25.

Property Access

123 The property accesses affected by the proposal (once operational) have been assessed and are described in TR32 (Section 6.4, page 64). I describe those effects below, from south-to-north through the corridor. I note that construction property access effects are discussed in the evidence of **Mr Hewett**.

124 Leinster Avenue serves properties north-west of the SH1/Poplar Avenue intersection and connects both to the south (at Poplar Avenue) and to the east (at the existing SH1). The proposed alignment of the Expressway passes through the eastern connection to SH1 so this is proposed to be closed, meaning that the sole access to this area would be via Poplar Avenue. There are also a few properties currently connecting directly to SH1 north of Leinster Avenue through which the Expressway would pass. These properties are included in the designation and will need to be acquired for this Project. Access to this part of the designation west of the Expressway will be provided via an extension of Leinster Avenue.[40]

125 Properties on Leinster Avenue would be affected as follows:

125.1 Those wishing to travel west or north-west on Poplar Avenue would not be materially affected.

125.2 Those wishing to travel south on SH1 would use Leinster Avenue then the new Poplar Avenue interchange. This is currently the shortest route for most of the properties so would not be a longer distance, and with the Project there would be significantly reduced delay (and improved safety) accessing SH1 from Poplar Avenue. Those properties on the northern (east-west) section of Leinster Avenue would cease to be able to directly access the existing SH1, and therefore would have to use Poplar Avenue. This new route would be up to 700 metres longer than the current route. The extra travel time of just under 1 minute for this movement would be off-set by the significantly reduced delays (and improved safety) using the new Poplar Avenue interchange.

125.3 Those wishing to travel north would not be able to access the proposed Expressway at the Poplar Avenue interchange, because this is a partial interchange with no northbound on ramp. These residents would have to use the existing SH1 to travel north via Poplar Avenue. The most adversely impacted properties would be those on Leinster Avenue immediately west of the Expressway, whose occupants would need to travel an extra 1.7km to make this movement by car. This would lead to 2 minutes of extra travel time to get to the

[40] Drawing CV-SP-106 AEE Volume 5 Plan Set.

same point on SH1 where Leinster Avenue currently connects. For properties roughly halfway along Leinster Avenue, the extra travel distance would only be 750 metres, while those near Poplar Avenue would not have any extra distance to travel. The additional delay properties would accrue in accessing SH1 would be at least partly off-set by the faster travel times on the existing SH1 once other traffic has diverted to the Expressway. The benefit of those faster travel times would be likely to more than off-set the additional time associated with the extra access distance for those travelling significant distances to the north. However, for those most affected residents making only a short trip (say to Paraparaumu), there would remain a fairly modest additional travel time of approximately 1 minute.

125.4 Pedestrians and cyclists from Leinster Avenue would retain access to the existing SH1 via the proposed pedestrian/cycle bridge, as well as direct access to the shared path running on the western side of the Expressway.

126 Overall, while there would be extra travel time and distance for a limited number of properties on Leinster Avenue heading north, these would be off-set by significantly improved (less congested and safer) access onto SH1 to head south.

127 The proposed new interchange on Kāpiti Road will impact some commercial properties on the north side of Kāpiti Road.[41] This is proposed to be addressed by extending an existing service lane. However, the design and land purchase for that arrangement are yet to be completed. Further design of this treatment was identified to be included in the "mitigation package". I discuss suggested conditions to address this later in my evidence.

128 Mazengarb Road is proposed to be lowered where the Expressway crosses it. The effect this would have for some property access in that area will be addressed through local regrading of accesses. The accesses will otherwise remain in their current locations.

129 A new access way is proposed running north from Otaihanga Road (on the eastern side of the Expressway), to provide access to properties whose existing access way to Otaihanga Road is severed by the Project.

130 Immediately north of the Waikanae River, a new access road under the Expressway will be required to maintain access between Kauri Road and the El Rancho camp. This small (50 metre) southward realignment of the current access road is not expected to significantly alter travel distance or times accessing this property.

[41] Drawing CV-SP-110 AEE Volume 5 Plan Set.

131 A new service road is proposed running south from Te Moana Road (on the western side of the Expressway), to provide access to properties whose current access is severed by the Proposal. This would be on a similar alignment to an existing access to this area, so would not add significant additional travel time or distance.

132 In Waikanae North, Ngarara Road and Smithfield Road are proposed to be realigned to accommodate the Expressway. These realignments will generally be close to the existing roads. However, a new access road from Smithfield Road is proposed to provide access to properties on the eastern side of the Expressway, including the Nga Manu Wildlife Sanctuary. While access will be altered, no significant change in travel distance is anticipated.

133 North of Peka Peka Road, some properties will have their current access to SH1 altered:

133.1 At Te Kowhai Road, this will be addressed by constructing a new road between Peka Peka Road and Te Kowhai Road.[42] In conjunction with the form and location of the southbound off-ramp proposed at Peka Peka, this will mean that vehicles wishing to head north from Te Kowhai Road would have an additional 1.3km over the current route while those wishing to access Te Kowhai Road from the north would have an additional 2.3km.

133.2 Movements from the north wishing to access Peka Peka Road would need to travel approximately 1 km more than they currently do. The reverse movement from Peka Peka Road towards the north is not affected because the northbound on-ramp is located at Peka Peka Road.

133.3 Hadfield Road (east of SH1) will retain its access to the existing carriageway, which will become the southbound off-ramp for the Expressway. Vehicles from the north wishing to get to Hadfield Road will not be affected but those seeking to travel north from Hadfield Road will need to travel approximately an extra 1.6km to cross the Expressway.

133.4 For all three roads (Peka Peka, Te Kowhai and Hadfields), travel to and from the south via the current SH1 route will not be affected. However, these properties will not be able to gain direct access to the Expressway to head south from this location (instead needing to use the other interchanges such as that proposed at Te Moana Road).

133.5 While some movements to/from the north from these areas will require additional travel time and distance, this will be

[42] Drawing CV-SP-118 AEE Volume 5 Plan Set.

off-set by the much safer and less congested access from Peka Peka Road onto the existing SH1 route (via a new roundabout), and the reduced congestion on the existing SH1 route itself. During periods of high traffic flows on SH1, turning to or from SH1 in this area is currently very difficult, so this improved access as a result of the Project will be significant.

134 In summary, the effects on property access are as follows:

134.1 Locations where property access is severed or otherwise directly affected have been identified and addressed so that access is provided.

134.2 This mitigation is in the form of new access roads or service lanes. For some movements from some properties, these modified access arrangements result in increased travel distances. However, in all cases these are generally off-set by improved travel times and safety for other movements from those properties, especially those wishing to turn right onto the existing SH1.

Traffic Flows and Operations

135 The most significant effect which the Project will have on traffic flow and operations is to divert a substantial volume from the existing SH1 corridor onto the new Expressway. The changes on the existing SH1 route in 2026 are expected to be as follows:[43]

135.1 11,600 vpd (57%) reduction south of Peka Peka;

135.2 17,200 vpd (54%) reduction south of Te Moana Road;

135.3 14,100 vpd (55%) reduction south of Otaihanga Road;

135.4 10,800 vpd (34%) reduction south of Kāpiti Road;

135.5 500 vpd (2%) increase south of Poplar Avenue (where the Expressway connects with the existing SH1).

136 These very substantial reductions in traffic flows will significantly reduce delays and queues, both on the existing SH1 route itself (especially at the traffic signals) and for vehicles trying to turn onto or from the existing SH1. The travel times on the existing SH1 are expected to reduce by up to 6.6 minutes (33%),[44] with similar

[43] TR34, Table 6.1.

[44] TR34, Table 6.15, page 56.

reductions in delays for vehicles trying to turn right onto the existing SH1 at give-way intersections during peak periods.[45]

137 Reductions in travel times on other key local roads are also expected,[46] including Te Moana Road (except eastbound in the PM peak where a very small increase in travel time is expected), Rimu Road, Mazengarb Road, Raumati Road and Poplar Avenue (except westbound in the AM peak where a very small increase in travel time is expected). A small increase (0.7 minutes) is expected on Kāpiti Road due to the new signalised interchange.

138 Reductions in travel times[47] are expected for almost all movements within and through the Kāpiti Coast, with the largest benefits being:

138.1 Up to 13 minutes travel time reduction between SH1 south of the Project and Waikanae Beach;

138.2 Up to 4 minutes travel time reduction between Paraparaumu and Waikanae;

138.3 Up to 10 minutes travel time reduction between MacKays Crossing and Peka Peka Beach; and

138.4 Up to 7 minutes travel time reduction between Paraparaumu and Peka Peka.

139 Some journeys are predicted to have small increases in travel times. None are expected to exceed 0.5 minutes and include the following movements:

139.1 Up to 0.4 minutes travel time increase between Paraparaumu Town Centre and Paraparaumu Beach (due to the new interchange on Kāpiti Road);

139.2 Up to 0.1 minutes travel time increase between Waikanae Town Centre and Waikanae Beach (due to the new interchange on Te Moana Road); and

139.3 Up to 0.2 minutes travel time increase between Peka Peka Beach and Otaki or Waikanae. This is the net effect of the improved access to SH1 (via a new roundabout) and the longer route for some movements to access the north-facing ramps.

140 All the areas that are expected to have these small increases are also expected to have significant reductions either for longer trips to

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45 TR34, Table 6.8, page 45.

46 TR34, Table 6.15, page 56.

47 TR34, Tables 6.13 and 6.14, page 53.

the north (Otaki) or south (MacKays) or for crossing the Waikanae River.

141 Significant improvements in journey time reliability are also expected as a result of the Project. This is because the source of the current levels of unreliability will be substantially removed, specifically:

141.1 For through traffic, the traffic signals on the existing SH1 route will be bypassed with no at-grade intersections on the Expressway.

141.2 Two lanes are proposed in each direction on the expressway, meaning that vehicles will be better able to travel at their desired speed, rather than the speed of the slowest vehicle.

141.3 The additional north-south route through the corridor (including a second crossing of the Waikanae River), will add significant resilience to the network, making it much less vulnerable to incidents on the existing route.

141.4 The significantly reduced traffic flow on the existing SH1 route will also make it much easier to turn onto or from that road from the various side roads, reducing the variability in the intersection delay.

142 It is difficult to predict future travel time variability, and hence I have not attempted to quantify the future levels of variability. However, the extra choices of route available and extra resilience added are expected to result in significant improvements in reliability.

143 Traffic flows are expected[48] to reduce on a significant number of local roads, including those listed in **Table 4** below:

Table 4 Roads with Predicted Reductions in Traffic Flow

Road	**2016 Reduction in Daily Flow**	**2026 Reduction in Daily Flow**
Matai Road	4600 (9%)	600 (10%)
Raumati Road	900 (68%)	1,500 (8%)
Rimu Road	800 (4%)	600 (4%)
Kāpiti Road (west of SH1)	2,800 (17%)	4,900 (26%)

[48] Technical Report 34, Table 6.4, page 38.

Arawhata road	400 (5%)	200 (3%)
Te Roto Road	400 (3%)	200 (2%)
Realm Road	600 (19%)	700 (17%)
Mazengarb Road	300 (5%)	500 (8%)
Ratanui Road	2,500 (32%)	3,000 (38%)
Otaihanga road	2,500 (34%)	3,100 (36%)
Te Moana Road (West of SH1)	5,100 (48%)	6,800 (52%)
Te Moana Road (West of Walton Avenue)	1,600 (28%)	2,600 (32%)
Peka Peka Road	600 (50%)	600 (46%)

144 In my view, these flow reductions would generally result in improved conditions both for users of these roads and for adjacent land uses. This would include reduced congestion (generally of a modest level on the local roads, except those accessing SH1 or where the reductions are significant), less likelihood of crashes and other traffic-related environment effects (such as noise and vehicle emissions).

145 Increases in traffic volumes are however expected on some roads, primarily associated with access to the new interchanges. The increases predicted by the modelling are summarised in **Table 5**:

Table 5 Roads with Expected Increases in Traffic Flow

Road	**2016 Increase in Daily Flow**	**2026 Increase in Daily Flow**	**Comment**
Poplar Avenue	400 (13%)	500 (15%)	This is due to the much improved access to SH1 (south) at the Poplar Avenue Interchange. The change and the resulting level of flow is still very low, therefore, the effect of this on the transport environment is expected to be minimal.
Kāpiti Road (west of Arawhata	600 (2%)	300 (1%)	This is a very small change so is not considered to have a material effect.

Road)			
Kāpiti Road (west of Te Roto Drive	1,600 (9%)	1,200 (6%)	This is due to vehicles being attracted to the new interchange on Kāpiti Road, a 'secondary arterial' in the KCDC road hierarchy. In this context I do not consider this increase to be significant at a daily level. However, this interchange has been investigated in more detail at an operational level during peak periods, which I describe in more detail later in my evidence.
Park Avenue	1,300 (45%)	1,700 (38%)	This is because Park Avenue will become the most direct route between the new interchange at Te Moana Road and some parts of Waikanae. In some cases the extra travel distance, compared to the alternative (e.g. route via Te Moana Road) is small. Hence, the choice of route would be sensitive to other influences such as the level of traffic, intersection delays, traffic calming, signage etc. Although this represents a large percentage increase, the resulting daily flow of 6,200 vpd is not expected to materially increase congestion or travel times on this road. The effect of the extra traffic at the intersections at the end of Park Avenue was explicitly assessed and not found to materially increase delays or queues.[49] The increase in daily traffic flow is only expected to have a minimal effect on travel conditions. Park Avenue is shown as a 'secondary arterial' in the KCDC road hierarchy so a level of through traffic would be expected on such a route. However, as this is predominantly a residential street and a school pedestrian route, any increase might be perceived to have an adverse effect on vulnerable road users. Traffic calming and signage could mitigate this by encouraging traffic to remain on Te Moana Road. The change in traffic patterns could potentially result in higher travel speeds, although I would not expect this to be high given the residential road environment. Given that the footpath on Park Avenue switches from the north side to the south side, this could impact on

[49] TR32 page 49.

			where pedestrians have to cross Park Avenue. The potential effect on vulnerable road users could be addressed through provision of a pedestrian crossing facility near number 87 Park Avenue where the footpaths switch sides. I discuss this further in response to submitters and the Proposed Consent Conditions.
Tutanekai Street[50]	2,300 (48%)	3,700 (75%)	The predicted increases is predominantly only in the southeast direction on Tutanekai Street. The increases are because the Project reduces the substantial delays trying to turn on to SH1 at the end of Amohia Street,[51] which Tutakekai Street connects to. The Project reduces traffic on the existing SH1, thereby reducing those delays (predicted at up to 4 minutes), making Tutanekai Street/Amohia Street (north) as attractive for south-bound traffic as it would be for northbound traffic. Tutanekai Street has mostly residential land use frontage and has a footpath at least on one side of the road. In the KCDC road hierarchy it is classified as a 'collector' road. This level of increase in traffic flow could create safety issues at the southern end of Tutanekai Street where there is a 90 degree bend where it connects to Amohia Street (north). At this location there is also car parking for the RSA and the Paraparaumu Reserve and an access to the Memorial Hall. Therefore I would recommend that appropriate calming measures be applied at this location to manage traffic speeds through this part of Tutanekai Street. I discuss this further in relation to the proposed mitigation and conditions.

[50] This street was not discussed in the Transport Assessment (TR32), but was later addressed following liaison with KCDC.

[51] Tutanekai Street connects to Amohia Street, which connects to SH1. There is however some confusion around street names because SH1 at that location is also Amohia Street.

Road Crashes

146 The Project is expected to significantly reduce the crash risk in this area for a number of reasons:

146.1 It will divert a significant volume of traffic from the existing SH1 route onto the higher-standard proposed Expressway with its improved lane and shoulder provisions, improved geometry, central median barrier and grade-separated intersections;

146.2 It will separate 'local' and 'through' traffic in the urban areas (especially the Waikanae and Paraparaumu Town Centres);

146.3 It will significantly reduce congestion and hence driver frustration and associated risk-taking;

146.4 It will reduce queuing and hence rear-end crashes;

146.5 It will significantly reduce delays to vehicles trying to access the existing SH1 route at give way and stop-controlled intersections (thereby reducing the risk of drivers becoming frustrated and taking unacceptable risks); and

146.6 It will provide improved and additional off-road pedestrian and cycle paths through the corridor area, taking these users off other, less safe routes.

147 Overall, the Project is expected to address all of the predominant crash types in this area, resulting in a significant reduction in the risk of crashes.

148 The higher-speed of traffic on the new Expressway could increase the severity of some crashes. However, this will be offset by the central median barrier, improved geometry, roadside clear zones, and grade-separated intersections. Also, while the crash risk for each individual traveller will be significantly reduced, the Project is expected to induce some extra travel due to the reduced congestion, which in simplistic terms will increase the number of vehicles exposed to that risk.

149 The significant reduction in crash risk will more than off-set the extra travel risk exposure, resulting in a significant net reduction in the number of crashes and the resulting crash costs. The crash costs were assessed using NZTA's Economic Evaluation Manual (EEM) using a combination of historic crash costs (scaled to reflect predicted future traffic flows) where only traffic flows change, and crash-prediction models on new or substantially altered facilities. I have described that analysis in more detail in **Annexure 6**, which is summarised in **Table 2** below.

Table 6 Predicted Change in Crash Costs (per year)

Year	Facility	Do Min	Option	Change	Change
2016	Existing Intersections	$2,746,000	$1,253,000	-$1,493,000	-54%
	Existing Mid-blocks	$5,109,000	$2,170,000	-$2,939,000	-58%
	New Mid-blocks	-	$985,000	$985,000	
	New Intersections	-	$471,000	$471,000	
	Total	**$7,856,000**	**$4,880,000**	**-$2,976,000**	**-38%**
2026	Existing Intersections	$2,880,000	$1,260,000	-$1,620,000	-56%
	Existing Mid-blocks	$5,561,000	$2,303,000	-$3,258,000	-59%
	New Mid-blocks	-	$1,183,000	$1,183,000	
	New Intersections	-	$498,000	$498,000	
	Total	**$8,441,000**	**$5,243,000**	**-$3,198,000**	**-38%**

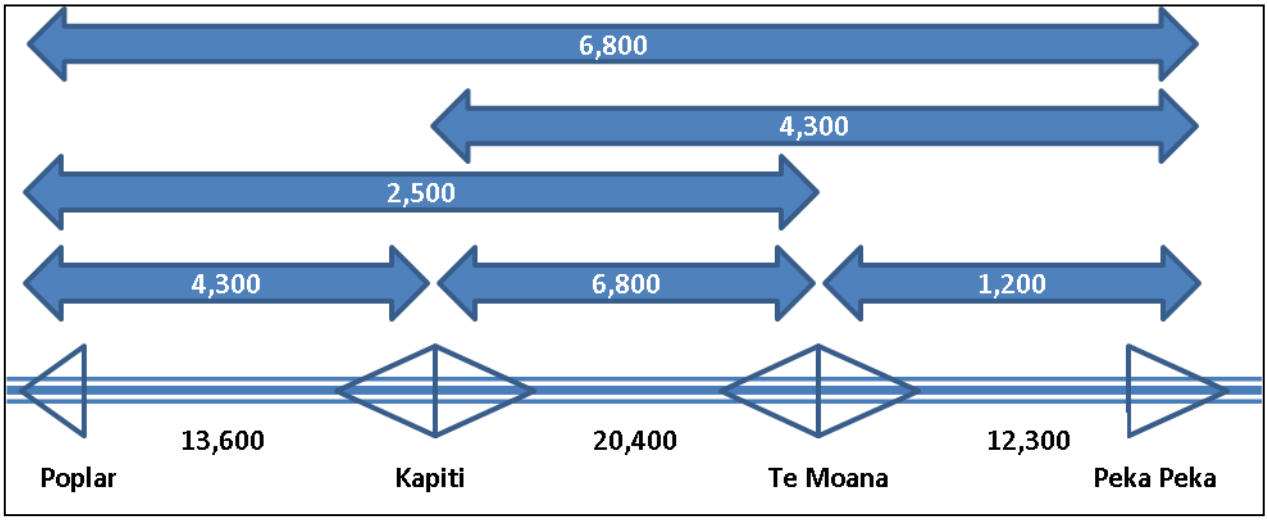
150 This analysis shows that the total crash costs in this corridor are expected to reduce by over $3 million (38%) every year.

Use and Operation of the Expressway

151 I have summarised in **Figure 7** both the predicted daily traffic flows on the new expressway between each interchange[52] as well as the movements that comprise the totals.

[52] Derived from TR34, Table 6.1 (page 45) and Table 6.11 (page 50). Note some minor differences in the total flows due to how the rounding was done.

Figure 7 Predicted Daily Flow Movements and Totals



152 This shows the following:

152.1 A total of 26,000 individual vehicle trips use the new Expressway daily (not all of these use all parts of the Expressway);

152.2 6,800 (26%) are 'through' traffic (between north of Peka Peka and south of Poplar);

152.3 6,800 (26%) are entirely internal (Kāpiti to Te Moana);

152.4 8,600 (33%) are between Paraparaumu and an external location (north of Peka Peka or south of Poplar);

152.5 3,700 (14%) are between Waikanae and an external location.

153 The Guiding Objectives agreed for the Alliance include target Levels of Service (*LoS*). These common traffic engineering indicators gauge the perceived performance of a traffic system, and range from LoS A (high quality performance) through to LoS F (very poor). For travel on the Expressway itself, the AUSTROADS Guide to Traffic Management (Part 3) was used to assess the expected performance using the peak hour traffic flows predicted by the traffic modelling. This analysis found that a LoS B was expected for travel along the Expressway.[53]

154 Local intersection modelling was undertaken at the intersections between the Expressway and the local network (that is, at the Poplar Avenue, Kāpiti Road, Te Moana Road and Peka Peka Road interchanges). Based on the average delays at those intersections

[53] See TR32 page 57.

and the LoS delay thresholds from the Highway Capacity Manual,[54] the following was determined:[55]

154.1 LoS B or better at the Poplar Avenue interchange;

154.2 LoS A at the Te Moana interchange;

154.3 LoS B or better at the Peka Peka Road interchange; and

154.4 An overall LoS C for the Kāpiti Road interchange, although some individual movements are expected to have LoS D or E.

ASSESSMENT OF THE PROJECT AGAINST RELEVANT TRANSPORT STRATEGIES AND POLICIES

155 The Transport Assessment contained in TR32 includes an assessment against local, regional and national policies and strategies. I present a summary of that assessment here.

KCDC Sustainable Transport Strategy

156 The sustainable transport strategy[56] identifies the following Transport Objective for the Kāpiti Coast:

> *"Within the overall District vision, the primary transport objective for the Kāpiti Coast is to… create a physical transport system that is attractive, affordable, connected, responsive, safe and offers effective mode choice so that it enables people to act in a sustainable way."*

157 It also identifies the key features of the KCDC Community Outcomes relevant to transport as follows:

157.1 **Outcome 1**: That Kāpiti Coast becomes nationally famous for an extensive walkway, cycleway, and bridleway system;

157.2 **Outcome 2**: That the level and quality of access within and between communities is improved;

157.3 **Outcome 3**: That linkages between Waikanae and Paraparaumu are improved to reduce energy use and travel time;

157.4 **Outcome 4**: That the District develops a role as a transport hub, including the distribution of freight;

157.5 **Outcome 5**: That there is improved internal transport access for the labour force;

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[54] The Highway Capacity Manual is produced by the Transportation Research Board (USA), and is in common usage in NZ for traffic capacity assessments.

[55] See TR32 page 61, Table 6.11 page 63 and TR34 Table 7.11, page 87.

[56] http://www.kapiticoast.govt.nz/Documents/Downloads/Strategies/Sustainable-Transport-Strategy.pdf

157.6 **Outcome 6**: That there is better public transport; and

157.7 **Outcome 7**: There are extensive access linkages within the District in addition to SH1.

158 In my view, the Project will contribute to all of these community transport objectives. For outcomes 1 to 5, and outcome 7 that contribution will be strong. Comparatively, the Project will contribute less towards outcome 6 (Improved Public Transport). As I have described, the Project is expected to result in a small reduction of public transport use. On the other hand, the Project provides improved travel times and reliability for buses and improved access to the railway stations as well as providing an opportunity for improved bus services between the Paraparaumu and Waikanae communities. Hence, the Project will still contribute to outcome 6, albeit not as strongly as it does to the other outcomes.

Land Transport Management Act

159 The Land Transport Management Act 2003 (*LTMA*) provides the legal framework for managing and funding land transport activities. The purpose of the LTMA is to achieve an affordable, integrated, safe, responsive and sustainable land transport system. Transport Projects must be assessed against the LTMA and the five objectives from the New Zealand Transport Strategy (*NZTS*) as outlined below.

159.1 Assisting economic development;

159.2 Assisting safety and personal security;

159.3 Improving access and mobility;

159.4 Protecting and promoting public health; and

159.5 Ensuring environmental sustainability.

160 The Transport Assessment considers the Project against the first 3 of these objectives, and the last two are dealt with in other parts of the overall AEE (and related evidence). In my view, the Project will contribute strongly to all five of the objectives. Specifically, this is because it will:

160.1 Reduce congestion and improve travel time reliability for both local and strategic traffic (including freight);

160.2 Significantly reduce crash risks for all road users in this area by diverting traffic from the over-capacity SH1 route onto a higher-standard and safer environment;

160.3 Separate local and 'through' traffic, particularly in the urban sections along the existing SH1 route; and

160.4 Significantly improve accessibility between Paraparaumu and Waikanae communities, for all modes.

Government Policy Statement Assessment

161 Under the LTMA, the NZTA must give effect to the Government Policy Statement on Land Transport Funding in developing the National Land Transport Programme and take account of the GPS when approving funding for activities.[57] The LTMA requires the GPS to contribute to the aim of achieving an affordable, integrated, safe, responsive and sustainable land transport system, and contribute to the five transport objectives of the NZTS (set out above).

162 SH1 from MacKays to Peka Peka forms part of the Wellington Northern Corridor RoNS set out in the GPS, and this Project gives effect to that desired Government policy.

163 The GPS also contains a number of short to medium-term goals that the Government expects to be achieved through the use of the National Land Transport Fund that contribute to economic growth and productivity. These include improvements in the provision of infrastructure and services that enhance transport efficiency and lower the cost of transportation through:[58]

163.1 improvements in journey time reliability;

163.2 easing of severe congestion;

163.3 more efficient freight supply chains;

163.4 better use of existing transport capacity;

163.5 better access to markets, employment and areas that contribute to economic growth;

163.6 a secure and resilient transport network.

164 Other short to medium-term goals that the Government expects are:

164.1 reductions in deaths and serious injuries as a result of road crashes;

164.2 more transport choices, particularly for those with limited access to a car where appropriate;

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57 This is explained in the evidence of **Mr Rod James**.

58 www.transport.govt.nz/ourwork/keystrategiesandplans/gpsonlandtransportfunding/, page 7.

164.3 reductions in adverse environmental effects from land transport; and

164.4 contributions to positive health outcomes.

165 As outlined in the Transport Assessment,[59] the Proposal is expected to contribute strongly to these objectives.

Regional Land Transport Strategy (RLTS)

166 The RLTS[60] provides an overall context and direction for investment in the region's transport network. It provides six objectives, five of which are the same as those in the NZTS, which I referred to in relation to the LTMA. In terms of the sixth objective, matters of project funding and economics are addressed by **Mr James**, **Mr Nicholson** and **Mr Copeland**.

Regional Freight Plan[61]

167 Greater Wellington Regional Council's June 2011 Regional Freight Plan highlights the importance of freight movement in the regional and national economy and indicates that freight volumes are expected to double by 2031. The Regional Freight Plan identified projects that could help accommodate such growth, which includes the Wellington Northern Corridor (Levin to Wellington Airport) RoNS.

168 The Project is part of the Wellington Northern Corridor RoNS and will significantly reduce congestion and improve travel time reliability for freight passing through or servicing the Kāpiti area.

ASSESSMENT AGAINST PROJECT OBJECTIVES

169 I have assessed the Proposal against the specific Project Objectives:

> *To enhance inter-regional and national economic growth and productivity;*

170 The Project will contribute towards this objective by reducing the costs of travel (by reducing congestion, improving travel time reliability and reducing crash costs) and removing constraints on growth, both for local development and regional 'through' traffic.

> *enhance efficiency and journey time reliability from, to and through the Kāpiti District, Wellington's CBD, key industrial and employment centres, port, airport and hospital;*

171 The Project will enhance efficiency and journey time reliability by better separating the through movement and local movement

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59 Technical report 32, Section 6.5.3 page 76.

60 http://www.gw.govt.nz/rlts/, page 27.

61 http://www.gw.govt.nz/freight/.

functions, providing additional capacity, removing at-grade intersections for through traffic and significantly reducing travel times both for traffic passing through Kāpiti and for Kāpiti traffic travelling outside the region.

enhance safety of travel on SH1;

172 The Project provides a new alignment for SH1 with improved geometry, grade-separated intersections and a central median barrier, which is expected to significantly improve safety for travellers on this new SH1 route. It will also significantly reduce traffic on the existing SH1 route, thereby reducing conflicts between through and turning traffic as well as between through traffic and other travel models such as pedestrians and cyclists.

appropriately balance the competing functional performance requirements of inter-regional and local traffic movements, recognising that modal and route choice opportunities need to be provided that enable local facilities and amenities in the Kāpiti District to be efficiently accessed;

173 The Project meets this objective by diverting all 'through' traffic onto the new Expressway (and hence allowing the existing SH1 route to perform a predominantly local function) and also by providing Expressway interchanges within the two main communities of Paraparaumu and Waikanae, which improves both regional and local access to and between these communities. It also provides a significantly enhanced pedestrian and cycle network to provide better local connectivity for these modes.

by developing and constructing a cost optimised new State highway alignment to Expressway standards between MacKays Crossing and Peka Peka.

174 Matters concerning the design process, funding and economics are addressed by **Mr Nancekivell**, **Mr James**, **Mr Nicholson** and **Mr Copeland**.

To manage the social, cultural, land use and other environmental impacts of the Project on the Kāpiti District and its communities by avoiding, remedying or mitigating any such effects through route and alignment selection, Expressway design and conditions.

175 As described elsewhere in my evidence, in transport terms, I consider that core elements of the Project design and function will help to meet this objective.

To integrate the Expressway into the urban form of Kāpiti District by taking into account current and future planned

settlement patterns in route and alignment selection and Expressway design [and conditions].

176 In transportation terms, the possible future development plans have been considered in the design via the testing of the design under both 'expected' and higher 'full growth' traffic scenarios.

177 Overall, it is my opinion from the perspective of a traffic and transportation expert, the Project will meet the Project Objectives.

ASSESSMENT AGAINST GUIDING OBJECTIVES

178 I have also assessed the Proposal against the transport elements in the Alliance Objectives:

93)(a) the Expressway achieves Level of Service 'B' between MacKays Crossing rail over-bridge and the location of the current intersection of Peka Peka Road and the existing SH1 [in the year 2026].;

179 As described above, a LoS B is expected for travel along the Expressway during peak periods in the year 2026.

(3)(b) Level of Service 'C' is achieved at the intersections between the Expressway and local network [in the year 2026].

180 Based on the detailed modelling undertaken, a LoS C or better is expected for the intersections where the Expressway ramps meet the local road network.

(3)(c) that the overall network operates to significantly improve travel times.

181 This has been confirmed by the traffic modelling.

(3)(*d) an integrated transport network can operate in a manner which reduces congestion in Waikanae town centre and at Elizabeth Street level crossing.*

182 The modelling has confirmed that the Project will remove a significant amount (approximately 50%) of the traffic on the existing SH1 route through the Waikanae Town Centre. This provides an opportunity for the road environment and traffic management priorities (via traffic signal control) to be altered to improve conditions for side-road traffic (including Elizabeth Street) and for other road users (such as pedestrians and cyclists, including those accessing the rail stations).

(4)(a) All existing and proposed east/west local road, cyclist and pedestrian connections are to be maintained…

183 All existing east/west road and pedestrian/cyclist connections are maintained (albeit some in an altered form). Access to the new growth area of Ngarara is provided by the bridges over the Expressway at Ngarara Road and the realigned Smithfield Road. A potential new east/west connection between Ngarara Road (at Nga Manu) and SH1 has previously been proposed by KCDC to support growth plans in the Waikanae North area (shown as a 'notional' road in the Map 07 of the District Plan). That proposed road is not included as part of this Project, however the realigned Smithfield Road has been designed to accommodate such a future link.[62]

(4)(b) The Project will maximise connectivity (including grade separated and left on/left off interchanges) to the local network consistent with the Expressway's inter-regional function.

184 Consideration of connections to the Expressway is described in the Urban and Landscape Design Framework (TR5). Section 5.3 of that report (page 59) describes the elements considered in that analysis, including community connectivity, urban form and KCDC growth strategies and economic development. Although the phrase 'maximise connectivity' is difficult to define, it is my opinion that an appropriate set of options for connectivity to the Expressway has been considered, along with appropriate consideration of transport elements in selecting the preferred access arrangement.

(5)(a) The Project will improve network resilience in the event of emergencies.

185 The provision of a second north-south route through this corridor, including a second vehicle crossing of the Waikanae Rover will significantly improve the resilience of the network, by providing alternative routes in the event of incidents and emergencies.

(7) (a) The Project is to be designed and constructed in a way that seeks to minimise adverse impacts on adjoining and surrounding properties.

186 Based on my assessment of the effects on property access (as described in this evidence), it is my opinion that the design has sought to minimise adverse transport effects on adjoining and surrounding properties.

(8)(b) …the Project is to include well designed, direct access via the Expressway into and out of Paraparaumu town centre, nearby

[62] Drawing CV-SP-125 AEE Volume 5 Plan Set.

commercial areas and the airport, consistent with the Expressway's inter-regional function.

187 It is my opinion that the full-movement interchange proposed at Kāpiti Road represents an appropriate balance between the desire to minimise local access points (to protect the interregional function), with the need to provide local access to Paraparaumu town centre and the wider commercial and residential areas.

188 Overall, I conclude that the Project is consistent with the guiding objectives for the Alliance.

SENSITIVITY TESTS

189 I summarise here the outcomes of the sensitivities tests undertaken for this assessment.

Full Development Growth

190 This test involved applying the traffic generation expected for full build-out of the key development areas in the 2026 models. This test is described in detail in TR34 (pages 91-104), from which the key outcomes were:

190.1 Under the 'Full Growth' scenario, the growth in vehicle trips in the study area is nearly twice that of the 'composite' growth scenario used in the main assessment;

190.2 The model did not converge[63] when the Full Growth demands were loaded to the Do Minimum (no project) network. This was because the demands significantly exceeded the network capacity and a stable model result could not be found. This outcome indicates that the Do Minimum network would not be able to accommodate the Full Growth development scenario;

190.3 The model with the Project in place did converge so was able to be used to estimate traffic flows and performance for such a scenario.

190.4 There would be LoS D at the Expressway intersections on Kapiti Road and significant delays were predicted for vehicles wishing to turn out of Milne Drive and Te Roto Drive. However, those models did not include the traffic signals at those two intersections now proposed to be installed by KCDC, which would address those delays.

[63] The model iterates loading traffic to the network, recalculating delays then re-calculating demands using the elasticity function to suppress/induce trips. Normally this iterative process continues until key travel results become (close to) static between successive iterations.

Network Assumption Tests

191 A test was undertaken of adding a northbound off ramp from the Expressway to the future extension of Ihakara Street. This test was requested by the Paraparaumu Airport and was intended to identify if such a ramp would reduce traffic flows on Kāpiti Road.

192 This test identified that such a ramp would divert traffic from Raumati Road onto the Expressway then Ihakara Street extension, with a negligible reduction in traffic in Kāpiti Road.[64]

193 A test was undertaken of the performance of the Kāpiti Road interchange with the recently consented Bunnings store on Milne Drive. That analysis was undertaken post completion of the Transport Assessment. It showed that with the Bunnings development and the associated mitigation (installation of traffic signals at the Kāpiti Road/Milne Drive intersection), the operation of this part of the Kāpiti Road corridor did not materially deteriorate (and was expected to improve). I discuss this further in relation to the submission by KCDC.

194 Also post completion of the Transport Assessment, KCDC requested an analysis of the Kāpiti Road/Arawhata Road intersection which I discuss later in relation to the KCDC submission.

195 Further tests were undertaken at the request of KCDC, involving removal of the Ihakara Street extension (assumed to be in the 2026 models for the main assessment) and a reduction in the growth assumed in the Paraparaumu Airport precinct. This test was compared to the 'Full Development Growth' test described above (that is, it included full development growth in areas outside the Airport precinct). The purpose of the test was to understand the potential impact on the operational traffic performance of Kāpiti Road under these different assumptions. These tests were only undertaken with the Expressway in place and only for the critical pm peak period.

196 The first test involved removing the Ihakara Street extension, and showed this would result in high levels of traffic diverting to Raumati Road, Matatua Road and Rosetta Road, and a small increase on Kāpiti Road.

197 The second test involved removing the Ihakara Street Extension and reducing the development growth in the Airport Precinct. When compared to the Full Development Growth scenario, this test showed significant reductions in traffic on Matatua Road, the Expressway and eastbound on Kāpiti Road (because of the reduced development). An increase in westbound traffic on Kāpiti Road was noted, created by the reduced congestion attracting traffic to use

[64] TR34 page 107.

Kāpiti Road to turn right into Te Roto Drive. When this increased right-turning traffic was put into the local corridor model for Kāpiti Road, it showed an increase in delay for vehicles turning out of the give-way side roads of Milne Drive and Te Roto Drive. That test was undertaken without the traffic signals at Milne Drive and Te Roto Drive now expected as part of the recent Bunnings consent. I would expect that, with those signals in place, the increases in delays at the give way controlled intersections would not be apparent. This is also discussed further in response to the KCDC submission.

RESPONSE TO SUBMISSIONS

198 I address below key transportation issues raised in the submissions. My approach to those has been generally as follows:

198.1 I have addressed common themes by issue rather than individually to each submission.

198.2 I have however addressed some specific submissions individually, where the topics raised are unique.

198.3 Where multiple submitters raise a common issue, I have only referenced a representative selection of them.

198.4 I have focussed on operational transport issues where I believe I can provide some information to the Board. Without implying disrespect to any submitters, I have not addressed those that provide statements (supportive or opposed) without any technical detail to which I can respond.

198.5 I have not addressed every statement that I consider to be factually incorrect, unless it relates to a key issue.

198.6 I have considered the preference for technical design details raised by traffic experts, but consider this better to be addressed during witness conferencing (as per KCDC's suggestion).

199 I firstly cover key common issues, followed by specific submissions from KCDC, Greater Wellington Regional Council and the Kāpiti Coast Airport. I have grouped the issues into the following topic areas:

199.1 Alternatives (including the Western Link Road);

199.2 Access;

199.3 Traffic flow effects;

199.4 Impacts on public transport;

199.5 Assessment methodology; and

199.6 RoNs Staging.

Alternatives

Alternative Road Options (Western Link Road)

200 Many submitters[65] have suggested that there are better alternatives to address the traffic problems, including general themes that:

200.1 The Western Link Road (*WLR*) will address the problems; and

200.2 The WLR with upgrades of the existing SH1 is sufficient and/or better than the Project. Some submitters include suggestions to upgrade SH1 (remove traffic signals with flyovers) but most do not specify a particular treatment.

201 I have addressed this issue by consideration of the form and function of the improvements needed to address the current and expected transport issues and to achieve the project objectives. For this, I have referenced previous work done by others prior to the formation of the Alliance, which included both WLR and SH1 expressway options.

202 Firstly, I considered the current issues with the transport network in the study area, namely that the current SH1 corridor has to perform a variety of functions:

202.1 A strategic State highway through route;

202.2 A sub-regional arterial function (moving traffic between the key areas such as Paraparaumu and Waikanae);

202.3 A local road and property access function;

202.4 A movement corridor for pedestrians and cyclists; and

202.5 An interface between the Town Centres and the railway stations, as well as between the communities east and west of SH1 and the railway.

203 These functions are generally in conflict which results in congestion, unreliable travel times, a high and consistent record of crashes and a generally unsafe and intimidating environment for pedestrians and cyclists. Additionally, the key sources of the current and expected congestion and travel time reliability problems are due to:

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[65] See for example Hunter (008), Cairncross (180), Davies (184), Kennedy (189), Tennyson (191), Griffis (245), Sisarich (328), Vere-Jones (370), Du PLessis (374), Bull (500), Groves (520) and Hagler and miller (670).

203.1 Insufficient capacity to accommodate the current and forecast traffic demands;

203.2 At-grade intersections with conflicting movements (including pedestrian demands);

203.3 High volumes on single-lane roads meaning vehicle speeds are highly variable and controlled by the slowest-moving vehicle;

203.4 The lack of alternative north-south routes, meaning a lack of resilience when incidents occur on the current route; and

203.5 High levels of direct property access creating 'friction' to travel and safety risks.

204 The WLR was planned as a local arterial road to provide north-south connectivity that allowed communities to be connected without needing to use SH1. Previous work indicated that that scheme would provide a significant improvement in local connectivity and hence travel benefits.[66] It was also expected to reduce the flow on SH1 by 26%,[67] thereby also improving travel time on that route. Provision of an additional north-south route (especially an additional crossing of the Waikanae River) would also improve the resilience of the network in responding to incidents on the existing SH1 route.

205 However, if no other work was undertaken, the objectives of the Project would not be addressed because:

205.1 The travel times would remain poor with LoS D;[68]

205.2 Although additional resilience would be added with the WLR, the other drivers of journey time variability would remain on SH1, namely single-lane travel, at-grade intersections, insufficient capacity and property access issues;

205.3 Although the volume of traffic on SH1 would reduce, resulting in a reduced exposure to crashes, this risk would simply be transferred to the new WLR. The other drivers of safety risk would remain (at-grade intersections, direct property access,

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66 Kāpiti SH1 Strategy Study Technical Report, page 15.

67 Kapiti SH1 Strategy Study Technical Report, Table 3.4 page 18: Flow on SH1 at Waikanae Bridge reduces from 39,323, vpd to 28,921 vpd with the addition of the WLR.

68 This is based on peak hour flows on SH1 of 1600 (TR34 Table 6.2) and an assumed 26% reduction due to the WLR, giving peak flows on SH1 of 1180 vph. Using Exhibit 15-2 of the Highway Capacity Manual (HCM 2010) indicates the Percent Time Spent Following of 80%, while Exhibit 15-3 of the HCM showed that this would equate to a LoS E.

driver frustration from single-lane travel, 2-way travel without central median or barriers).

206 Therefore, the WLR project alone would not meet the objectives of the Project (to enhance efficiency, journey time reliability and safety on SH1). The desired network form was assessed in the Kāpiti SH1 Strategy Study which considered the network options of:

206.1 Only the WLR;

206.2 Only a strategic expressway route with limited access points;[69] or

206.3 A network with both the WLR and an Expressway.

207 The outcomes of those tests were that:

207.1 The WLR on its own provided significant transport benefits and improved local connectivity;

207.2 An Expressway on its own with only limited access points improved through travel but performed very poorly for local connectivity;

207.3 A network with both a WLR and an Expressway through route performed the best in transport terms.

208 From this, the Strategy Study identified a desirable network structure that provided both a Strategic through route and north-south arterials (both 'west' and 'east' of an expressway). My interpretation of those tests is subtly different, in that I consider that it identified the preferred *functions* required of the network, rather than a preferred *form* (i.e. it showed that a high-quality through route was required as well as improved north-south connectivity). I discuss this later in my evidence.

209 I have considered the form of road best able to meet the transport outcomes included in the Project Objectives, namely to improve efficiency and journey time reliability and to enhance safety for travel on SH1:

209.1 In terms of efficiency, two travel lanes in each direction would be required to provide an adequate level of service,[70] while a

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69 Half interchanges at Poplar and Peka Peka Roads and a full interchange at Otaihanga Road.

70 HCM 2010 Exhibit 15-3 shows that a LoS B of better would require the Percent Time Spent Following to be less than 50%. Exhibit 15-2 of that manual showed that this would require flow rates below 600 vph. The flow rate on the expressway is expected to be 1200 vph (TR34 Table 6.2), meaning that 2 lanes of travel in each direction would be required.

100km/hr speed limit would maximise efficiency travel through the corridor;

209.2 In terms of journey time reliability, two lanes in each direction would permit vehicles to overtake slower vehicles and grade separation would remove the variability inherent in intersection delay;

209.3 In terms of safety, the predominant crash types for fatal and serious crashes relate to lost control/head on, crossing turning and overtaking, which together comprise 85% of fatal and serious crashes. The less severe crashes (minor and non-injury) are dominated by crossing/turning and rear-end/obstruction type crashes). To address the safety problems would require the following:

(a) Improved alignment (for loss of control crashes);

(b) A central median (for overtaking and head on crashes);

(c) Grade separated intersections and restricted property access (for turning/crossing intersections); and

(d) Reduced congestion and queuing (for rear-end crashes).

210 In principle, it may not be necessary to have all these elements to achieve the objectives. However, pragmatic considerations would indicate that all of these elements are required because:

210.1 A 100 km/hr speed limit which maximises efficiency would require improved road alignment and geometry;

210.2 Retaining at-grade intersections in a high-speed environment would not adequately address the safety objective;

210.3 High speed, multi-lane roads require central medians to address head-on safety issues; and

210.4 Property access restrictions (via central medians or left-in/left-out only restrictions) can address safety and efficiency issues but create difficulties and high conflicting flows (including u-turns) at at-grade intersections.

211 Therefore, it is my opinion that an expressway form of road is required to reasonably meet the Project Objectives.

212 The Strategy Study reached the same view[71] and assessed four different expressway alignments, finding the following:

212.1 Widening of the existing SH1 corridor was the most expensive,[72] was likely to take the longest time to construct (equal with a route along the rail corridor), had the second-lowest transport benefits,[73] would not create an eastern arterial function (although it would allow a separate western arterial) and would require some part of the WLR and service lanes to mitigate the severance effects to local trips[74] and property access.[75]

212.2 Conversely, an alignment along the WLR corridor had the highest transport benefits, lowest cost, quickest construction time and creates an eastern arterial for local trips via the existing SH1 (although it precludes the WLR).

213 The study found that, to serve both inter-regional and local trips, both the SH1 expressway and parts of the WLR are required, and that other parts of the WLR are desirable and should also be provided.[76]

214 As mentioned above, the expressway options considered in the Strategy Study only included a single interchange at Otaihanga (in addition to the tie-in ramps at Poplar Avenue and Peka Peka Road). This assumption will have had a significant effect on the results of the assessments, with the Otaihanga interchange not providing high quality connectivity between the two main centres of Waikanae and Paraparaumu. Because of this assumption, I consider that it is only possible to find from that analysis that both a local road and strategic *function* are required, and not necessarily that a specific combination of expressway and arterial corridors are required.

215 During the initial scoping stage of the Project by the Alliance, a series of interchange connection options was considered (see AEE Figure 9.2, page 239). From a purely transport perspective, options with two intermediate interchanges (one in Paraparaumu Town Centre and one on Te Moana Road) performed better than options with only single (at Otaihanga Road) or no intermediate

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71 Kapiti SH1 Strategy Study Technical Report, Page 61, recommendation (a)"that a four lane expressway be built as part of the Government's Road of National Significant for Wellington…".

72 Kapiti SH1 Strategy Study Technical Report, table 7.4 page 53.

73 Kapiti SH1 Strategy Study Technical Report, table 7.2 page 51.

74 Kapiti SH1 Strategy Study Technical Report, Page 61, recommendation (a).

75 Kapiti SH1 Strategy Study Technical Report, Figure 5.1 Page 29. Note also the analysis shown in Table 7.4 includes effects on severance and impacts on the town centres, which I have considered here to be transport issues.

76 Kapiti SH1 Strategy Study Technical Report, Pages 60-61.

connections.[77] The preferred connection option identified in that Scoping Study was full interchanges on Kāpiti Road and Te Moana Road and partial interchanges at Poplar Road and Peka Peka Road.

216 This Project has identified alternative connection options (at Paraparaumu and Waikanae) that mean that both the strategic through function and the 'western' arterial function can be accommodated by the same facility. This also allows the existing SH1 corridor to focus more on its local movement and direct access functions, thereby providing the 'eastern arterial' function identified in the Strategy Study.

Summary of WLR Consideration

217 Based on the above analysis, I have concluded the following:

217.1 The WLR alone would not meet the Project Objectives nor provide the network function identified in the Strategy Study;

217.2 Even in conjunction with the WLR, minor upgrades to the existing SH1 route would not meet the Project Objectives;

217.3 An expressway form of road would be required to meet the Project objectives for inter-regional travel (namely a 4-lane, divided, limited access facility with grade-separated interchanges);

217.4 From a transport perspective, the Project more efficiently provides for the strategic, arterial and local access functionality than a network comprising both a WLR and a limited access expressway on the alternative alignments considered in the Strategy Study; and

217.5 The Project provides the strategic through function and both the 'western' and 'eastern' north-south arterial function identified in the Strategy Study.

Other Alternative Options

218 Many submitters have suggested that there are better alternatives to address the traffic problems, such as:

218.1 Improving public transport;[78]

218.2 Improving coastal shipping;[79] and

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[77] This is in the MacKays to Peka Peka Scoping Report, M2PP Alliance, October 2010, Chapter 6.

[78] See Lenk (329), Malone (452), Pomare (465), Bull (576), Young (590), Hager and Miller (670).

[79] See Hunter (8).

218.3 Putting freight on rail.[80]

219 The Kāpiti Coast already has a good public transport system, with extensive coverage and a regular train service. While investment in improved services could reduce traffic flows in the area to some extent, the underlying issues with the transport network would remain (mixing of through and arterial/local traffic, conflicts at property access, congested intersections and an undivided, low speed alignment), meaning that the Project Objectives would not be met. It is also worth noting that the RLTS and Western Corridor studies were full multi-modal studies which identified that a package of both public transport and road network improvements was required to achieve the desired transport outcomes identified. Therefore, while the suggested alternatives may have transport benefits (and some are included in the regional strategies), on their own they would not meet the objectives of this Project.

Access

Interchanges and Access

220 Various submitters raised access issues, including:

220.1 Peka Peka interchange and whether there should be south-facing ramps to the Expressway at Peka Peka;

220.2 Access to SH1 at Te Horo;

220.3 Desire for an interchange for access to the Expressway at Otaihanga;

220.4 Access to Nga Manu Reserve and an associated east-west link; and

220.5 Access to properties on Kapiti Road.

Peka Peka Interchange[81]

221 In this discussion on additional ramps at Peka Peka, I have focussed on the impact on/benefits to vehicles in the general Peka Peka area. Effects on access to the Te Horo area are discussed separately.

222 To access the Peka Peka area, vehicles from the south would need to exit the Expressway at Te Moana Road interchange then travel east to SH1 then north to Peka Peka, or west on Te Moana Road then Paetawa Road to get to Peka Peka Beach. Alternatively they could exit further south such as at Poplar Avenue or Kāpiti Road, then use the existing SH1. The availability of the Expressway for

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80 See Zajaczkowski & Beaumont (172), Ash (555), Wrin (560), Grifith (579).

81 See Brown (17), Foskett (36), Turver (58), Marico Marine (92), Trustees of Arthur Bills (243), Jack (259), H Brown (286), Kane (361), Jensen (472), Haines (476), Lynwood Nursery (483).

part of this trip, and the significant reduction in traffic on the existing SH1 route would make such movements less congested and safer (and certainly no worse), then their current movements.

223 I have previously identified that the Project does not create an adverse transport effect for access in this area. As such, I do not consider that south-facing ramps at the Peka Peka interchange are required to mitigate adverse effects on property access.

224 Providing south facing ramps at Peka Peka would allow vehicles from Peka Peka Road, Te Kowhai Road and Hadfield Road to get direct access to the Expressway to/from the south, and would therefore provide transport benefits to vehicles accessing the Peka Peka area. However, the number of vehicles wishing to use those ramps is expected to be low. Clearly, the creation of a full interchange would require additional infrastructure and costs.

225 Throughout the development of the Expressway project, KCDC has strongly opposed south facing ramps at Peka Peka because of its concern that it would encourage land use development in Peka Peka contrary to their growth development plans. I concur that, in transport terms, a lack of direct Expressway connection between Peka Peka and areas south could make it less attractive to develop activities in Peka Peka that relied on easy access to large residential catchments (such as large scale retail activities), and I support the general philosophy of integrating land use and transport planning.

226 I have assessed the ramps against the Project objectives in Table 7 below:

Table 7 Assessment of Peka Peka Ramps against Transport Objectives

Transport Objective	**Assessment**
Enhance inter-regional and national economic growth and productivity.	No material effect due to low catchment area.
Enhance efficiency and journey time reliability from, to and through the Kāpiti District, Wellington's CBD, key industrial and employment centres, port, airport and hospital.	It would only marginally enhance efficiency to a small part of Kāpiti, but not for through traffic.

Enhance safety of travel on SH1.	It would not materially enhance safety for travel on SH1 (either on the new Expressway or the existing SH1), due to the very low traffic volumes affected and the fact that additional ramp merge/diverge areas will create an additional conflict point on the Expressway.
Appropriately balance the competing functional performance requirements of inter-regional and local traffic movements, recognising that modal and route choice opportunities need to be provided that enable local facilities and amenities in the Kāpiti District to be efficiently accessed.	While the ramps would add route choice, this would predominantly be for private properties in Peka Peka rather than local facilities/amenities. Additionally, there is generally a trade-off between through traffic function and local access with the provision of such ramps. Under the planned land use, the impact of extra ramps on through traffic efficiency would be low, however such effects could become much more significant if high traffic generating activities (such as retail) were to establish in Peka Peka.
To manage the social, cultural, land use and other environmental impacts of the Project on the Kāpiti Coast District and its communities by avoiding, remedying or mitigating any such effects through route and alignment selection, Expressway design and conditions.	Based on KCDC's expressed concern, south facing ramps have the potential to have an adverse effect on the land use and planning in the District, which in turn could create an adverse effect on the Expressway (by high volumes on short trips on the Expressway compromising the through traffic efficiency and safety).
To integrate the Expressway into the urban form of Kāpiti District by taking into account current and future planned settlement patterns in route and alignment selection and Expressway design [and conditions].	South facing ramps at Peka Peka would not be required to serve KCDC's growth strategies in this area.

227 Based on the above assessments, it is my opinion that:

227.1 South facing ramps at Peka Peka would have transport benefits in terms of reduced travel times and improved accessibility to a relatively small number of vehicles in the Peka Peka area; however

227.2 The improved access between Peka Peka and areas south could result in short trips on the Expressway that compromise through traffic efficiency and safety if retail/commercial activities established in Peka Peka. KCDC oppose such ramps because of the risk that they could encourage such development in Peka Peka;

227.3 I do not consider that they are required to mitigate an adverse effect of the Project; and

227.4 I do not consider that they are required to meet the objectives of the Project.

Access to SH1 at Te Horo[82]

228 Submitters from Te Horo also requested south facing ramps at Peka Peka in order to provide better access from the Expressway. The M2PP Project does not alter access to SH1 at Te Horo, however, the separate Peka Peka to Otaki (*PP2O*) project currently proposes alteration to that access. Consents for that project have not yet been sought.

Interchange at Otaihanga[83]

229 My assessment of this is similar to my assessment of ramps at Peka Peka as:

229.1 They would provide some travel time savings to vehicles in the Otaihanga area, however as more interchanges are added this would start to compromise the efficiency and safety of the through traffic function of the Project;

229.2 They are not required to mitigate an adverse effect on accessibility;

229.3 They are not required to meet the objectives of the Project; and

229.4 During development of the scheme, such ramps were not considered desirable because (like Peka Peka) it was considered that they could encourage land use development outside the planned growth areas.[84]

Emergency Services Access

230 The submission by the New Zealand Fire Service (515) requests additional connections to the Expressway to improve emergency

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82 See Four Seasons Caravans (227), Hyda Park Museum (384), Reid (457), Koru Ice Ltd (460), Penray Gardens (618).

83 See Tennyson (191), Regan (218), Jack (259), Hooper (273), Allan (502), Barnett (704).

84 TR5, Section 5.3, page 59.

response times. Provision of full interchanges at Kāpiti Road and Te Moana Road are consistent with its earlier requests for such connections and provide good access to the Expressway from the fire stations in Waikanae (Te Moana Road) and Paraparaumu (on Te Roto Drive just north of Kapiti Road). The Expressway would not be able to be used to provide direct access to Raumati South, Otaihanga or Peka Peka. These locations would be accessed using existing roads as currently. The Project is likely to improve access times to much of the network due to reduced traffic loads on the existing SH1 and the extra resilience of the network to cope with incidents on the existing SH1 route. Additional Expressway connections at Poplar Road (north facing), Otaihanga and Peka Peka (south facing) would provide additional options for emergency vehicles to use the Expressway to service those locations. However, following detailed consideration of a range of issues,[85] those options were not favoured and are not part of this Project.

Access to Nga Manu and east-west Link[86]

231 Access to 281 Ngarara Road and the Nga Manu estate will be retained via Ngarara Road and the proposed new local road that crosses the Expressway. Provision has also been made for that new local road to connect to a future east-west road proposed by KCDC in relation to planned developments in Waikanae North. Further details of that access road are included in the evidence of **Mr Nancekivell**.

Access to Properties on Kapiti Road[87]

232 The issue of access to properties on Kāpiti Road near the proposed interchange (including the Paraparaumu Medical Centre) are subject to further design, as discussed in the evidence of **Mr Nancekivell.**

Traffic Flow Effects

Traffic Effects on Te Moana Road

233 Various submitters[88] raised concerns about increased traffic effects on Te Moana Road due to the interchange proposed on Te Moana Road attracting Expressway traffic through local streets.

234 The Project is expected to attract some traffic to use Te Moana east of the interchange to travel from the Expressway to Waikanae Town Centre (which would otherwise have used the existing SH1). However, those increases in flows are expected to be offset by the vehicles from the western parts of Waikanae and Waikanae Beach being able to access the Expressway and no longer needing to travel

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85 See TR5, Section 5.3 and the AEE Chapter 9 and the evidence of **Mr Nancekivell**.

86 See McKenzie (46), Nga Manu Nature Reserve (90).

87 See Mackay (402), Paraparaumu Medical Centre (521), Kapiti Car Clinic (612).

88 See Ford (73), Jury (253), Laing (337), Aregger (382), Pettie (463), Grieve (474), Edbrooke (517), Benge (659), Starke (690).

the full length of Te Moana Road to access the existing SH1 (that is, the Expressway 'intercepts' traffic heading further east on Te Moana Road).

235 The traffic modelling for 2026 shows these changes as a result of the Expressway:

235.1 A reduction of 3,400 vpd between Te Moana Road west of the interchange and Te Moana Road east of Park Avenue;

235.2 No change in the volume of traffic between Te Moana Road west and Park Avenue;

235.3 5,800 vpd between Te Moana Road west and the Expressway;

235.4 1,700 vpd between Te Moana Road (east) and the Expressway;

235.5 1,700 vpd between Park Avenue and the Expressway;

235.6 A reduction in local[89] trips near the interchange to Te Moana Road south of 900 vpd;

235.7 1,400 vpd local from near the interchange to the Expressway.

236 These changes in movements result in changes in total flows as follows:

236.1 An increase of 2,300 vpd on Te Moana Road, west of the interchange;

236.2 A net increase of 400vpd (4%)[90] immediately east of the interchange;

236.3 A net reduction on Te Moana Road east of the interchange of 2,200 vpd (32%) west of Walton Avenue[91] and 6800 vpd (52%) less near SH1; and

236.4 An increase on Park Avenue of 1700 (36%) vpd.

237 East of Park Avenue, traffic flows on Te Moana Road are expected to reduce significantly due to the Project.

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89 Here "local" refers to those within an approximate distance of 500m from the interchange.

90 Flows in this specific location were not recorded in TR34, however they have been extracted from the models and shows 2026 daily flows of 10,300 vpd without the Project increasing to 10,700 vpd with the Project.

91 TR 34, Table 6.4, page 38.

238 To the west of the proposed interchange, Te Moana Road predominantly only serves Waikanae Beach, although an access is also provided through to Peka Peka Beach. The modelling shows that the Project is expected to increase the traffic on that part of Te Moana Road by 2,300 vpd (27%).[92] This section of road is a 'secondary arterial' in KCDC's hierarchy and generally has wide lanes and shoulders and a footpath so has adequate capacity to accommodate this extra traffic. This increase in traffic is mostly due to induced traffic effects, with Waikanae Beach residents making more trips due to their significantly improved accessibility to areas such as Paraparaumu and Wellington (time savings of up to 13 minutes are expected from Waikanae Beach to some locations).[93]

Traffic Effects on Park Avenue

239 Various submitters[94] raised concerns about the increased traffic expected on Park Avenue, due to it being a direct route between the Te Moana interchange and the northern parts of Waikanae. Without the Project, such traffic would have used the existing SH1 corridor to access such locations, including via Kohekohe Road and Rimu Road (both of which are expected to have reduced flows as a result of the Project).

240 The traffic modelling suggests that traffic flows on Park Avenue would be likely to increase from 4,500 vpd to 6,200 vpd[95] due to the Project (an increase of 1,700 vpd or 38%). Although large in percentage terms, the actual increase in flows is quite modest. The intersections at each end of Park Avenue (with Te Moana Road and Ngarara Road) were assessed and it was found that no material increase in delays was expected as a result of the increase in traffic flows (delays actually are expected to reduce at Te Moana Road intersection due to the reduction of flows on Te Moana Road).

241 Although not directly relevant to this assessment, I note that a similar effect would occur with the Western Link Road which also connected to Te Moana Road, and for which a designation was confirmed.

242 The KCDC Road Hierarchy Map (dated 2010) categorises four levels of road functionality, namely: National/Major District Arterials, Secondary Arterials, Collector Roads and Local roads (see **Annexure 1**). In this hierarchy, Park Avenue and Te Moana Road are shown as 'Secondary Arterial' roads. These categories differ from the hierarchy shown in the KCDC 'Sustainable Transport Strategy Network Hierarchy', where Park Avenue is shown as a

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92 The models showed flows of 8,700 vpd increasing to 11,000 vpd.

93 TR34 table 6.14.

94 Including Bunch (124), Ansell (229), Jury (253), Kapanui School (415), Harris (713).

95 TR34 Table 6.4, page 38.

'local community connector' and Te Moana Road as 'Major Community Connector". Under either definition, Park Avenue has been identified to have a key movement function rather than just serving as a local road.

243 Park Avenue has a footpath but this switches between the north and south sides mid-way along. Because the additional traffic expected on Park Avenue may include traffic not previously associated with this part of the community, there could be an increase in travel speeds due to the increase in 'through' traffic and with potential safety implications for pedestrians crossing the road. This issue was specifically raised in the submission of Jury (253).

244 The AEE identified methods to manage this effect, namely a monitoring and review regime. I consider that this mitigation should be extended to specifically provide for a pedestrian crossing facility on Park Avenue where the foot path switches sides near number 87. I discuss this in regard to draft conditions later in my evidence.

Traffic Effects on Kāpiti Road

245 Various submitters[96] raised concerns about the expected increase in traffic on Kāpiti Road, including concerns about increased congestion and pedestrian safety. The changes in traffic on Kāpiti Road are complex with the interchange 'intercepting' some traffic that would otherwise use the eastern end of Kāpiti Road but also attracting traffic to the Town Centre that would have used the existing SH1, and traffic to/from Paraparaumu Beach that would otherwise have passed through Raumati to access SH1.

246 The year 2026 traffic modelling indicates that the net effect to be as follows:

246.1 A reduction of 4900 vpd (26%) at the eastern end of Kāpiti Road;

246.2 An increase of 300 vpd (1%) west of Arawhata Road; and

246.3 An increase of 1,200 vpd (6%) west of Te Roto Drive.

247 Those reductions at the eastern end will reduce traffic through that part of the Town Centre, and allow greater traffic management priority to be given to pedestrians and cyclists. Kāpiti Road is a 'secondary arterial' in the KCDC hierarchy and the modest increase in daily traffic flows would not be inconsistent with the intended function of that road. The resulting traffic flows on Kāpiti Road (north of Te Roto Drive) are below, but starting to approach the

[96] Including Ford (73), Tennyson (81), Ryan (156), Fourways Enterprises (230), Cherrington (356), Pettie (463), Edbrooke (488), Allan (502).

traffic levels that could be accommodated on the current single-lane form. Kāpiti Road has footpaths, a central flush median and cycle lanes in place in this corridor, so the effect of this increase in traffic on its performance is not expected to be significant.

248 The capacity, and hence levels of congestion, is expected to be controlled by the key signalised intersections at and adjacent to the proposed interchange (including Arawhata Road, Milne Drive and Te Roto Drive), rather than by the single-lane form.

249 In terms of congestion, the detailed operational modelling showed that the addition of the two new traffic signals at the interchange ramps would increase the delay for through traffic on Kāpiti Road by 20 to 40 seconds during peak periods.[97] However, the change in traffic patterns and the platooning effects of the traffic signals mean that the overall level of service at the existing Milne Drive, Te Roto Drive and Arawhata Road intersection are likely to improve during the pm peak and remain similar to having no Project in the am peak.

250 At the time the transport assessment was prepared, it was assumed in the modelling that the Kāpiti Road/Milne Drive intersection would remain as a give-way controlled intersection. Since then, KCDC has approved consent for development of the Bunnings site on Milne Drive, which includes a precondition to install traffic signals at the Kāpiti Road/Milne Drive intersection. Subsequent modelling showed that with these signals installed the performance of this section of Kāpiti Road with the interchange in place actually improved.

251 In summary, while additional delay for through traffic is expected on Kāpiti Road as a result of the Project, this is offset by the significant improvement in travel times for those wishing to travel north or south via the Expressway itself (for example up to 6 minutes quicker between Paraparaumu and SH1 south and 9 minutes quicker to Waikanae Beach).

252 I discuss improvements to the Milne Drive and Arawhata further in response to issues raised in the submission by KCDC.

Impact on Public Transport/Regional Objectives

253 The submissions by Generation Zero (537) and Public Transport Voice (441) raise a similar concern that the Wellington Northern Corridor RoNS (which includes this Project) will result in a significant decline in public transport. The submitters argue that it is, therefore, inconsistent with key objectives and outcomes in the RLTS. The submitters suggest that the transport issues could be addressed by KCDC's previous WLR scheme.

[97] TR34 tables 7.3, 7.6, 7.9 and 7.12.

254 My evidence explains that I expect that this Project would reduce public transport patronage relative to a baseline scenario with no improvements to the road network. However, I also explain that I predict this to be about 7%. While reduction in public transport patronage is not desirable, I do not consider the predicted reduction to be significant, especially within the context of the overall improvements which the Project will bring to the transport system. That reduction is not because travel by public transport system is made worse (it is actually expected to improve slightly), rather it is due to the significant reduction in congestion and significantly improved accessibility to, through and within Kāpiti. The WLR scheme was also expected to significantly reduce congestion and improve local accessibility (albeit less so for through traffic). As it is local travellers rather than through traffic most likely to use public transport, it would be expected that the WLR would have a similar effect on public transport usage as would the Expressway Project.

Assessment Methodology

255 Various submitters[98] have raised concern that the Expressway would create induced traffic which could off-set the reductions in congestion. Induced traffic was factored into the traffic modelling so the assessed savings in travel time have already included such effects. It is also worth noting that it is not the provision of a new road per se that induces traffic. Rather, it is the reduction in travel costs (which might include reduced distance, time, congestion, safety risk or less stop-start interruptions) that result in people changing their travel patterns. This means that any project that seeks to reduce those costs via improved connectivity or reduced congestion (such as the WLR), will induce changes in travel.

256 The submission by Action to Protect and Sustain Our Communities (APSOC) (677) includes criticism that the Project has not been assessed "in a multi-modal framework'. I disagree with that comment, as the Project has been identified in both the RLTS and the associated Western Corridor Strategy. Both those strategies include a 'multi-modal' framework and both have identified the need for a package of projects to achieve the desired outcomes, including both improvements to Public Transport services and improvements to the road network.

257 The submission by Lewis (427) requested that the transport modelling and assessments be redone with the WLR included in the base case. I do not agree with this because the WLR is not a committed project which would justify its inclusion in the base case. Also, as the Expressway shares the same corridor as the WLR project, they are mutually exclusive. The WLR could therefore only be considered an alternative option to the Expressway, rather than

[98] Including Hawken (72), Bosteels (196), Public Transport Voice (441), Duston (611).

part of the base case. I have outlined above why I do not consider the WLR to be a viable alternative to the Expressway in meeting the objectives of this Project.

RoNS Staging

258 Various submitters[99] raised concerns about the sequencing of the individual projects in the RoNS northern corridor. Specifically, submitters expressed concerns that completion of this Project before the projects either side (Transmission Gully to the south and Peka Peka to Otaki to the north), would create significant traffic 'bottlenecks' at those locations (i.e. at MacKays Crossing for southbound traffic and at Peka Peka for northbound traffic).

259 Southbound at MacKays Crossing, the AM peak traffic flows with the project are expected to be some 1200 vph.[100] This would be approaching (but below) the likely capacity of SH1 immediately south of MacKays Crossing. It is likely that some level of peak 'compression' would occur, where vehicles change their departure times due to the reduced congestion, generating a more intense traffic load for a short period within the peak (i.e. the opposite of peak spreading where vehicles start their journeys earlier or later to avoid the congestion at the height of the peak). Even if such effects were to occur, they would be expected to be minor. This is because during peak periods the congestion elsewhere in the corridor (such as Pukerua Bay) would remain, meaning that there would be little gain in such peak compression, and motorists would revert back towards their original departure times.

260 During holiday and weekend periods, southbound traffic could create queuing and this could give rise to congestion at MacKays Crossing for the period until Transmission Gully is completed. However, this would only affect southbound traffic leaving the study area, and would not negate the significant benefits to local traffic within the study area. I do not consider that the possibility for such congestion occurring would constitute an unacceptable adverse effect, because at worst it would involve shifting an existing bottleneck, while all the benefits of the Project from removal of traffic from SH1 within Paraparaumu and Waikanae would remain.

261 At Peka Peka, the weekday PM peak hour traffic models do not suggest that such a problem will occur, with hourly flows northbound in the PM peak remaining at 900[101] vehicles per hour (vph) in 2016 after the Project is completed. That level of traffic is below what the capacity of SH1 at the location would be. During holiday periods, the flows could be higher. However during those periods, the traffic would be constrained by the downstream

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99 Including Aldridge (237), Jury (253), Blok (268).

100 TR34 Table 6.2.

101 TR34 Table 6.3.

bottlenecks at Pukerua Bay (presuming that Transmission Gully Project has not been completed).

Submission of KCDC (#0682)

262 I address here the issues raised in relation to operational traffic effects by KCDC (#682). I have referenced my response to the paragraph numbers for the specific 'outcomes sought' by KCDC.

Levels of Service on Kāpiti Road (paras 156-158)

263 At paragraphs 156 to 158, KCDC seek the following outcomes:

263.1 Further independent modelling to identify locations where work is required to achieve LoS C;

263.2 A commitment to 4-laning Kāpiti Road between the Expressway and Milne Drive and provision of traffic signals at Arawhata Road; and

263.3 A commitment that remedial work would be undertaken if the Level of Service in 2026 is less than predicted.

264 The stated rationale for these requests are:

264.1 That the Guiding Objectives of the Project Alliance Board regarding LoS should extend beyond where the Expressway connects to the local road;

264.2 That there is uncertainty in the future modelling;

264.3 That four lanes should be provided unless independent modelling showed otherwise; and

264.4 That the Project should be modified to include traffic signals at Milne Drive and Arawhata Drive because otherwise they will operate at a low LoS and be unsafe.

Further independent modelling and LoS

265 Detailed, peer-reviewed modelling was undertaken of the Kāpiti Road interchange and immediately adjacent intersections. This included using assumptions regarding the future network that were explicitly agreed with KCDC. In this location, those agreed assumptions included the provision of the extension to Ihakara Street in the 2026 models and the installation of traffic signals at Arawhata Road.[102] The submission states (paragraph 151) that the modelling has included traffic growth projections for the airport at a lower level than that which would apply if the Ihakara Street connection is provided. It is correct that the full level of potential

[102] See TR34, Tables 4.3 and 4.4,page 20.

development of the Airport precinct is not included in the 2026 models. However, I note the following:

265.1 The Ihakara Street extension is likely to be required to facilitate growth in the Airport precinct, however provision of the link will not in itself mean that the site will be fully developed by 2026;

265.2 There is no certainty as to the likely rate of growth for that development, and I do not consider the rate of growth used to be unrealistic; and

265.3 For the transport assessment, a higher level of growth was tested, as was the scenario of having no Ihakara Street extension and less airport development. As described previously, the Full Growth test showed that the Expressway intersections with Kapiti Road would operate at a LoS D. Full build-out of all development in this area is not expected by 2026, so I do not believe this is contrary to the Alliance Guiding Objectives.

266 KCDC commissioned its own traffic modelling of Kāpiti Road that included the proposed signalisation of the Te Roto and Milne Drive intersections along with traffic associated with the recently consented Bunnings development. That modelling was shared with the Alliance as it suggested different outcomes than that undertaken by the Alliance itself. The Alliance team undertook an extensive analysis of those differences and concluded that the Alliance models were appropriate and robust. On this basis, I consider that the detailed modelling undertaken by the Alliance is appropriate, and while all modelling of future years is subject to uncertainty, I do not consider there is any reason to consider this situation to be more uncertain than others.

267 Therefore I do not see the need for or value in undertaking further modelling, especially the 'independent' modelling that KCDC has requested.

268 In regard to the LoS, I consider that the Guiding Objectives are quite clear in their scope, stating that "that Level of Service C is achieved at the intersections between the Expressway and the local network [in the year 2026]". I do not consider that this means that intersections further away should also achieve that LoS, and neither does it imply a need to also meet a LoS C for a higher level of growth than is expected in 2026.

269 In my experience, a target LoS C for a motorway interchange 10 years post opening is fairly rare, with lower service levels such as LoS D being accepted in constrained urban environments such as this. I note that, while KCDC has requested a LoS C through this

corridor (and not just at the interchange), in developing the Western Link Road KCDC was willing to accept a lower LoS for that Project. I base this on the Council Report dated 2 October 2008 which recommended that the 'Macro Scope' of the WLR should:[103]

> *Have an intersection performance to a minimum Level of Service E (on any movement) at 2026 projected traffic volumes with overall Level of Service D"*

270 For the WLR, KCDC recognised the constraints of providing high road capacity, stating that:[104]

> *For Kapiti Road, and to a lesser extent Mazengarb Road, LoS C cannot be achieved with any reasonable size of intersection, and it is proposed that LoS D is appropriate."*

271 The detailed modelling undertaken[105] by the Alliance team also showed that, during the PM peak, the LoS at those adjacent intersections of Te Roto Drive, Milne Drive and Arawhata Road was actually expected to improve with the Project (being LoS E, D and C respectively as opposed to LoS F, F and C respectively without the Project). In the AM peak, the modelling showed more mixed results with the Project improving the LoS from C to B at Arawhata Road but reducing it from B to D at Te Roto Drive.

272 In summary, I do not consider it necessary for the Project to achieve a LoS C at the adjacent intersections as requested by KCDC for the following reasons:

272.1 It is not consistent with the scope of the Guiding Objectives;

272.2 It requests a higher LoS at this location than KCDC was willing to accept for the WLR; and

272.3 The Project is actually expected to improve the LoS at those adjacent intersections during the critical PM peak period.

Four-laning Kāpiti Road and traffic signals

273 In regard to the need for four-laning of Kāpiti Road, I note that the Project provides for a 4-lane cross-section immediately west of the Interchange, tapering to match the existing 2-lane cross section at Milne Drive. KCDC recently announced[106] that as part of approving the consent for the Bunnings development on Milne Drive, KCDC would be installing traffic signals at the Kāpiti Road/Milne Road

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103 Council Report MDP-08-372, paragraph 18, page 4.

104 Council Report MDP-08-372, paragraph 26, page 5.

105 TR 34 Tables 7.8 and 7.11.

106 http://www.kapiticoast.govt.nz/Your-Council/News/2012/Milne-Drive-intersection-to-be-upgraded-/

intersection by March 2013. Those traffic lights will require multiple lanes on the Kāpiti Road approaches, tapering to the existing 2-lane from east of Milne Drive. Therefore, between the KCDC works at Milne Drive and the Expressway Project, appropriate lane configurations will be provided on Kāpiti Road between the Expressway and Milne Drive.

274 It would be appropriate for the works proposed for the Project to integrate with those for this proposed intersection upgrade. I therefore suggest that a condition could be included for the Project requiring development of a Network Integration Plan (NIP), that sought to integrate the works proposed as part of the Project with the local network. I discuss this later under proposed conditions.

275 To the east of the interchange, the Project scope includes tapering the 4-lane cross section at the interchange to the existing 2-lane cross-section prior to Arawhata Road. As noted above, it was agreed with KCDC that traffic signals should be assumed at the Kāpiti Road/Arawhata Road in the 2026 models irrespective of the Project. This was included in the 2026 models in conjunction with the Town Centre Link. This implies that traffic signals at Arawhata are related to land use development in Paraparaumu approved by KCDC. The modelling undertaken for the year 2016 (which did not include those assumed traffic signals), actually showed an improvement in service levels at the Arawhata Road intersection as a result of the Project with delays on the Arawhata Road approach reducing from up to 50 seconds without the Project to only 15 seconds with the Project.[107] These improvements were due to the change in traffic patterns and creation of larger gaps in the opposing traffic flow from the effects of vehicle platooning from the new interchange traffic signals.

276 KCDC also requested specific analysis of the Arawhata intersection to determine if the Project accelerated the need to provide traffic signals at the Arawhata Road intersection. Additional modelling undertaken to investigate this issue found that by 2026 a LoS F was expected at the Arawhata Road intersection if retained in its current form, regardless of whether the Project was provided. That work identified that traffic signals would be desirable at that location, however, this was as a result of general traffic growth and not as a direct result of the Project.

277 Therefore, I disagree that traffic signal control should be provided at Arawhata Road as a result of the Project.

Commitment to remedial work (KCDC para 158)

278 In my opinion, it is neither practically possible nor appropriate to have a consent that requires retrospective action 10 years post

[107] TR34 tables 7.2 and 7.5.

construction if traffic performance is different to that predicted. This is because there are many things that will affect traffic levels and performance that would be well outside the control of NZTA (such as consenting of developments and/or investment (or lack of investment) in associated road upgrades to support such growth).

Intersections/roundabouts, local road links (paras 161-163)

279 At paragraphs 161 to 163, KCDC seeks the following outcomes:

279.1 Modification of the design of the Te Moana interchange to use traffic signal control rather than roundabouts (primarily for pedestrian and cyclists safety);

279.2 Design details of local road crossings; and

279.3 Confirmation of access restrictions on Kāpiti Road and details of traffic signal phase times.

280 In terms of the choice of traffic signals or roundabouts at Te Moana Road, I note the following general comments:

280.1 In general terms, roundabouts provide less delay to traffic during off peak periods compared to traffic signals but can struggle to cope with high peak period delays. In this location, the traffic modelling indicates that the roundabouts will perform well in terms of traffic delay during peak periods.[108] Although I have not modelled traffic signal intersections, I would expect that such control will result in higher overall delays than the proposed roundabouts.

280.2 Traffic signals provide dedicated controlled crossing facilities for pedestrians and hence are generally safer for pedestrians. However, this can be offset if traffic signal cycle times are long and pedestrians require multiple crossings to progress through the interchange. In those situations, some pedestrians may choose to cross the road without waiting for the pedestrian phase, thereby negating their benefit.

280.3 Traffic signals are generally considered preferable for cyclists, as roundabouts often have poor cyclist's safety records, especially at the exit point. Off-road cycle facilities can be provided with roundabouts (as proposed for the Project), however this does not provide controlled crossing points for cyclists.

281 Overall, in traffic terms there are positive and negative elements to each control type. In traffic terms I consider that either option could be adequately provided, and do not have a strong preference.

[108] TR32 table 6.11 page 63.

I believe that a review of the control form could be undertaken prior to detailed design, in conjunction with KCDC.

282 I understand that a response to the request for the design details of local road crossings and access is provided in the evidence of **Mr Nancekivell**. In terms of traffic signal timings, these would be initially developed during detailed design. They would also be subject to change as the operators of the network sought to respond to changes in traffic flows, queues etc.

283 I would recommend that broad protocols on how the traffic signals in this corridor will be mutually operated by both NZTA and KCDC should be developed, and have included a suggested Condition that a Network Integration Plan be developed (see later discussion on Conditions).

Cycleway, Walkway and Bridleway (CWB) (paras 172-173)

284 KCDC seeks further details on the cycleway design (paragraphs 172-173), which is addressed in the evidence of **Mr Nancekivell**. Issues as to provision for cyclists in Queen Elizabeth Park and as to pavement remediation of the Raumati Straight section of SH1 are addressed by **Mr Baily** and **Mr Nancekivell** respectively.

Submission of Greater Wellington Regional Council (#0684)

285 The key transport concern raised by the Regional Council relates to effects on public transport. As noted earlier in my evidence, the effects on public transport are expected to be as follows:

285.1 Reduction in traffic on most bus routes and particularly on SH1 and routes near the Paraparaumu and Waikanae Town Centres;

285.2 Significant reductions in traffic flows and congestion at the interface with the rail stations, for both buses and pedestrians;

285.3 Significantly reduced congestion on routes using the existing SH1 or accessing SH1;

285.4 Small increases in delays on Kāpiti Road due to the extra traffic signals;

285.5 An overall reduction in public transport patronage (estimated at 7%), due to the significant reductions in delays and travel costs to cars; and

285.6 The need to relocate existing bus stops on Kāpiti Road and Peka Peka Road.

Submission of Kapiti Coast Airport Limited (525)

286 This submission raises a number of detailed technical issues related to the transport modelling and assessment. I do not agree with that assessment and would welcome an opportunity to discuss these in witness caucusing. I would however note the following:

286.1 The submission suggests[109] that traffic growth in the Airport precinct has been 'reduced' in order to 'ensure an intended outcome'. That is not correct. The growth forecasts used in the models were developed in liaison with NZTA, KCDC and Greater Wellington Regional Council and agreed for use prior to the detailed operational modelling.

286.2 The submission suggests that the adopted levels of growth are unrealistic, arbitrary and significantly understate future growth. I do not agree with that assessment. The levels of growth included in the main models for the year 2026 were based on information sourced from the Regional Council and KCDC and assessed against historic growth trends. Allowing 100% development in the identified growth areas would result in a 60% increase in traffic, which would be more than three times greater than the growth forecast by the Regional Council at the time.

286.3 The submission notes that the Ihakara Street extension was envisaged as a 'public/private' initiative, which I understand was to support the planned growth in this area. I also understand that development of the Airport land above 102,900m^2 of floor space becomes a discretionary activity under the District Plan, for which the effects of traffic is a matter for assessment.[110] The District Plan also links development of this area to extensions of Ihakara Street.[111] The modelling assumes nearly 140,000 m^2 of development in 2026.[112] The submission states that at these levels, they would not be able to contribute towards that project.[113] This statement does not appear consistent with the District Plan provisions for growth in this area.

286.4 Testing of full development in Kāpiti (not just of the Airport precinct) was undertaken which showed that the Expressway interchange could operate below capacity, but that there would be congestion on the local roads. It is my opinion that the Project will facilitate growth in Kāpiti, but that further

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109 Kapiti Coast Airport Ltd Submission: page 4.

110 KCDC District Plan, Section D.9.

111 KCDC District Plan, Page D.9-16.

112 TR34, Appendix 34.B, Figure B4.

113 Page 5.

improvements to the network will be required to support that growth (as identified in the planning provisions).

286.5 In investigating these issues further during witness conferencing, it would appear essential that advice is first sought from planning witnesses on the applicable District Plan provisions related to development of the airport precinct, so that the appropriate baseline for assessment of issues the submitter raises about the Expressway can be discussed.

RESPONSE TO SECTION 149G(3) KEY ISSUES REPORTS

287 I have also considered the transport-related issues raised in report on 'Key Issues' prepared for the EPA by KCDC.

Connectivity and accessibility

288 The report raises issues about the Ihakara Street extension, the connection with Milne Drive and Arawhata Road intersection with Kapiti Road. I have addressed the issues regarding Kāpiti Road in my response to the KCDC submission.

289 The report raises an issue with pedestrian safety at the Te Moana Road interchange, which again I have addressed in the response to the KCDC submission.

290 The report states that there are unresolved issues with the soon-to-be-constructed paired set of traffic lights at the intersection of Kāpiti Road and Milne Drive and Te Roto Road. I have addressed issues at these intersections in reply to the KCDC submission.

Existing SH1

291 The report raises a concern about how the reduced traffic flows on the existing SH1 could impact on traffic speeds and hence safety. The substantial reduction in traffic on SH1 as a result of the Project provides an opportunity for the form and function of the existing SH1 to be reviewed to provide greater priority to local access function and to other road users. However, I do not consider that the Project is likely to create a detrimental impact on road safety that requires specific remedial action. I have based my opinion on the following:

291.1 The reduced traffic levels are expected to both reduce the occurrence of crashes (less vehicles, fewer trucks, much easier access to SH1 at give-way intersections) and the likelihood of single-vehicle crashes colliding with other vehicles (due to there being less opposing traffic flow);

291.2 Compared to the 'No Project' scenario, the speeds on the existing SH1 are expected to increase as a result of the Project. However, this increase will be from removal of

congestion (where vehicles travel significantly below the posted speed limit), and allow vehicle speeds to more often be controlled by the prevailing speed limits. The existing route will retain relatively high levels of traffic, meaning travel speeds would not become completely free-flowing.

291.3 I consider the prevailing speed limits are suitable to the road environment (generally being 50 km/hr in dense urban areas and generally 80km/hr in the 'rural' sections). However, these could be reviewed to suit the new function of the road.

291.4 There is a general correlation between increased travel speeds and increased crash severity. However as reported earlier in my evidence (see Table 6), the reduction of vehicles is expected to outweigh such increases, resulting in a significant reduction in expected crash costs on the existing SH1 route.

292 The report identifies a key issue regarding how the existing SH1 road will be re-developed to accommodate the impact of the Expressway. It is my opinion that, in transport terms, the Expressway will have significant beneficial impact on the existing SH1 route.

Transportation

293 The report identifies the performance of Kāpiti Road as a key issue along with uncertainties in the modelling. I have addressed both of these issues directly in response to the KCDC submission.

District Plan Provisions (C5 Industrial/Service Zone)

294 The report identifies design issues about how the Expressway works on Kāpiti Road will interact with the works proposed by KCDC at the Milne and Te Roto Drive intersections on Kāpiti Road. Again, this issue has been addressed in regard to the KCDC submission.

PROPOSED MITIGATION MEASURES

295 The AEE (Table 12.8, page 358) discusses methods for managing the identified effects of the Project on the transport network. During preparation of this evidence, I have clarified further suggested mitigation for incorporation into associated designation conditions.

296 In **Table 8** below, I list the identified effect, the method proposed to manage that effect and a reference to the suggested condition (ie existing or new). In **Table 9,** I then outline my intentions for suggested conditions that relate to operational traffic issues (traffic issues related to construction are dealt with in the evidence of **Mr Hewett**). I note that transport-related conditions were not fully captured in the Draft Conditions included with the Application, and

hence what I propose are generally new conditions (the wording of which may need some refinement). I understand that **Mr Schofield** is preparing a document that he will lodge which will compile my various suggestions along with those of other witnesses.

Table 8 Methods for managing Identified Effects on the Transport Network

Identified effect	Method to avoid, remedy or mitigate potential effect	Condition Reference
Disruption of property access	Further design work to be carried out to finalise detail for alternative access to properties whose existing access is affected by the Project, particularly on Kāpiti Road.	DC.X3
Bus stops disrupted on Kāpiti Road and at Peka Peka	Detailed design work to be undertaken to develop suitable alternative locations for bus stops to be relocated on Kāpiti Road and at Peka Peka.	DC.X3
Park Avenue residential character changes due to increased traffic volumes and potential increases in traffic speed	• A pedestrian crossing refuge island to be provided on Park Avenue where the footpaths swap sides, near #87 Park Avenue. • A post-construction survey within one year after commissioning to determine if any further traffic calming measures are warranted to manage traffic speeds.	DC.X1,DC.X3
Potential conflict with pedestrians and parked vehicles on Tutanekai Street at the intersection with Amohia Street due to increase in traffic flows	Provision of traffic calming measures at the southern end of Tutanekai Street (where it meets Amohia Street) to manage traffic speeds and potential conflicts between traffic and parking/manoeuvring vehicles at the RSA and Paraparaumu Reserve.	DC.X2, DC.X3
Reduced safety and amenity of the regional cycle network around the tie-ins / intersections including at Poplar Avenue, and SH1 at Peka Peka.	Further detailed design to address this by detailing pedestrian and cycle tie-ins with local roads and the dedicated walkway / cycleway as part of CEMP process.	DC.X3
Loss of pedestrian and cyclist accessibility at mid-block locations at Poplar Avenue to Raumati Road, and the Kāpiti Road to Mazengarb Road sections	Project provision of pedestrian and cycle overbridges for locations where accessibility would otherwise be cut off by the proposed Expressway. NZTA will work with KCDC to put these overbridges in place prior to opening of the proposed Expressway. Overbridges are to be formalised and	DC.6

of the Project.	vested with KCDC.	
Concern over the potential delays due to operation of traffic signals on Kāpiti Road, especially for pedestrians	Develop agreed protocols between NZTA and KCDC as to how the traffic signals on Kāpiti Road between (and including) Arawhata Road and Te Roto Drive would be operated.	DC.X3
Potential safety impact on pedestrian and cyclists due to roundabout design at Te Moana Road interchange	Undertake further assessment, in liaison with KCDC, of the preferred form of control and design for the Te Moana interchange.	DC.X3

Table 9 Suggested Additional Designation Conditions

Ref	**Draft Conditions**
Transport (Operational)	
DC.X1	As part of the Project, a pedestrian crossing facility (a refuge island or similar) should be provided to assist pedestrians cross Park Avenue near Number 87 where the existing footpaths swap sides of the road. This should be constructed and completed by the time the Expressway is fully operational. A post-construction survey within one year after commissioning should be undertaken determine if any further traffic calming measures are warranted to manage traffic speeds. This should be based on an analysis of pre and post-construction surveys of vehicle speeds and volumes on Park Avenue.
DC.X2	As part of the Project, traffic calming should be provided at the southern end of Tutanekai Street, to manage vehicle speeds and conflicts with the parking provided with the RSA and Paraparaumu Reserve. This should be constructed and completed by the time the Expressway is fully operational.
DC.X3	The NZTA shall prepare in collaboration with KCDC a Network Integration Plan (*NIP*) for the Project, or relevant Project phases, to demonstrate how the Project integrates with the existing local road network and with future improvements planned by KCDC. The NIP shall include details of proposed physical works at the interface between the State highway and the local road network, and shall address such matters as pedestrian/ cycleway design detail, lane configuration, traffic signal co-ordination and operational strategies, signage and provision for bus stops. In addition, the NIP will address: a) How the works required for the Project at the Kāpiti Interchange will interface with the upgrades to intersections on Kāpiti Road at Milne Drive and Te Roto Drive proposed by KCDC (in particular lane configurations to two continuous traffic lanes

	in each direction between the expressway intersection and Milne Drive). b) Design details of where the shared pedestrian/cycleway proposed as part of the Project will interact with the local network, especially where it uses parts of the local road network at Mazengarb Road, Otaihanga Road, Kauri Road, Ngarara Road, and the realigned Smithfield Road. This should include the details of the form and dimensions of the facility. c) Details of the agreed protocols for operating the traffic signals on Kāpiti Road at and immediately adjacent to the Expressway interchange. This should include priorities for queue management and targets for pedestrian crossing times. d) Design work carried out to finalise detail for alternative access to properties on Kāpiti Road whose existing access is affected by the Project. e) Detailed design work undertaken to replace bus stops on Kāpiti Road and at Peka Peka. f) Design details for provision of the pedestrian and traffic calming facilities referred to in condition DC.X1 and DC.X2. g) Arrangements for a design workshop with KCDC to confirm the preferred intersection control and concept design for the Te Moana Interchange. Works identified in the NIP which are the responsibility of the NZTA, will be undertaken as at the time of construction works for the Project.

CONCLUSIONS

297 The Project will be effective in addressing existing and expected future deficiencies on the transport network. In particular, it is well designed to achieve its Objectives and so rectifies poor north-south connectivity (especially between Waikanae and Paraparaumu), the present unsatisfactory mix of functionality on SH1, and its associated congestion, unreliable journey times, unsafe conditions for pedestrians and cyclists, high crash rate and lack of resilience to accommodate incidents. The significance of the safety enhancement the Project will offer can be quantified as $3 million per year (38%), and journey time efficiency and reliability is expected to increase significantly, both for through traffic and local traffic.

298 The Project will retain and enhance cycling and pedestrian routes. The proposed new pedestrian/cycling facility, along with the substantial reductions in traffic expected on many local roads (especially the existing SH1 corridor), will enhance cycling and walking facilities in this area.

299 The Project will retain or improve bus journey times and reliability. In particular, this will be assisted by the new crossing of the Waikanae river, which will allow improved bus services between the communities of Waikanae and Paraparaumu. The improved accessibility by car between Waikanae, Paraparaumu and Wellington is expected to reduce public transport usage to/from Kapiti by some 7%. While such a reduction is not desirable, I do not consider this to be significant within the context of the significant improvements to the transport system.

300 I consider that the Project Objectives match the existing and expected future transport issues and that the Project achieves both its defined Objectives and the guiding design objectives developed by the Alliance of NZTA and KCDC. I consider that alternative options to meet the project objectives have been appropriately considered.

301 I have considered the public submissions and the Key Issues Report prepared by KCDC. From that, I have clarified and extended the proposed mitigation, including draft conditions related to transport operations. There are some areas of technical disagreement for which I welcome further discussion in witness conferencing. However, I have not identified any issues which have caused me to alter my conclusions.

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Andrew Murray
6 September 2012

LIST OF ANNEXURES

Annexure 1 – KCDC Road Hierarchy (ATE Figure 3.2)

Annexure 2 – KCDC Sustainable Transport Strategy Hierarchy (ATE appendix 32b)

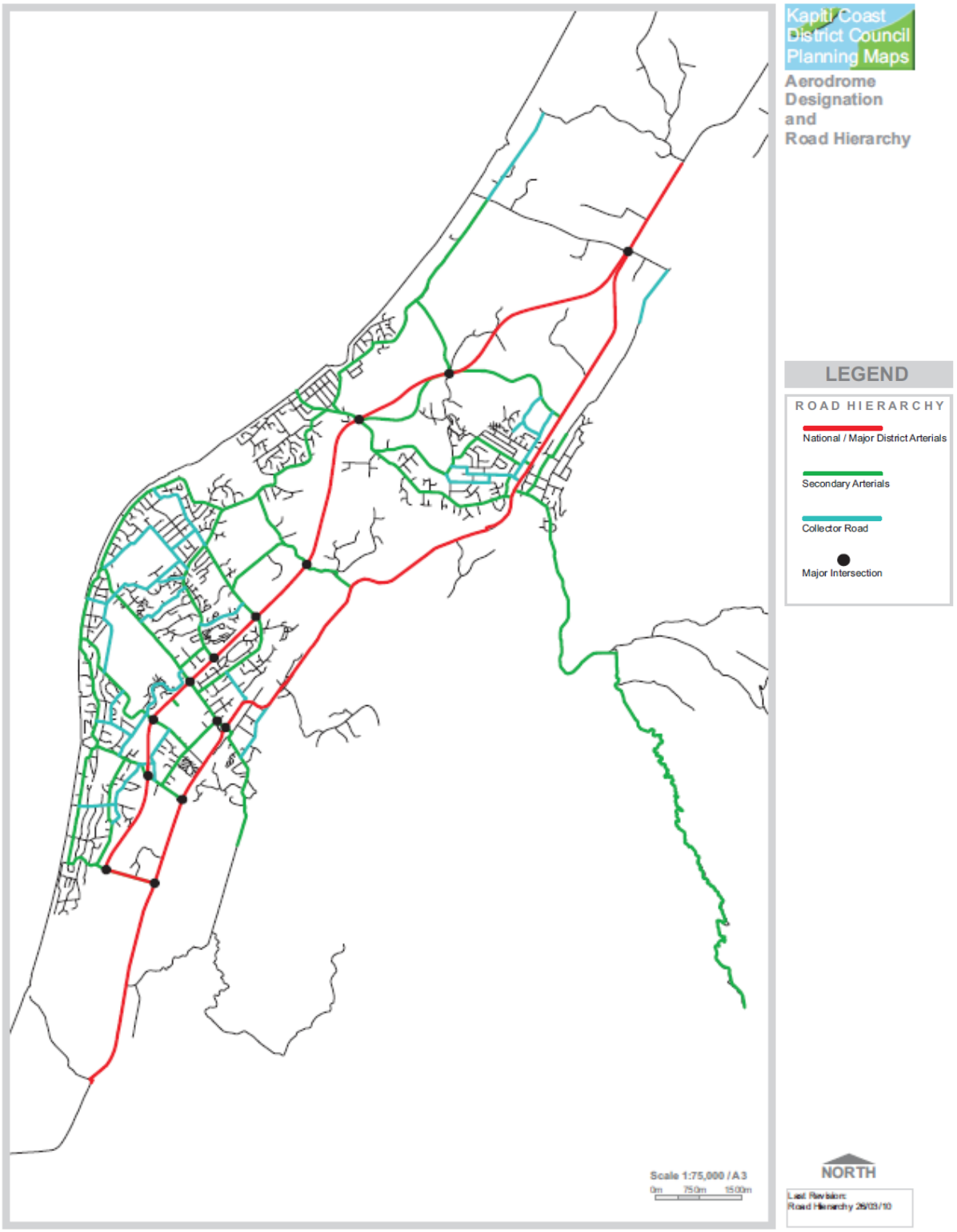
Annexure 3 – Public Transport Network (ATE Figure 3.2).

Annexure 4 – Agreed future do minimum networks (modelling report appendix 34.C, figure A3 etc).

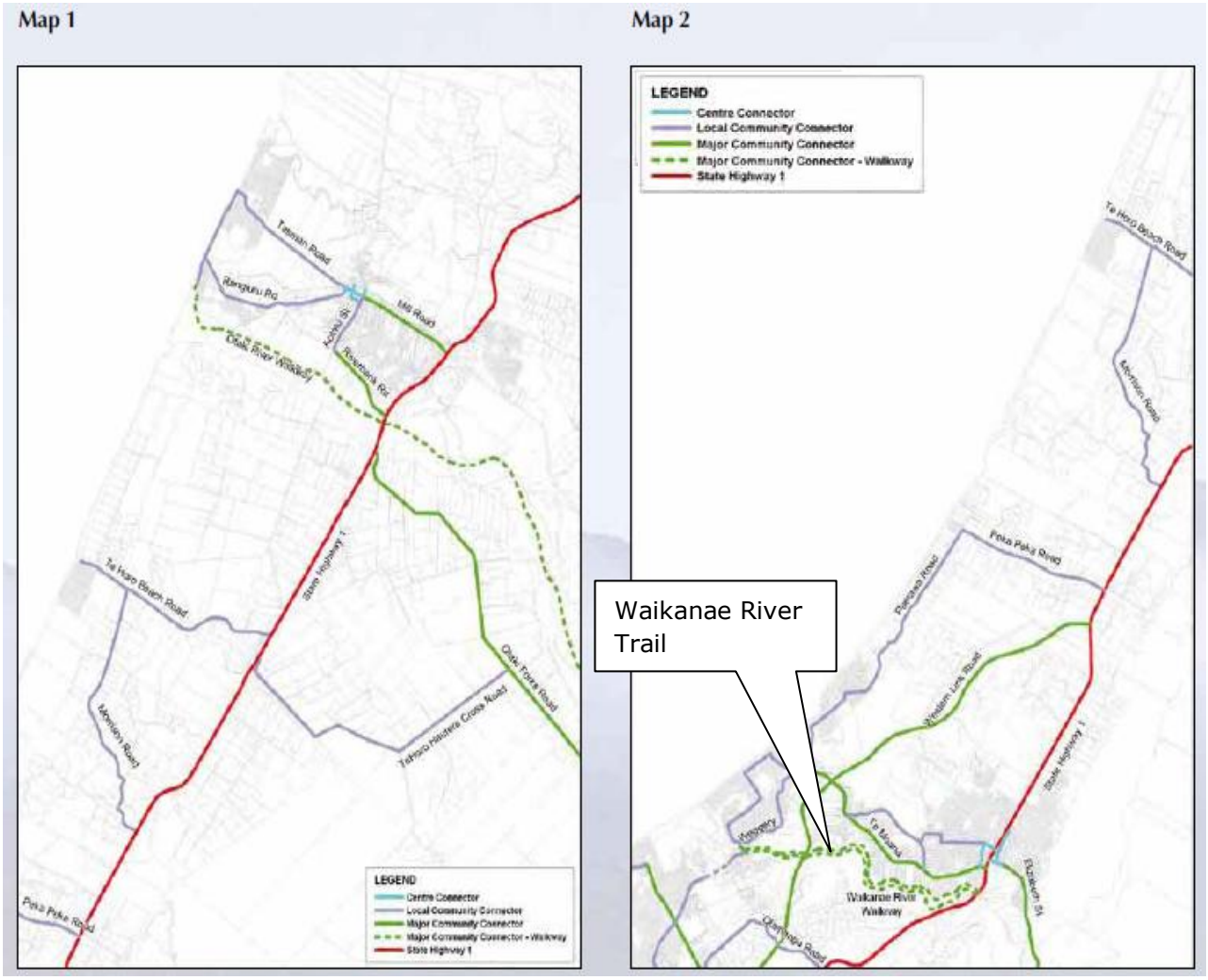
Annexure 5 – Transport-related guiding objectives for the Alliance Board

Annexure 6 – Description of crash analysis

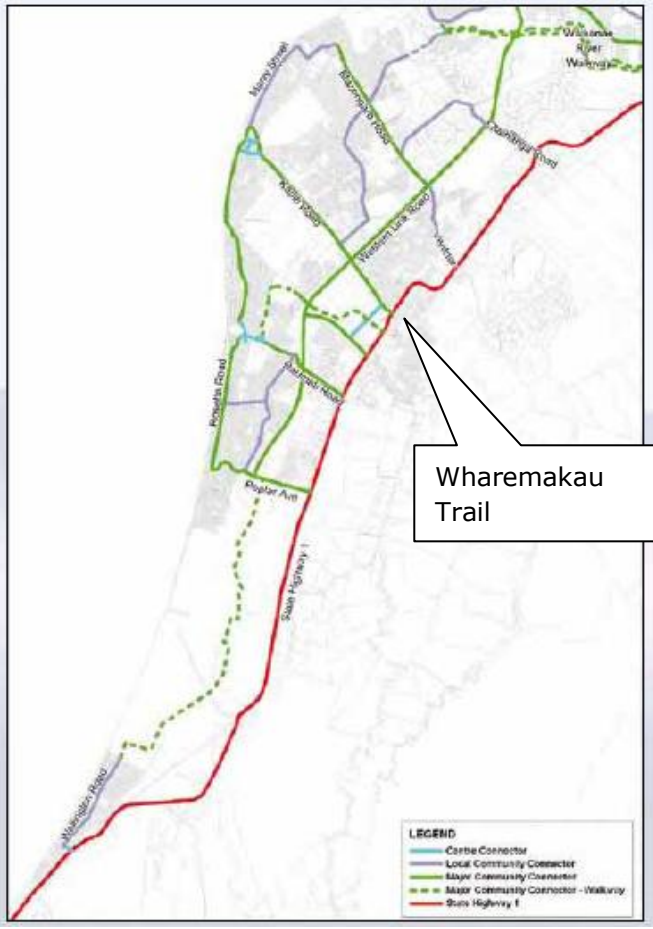
ANNEXURE 1 – KCDC ROAD HIERARCHY



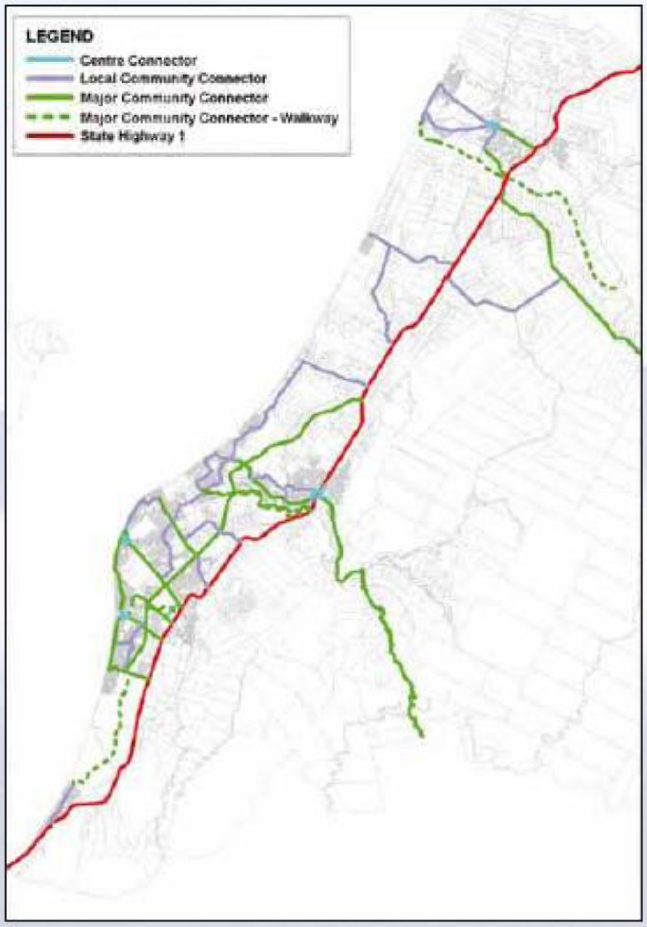
ANNEXURE 2 – KCDC SUSTAINABLE TRANSPORT STRATEGY HIERARCHY



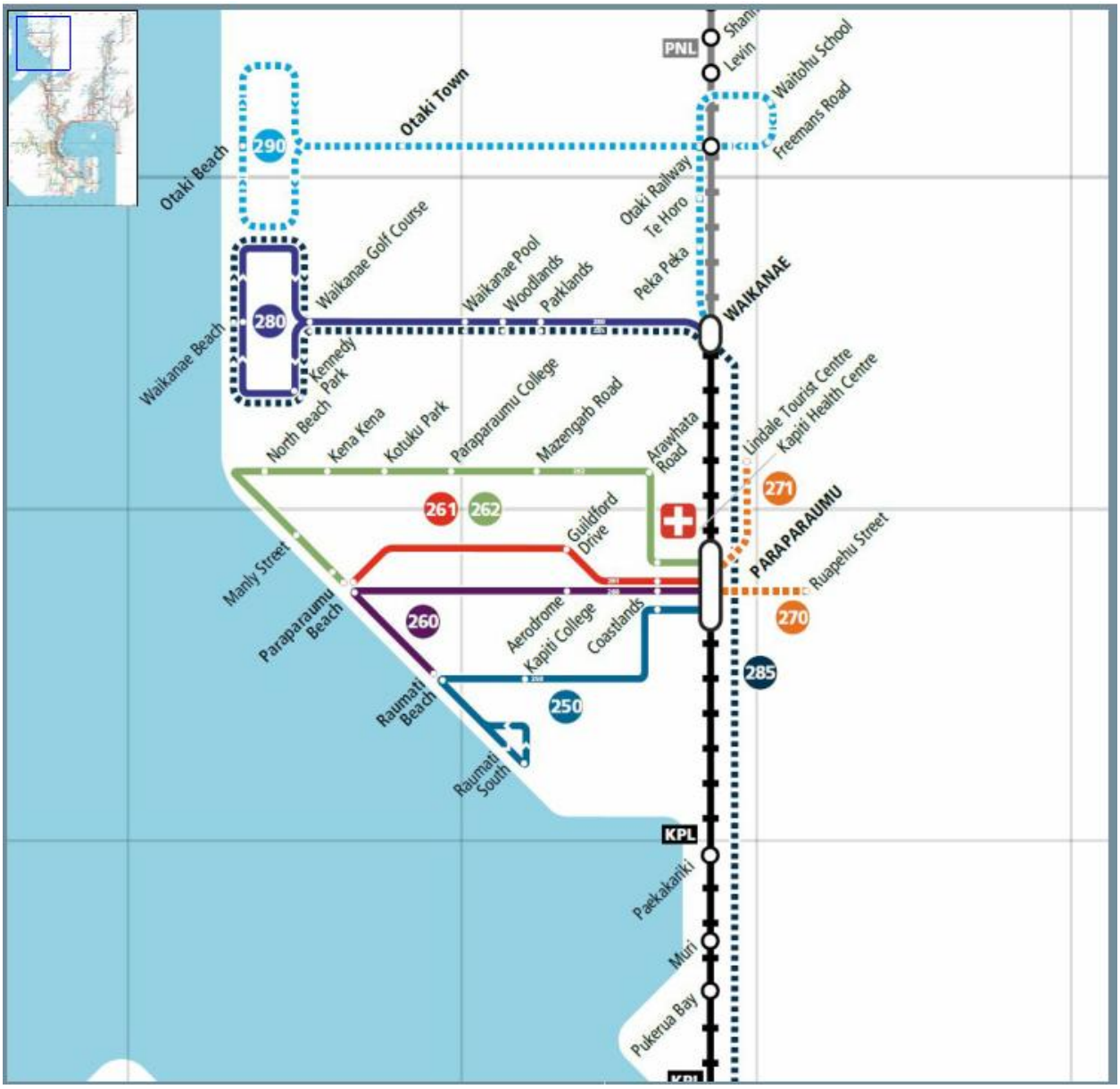
Map 3


Wharemakau Trail
LEGEND
Centre Connector
Local Community Connector
Major Community Connector
Major Community Connector - Walkway
State Highway 1

Map 4


LEGEND
Centre Connector
Local Community Connector
Major Community Connector
Major Community Connector - Walkway
State Highway 1

ANNEXURE 3 – PUBLIC TRANSPORT NETWORK



KAPITI COAST BUS ROUTES

250	Raumati South	271	Lindale Tourist Centre
260	Raumati Beach	280	Waikanae Beach
261	Paraparaumu	285	Kapiti Commuter
262	Paraparaumu North	290	Otaki Beach
270	Paraparaumu East		

TRAIN, CABLE CAR & FERRY ROUTES

KPL	Kapiti Line
PNL	Capital Connection

ANNEXURE 4 – AGREED FUTURE DO MINIMUM NETWORKS

Figure 4.1 Paraparaumu Town Centre Concept Plan

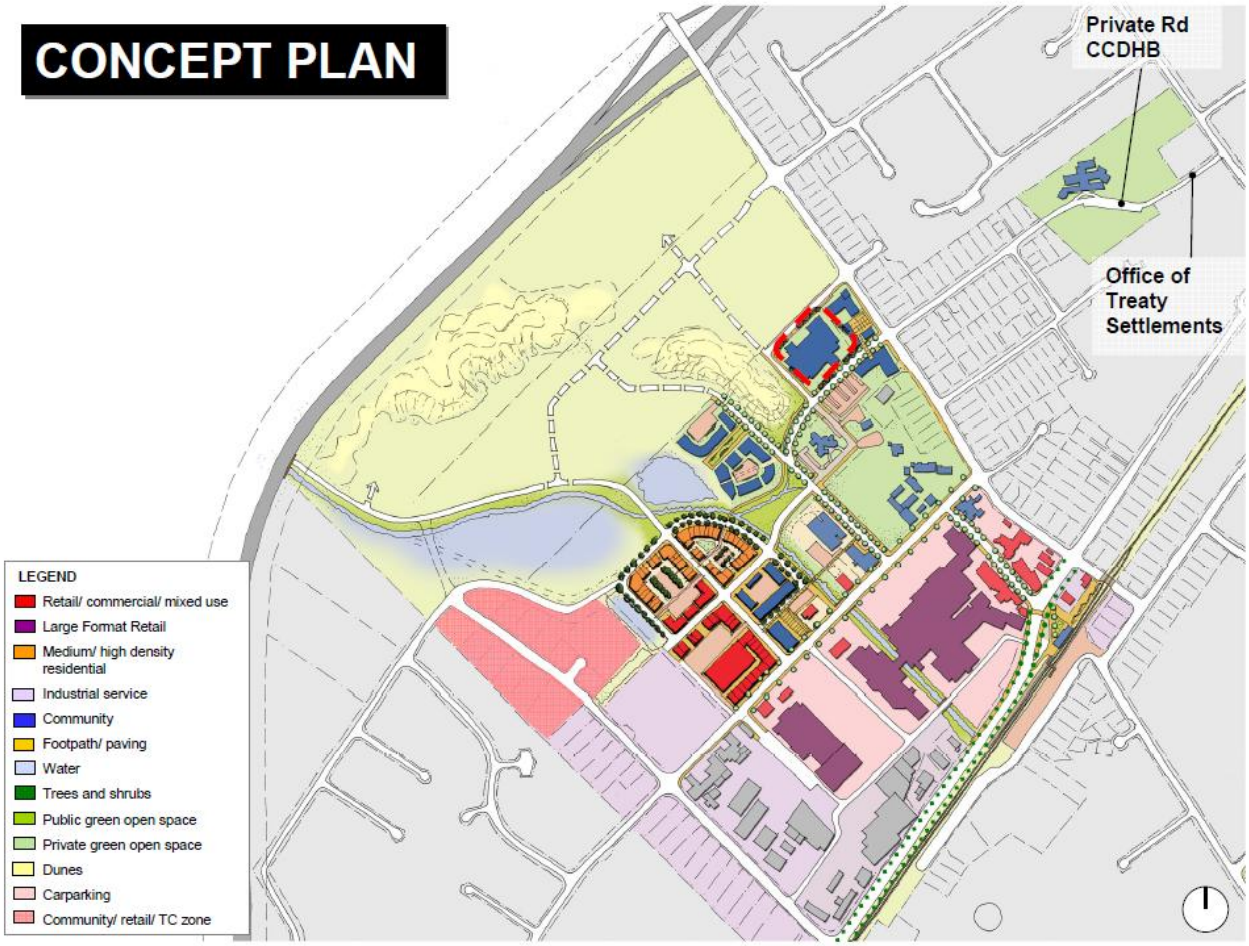


Figure 4.2 Assumed Network Changes in Paraparaumu

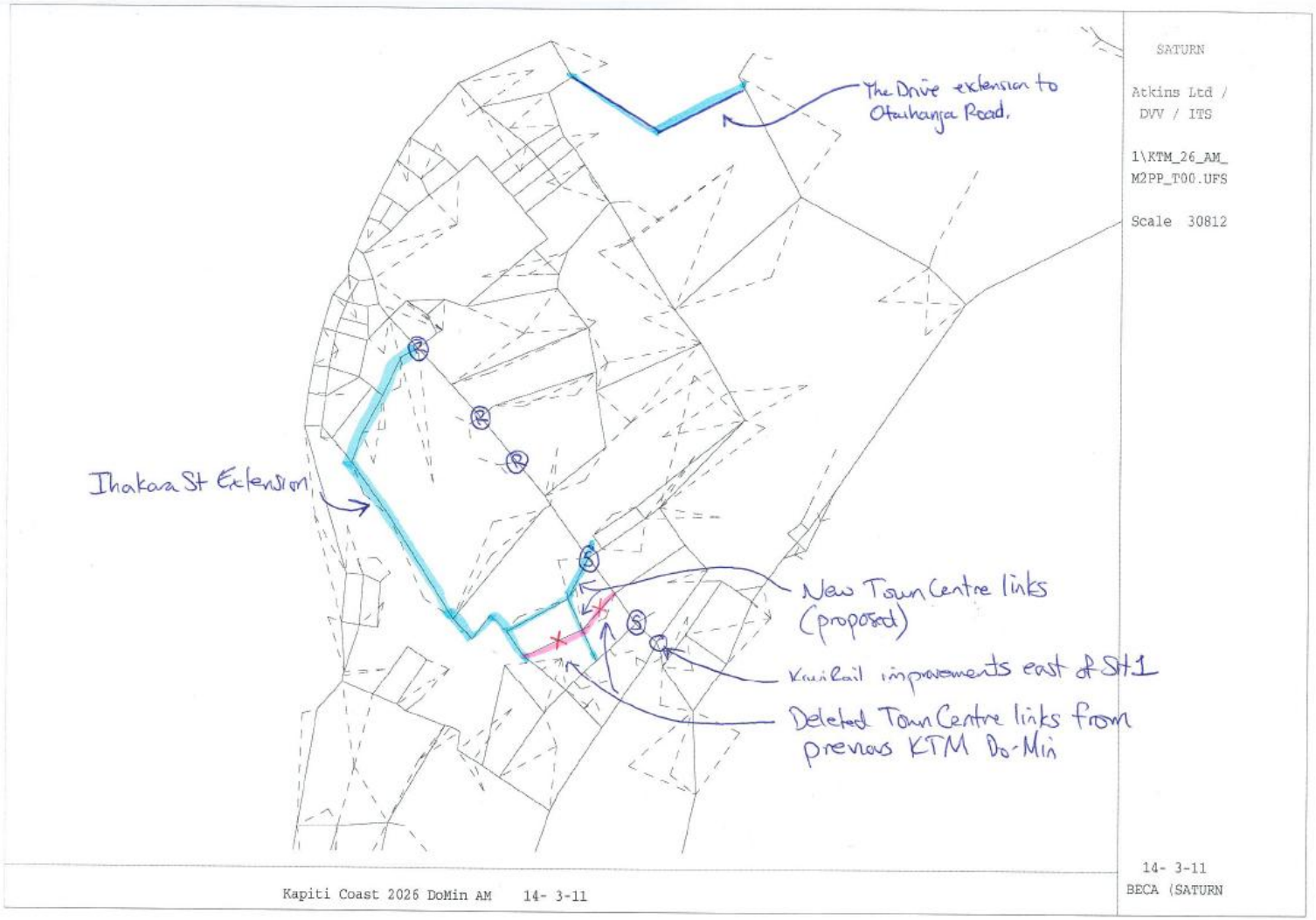
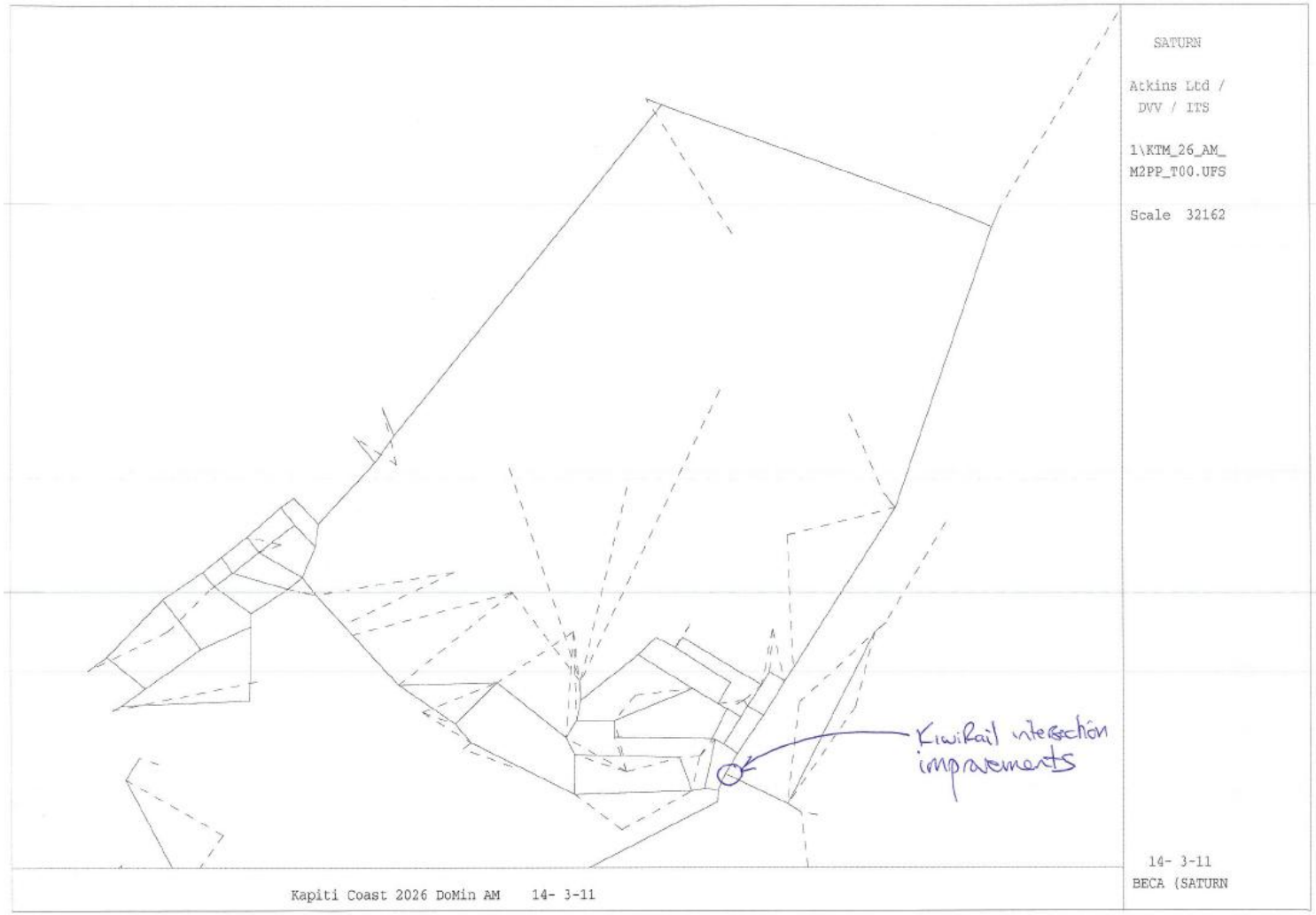


Figure 4.3 Assumed Network Changes in Waikanae



ANNEXURE 5 – TRANSPORT-RELATED GUIDING OBJECTIVES FOR THE ALLIANCE BOARD

- (3) **Levels of Service**:
  - (a) the Expressway achieves Level of Service 'B' between MacKays Crossing rail over-bridge and the location of the current intersection of Peka Peka Road and the existing SH1 [in the year 2026].
  - (b) Level of Service 'C' is achieved at the intersections between the Expressway and local network [in the year 2026].
  - (c) that the overall network operates to significantly improve travel times.
  - (d) an integrated transport network can operate in a manner which reduces congestion in Waikanae town centre and at Elizabeth Street level crossing.
- (4) **Connectivity:**
  - (a) All existing and proposed east/west local road, cyclist and pedestrian connections are to be maintained…
  - (b) The Project will maximise connectivity (including grade separated and left on/left off interchanges) to the local network consistent with the Expressway's inter-regional function.
- (5) **Resilience**:
  - (a) The Project will improve network resilience in the event of emergencies.
- (7) **Property Impacts**:
  - (a) The Project is to be designed and constructed in a way that seeks to minimise adverse impacts on adjoining and surrounding properties.
- (8) **Local Planning:**
  - (b) …the Project is to include well designed, direct access via the Expressway into and out of Paraparaumu town centre, nearby commercial areas and the airport, consistent with the Expressway's inter-regional function.

ANNEXURE 6 – DESCRIPTION OF CRASH ANALYSIS

Assessment of Expected Crash Rate on SH1:

This was undertaken by applying the crash prediction models in the NZTA Economic Evaluation Manual (EEM), using 2010 traffic flows. Separate models were applied to mid-block sections and at key intersections.

The table below summarises the actual recorded crashes and the crashes predicted from models, where it can be seen that on average, 20.4 injury crashes per year were recorded, while 16.6 crashes per year would be expected using prediction models calibrated from other NZ highways.

Assessment of Crash Cost Savings due to Expressway:

Firstly the current annual crash costs were assessed based on the recorded crash history (2006-2010) and the costs per crash included in NZTA's Economic Evaluation Manual (EEM).

For the No Project (Do Minimum) scenario, the future year crash costs were assessed by factoring up the recorded base year crash costs by the change in predicted crash rates. Those crash rates are a function of the change in traffic flows (where rates are not always linearly proportional to flows).

For the Project scenario, the same process was applied to existing roads (so crash costs again changed in proportion to the change in traffic flows), while crash prediction models were used to estimate crash costs on the new Expressway.

	ROAD SEGMENT	Class	Length (km)	Traffic Counts	Total Injury Crashes 06-10	Average Annual Crash	2010 Predicted Crash	Intersections	Total
1	**Mackays Crossing to Poplar Ave**	Rural 4 lane	3.6	23219	5	1	2.00	0.24	**2.2**
2	**Poplar Ave to Ihakara St**	Rural 3-lane	2.2	24316	15	3	1.42	0.45	**1.9**
3	**Ihakara St to Nikau Palm Rd**	Urban	2.1	24316	24	4.8	2.04	1.90	**3.9**
4	**Nikau Palm Rd to Te Moana Rd**	Rural	5.5	22628	28	5.6	3.30	0.35	**3.7**
5	**Te Moana Rd to Hemi St**	Urban	1	20235	15	3	0.83	1.38	**2.2**
6	**Hemi St to Peka Peka Rd**	Rural	3.8	20235	15	3	2.04	0.68	**2.7**
	Mackays Crossing to Peka Peka Rd		18.2		102	20.4	11.62	5.00	**16.6**

= approximate

EXISTING MID-BLOCK ANALYSIS						Parameters			
No	Mid-block Section	Length	Speed Env.		Model Type	b_0	Sadj/b1	Qo/x	AT+accide
1	Mackays Crossing to Poplar Ave	3.6	Rural		13) General motorways $ 4-lane divided rural roads AT=bo x Qo^b1 x L	3.55E-07	1.45	11,610	2.00
2	Poplar Ave to Ihakara St	2.2	Rural		11) General Rural two lane roads (>=80km/hr) AT=bo x Sadj x X	11.00	0.66	0.20	1.42
3	Ihakara St to Nikau Palm Rd	2.1	Urban		5) General urban mid-blocks (50-70km/hr) AT=bo x Qt^b1 x L	0.0001340	0.88	0.19	2.04
4	Nikau Palm Rd to Te Moana Rd	5.5	Rural		11) General Rural two lane roads (>=80km/hr) AT=bo x Sadj x X	11.00	0.66	0.45	3.30
5	Te Moana Rd to Hemi St	1	Urban		5) General urban mid-blocks (50-70km/hr) AT=bo x Qt^b1 x L	0.0001340	0.88	0.07	0.83
6	Hemi St to Peka Peka Rd	4	Rural		11) General Rural two lane roads (>=80km/hr) AT=bo x Sadj x X	11.00	0.66	0.28	2.04
								Total	11.62

INTERSECTION ANALYSIS					Model Type	Parameters			AADT		Calculated Accident Rate
No	Intersection Name	Control	Speed Limit (kmh)	Growth Rate Adj		b_0	b_1	b_2	2010		2010
									Q_{major}	Q_{minor}	
7	SH1 / Ngio St	Priority (T)	50	-3%	1) General urban cross and T intersection (50-70km/hr) AT=bo x Qmajor^b1 x Qminor^b2	5.65E-05	0.76	0.20	21,458	9,060	0.68
1	SH1 / Elizabeth St	Signal (T)	50	-3%	1) General urban cross and T intersection (50-70km/hr) AT=bo x Qmajor^b1 x Qminor^b2	1.52E-01	0.04	0.12	21,458	12,190	0.70
2	SH1 / Te Moana Rd	Signal (T)	50	-3%	1) General urban cross and T intersection (50-70km/hr) AT=bo x Qmajor^b1 x Qminor^b2	1.52E-01	0.04	0.12	21,458	8,920	0.67
3	SH1 / Otaihanga Rd 80kph	Priority (T)	80	-1%	7) General high speed cross and T intersection (>=80km/hr) AT=bo x Qmajor^b1 x Qminor^b2	4.07E-04	0.18	0.57	23,660	5,937	0.35
4	SH1 / Amohia St	Priority (T)	50	-3%	1) General urban cross and T intersection (50-70km/hr) AT=bo x Qmajor^b1 x Qminor^b2	5.65E-05	0.76	0.20	25,744	1,990	0.58
5	SH1 / Kapiti Rd	Signal (X)	50	-3%	1) General urban cross and T intersection (50-70km/hr) AT=bo x Qmajor^b1 x Qminor^b2	3.25E-03	0.46	0.14	25,744	13,660	1.32
6	SH1 / Raumati Rd	Priority (T)	100	-1%	7) General high speed cross and T intersection (>=80km/hr) AT=bo x Qmajor^b1 x Qminor^b2	4.07E-04	0.18	0.57	25,744	8,886	0.45
6.1	SH1 / Poplar Ave	Priority (T)	100	-1%	7) General high speed cross and T intersection (>=80km/hr) AT=bo x Qmajor^b1 x Qminor^b2	4.07E-04	0.18	0.57	23,000	3,000	0.24
6.2	SH1 / Peka Peka Rd	Priority (T)	100	-1%	Included as mid-block crashes below						