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# Simple guide tells transport story of developments

Guidelines aimed at assessing and mitigating the transport-related effects of proposed developments have highlighted the importance of early discussion between developers and councils and the role that sustainable transport (walking, cycling and public transport) can have in transport assessments.

From first notification to the council to completion of any transport impact assessment, the guidelines stress the importance of discussion between the parties to determine the assessment's scope and content.

The guidelines are the result of a research project funded by Land Transport NZ and undertaken during 2005 and 2006 by Beca. The project's purpose was to draw up best practice guidelines for carrying out transport impact assessments in New Zealand. Local authorities and other statutory planning authorities are required by law to consider the impact of development proposals, including in the area of transport.

Research manager Shane Turner says the guidelines are needed because current assessment of transport impacts varies significantly around the country. And in many cases, assessments are not taking into account some of the key pieces of national legislation, such as the Resource Management Act 1991 and the Land Transport Management Act 2003.

Shane says the researchers' first job was to understand international best practice, before identifying the most appropriate approach for New Zealand and then compiling a guide for use by transport professionals here.

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## Your views

**Land transport research** welcomes letters from readers. Letters should be addressed to:

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The researchers determined that what they produced should serve two main purposes:

- be a guide, for people carrying out assessments, that identifies the assessment's scope and content according to the location, type and size of the development
- be a guide, for people reviewing such assessments, that determines that the content is appropriate to the location, type and size of the development.

'We wanted to create a simple and intuitive reference guide that would serve both these roles,' says Shane. 'The best means of achieving this was to design a simple flow chart, backed up with examples and additional advice.'

He emphasises that their guide does not replace current Transit New Zealand and Auckland Regional Transport Authority guidelines in this area.

## Feeding into the decision making

The first step under the guide is for the developer and the council to decide whether a transport impact assessment is needed. The developer or their consultant should fill out a pre-application questionnaire and submit it to the council planners.

'The questionnaire informs the council on the general form, scale and location of the development. It's a good way of enabling discussion between the parties early in the resource consent process,' says Shane.

The questionnaire should include:

- the type and scale of the development
- the floor area or number of residential units
- the number of staff for retail or food and beverage developments
- peak periods of trip generation
- parking provision
- the types of vehicles involved with the site.

Another ingredient crucial to the scoping mix is the impact of the development on the wider transport network, particularly on road links and intersections that are approaching capacity, on peak traffic flow periods, and on the role public transport can have on reducing these impacts.

Shane says thresholds that trigger various levels of detailed assessment need to be developed. He says thresholds will vary depending on the land use type of the development and in different towns and cities.

**'It's a good way of enabling discussion between the parties early in the resource consent process'**



While the number of dwelling units is likely to be used for threshold limits for residential developments, most others will be assessed against their gross floor area. The number of car parking spaces is also a threshold, regardless of land use.

'These thresholds will be a guideline only and will not replace discussion between developers and the council. Each development will be assessed on its merits to account for the individual nature of each site location and the local transport network.'

'The questionnaire and the thresholds will inform the scope of the assessment, but the council will decide if an assessment is required and, if so, the level of detail it should contain. The council should determine the assessment's scope through discussion with the developer.'

## **From basic to wide area – the guide has it covered**

The council will decide on one of four levels of detail for a transport impact assessment:

- **basic** – the proposed development will have a negligible transport impact
- **neighbourhood** – the proposed development will have a minor transport impact over the local transport network
- **local area** – the proposed development will have a significant transport impact over the local transport network
- **wide area** – the proposed development will have a significant transport impact over the wider transport network.

Depending on the level, some or all of the following inputs will be required:

- details of the proposed development
- current site and transport data
- details of development already committed to in the area
- policies relevant to the area
- trip generation data
- details of sustainable travel initiatives
- infrastructure capacity testing and mitigation.

The guide provides a checklist of inputs to each level of the assessment, ranging from four items on the basic checklist to 41 under the wide-area level. It also contains a flow chart of the overall process (see page 4).

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A literature review undertaken as part of developing the transport impact guidelines suggests New Zealand's lack of national guidelines may be limiting opportunities for sustainable development.

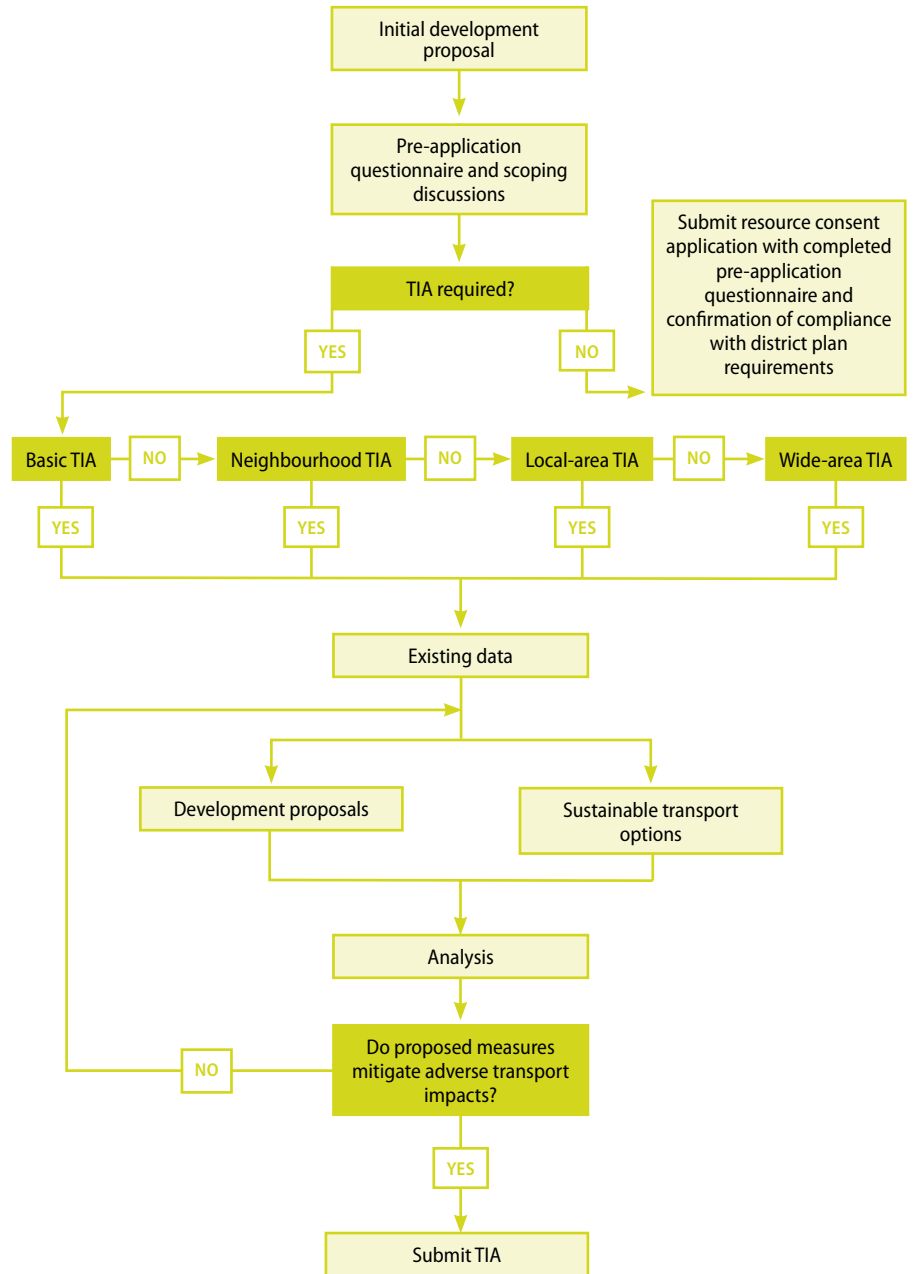
The report summarising the review says that, where there are guidelines, they do not appear to sufficiently promote the need to consider the sustainability of developments.

It includes a comparison of best practice in New Zealand and internationally, and assesses the pros and cons of each approach.

The report says sustainable development is a key aspect of the planning process elsewhere, such as in Hong Kong and the United Kingdom.

In developing the transport impact guidelines for use here, the New Zealand researchers included travel plans and access by sustainable means of travel in development planning – aspects well promoted in England and Scotland.

### Process for preparing transport impact assessments (TIAs)



### Contact for more information

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*Transport impact guidelines for site development*, Land Transport NZ research report 327 (part I) and literature review (part II), \$30.00.

See page 12 for details about buying reports.

The basic level means that only a minimal amount of information is required and no transport impact assessment is needed for the resource consent application.

At the neighbourhood and local-area levels, the geographical scope is likely to extend no further than a few hundred metres from the site (for the neighbourhood level) or up to a kilometre from the site (for the local-area level). These assessments will mostly be required when the predicted trips generated by the development exceed a council-set threshold.

The wide-area assessment is the probable option when the transport impact will cover an extensive area; it is the most appropriate for large mixed-use or retail developments. It requires extra information such as sustainable travel initiatives to reduce single-occupancy car travel, details of any special events and the proposed phasing of the development.

Sustainability is also a factor in the local-area level of a transport impact assessment.

# Park-and-ride convenience overrides short walks to station

The factors that influence park-and-ride users reveal implications for efforts to encourage that most basic of human travel choices – putting one foot in front of the other.



The convenience of park-and-ride facilities prompts drivers who live a short distance from public transport to choose a car trip to the station over walking there, according to research funded by Land Transport NZ.

Dr Darren Walton of Opus Central Laboratories, who led the research, says park-and-rides were introduced to encourage people to use public transport, but in practice they appeared to be having an unintended effect.

'These facilities prompt public transport trips and reduce congestion so they seem appropriately beneficial,' he says. 'However, they also seem to reduce potential walking trips because they provide a convenient opportunity to undertake the journey by car.'

The research findings present a challenge to transport policy analysts – how to make park-and-rides less convenient for people who live less than 1 km away and could walk.

Suggestions discussed in the research report include:

- locating park-and-rides 200–300 m farther from train stations

- introducing a ticketing system to prevent people living within 1 km of stations from using park-and-rides on a regular basis
- introducing a parking charge
- putting up signs that park-and-rides are not intended for regular use by people who live close.

A survey undertaken as part of the research showed there were four factors that best predict whether someone will walk or drive to the station. The influence of park-and-ride facilities features in two of them.

The factors are:

- the belief that park-and-rides provide convenience
- the belief that park-and-rides are appropriately used by people who live close
- the weather (sunshine or rain)
- the availability of a car.

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## The studies

Carried out in 2005, the research comprised two studies into supposed impediments to walking. Its objective was to identify factors affecting walking as a travel choice for short trips.

The type of walking investigated was to and from a train station, known as the 'access sub-mode' of walking.

The main study involved surveying and comparing the attitudes and behaviour of commuters who walk to and from train stations, and those who live less than 1 km from the stations and use free park-and-ride facilities. The survey was conducted in two cities (Auckland and Wellington) using a sample of 110 drivers and 238 walkers.

A secondary study observed the use of the park-and-ride facilities over five consecutive days – twice in summer and twice in winter.

The park-and-riders provided a 'unique, natural experiment to reveal real impediments to walking,' explains Dr Walton.

He says this group demonstrated an irregular break in their dependence on cars by driving to the station to use public transport. The key question was: why drive there, instead of walking?

'Understanding the factors that encourage these commuters to start their journeys by car provides insights into genuine impediments to walking.'

## The findings

- Distance is not a significant consideration. People perceive 820 m as a reasonable walking distance to the station, a trip they expect to do in 9–10 minutes. This perception is the same for those who walk and those who drive.
- In this study, the impediments to walking found in research elsewhere almost all disappear. This includes such factors as time, distance, the need to carry things, fatigue, parking charges, fear of crime, or even geography (eg hills to climb).
- The exceptions to the above are two aspects of weather – sunshine and rain. Fine weather encourages people's decisions to walk; rain influences their choice to drive.
- The convenience of the car, when there is an opportunity to park for free in a monitored facility, prompts those who might otherwise walk 1 km to the station to do the trip by car instead.

Dr Walton says the presence of a car is a major contributing factor that distinguishes the walkers from the drivers. Each additional car in a household reduces the likelihood of walking by about 50 percent.

'Our findings support the literature that suggests the convenience of the car is the dominant factor impeding walking when considered as an access sub-mode,' he says.

## Ways of walking need serious study

Encouraging walking is strategically important. It reduces congestion and reliance on vehicles, improves public health and underpins sustainable transport.

However, despite recognition of this importance, particularly to travel using various means of transport, there appears to be a worldwide decline in walking trips.

In Britain, walking trips declined by 16 percent between 1995–1997 and 2005, with similar trends in the United States. In New Zealand, it is estimated that walking to other means of transport has dropped from 21.2 percent of all walking trips in 1990 to 14.8 percent in 2004.

Dr Walton says, 'If policy is to be directed towards improving the rate of walking, it should be broken into the four classifications of walking, and each supported by research that captures the complexities and interrelationships between travel modes and travel choices.'

The research report's first recommendation is to separate the four different types of walking and investigate each fully.

The four types are:

- access mode, eg walking to work
- access sub-mode, eg walking to public transport (which was the subject of the research report)
- leisure/recreation
- circulation/exchange, eg walking around a shopping mall.

Dr Walton says that, although walking seems simple, the range of influences on what motivates people to walk, particularly in relation to alternative choices, makes its study complex.

'Walking is not a separate activity to be marginalised ... but an essential component to all other modes of transport and our emphasis on understanding the influences on it needs serious attention.'

The full report goes into more detail about walking research methods and the findings of previous research and discusses whether this study could be extended to other modes of walking.

## The recommendations

The report contains three recommendations arising from the research findings:

- improve definitions and research methods around the different types of walking (see the panel above)
- establish a mechanism to make park-and-rides less convenient to drivers who can walk and who live less than 1 km from the facilities
- provide better rain shelters and covered walkways, where possible.

Dr Walton says more than 90 percent of the survey respondents continue their journey by walking after using public transport.

'It is reasonable to suppose that the quality of the waiting cover that is offered in a CBD by covered walkways and verandas assists walkers, and better protection will encourage both walking and the uptake of public transport.'

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*Impediments to walking as a mode choice*,  
Land Transport NZ research report 329,  
\$20.00.

See page 12 for details about buying reports.

# Lining up the case for more roads with rumble strips

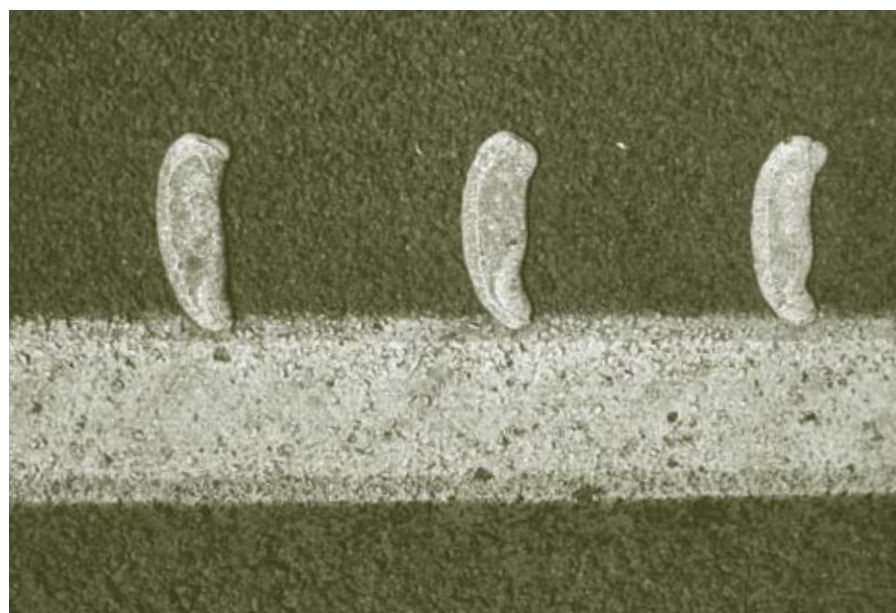
New research shows that significant safety benefits from marking more New Zealand roads with rumble strips could outweigh the costs.

A rumble strip is the common term for audio tactile profiled – or ATP – road markings. These special features are designed to prevent drivers from running off the road or straying across the centre line, because the markings can be heard and felt as car wheels go over them.

With safety benefits and durability that outstrip standard paint, such materials are being used increasingly in New Zealand as part of efforts to increase safety on our roads.

However, rumble strips currently tend to be laid where there is an obvious history of crashes resulting in injury.

What the new research funded by Land Transport NZ suggests is that there may be the potential for a larger proportion of our rural roads to have safety measures such as ATP road markings. It would also bring more consistency to our country's road network.



## Getting the ratio right

The research project, led by Hamish Mackie and Peter Baas of TERNZ Ltd, was set up to look at the cost effectiveness of these safety measures.

Says Hamish, 'Materials such as ATP thermoplastic and cold applied plastic are more expensive to install than conventional flat lines. This leads to a trade-off between cost and safety.'

'However, the longer life of these products makes them potentially more cost effective, and profiled treatments offer safety benefits through a reduced number of injury accidents.'

The research project developed a cost management tool to help road controlling authorities make decisions about delineation, or the way in which they mark lines such as edge lines and 'no overtaking' centre lines on roads.

The spreadsheet-based tool is designed to help authorities, such as Transit New Zealand, to prioritise markings with added safety benefits compared with standard road markings.

It calculates a benefit/cost ratio for a given road segment (which can accommodate rural mid-block, curve and bridge road environments). The ratio is based on road parameters, details of the delineation improvements and a crash reduction factor based on those improvements.

As part of the research, the tool was applied to a range of road-marking situations.



Source: Highway Systems Ltd

**'Our report recommends that these road markings be installed on a much more widespread basis ...'**

In general, the tool demonstrates favourable benefit/cost ratios for ATP markings on roads with relatively modest traffic counts, and much higher ratios from higher traffic counts. A typical mid-block application of edge lines and 'no overtaking' centre lines in ATP materials resulted in a ratio greater than one at about 1300 vehicles a day. A typical section of New Zealand rural road that contains straights, curves and the odd bridge treated with ATP markings would result in a benefit/cost of approximately 6 to 1 using current road-marking costs.

## Making a mark on more roads

Hamish says, 'It would appear that audio tactile road markings provide significant safety benefits that outweigh the treatment costs even at relatively low traffic volumes. Our report recommends that these road markings be installed on a much more widespread basis where road conditions allow, and policy changes should reflect this.'

Rumble strips could be installed immediately where there was a significant road shoulder and little chance of residents being affected by the noise.

However, Hamish adds that more research is being carried out to determine whether rumble strips are appropriate in some situations, such as where there is little sealed shoulder or where cyclists use the road a lot.

The report also recommends more structured research on the safety benefits of ATP and other road markings. This would make estimates of the benefits more accurate, as they are currently based on North American studies, with different road environments, and informal New Zealand case studies. The researchers had a limited number of analyses to work with involving New Zealand crashes when it came to evaluating the safety benefits of rumble strips. However, Hamish says the New Zealand results were in line with overseas literature and provided a degree of validation for the cost management tool the researchers developed.

'The capability of the cost management tool we have developed will evolve as further information about the safety benefits of other road markings becomes available,' says Hamish.

'Of particular interest will be information about products that don't have audio tactile response but excellent wet-night retroreflectivity. This is very relevant, as conventional road markings perform poorly on wet nights and this problem is becoming increasingly important for road controlling authorities.'

Retroreflectivity refers to the property of a material to redirect light back towards its source, and is critical for night-time driving.

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Source: John Edgar



Source: John Edgar

## Case study – Piarere to Desert Road

A study of the effects of ATP and double yellow 'no overtaking' road markings on driver behaviour within the SWATT (South Waikato and Taupo target 2010 remediation treatments) area has been completed by Samuel Charlton at Waikato University.

ATP road markings and other treatments were systematically installed at various sites in response to high crash rates on State Highway 1 between Piarere (near the State Highway 29 intersection) and the Desert Road summit.

The two key problems identified on this section were drivers losing control and failing to stay on the road, and a high incidence of head-on crashes and drivers crossing centre lines.

As the new road markings were progressively introduced throughout 2005 and 2006, drivers' lane-keeping, speeds and overtaking were monitored at five sites.

Results showed that the 'no overtaking' lines eliminated overtaking at the monitored sites. ATP edge lines and centre lines significantly reduced the number of vehicles whose wheels went over lane lines, and eliminated centre-line crossing at sites where it had happened most.

Hamish says, 'The results suggest that ATP and "no overtaking" centre lines may contribute significantly to reducing the crashes that have been occurring within the study area and possibly on the wider New Zealand road network.'

However, he adds that crash data from before and after the markings were installed would need to be evaluated to verify this.

## Are our state highways ready to rumble?

About 70 percent of New Zealand's state highways would qualify for some degree of ATP marking, according to the new management tool researchers developed to assess cost effectiveness.

The exercise was carried out to estimate the extent to which the highway network might be upgraded to include rumble strips, based on an analysis of the benefit/cost ratio. Researchers acknowledge that, in reality, a proportion of the network would not be suitable for the markings, because of intersections, driveways and people living nearby.

Using Transit New Zealand data, the researchers were able to estimate the proportion of the network that has a given annual average daily traffic (AADT) count. The table below shows the proportions of the network that might qualify for upgrading to ATP lines using benefit/cost ratios of 1.0 and 4.0.

Hamish Mackie says more of our state highways could have rumble strips applied immediately, where the road environment allowed.

'Using this approximation, it is clear there would be a net benefit in treating a substantial amount of the state highway network with ATP road markings. Even if a benefit/cost ratio of 4.0 was used as minimum criteria for treatment, 70 percent of the network would qualify for some degree of ATP treatment.'

It is estimated that no more than about 300–500 km (about 3–5 percent) of New Zealand state highways have been marked with rumble strips.

### Approximate percentage of the state highway network that could be treated with ATP lines (as per the specifications in figure 3.1 of the report) at BCRs of 1.0 and 4.0

	BCR > 1.0	BCR > 4.0
Treat all	70% (>1300 AADT)	26% (>5000 AADT)
Treat curves	21% (>600 AADT)	44% (>2200 AADT)
Don't treat	9% (<600 AADT)	30% (<2200 AADT)

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*The cost effectiveness of delineation improvements for safety*, Land Transport NZ research report 322, \$20.00.

See page 12 for details about buying reports.

# New research publications

## **Road surface effects on traffic noise: stage 3 – selected bituminous mixes**

Research report 326

Vince Dravitzki and Igor Kvatch, Opus International Consultants Ltd  
Freely available online at [www.landtransport.govt.nz/research](http://www.landtransport.govt.nz/research)  
\$20.00

The noise from road traffic affects large numbers of people living in the vicinity of state highways and arterial roads. An increasingly important aspect of developing traffic noise reduction measures is the definition of 'quiet' road surface types and their application in affected areas. This research, undertaken in 2004–2005, identifies the noise effect that different low macro-texture bituminous mix road surfaces, such as asphaltic concrete, slurry seal, open-graded asphalt and stone mastic asphalt, have on road traffic noise at urban driving speeds and at open road speeds.

Significant noise variations, of the order of 2–3 dBA, could occur between different bituminous mix road surfaces within the same generic type. While noise reductions as small as 1–2 dBA were previously regarded as too small to be significant, it appears that such reductions could actually be of considerable benefit to the community living adjacent to busy urban roads.

Selecting a quieter road surface type when resealing can be a highly effective measure if roading engineers wish to reduce traffic noise.

## **Commercial vehicle usage and forecasting: stage 2 – national freight traffic**

Research report 330

L Jewell, F O'Riley and W Wallace, Opus International Consultants;  
A Stroombergen, Infometrics Ltd  
Freely available online at [www.landtransport.govt.nz/research](http://www.landtransport.govt.nz/research)  
\$50.00

This report presents the findings of the second stage of research looking at regional transport modelling and long-term road planning. The research aimed to define the amount of commercial traffic on the major highways in New Zealand, giving trip numbers at the boundaries of each region and the likely destination and routes taken by these trips within the region.

Stage 1 was completed in February 2002. Stage 2 was broken down into two parts, which were completed in the 2004/2005 and 2006/2007 research programmes.

The stage 2 research can be broken down into five major components of work:

- literature review and New Zealand freight overview
- input-output analysis model
- SATURN traffic model
- gravity model
- model comparisons and recommendations.

The three models are essentially three ways of looking at the same problem. Three matrices were derived from each model, giving a robust approach and a means of calibrating the results.

The goal of this research project is to look at the potential methods for creating a national freight model, and to make recommendations on how these methods can be used either singly or in combination to create a robust national freight model.

## **Impacts of fuel price changes on New Zealand transport**

Research report 331

David Kennedy and Ian Wallis, Booz Allen Hamilton (NZ) Ltd  
Freely available online at [www.landtransport.govt.nz/research](http://www.landtransport.govt.nz/research)  
\$40.00

The impacts of petrol price changes on petrol consumption, traffic volume and public transport patronage in New Zealand are discussed. Based on this evidence and that from Australia and other countries, a set of 'best estimate' petrol price elasticities for the New Zealand context, of –0.15 for the short run and of –0.20 for the medium run, are recommended.

Transport fuel prices in New Zealand (as in other countries) have varied quite dramatically over the last five years. Knowledge of the likely market responses to fuel price changes is important for transport forecasting applications, such as those for:

- government taxation revenues
- fuel import demands, and consequent impacts of fuel imports on related macroeconomic variables
- transport demand and its associated energy demand
- transport emissions, including the impact of climate change policies
- traffic growth trends, for use in road investment planning and evaluation
- public transport planning, particularly in regard to future peak demand levels and hence rolling stock requirements.

Applications and implications of the impacts of petrol price changes on modelling, policy making and further research are made.

## **Total voids in unbound granular pavements**

Research report 332

Frank G Bartley, Bartley Consultants Ltd  
Freely available online at [www.landtransport.govt.nz/research](http://www.landtransport.govt.nz/research)  
\$45.00

In New Zealand, excessive deformation in the wheel paths due to post-construction densification has occurred in a number of new pavements constructed in recent years. It is believed that much of the deformation could be avoided if the aggregate layers were to be compacted to a high level of density prior to the road being opened to traffic.

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This research project was designed to explore the factors that control the density of unbound granular aggregate and the influence that particle size distribution has on the density, on the compaction process and on the subsequent performance of a pavement. It was carried out in the period between 2004 and 2007.

The results show that it is practical to produce base course with a dense grading by blending the normal quarry product with crusher dust or sand. Full-scale trials showed that dense-graded base course could be compacted to a total voids content of less than 15 percent and that the mean depth of ruts after 12 months trafficking was less than 5 mm.

### **Integrating land use and transport planning**

Research report 333

M Ward and J Wilson, Ward-Wilson Research; J Dixon, University of Auckland; B Sadler, EA Worldwide (UK)

Freely available online at [www.landtransport.govt.nz/research](http://www.landtransport.govt.nz/research)  
\$25.00

Over the last decade, the integration of land use and transport has gained increasing international attention. This trend has been necessitated by the growing environmental and social impacts of road networks and motor vehicle use. These impacts are widely seen as being exacerbated by a lack of integration between land use and transport planning.

This report examines potential legal and institutional barriers to the integration of land use and transport planning in New Zealand. It provides an analysis of key planning instruments and practices in relation to the Resource Management Act 1991, Land Transport Act 1998, Land Transport Management Act 2003 and Local Government Act 2002. It also reviews overseas experience to identify key characteristics of effective integration that support sustainable transport outcomes. Drawing on international experience, recommendations are presented for improving New Zealand's land use and transport planning arrangements to facilitate integration. The research undertaken for the report was carried out between July 2006 and August 2007.

## **Obtaining research publications**

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## **Land transport research**

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