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Making the case for bumpy lines

Research into audio tactile profiled road markings (or rumble strips) has opened the way for their more extensive use and created a significant opportunity to improve the safety of New Zealand roads.

We all know that uncomfortable (and noisy) bumpy feeling when we veer too far to the left (or right) on certain roads.

Audio tactile profiled (ATP) road markings, or rumble strips as they are more commonly known, have been used on selected roads in New Zealand for a number of years. A 2007 research project[1], however, found that making greater use of ATP road markings, in a wider range of traffic and roadway situations, offered a cost-effective way to reduce crashes. The report suggested that ATP road markings could be used on up to 70 percent of New Zealand's highways, a vast increase from the estimated 3 to 5 percent that currently have some form of ATP marking.

To follow up the report, Land Transport New Zealand commissioned a second project to investigate possible impediments to the wider use of ATP road markings and to consider whether existing guidelines for ATP road marking use needed to be reviewed.

Researcher Peter Baas of Ternz states that the report's purpose was to help in developing best-practice guidelines for ATP road markings, by tapping into and gathering together the collective experience of road practitioners.

'The initial stage of the project involved a discussion paper containing 20 main issues, which was subsequently discussed at workshops with road users, central and local government road owners and providers, road marking contractors and suppliers, highway and road safety managers, researchers and consultants.'

1 Mackie, H.W., & Baas, P.H. 2007. The cost effectiveness of delineation improvements for safety. *Land Transport New Zealand Research Report 322*. Wellington: Land Transport New Zealand.

'As a result the report represents the current body of industry knowledge, best practice and technology for what is essentially a relatively new road safety treatment. We anticipate that this knowledge will continue to evolve, but in the meantime it is available for informing standards, guidelines and other procedures so that ATP road markings can be put to the best possible use.'

Getting to grips with the issues

At present, how and where ATP road markings are used varies from place to place. In addition, road practitioners hold varying opinions on some of the issues connected with this use. The concern is that uncertainty and variation will limit the uptake of ATP road marking technology, or may lead to markings being used in less than optimal situations or ways.

Gathering together, and enabling industry discussion on, the issues was a crucial first step for the research project. Twenty main issues were identified for review (which, during discussions, naturally amalgamated into 18). These were arranged into three loosely related areas: strategic and funding related issues; road user issues; and standards and installation issues.

Strategic and funding issues:

- Continuous versus isolated ATP road marking treatments.
- Threshold traffic volumes for ATP installations and installation at new road works and upgrades.
- Processes for approval and funding of ATP installations.
- The cost of ATP installation and maintenance.
- Increasing the use of ATP installations on local government owned roads.
- Product selection, performance and maintenance.

Road user issues:

- Effects on vehicles and steering.
- Considerations concerning cyclists.
- Considerations concerning motorcyclists.
- Considerations concerning heavy vehicles.
- Environmental noise generation.
- Publicity and communications.

Standards and installation issues:

- Shoulder and lane width.
- Reflective performance.
- Additional uses for ATP markings.
- Snow conditions.
- Motorways.
- Standards and specifications.

Following industry consultation, conclusions were developed for each issue and included in the report.

In a number of cases the consultation found that existing practice was appropriate, or that current provisions could be endorsed with only minor changes or clarifications.

In other areas, it was agreed that significant changes in policy or standards were necessary.

The overall outcome was strong agreement that use of ATP road markings should be substantially increased, in particular on state highways. Participants were unanimous in the view that ATP road markings should be used as a continuous treatment along significant lengths of road (rather than in short or spot treatments, which is the more common usage at present), in order to build a consistently safe road environment.

Participants were also unanimous in the view that each potential ATP road marking installation should remain subject to economic evaluation on a case-by-case basis (rather than being applied automatically to roads with certain traffic volumes or of certain types, as was alternatively proposed). This should include a comparison between ATP markings and other available road delineation techniques.

Peter Baas explains, 'Having discussed the issues, we recommended that, as is the case at present, each ATP road marking installation should remain subject to an appropriate cost-benefit evaluation and to technical assessment procedures'.

'In the earlier report, we had already developed an economic evaluation tool for making this assessment and it was agreed that this tool remained appropriate, with minor updating and enhancement.

What are ATPs

Audio tactile profiled (ATP) road markings are a type of long-life road marking product that have raised ribs running perpendicular to the strip's longitudinal direction. If a vehicle's tyre runs over an ATP road marking it provides a tactile and audible warning to the driver, making them less likely to leave the traffic lane unintentionally. In addition, the raised ribs can make the line more visible to drivers in wet conditions.

ATP road markings are usually made of either thermoplastic or poly methyl methacrylate (commonly known as cold applied plastic), and ribs can either stand alone or be placed with an interconnecting line of the same material. Another option is for the ribs to be placed, then a painted line sprayed alongside or over the top of them.

All long-life road marking products have particular performance characteristics making them best suited to certain applications. With ATP road markings, the driver stimulus provided is considered especially useful for managing driver fatigue and for reducing driver inattention.

At present ATP road markings are most commonly used for marking centrelines, edge lines and lane lines. Short lengths have also been used for separating traffic travelling in the same direction as vehicles approach or depart from intersections, and for diverge and merge areas on motorways.

Selecting a road marking product for a particular installation requires practitioners to take into account the characteristics of the highway in question and what drivers require to help them stay safe. The distinctive performance characteristics and established road safety benefits of ATP road markings, however, strongly support a general increase in their use.

The tool basically enables users to calculate a benefit/cost ratio for a given road segment, taking into account road parameters, details of the proposed delineation improvements, and a crash reduction factor.'

Other conclusions included:

- Agreement that ATP treatments on local-government-controlled roads should meet the same technical standards as those on state highways.
- Recommendations for amending existing standards for road delineation treatments so that they comply with current best practice.
- Guidance on addressing potential noise nuisance.
- Suggestions for further research into the needs of cyclists.
- Caution about the use of ATP road markings in situations where vehicles will purposefully need to traverse them.

Seven recommendations were put forward in the report based on the conclusions.

Peter Baas says, 'Implementing the results in the report will help to improve the safety of the road environment by encouraging the use of ATP road markings where this is appropriate, and enabling that use to be more uniform and consistent'.

'Although installing and maintaining ATP products is likely to remain more expensive that other types of long-life road markings, we anticipate that the cost differential will reduce as their use increases. By paying careful attention to installation details and technical specifications, users should be able to achieve a positive trade off between cost and safety results.'

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The usability and safety of audio tactile profiled markings, NZ Transport Agency research report 365

Freely available online at *www.landtransport.govt.nz/research*

Hard copy $20.00
email *research@nzta.govt.nz* to order.

Changing trends in over-60s travel

With the proportion of older people in New Zealand's population set to increase, understanding how and how often older people travel will be crucial for planning effectively for future transport demands.

The Ministry of Transport's New Zealand Household Travel Survey, conducted on an ongoing basis throughout the year, collates a wealth of data about New Zealanders' travel patterns. The NZ Transport Agency-funded research has tapped into this data, using the recently complied 2004–07 Ongoing New Zealand Household Travel Survey database to compare how older people's travel habits have changed since the data was last brought together in 1997/98. The report on the research updates a 2003 study into older people's travel patterns by the same authors[1], based on the data from the 1997/98 survey.

Co-author of the current report, Carolyn O'Fallon from Pinnacle Research, says,

'We updated our earlier study with a comparative analysis of older people's travel patterns using the 2004 to 2007 household travel survey database. Analysing changes over a period of time is useful for detecting travel patterns that could lead to future issues with infrastructure quality or provision, and for forecasting future demand'.

'Understanding trends in older people's travel behaviour is also helpful for decision and policy makers who are wanting to put in place travel demand management or travel behaviour change programmes. To encourage more sustainable transport use for the future we need to understand how older people are currently using the transport network, and the levels of accessibility and mobility that they require.'

Establishing trends in travel behaviour also enables transport models to be better calibrated, so that they can more accurately predict future travel patterns in light of changes to the transport network.

1 O'Fallon, C., & Sullivan, C. 2003. Older people's travel patterns and transport sustainability in New Zealand cities. Paper presented at the Australian Transportation Research Forum, September 2003, Wellington, New Zealand. Available from www.patrec.org/atrf/index.php.

The New Zealand household travel survey

Initially completed by the Ministry of Transport in 1997/98, the New Zealand Household Travel Survey has run on a continuous basis since 2003.

Between 2003/04 and 2007/08, 2200 households were invited to participate each year. As from 2008/09 onwards, approximately 4600 households are being invited to take part in the survey each year. In addition, Environment Canterbury, Christchurch City Council, and Waimakariri and Selwyn district councils have contributed funding for an expanded sample in their areas during the 2008/09 and 2009/10 years.

Every person in the household is visited and interviewed about their travel for two consecutive days specified by the interviewer. Surveying takes place throughout the year, and every day of the year is covered. A complete dataset representing all of New Zealand is compiled from the survey every four years. The increased annual sample sizes for the survey will allow more extensive geographical-based analysis of the data than has been possible previously.

Further information about the continuous survey is available from the Ministry of Transport's website www.transport.govt.nz/ongoing-travel-survey-index/.

A growing group

The proportion of older people in New Zealand's population has been increasing steadily since the beginning of the 1900s. Statistics New Zealand projects that between 2006 and 2051, New Zealand's 65+ population will more than double, from 512,000 to between 1.17 and 1.48 million people, at which point older people will make up one quarter or more of all New Zealand residents (as opposed to around 12 percent currently).

That this growth alone will create increases in travel by older people is obvious, but it is likely that travel growth will also be fuelled by other factors.

In line with other Western countries, New Zealand has experienced a marked increase over the past 20 years in the number of trips being taken as the driver of a motor vehicle and the total annual distance being travelled by older people. Reasons for this are varied and include a dramatic increase in the number of women over 65 who hold a driver licence, an increasing proportion of the 65+ population who are still in paid employment (and hence travelling to work), and a greater number of residents aged 80+ who are still driving.

The growth in New Zealand's older population has generated interest in the transport sector in understanding what their future transport requirements, and travel patterns and behaviour will be. A couple of reports have already explored issues within this context and the current report adds to this understanding, painting a broader picture of how, when and why older people travel.

The research created three older people age groups – 60 to 64, 65 to 74, and 75+. These groups were compared with the general adult population, aged 25 to 59.

In response to demand from various agencies for data broken down by location, these age groups were further divided for some purposes into three geographical areas – metro New Zealand (made up of respondents living in Auckland, Wellington and Christchurch); other main urban areas (with populations of 30,000 or more); and other urban and rural areas.

The research then went on to examine trends in trip segments taken by these groupings, as this was the approach taken in the earlier analysis and would enable comparisons to be drawn. The authors have recently published a separate report comparing 2004–07 trip chain and tour datasets with earlier datasets derived from the 1997/98 survey[1].

Trip trends

One trend that was immediately apparent from both the 2004–07 data and the earlier 1997/98 data is that older people travel considerably less than the younger adult population.

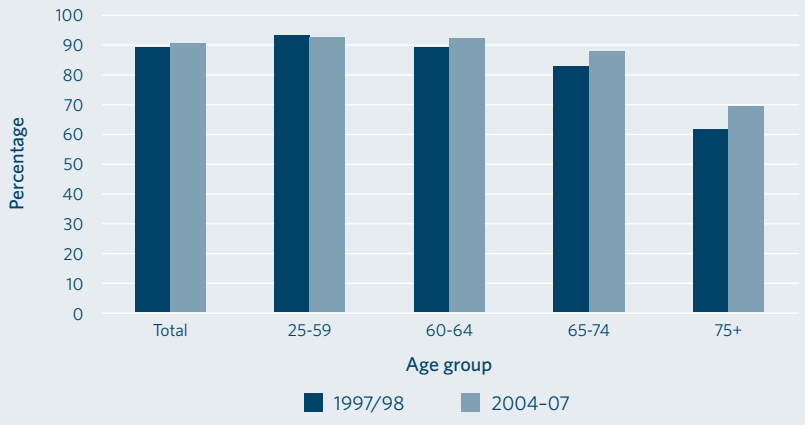
Carolyn O'Fallon explains, 'This is the case whether you're looking at the total or mean number of trip segments that people make in a day, the distance covered by a typical trip segment, or the average distance covered in a day. The number of trips taken and the distances travelled decline steadily as people age'.

'However, what we did see is that between 1989/90 when the first household travel survey was conducted and the 2004–07 dataset, the volume of travel for the older age groups increased significantly. So while they still travel less than the general adult population, the number of trips being taken by older people and the distance being covered by these trips is on the increase.'

Women are most likely to change the way that they travel as they grow older, with more trips being taken as a passenger or by foot once they were over 65, and fewer as a driver.

However, while older women may be driving less than they did in their youth, older drivers as a whole formed a significantly higher proportion of the vehicle traffic stream in 2004–07 than they had in 1997/98 (18 percent, compared to 15 percent). This was

Figure 2.1 Proportion of population (by age group) holding a car driver licence (1997/98 and 2004–07)



Segment, chain or tour?

A trip segment (or trip) is recorded each time that travel is interrupted – whether the person stops to drop someone off or pick someone up, buy a newspaper, change their mode of travel, or for any other reason.

A trip chain starts at a person's home or place of work (ie when a person leaves home or leaves work this starts a new chain) and ends when the person arrives at home or work, or stays in one other location for 90 minutes or longer.

A tour is a series of trip segments that starts at home and ends at home.

1 O'Fallon, C., & Sullivan, C. 2009. Trends in trip chaining and tours – analysing changes in New Zealanders' travel patterns using the Ongoing NZ Household Travel Survey. *NZ Transport Agency Research Report 373*. Wellington: NZ Transport Agency.

Figure 3.2 Median km travelled per trip segment (walking distance imputed) per person by age group (1997/98 and 2004–07)

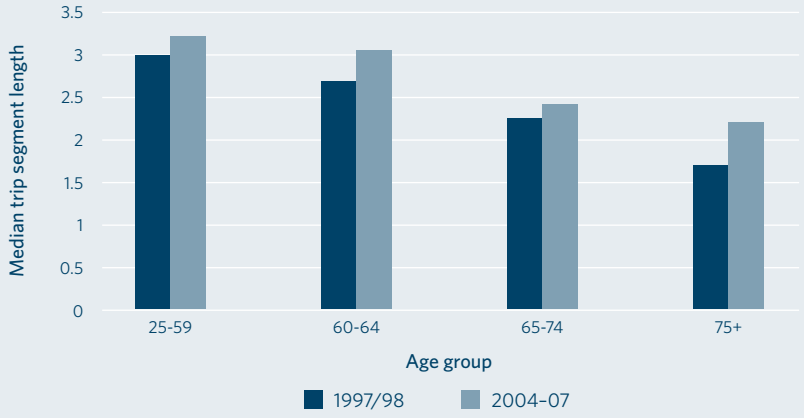
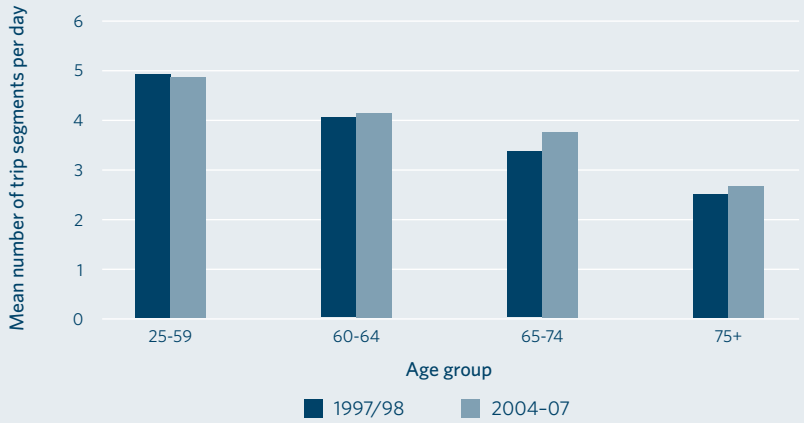


Figure 3.3 Mean number of trip segments travelled per day per respondent by age group (1997/98 and 2004–07)



consistent with the finding that, although in general people drove less as they aged, the trend between 1997/98 and 2004–07 was for the older age groups to take a higher proportion of their trips by driving. When all the age groups over 60 were combined the increase became statistically significant.

Other findings of interest included:

- Older people were more likely than younger adults to stay at home on one or both of the travel days surveyed.
- Trips taken as a vehicle driver form a greater proportion of all trips taken for people living in other main urban areas, and other urban and rural areas, than for people living in metro New Zealand (this finding is the same for the younger adult population).
- There were discernible shifts in the trip purpose or destination of trips by older people, with more citing work or education as the reason for their trip.
- Older adults took a greater share of their trips between 9:01am and 3:00pm than other adults, and less after 6:30pm, although this trend was decreasing, reflecting the larger number of people over 60 who are still in paid employment.

Carolyn O'Fallon says, 'What our analysis suggests is that over the next 40 years, as older people become a greater proportion of New Zealand's population, there will be a discernible impact on the overall travel patterns of New Zealanders. For example, we expect that there may be noticeable differences in the amount of trips being taken (both their quantity and length), changes in the timing of travel both on roads and public transport, a decline in the overall vehicle kilometres being travelled per person per day, and an increase in walking as a means of getting around'.

'Although some of these changes may be masked by overall population growth in New Zealand, there will still be implications in terms of the type of infrastructure and services that will be needed, and where, when and how they are provided.'

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Trends in older people's travel patterns, NZ Transport Agency research report 369

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2009/2010 NZ Transport Agency research programme

The NZ Transport Agency has recently announced its 2009/2010 National Land Transport Programme, which incorporates the research programme for the coming year.

This year, we will be funding 27 research projects across the seven key research areas. These projects are outlined below.

Economic development

Project name: **The benefits of public transport: Option and non-use values**

Research organisation: Ian Wallis Associates Ltd

Objectives: This project will investigate the economic concepts of option and non-use values, as they apply to public transport services, and will undertake primary market research in New Zealand to estimate appropriate valuations.

Current evaluations of the benefits associated with public transport services do not commonly take into account option and non-use values (as these concepts are more commonly applied in environmental economics, where a large body of literature supports their measurements and valuation). However, in the UK, transport evaluation procedures recommend that option values should be assessed for public transport schemes.

Project name: **New Zealand bus policy manual**

Research organisation: Ian Wallis Associates Ltd

Objectives: This project will develop a bus policy model that could be used to assess future levels of demand, operational requirements, costs and financial results for scheduled bus services in New Zealand. The model will be designed for forecasting and addressing 'what if' scenarios, initially at a regional level, but also potentially at a national level later on. Key users of the model are expected to be regional councils, the NZ Transport Agency and bus operators.

Project name: **Sustainability implications of road investment**

Research organisation: Ian Wallis Associates Ltd

Objectives: This project aims to provide improved evidence about the impacts that major road investments in metropolitan and urban areas have on sustainability factors. These factors will include fuel consumption, local environmental effects, global environmental effects, transport accidents and urban development patterns. It is anticipated that the improved evidence gathered will potentially lead to improved modelling and evaluation methods.

The project will be looking at the international evidence of the impacts of such investments, and considering the application and implications of this evidence in a New Zealand context.

Project name: **Scoping approach and measuring the impact of indexing unit cost parameters in cost-benefit analysis**

Research organisation: Hyder Consulting Ltd

Objectives: This project will identify the basis and impact of indexing future unit cost parameters in cost-benefit analyses. It is expected that investment decisions would be made on a more informed and consistent basis if the assumptions about the costs and values of future impacts that underpin cost benefit analyses were consistent with the views and forecasts of sector stakeholders. This in turn would lead to a more reliable and coherent framework for contributing to the New Zealand Transport Strategy and Government Policy Statement on Land Transport Funding (GPS) targets through land transport investment decisions.

Project name: **Car passenger valuations of quantity and quality of time savings**

Research organisation: Ian Wallis Associates Ltd

Objectives: This project's objective is to carry out market research in New Zealand into the value that car passengers place on time savings in a range of situations. The information gained will be useful for transport modelling, road pricing and toll road forecasting, and project evaluation purposes.

Although travel as a car passenger is the second largest mode of travel for people in New Zealand (after car driver, in terms of person kilometres travelled),there has been little research, either here or internationally, into the perceived values of time savings attributed to car passengers. This project seeks to fill this gap.

Project name: **Fleet management commitment to fuel efficiency and safety**

Research organisation: TERNZ Ltd

Objectives: This project aims to overcome the barriers that light and heavy fleet managers face in adopting fuel efficiency as an integral part of their normal way of doing business.

Unless fuel efficiency becomes embedded within the culture of an organisation, efforts to conserve fuel will be lost as fleet users revert to their familiar ways of doing things. To address this, the project will identify the type of measures that fleet managers need to adopt in order to ensure that fuel efficiency becomes the norm.

Project name: **Econometric models for public transport forecasting: Elasticity estimates and forecasting models**

Research organisation: DMK Consulting

Objectives: This project has three objectives:

- To identify the best econometric model structures for forecasting public transport patronage.
- To develop econometric forecasting tools that public transport operators can use to forecast the impact that changes in petrol prices, fares and services will have on patronage.
- To produce robust up-to-date econometric estimates of public transport elasticities for a collection of New Zealand cities (which can then be used to feed into the development of forecasting tools).

Activity management

Project name: **Steel and concrete composite bridge design guide**

Research organisation: NZ Heavy Engineering Research Association

Objectives: This research will provide New Zealand-specific guidance on designing steel and concrete composite road bridges in order to provide cost-effective and sustainable bridges. The guidance will be developed in parallel to the revision of NZS3404: Structural Steel Design Standard, which is being expanded to include matters relevant to bridge construction and design. The guidance will complement NZS3404 and will replace the design guidance currently contained in the NZ Transport Agency's Bridge manual.

Project name: **Extending pavement life: Documentation of the distress mechanism of premature failures in unbound granular pavements and validation of criteria for their prevention**

Research organisation: Tonkin and Taylor Ltd

Objectives: This project aims to maximise the life of newly constructed or rehabilitated unbound granular pavements.

Recent pavement failures have demonstrated that base-courses that fully comply with M/4 and are laid in accordance with B/2 can still fail prematurely. For a significant number of these, the failure mechanism has been identified as the instability of the unbound granular material (mainly base-course, but also some instance of sub-base). The research will aim to prevent these premature failures attributable to instability of granular layers, as well as failures attributable to inappropriate assessments of required pavement thickness and compaction methods.

Project name: **Characterisation and use of stabilised materials in transportation projects in New Zealand**

Research organisation: Opus International Consultants, in association with the New Zealand Stabilisation Working Group

Objectives: This project will provide guidance to the transport industry on the characterisation and effective use of stabilised granular materials. The guidance will be based on performance data from existing stabilised pavement solutions in New Zealand and will look at a range of stabilising agents, locations and material types. Field research will look at up to 10 projects sites, examining whether design expectations at these sites have translated into expected field performance. The project will contribute to the NZ Transport Agency's ongoing review of national specifications and guidelines for pavements.

Project name: **Potential of the Wehner-Schulze test to predict the on-road skid resistance performance of New Zealand aggregates**

Research organisation: Opus International Consultants Central Laboratories

Objectives: This project will determine the ability of the German-developed Wehner-Schulze aggregate polishing test to predict or rank the on-road skid resistance performance of New Zealand aggregate.

Since the 1990s, the British polish stone value test has been used in specifying aggregates for use on New Zealand roads. However, research has shown that the test is a poor predictor of performance. The project will look at the Wehner-Schultz test as an alternative, to determine if it is a good predictor of polishing and whether further investigation and capital outlay is warranted.

Integrated land use and transport systems

Project name: **National travel profiling (part B) – trips, trends and travel predictions**

Research organisation: Trips Database Bureau

Objectives: This project aims to maximise the value of information held in the Ministry of Transport's New Zealand Household Travel Survey database, by converting it into a form that can be used for transport and regional planning studies and research.

The project will build understanding of and test the predictors of travel demand. This will enable the survey data to be used in a predictive context for transport planning, which will in turn enable more informed decision-making on transport policy and infrastructure investment. Feedback will be provided to the New Zealand Household Travel Survey to maximise the value of future surveys.

Project name: **Development of indicators for monitoring integrated land use transport projects**

Research organisation: CityScope Consultants Ltd

Objectives: This project will create a framework for developing different types of indicators and applying them to various stages of transport planning and implementation projects. Developing indicators is a necessary part of setting performance targets for transport strategies, plans and projects, as indicators enable progress to be towards outcome objectives to be monitored.

The research will also explore the relationship between indicators and policy measures typically associated with integrated planning.

Project name: The value of integrating land use and transport – Sylvia Park as a case study

Research organisation: McCormick Rankin Cagney

Objectives: This research will demonstrate, in a New Zealand context, the value of development that integrates with and invests in multi-modal transport infrastructure. The research is expected to increase private sector support for integrated transport planning practices (as advocated for by a number of government agencies), and to improve the alignment between public and private sector transport and land use goals.

The research will:

- quantify and discuss the direct financial costs and benefits to developers of integrated development
- investigate a local example of such a development that illustrates its value
- provide information on the wider economic costs and benefits
- catalyse discussion on regulatory reforms to provide incentives and rewards.

Project name: Reallocation of road space

Research organisation: Beca Infrastructure Ltd

Objectives: This research aims to identify the benefits of reallocating road space in favour of walking, cycling and public transport. The research will look at:

- traffic volumes and speeds
- pedestrian and cycle volumes and speeds
- the economic benefits and increase in footfall for shop owners, as a result of reallocation schemes that favour pedestrians and cyclists.

Reallocating road space in favour of walking, cycling and public transport can encourage use of these modes, help address congestion in urban centres, and make safer and more attractive environments. Established methods include traffic calming, pedestrian-only areas, cycle lanes and bus lanes.

Project name: Second edition of report 209: Trips and parking related to land use

Research organisation: Trips Database Bureau

Objectives: This project will review, enhance and update the content of NZ Transport Agency Research Report 209: Trips and parking related to land use (2001) to create a second edition.

Report 209 has been widely valued and used by the transport planning and engineering industries, and continues to be seen as a reliable and informative text. However, some tables need to be revised to reflect changes since 2001, and others could be enhanced to widen the base of the information offered, and better reflect the variety of information now available.

Transport demand management

Project name: Company cars: Understanding the impacts of company car policy on strategic transport targets

Research organisation: Booz and Company (New Zealand) Ltd

Objectives: Company cars are a significant part of the transport sector and have distinctive characteristics in terms of the type of vehicle used, and how, when and where they are driven.

This project will:

- identify the impacts that company cars have compared to other travel modes
- identify potential policy changes that have been used elsewhere to reduce the negative influences of company car use
- identify the characteristics of company car use in urban environments
- identify the types of vehicles commonly used and the distances driven
- analyse the fuel efficiency of company cars
- examine if company car users are likely to use the alternative travel modes of walking, cycling and public transport.

Safety, security and public health

Project name: Detailed observations and validated modelling of the air quality impact of traffic on roadside communities

Research organisation: National Institute of Water and Atmospheric Research Ltd

Objectives: This project will:

- conduct detailed observations of air quality in a typical New Zealand roadside residential community
- provide validation of existing international roadside dispersion models in the New Zealand context, and of recently developed New Zealand-based vehicle emission and roadside dispersion tools
- compare the performance of existing and new models, and make recommendations about their use
- enable individual road projects to be analysed for their general health impact.

Project name: Crash prediction models for signalised intersections: Signal phasing and geometry

Research organisation: Beca Infrastructure Ltd

Objectives: This project will develop crash prediction models that take into account signal phasing at traffic signals.

A significant proportion of crashes at traffic signals involve vehicles running the amber or red signals. This means that the impact of phasing configuration, cycle time and degree of saturation for key movements are all important aspects that need to be considered in crash prediction modelling. The research will build on previous modelling work already carried out in this area.

Project name: Rural crash prediction models: Next generation (main study)

Research organisation: Beca Infrastructure Ltd

Objectives: This project will build a better understanding of the relationship between rural road crashes and road features, by developing the next generation of crash prediction models for rural roads.

Current models are considered deficient because they do not include all the key variables that influence whether crashes occur. Nine key variables have been identified from international research, and the current project will consider the impact of all of these and the relationships between them. The project will enable road controlling authorities to compare the benefits of safety improvements made to roads with those made to the roadside environment.

Environmental impacts of land transport

Project name: **Evaluation of innovative stormwater treatment devices for removing contaminants in road runoff**

Research organisation: National Institute of Water and Atmospheric Research Ltd

Objectives: This project will evaluate the performance of a number of innovative, filtration-based treatment devices in removing total suspended sediments (TSS), metal and hydrocarbon contaminants from road run off, and provide guidance on using these devices.

At present, road managers are reluctant to invest in many of the new devices that have been developed in recent years for treating road run off, due to the lack of monitoring data available to support their efficacy. The current project aims to demonstrate the potential environmental and economic gains that may be achieved through using these devices, and provide national guidance on the circumstances in which they might provide a more effective solution than more established practices.

Project name: **Life time environmental impacts of road transport infrastructure and construction**

Research organisation: Landcare Research Ltd

Objectives: The primary goal of this project is to improve the life-cycle costing of New Zealand's land transport sector and hence enhance the basis of land transport decision making.

In particular, the project will develop understanding of the environmental externalities associated with life-cycle options around certain modes of passenger and freight transport. These externalities include life-cycle greenhouse gas emissions, embodied energy and life-cycle stormwater contaminant loadings.

Project name: **Are the harmful emissions for New Zealand's light duty vehicle fleet improving?**

Research organisations: National Institute of Water and Atmospheric Research, and Emission Impossible Ltd

Objectives: This project will determine if the harmful emissions from New Zealand's light duty fleet are reducing under the current business-as-usual scenario.

At present it is unknown how much influence new vehicle technologies and improved fuel are having on emissions from New Zealand's light vehicle fleet. The project will compare vehicle emissions measured in 2005, with measurements from a comparable monitoring programme to be conducted in 2009. This will enable researchers to quantify any reductions in emissions and understand how they are changing over time, and may flag if additional emission reduction strategies and policies are required in order for environmental standards to be met.

Sustainable land transport

Project name: **Improving combined use of physical activity and health, and transport datasets**

Research organisation: Capital Research Ltd

Objectives: This project aims to improve active transport measurement and monitoring, and collaboration over data collection and analysis between transport and health agencies.

The project will use SPARC's Active New Zealand Survey to:

- quantify how much walking and cycling is done for recreation rather than transport
- quantify the proportion of active transport that contributes to meeting health guidelines
- quantify the proportion of people meeting key health guidelines for physical activity through active transport alone
- establish whether or not the survey's estimates of transport-related cycling and walking are comparable to those in the Ministry of Transport's Ongoing Household Travel Survey
- recommend refinements to data collection, analysis and interpretation.

Project name: **Predicting walkability**

Research organisation: Abley Transportation Engineers, with Beca Infrastructure

Objectives: This project will provide practitioners with a tool to predict the quality of walking environments using engineering measurements. The research will derive prediction equations for path lengths and road crossings, where a number of engineering variables can be input, and a level of success for the link or path derived. Practitioners will be able to use the tool and the equations to quantify the quality of the walking environment, so that they can identify potential improvements and measure the significance of implementing them.

Project name: **Demand for transport services: Impact on networks of older person travel as the population of New Zealand ages**

Research organisation: Opus Central Laboratories

Objectives: This project will provide practical predications of demand by older people for transport over the next 30 years, and how this and other accompanying demographic changes will impact on the country's transport networks.

Older people require safe mobility on a sustainable basis if they are to age positively and productively in line with the government's transport and positive aging strategies. The information to be provided by this project will enable proactive planning to occur, so that the transport needs of this growing group of New Zealanders can be catered for in a sustainable manner.

Project name: **Generation of walking, cycling and public transport trips: Pilot study**

Research organisation: Traffic Design Group

Objectives: This project will develop techniques for establishing trip generation rates for walking, cycling and public transport to a variety of activities.

The research is necessary, as while there are well-established methods for surveying the generation of motor vehicle trips, there are currently no such methods for accurately measuring, and subsequently predicting, how a particular activity will generate demand for walking, cycling and public transport trips. The research will help to fill this gap by establishing procedures for surveying and recording variables (such as residential density) that may later show a correlation with trip rates.

New research publications

Obtaining our research reports – These research reports are freely available online at www.landtransport.govt.nz/research. They can also be purchased in hard copy from about $15 to $40 each. To order any of these reports, or with questions regarding the NZ Transport Agency's research programme, please email research@nzta.govt.nz.

Economic development benefits of transport investment

Research Report 350

I Wallis, Booz and Co Ltd

Freely available online at
www.landtransport.govt.nz/research/reports/index.html#sustainable
Hard copy $25.00

This report reviews the major approaches for assessing national and regional economic benefits, as well as the potential distributional implications of transport induced benefits. The paper assesses whether transport influences national and regional economic development and, if so, how this role is best asserted.

The primary economic assessment methods considered include: Social Cost Benefit Analysis (SCBA), Input-Output Analysis (I-O), and Computable General Equilibrium (CGE). SCBA is most effective for determining the value of project objectives and outcomes from a social welfare perspective. I-O and CGE take macroeconomic perspectives of system wide effects of transport investment including employment, GDP and taxes.

The link between transport improvement and economic development depends on complementary regional infrastructure and specific contextual considerations. I-O poses a risk of over-stating results. CGE may be effective at a national level, but faces scaling issues for regional or local effects. Neither is particularly useful for assessing the distributional affects of investment.

The findings support SCBA as a policy assessment method that quantifies, in monetary terms, the value of policy consequences to society with recommendations for accommodating non-market and qualitative consideration into value propositions.

Resealing strategies to increase seal life and prevent seal layer instability

Research Report 372

G FA Ball and J.E Patrick, Opus International Consultants Ltd

Freely available online at
www.landtransport.govt.nz/research/reports/index.html#asset
Hard copy $10.00

A study of cores from multilayer chip seals shows that fine solid materials (passing 4.75 mm) fill a significant proportion of the chip seal volume that would otherwise be available for bitumen. If fines are ignored, the available voids are typically about twice the expected volume of bitumen that would be sprayed. Generation of fines may therefore contribute significantly to premature flushing. The origin of these fine materials remains to be examined; at least six different processes may contribute, and the relative contributions may vary from site to site.

Trends in trip chaining and tours

Research Report 373

C O'Fallon, Pinnacle Research and Policy Ltd; C Sullivan, Capital Research Ltd

Freely available online at *www.landtransport.govt.nz/research/index.html#travel*
Hard copy $15.00

This report describes the 2008/09 reformulation of the 2004–07 Ongoing New Zealand Household Travel Survey trips database into trip chains and tours. The reformulation required the re-creation of programming sequences for key elements of the new datasets (segments, trip chains, tours, main mode and main purpose, and three different tour classification schemes) based on previous reformulation of the 1997/98 New Zealand Household Travel Survey dataset.

The reformulated datasets permitted a comparison to be made between New Zealanders' travel patterns in 1997/98 and over 2004–07. Thus, the report is able to comment on some trends in New Zealanders' travel behaviour.

Comparing the 2004–07 and 1997/98 datasets revealed that:

- the mean number of trip chains per day (2.3) and the mean number of tours per day (1.3) were essentially unchanged
- both trip chains and tours were increasingly likely to have fewer segments
- vehicle driver only trip chains increased significantly to 53% of all trip chains from 48%. Vehicle driver only tours increased significantly to 50% from 47%. Both findings are significant at a 95% confidence interval
- most trip chains and tours were 'non-work/non-education' tours (eg personal business, shopping, social, recreational, etc)
- walk only trip chains declined to 11% from 13%.

Comparisons of NZ and UK trips and parking rates

Research Report 374

A Milne and S Abley, Abley Transportation Engineers Ltd; M Douglass, Douglass Consulting Services Ltd

Freely available online at
www.landtransport.govt.nz/research/reports/index.html#travel
Hard copy $20.00

Trip generation, parking demand, modal split and travel activity related to different land uses are fundamental information for

transportation planning and land use planning, now and in the future. While trip generation related to residential, business, tourism, recreation, industry and rural activities has been investigated, these areas have not always been surveyed or analysed consistently or reported in sufficient detail to provide transportation professionals with a robust assessment for planning and design purposes.

This investigation sought to establish whether trip making and parking demand were similar between similar land uses in New Zealand and the United Kingdom. The conclusion is that travel patterns over a wide range of land uses, and especially those related to retail shopping centre activities, are similar in both countries.

The analysis includes retail, service stations, restaurants, fast food, business parks, manufacturing, warehousing, medical centres, preschools and residential activities. While many characteristics are shared, the research showed that New Zealand vehicle trip generation rates are marginally higher than the UK's for most sites. However, more surveys are required in New Zealand to give more useful data. Ongoing and parallel surveys in both countries would have good value, as would the exchange of information between transportation professionals.

Applying health impact assessment to land transport planning

Research Report 375

J Ball, L Thornley and R Quigley, Quigley and Watts Ltd; M Ward, Ward Wilson Research

Freely available online at
www.landtransport.govt.nz/research/reports/index.html#sustainable
Hard copy $25.00

This research draws on learning from New Zealand and other countries to meet the following research objectives:

1. To assess the need for health impact assessment (HIA), in the context of the New Zealand Transport Strategy and relevant legislation
2. To evaluate the role of HIA in land transport planning to date in New Zealand and explore barriers to the use of HIA
3. To understand the best point(s) for application of HIA within the New Zealand transport sector
4. To produce recommendations for better integration of HIA with other development processes in the transport context.

Three data collection components were undertaken between September 2008 and January 2009: (1) an international literature review; (2) a descriptive review of transport planning processes in New Zealand; and (3) four case studies examining application of HIA transport in New Zealand. Findings indicate deficiencies in current assessment processes and a need for HIA. The New Zealand case studies provide useful lessons about the benefits of, and barriers to, HIA in the transport sector. Recommendations are made about applying and integrating HIA in transport planning processes. Administrative changes are suggested to support the transport sector to protect and promote public health.

Agglomeration elasticities in New Zealand

Research Report 376

DC Maré, Motu Economic and Public Policy Research Trust; DJ Graham, Centre for Transport Studies, Imperial College, London

Freely available online at
www.landtransport.govt.nz/research/reports/index.html#sustainable
Hard copy $15.00

This report analyses the relationship between the multi-factor productivity of New Zealand businesses and the effective employment density of the areas where they operate. Quantifying these agglomeration elasticities is of central importance in the evaluation of the wider economic benefits of transport investments. The report estimates that firms in an area with 10 percent higher effective density will have productivity that is 0.69 percent higher, once controls are added for industry-specific production functions and the sorting of more productive firms across industries and locations. The report presents separate estimates of agglomeration elasticities for specific industries and regions, and examines the interaction of agglomeration with capital, labour and other inputs.

Timing Alert!

NZTA's 2010/11 Research Programme

The 2009/12 National Land Transport Programme provides funding for sector research through the NZTA's Research Programme.

In order to ensure that funding for research for the 2010/11 and 2011/12 Programmes continues to meet the objectives of the Government Policy Statement on Land Transport Funding (GPS) and the NZTA's Investment and Revenue Strategy (IRS), the NZ Transport Agency (NZTA) is now reviewing its Approach to Research 2009/12.

The review is because the GPS, released by the Minister of Transport in May 2009, and the NZTA's IRS, have changed the strategic context for funding decisions and have identified clear funding priorities for the future. The current version of NZTA's Approach to Research 2009/12 was developed prior to these changes and is being reviewed to ensure that it aligns with the current strategic investment direction. The review will capture the role of the NZTA in relation to sector research, and its key research areas will be revised to provide clear direction to the research community.

As a consequence of the review, the current annual research timetable published in NZTA's Approach to Research 2009/12 is no longer correct, and the revised Approach to Research and Expression of Interest (EoI) documentation will not now be released until later in 2009. We will inform you of the release date as soon as it is known.

Links to relevant documentation are:

2009/2012 National Land Transport Programme (NLTP)
http://www.nzta.govt.nz/publications/nltp/index.html

Government Policy Statement on Land Transport Funding (GPS)
www.transport.govt.nz/news/newsevents/Documents/Final-GPS-May-09.pdf

NZTA's *Planning, programming and funding manual* – see section B1-8, page B1-17, where part 15 addresses NZTA's strategic investment direction for Sector Research
http://www.landtransport.govt.nz/funding/ppfm/docs/ppfm-part-b-v1a1.pdf

This message is also on the NZTA Research Programme website at
http://www.landtransport.govt.nz/research/funding-process.html

Further information about the timing for the 2010/11 Research Programme will be made available as soon as it is confirmed.

NZTA research

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NZTA research is published quarterly by the NZ Transport Agency. Its purpose is to report the results of research funded through the NZTA Research Programme, to act as a forum for passing on national and international information, and to aid collaboration between all those involved. It also aims to stimulate inquiry, discussion and solutions concerning land transport and NZTA's key research areas – namely, integrated land use and transport systems, transport demand management, activity management, sustainable land transport, safety, security and public health, environmental impacts of land transport and economic development.

Contributed articles are welcome, and should be typed in double spacing and not exceed 1000 words. Illustrations may be either black and white or colour, and must be of high quality. *NZTA research* reserves the right to edit, abridge or decline any article.

Advertisements of forthcoming conferences and workshops that are within this publication's field of interest may be published free of charge, when space permits.

Inquiries on specific articles should be made to the author. Otherwise, all general correspondence and queries related to conference notices and mailing list requests should be made to: research@nzta.govt.nz.

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Email research@nzta.govt.nz

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New Zealand Government

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