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NEW ZEALAND - NATIONAL REPORT

STRATEGIC DIRECTION SESSION ST1
Road quality service levels and innovations to meet user expectations

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Executive Summary

Deriving the greatest benefit from each dollar invested in land transport systems is a fundamental consideration for road controlling authorities world wide. Ensuring networks are reliable and durable are common key deliverables. Traditional means of measuring road network performance provide authorities with a picture of the physical condition of roads. Surveying features such as road roughness, rutting and skid resistance, is long-accepted as the basis for allocating limited funding for correction and maintenance of existing roads and expenditure on capital projects. For the government-owned authority there is also a growing pressure to be answerable to wishes of stakeholders and road users. While traditional performance measures continue to determine Transit New Zealand's (Transit's) work priorities, the desires of stakeholders and road users are increasingly determining the focus of the Crown road controlling authority's programme of works.

Rather than being an onerous undertaking, Transit's experience of marrying service levels based on the desires of the New Zealand road user with priorities driven by physical condition, has proved to be a catalyst for innovation.

Transit's initiatives to establish and measure the satisfaction of road users, uncovered a less desirable rating from a strategically important segment of road users. Commercial truck drivers were significantly less satisfied with state highways than the average road user. Transit's efforts to better understand the underlying reasons for this result led to the development of a new methodology for measuring truck drivers' experiences on the road.

The Truck Ride Index is one example of an innovation that provides a pavement condition measure more attuned to identifying problem areas of highways for trucks. The pre-existing and internationally recognised standard measure for road roughness was limited to the experience of road condition from the perspective of a passenger travelling in a car. These measures overlook the longwave pavement and transverse warping variations, to which trucks are more susceptible.

Supported by a governing and monitoring framework conducive to innovation, the index and other recent Transit initiatives are providing the tools to improve on identified deficiencies and deliver the service levels New Zealand road users desire.

Introduction

Harsh and challenging geography, a small, dispensed, low-density population, a commodity-based economy, and a nation of people who love using their vehicles*: These are the characteristics confronting the Crown agencies responsible for New Zealand's land transport system.

A good land transport system facilitates the economic health of a nation and creates greater social, recreational and cultural opportunities. Accessibility, safety and efficiency are the traditional key drivers. Today, sustainability and responsiveness are of increasing importance.

The third millennium view of accountability requires road controlling authorities to establish a clear vision for managing a road network based on road user and stakeholder expectations. These desires then have to be translated into performance on the road. The New Zealand experience detailed in this report shows that the employment of user expectations in both determining service levels and measuring performance fosters innovation. Specifically, this report presents Transit New Zealand's experience in setting service levels and how this process was the catalyst for an innovative programme to meet user expectations. This report also overviews the legislative and governance framework that supports an environment conducive to innovation and the characteristics of the New Zealand transport system in 2002.

All $ amounts are New Zealand dollars.

***New Zealand has one of the highest per capita car ownerships in the world.**


New Zealand's
State Highway Network
Waitiki Landing
Kaitaia
Paihia
Kaikohe
Whangarei
Dargaville
Helensville
Auckland
Coromandel
Thames
Waihi
Hamilton
Tauranga
Raglan
Te Awamutu
Kawhia
Otorohanga
Tirau
Whakatane
Kawerau
Opotiki
Ruatoria
Tokoroa
Rotorua
Te Kuiti
Taupo
Waikaremoana
Gisborne
New Plymouth
Taumarunui
Turangi
Wairoa
Stratford
Hawera
Waiouru
Napier
Hastings
Patea
Wanganui
Waipukurau
Bulls
Dannevirke
Palmerston North
Woodville
Levin
Masterton
Martinborough
Wellington
Collingwood
Motueka
Picton
Nelson
Blenheim
Westport
Murchison
Reefton
Greymouth
Lewis Pass
Kaikoura
Hanmer Springs
Hokitika
Arthur's Pass
Rangiora
Franz Josef
Christchurch
Mt Cook
Akaroa
Ashburton
Haast Pass
Fairlie
Twizel
Timaru
Omarama
Waimate
Milford Sound
Wanaka
Queenstown
Cromwell
Oamaru
Alexandra
Te Anau
Manapouri
Lumsden
Dunedin
Ohai
Clifden
Gore
Balclutha
Invercargill
Bluff

The Transport Sector in New Zealand

An Overview

Geography, small, low-density population and a strong commodity-based economy, influenced the development of New Zealand's transport system. Historically, investment in transport was heavily dependent on government funding, resulting in an extensive network of roads, railways, ports and airports. Since the late 1970s, the transport sector has been systematically deregulated, privatised and corporatised.

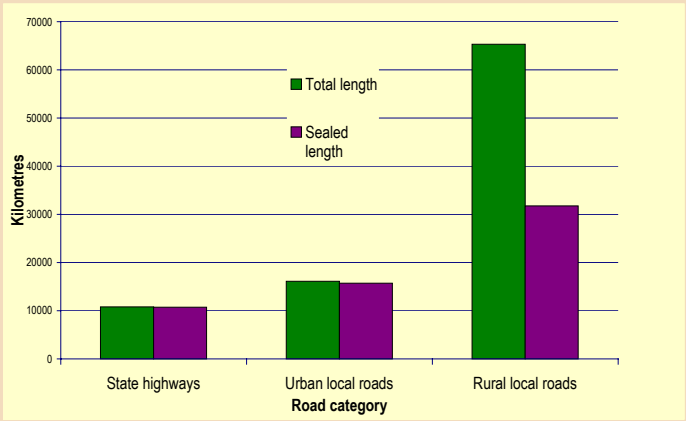
Today the transport system is an integral part of New Zealand's society and its economy. There is growing need to understand how social, economic, cultural and environmental systems interact with one another, and how transport contributes or hinders these systems.

The Facets

Road

Extending over 92,000 kilometres, New Zealand's roading network comprises the bulk of capital investment in its transport system. The state highway network of major roads and motorways, of which 99% are sealed, provides a strategic link to the local roads managed by territorial authorities. Motorways account for 3% of the total state highway network length and carry 9% of New Zealand's traffic, but overall the State Highways; while accounting for 11.5% by length of all New Zealand's roads; carry 46% of the vehicle kilometres travelled each year.

Figure 1. Sealed and Unsealed Roads in the Road Network



(Source: Transfund New Zealand 2001).

A survey of road-user satisfaction in 2000 showed that approximately 76% of state highway users rated the network as excellent, very good or good. Concerns were raised about the overall quality of the roading network, the level of investment, road furniture (e.g. signage) and the road toll. The quality of roading in certain economically disadvantaged areas has been identified as a barrier to growth. Accordingly, in 2002 the Government decided to allocate $30 million to roading and transport improvements in particular regions.

The road transport industry is an important contributor to the economy, employing around 3% of New Zealand's workforce and accounting for around 3.3% of Gross National Product. At March 2002, the number of registered goods vehicles (including rental cars) exceeded 408,000. Between 1996 and 2001 the vehicle-kilometres travelled by goods vehicles has increased by 34% for light goods vehicles and 19% for heavy goods vehicles.

Rail

The railway network extends over 3,900 kilometres. In the year to June 2001, Tranz Rail, New Zealand's leading privately-owned, multi-modal transport company carried 14.5 million tonnes of freight, a 25% increase on 1997 figures. The total revenue earned from rail freight over this period increased by 8%.

Sea

New Zealand's isolated position in the South Pacific places a heavy reliance on sea transport for overseas trade. Over 99% of imports and exports (by volume) are moved by sea. International shipping lines handle virtually all New Zealand's overseas shipping through 13 commercial ports, which are owned predominantly by local authorities and the private sector.

Air

With the majority of New Zealand's main markets on the other side of the world, airfreight is of crucial importance for low-volume/high-value, perishable goods and just-in-time dispatch. In the year ended June 2001, over 90,000 tonnes of international airfreight were loaded and 88,000 tonnes unloaded.

Air is the means through which New Zealand derives a major and growing source of revenue - tourism. International visitor arrivals have risen almost 216 percent between 1985 and 2002.

The Issues

Safety

Safe travel is a critical social and emerging workplace issue. Frameworks to deal with safety risk vary between modes of transport, reflecting the different modes need to manage the likelihood of an incident. This differs from region to region.

The social cost arising from road crashes is around $3.3 billion per year. The road toll for June 2001-2002 was 455 in a population of nearly 4 million. This compares with 628 in 1975, and 730 in 1990.

Growing vehicle use

Three out of four trips are in a motor vehicle. New Zealand's road vehicle fleet is predicted to increase to just over 3.1 million vehicles in 2015, with the largest increase expected in diesel-powered vehicles. Walking accounted for 17% of trips. Development of new cycling routes is a current issue.

Public transport

New Zealanders do not use public transport extensively: Only 2.2% of trips are made by bus and around 0.25% by rail. Around 12 million passenger trips per year are made by rail. Almost 82% of these are made in Wellington.

Public funding

Both central and local government fund and operate the public road network. Each year, central government invests over $1.3 billion in land transport from the National Roads Fund (NRF), with regional and territorial authorities investing around a further $400 million from property taxes. Dedicated funding for the NRF comes from Road User Charges collected from heavy and diesel-powered vehicles, motor vehicle registration, licensing fees, fuel excise duties on LPG and CNG, and a portion of fuel excise duty on petrol.

Around $230 million per year is spent on traffic management enforcement, road safety and education. The remainder is allocated to Transfund, the government funding agency. Transfund allocates 100% based funding to Transit as well as funding on a sliding subsidy basis to local authorities, for roading, public transport, walking and cycling. The roading capital expenditure for state highways and local roads is allocated on the basis of reduction of severe congestion, safety improvement, assisting regional development, promoting walking and cycling, improving passenger transport and alternatives to roading.

In February 2002 the government announced an extra $227 million to meet these priorities. It indicated it would introduce the following changes to the legislation:

- **More balanced funding system with longer-term focus** - broadening the funding system to enable more flexibility in funding priorities other than roads. This will require long-term planning of projects by Transfund and Transit.
- **Empowering regional councils and road controlling authorities** - so they can fund and, under agreed conditions, both own and operate public transport infrastructure and services.
- **Encouraging co-operation** - the removal of legislative barriers to the clustering of roading responsibilities between road controlling authorities.
- **Using electronic methods for collecting road user charges** - introduction of an electronic system (e-RUC). Initially, RUC vehicle operators will have the choice of moving to e-RUC or continuing under the existing system. It is expected that the majority of heavy and diesel vehicles will switch to e-RUC.
- **Allowing public/private partnerships** - the Minister of Transport will approve public/private partnerships for land transport infrastructure projects on a case-by-case basis under set criteria. Such projects would revert to full public ownership at the end of the partnership arrangement.
- **Enabling more tolling** - tolling projects will no longer require their own legislation. The government will introduce a generic regime for tolling schemes that will allow some new land transport infrastructure projects to proceed sooner. These projects will be approved on a case-by-case basis.
- **Investigating congestion pricing** - congestion pricing allows traffic demand to be managed by charging road users rates that differ according to the time and location of travel. Further work will be done on the potential use of congestion pricing to relieve congestion problems and provide environmental benefits.
- **Encouraging alternatives to roads** - changing legislation to allow a broader focus for land transport funding especially to allow the funding of alternatives to cars such as rail, walking and cycling. The government is continuing work on a national rail policy to maintain the integrity and viability of the national rail network. Where appropriate, there will be incentives

to encourage more heavy freight to be carried by rail. The government will also develop a National Cycling Strategy that must be considered when allocating funds.

New Zealand manages transport services through the New Zealand Ministry of Transport which has two key functions - policy development and advice to government, and monitoring the performance of government transport agencies.

Government Transport Sector Structure 2002

Local Government in New Zealand

Local government is one of the two branches of government in New Zealand and autonomous within the law. There are 86 regional and local councils in New Zealand.

Most local authorities carry out an independent, random, community satisfaction survey at least three yearly. Information from this is used to benchmark performance against other councils and identify areas for improving the level of service provided.

Local authorities are also required by statute to consult with their constituents annually on their overall programmes. Many also seek feedback from their communities on a project-by-project basis. There is currently a joint programme involving Transfund, Transit, and Local Authorities to establish methods of gaining input from the community to establish the expected service level from the Road Controlling Authorities.

Transit New Zealand

Transit New Zealand (Transit), is a Crown entity within the government transport sector, established under the Transit New Zealand Act 1989. It exists to plan, develop and maintain the state highway system in a way that contributes to an integrated, safe, responsive and sustainable land transport system.

Transit is essentially a manager and custodian of state highways that:

- Measure 10,775 kilometres
- Make up 11.5% by length of New Zealand's roads
- Account for 46% of the 34 billion vehicle kilometres travelled each year on New Zealand roads
- Are valued at $12 billion on a depreciated replacement basis.

Each year Transit must prepare a state highway programme covering its planned activities for the next financial year. These activities cover the planning, design, supervision, construction and maintenance work for its network. While responsible for the administration of these activities, Transit is required under its governing legislation to outsource the development and delivery of all capital and maintenance projects. This it does with the use of competitive pricing procedures, which were developed to provide the opportunity for a much wider range of businesses to enter the market.

Transit provides a long-term overview of its planned strategic direction for New Zealand's state highway system in its National State Highway Strategy. The strategy:

- Identifies objectives and priorities for the state highway network — including road smoothing
- Assesses the performance of the state highway network in terms of road user satisfaction
- Targets effective working relationships with road users and other stakeholders
- Articulates Transit's goal of leadership in terms of roading solutions.

Transit is allocated funds by the government funding agency Transfund New Zealand.

Levels of Service

Traditionally, measuring performance focused predominantly on the condition of the network asset. This has successfully ensured good physical condition of the network. However in today's environment, where sustainability and responsiveness are of increasingly importance, road controlling authorities must also take account of the priorities of road users and stakeholders.

Further, where networks are government-owned it is imperative that road controlling authorities communicate to the owner the funding requirements needed to achieve the different levels of service.

As Transit has strengthened its service delivery, it has established a number of initiatives to both determine and define the levels of service desired and to regularly provide the feedback on its performance as measured against those levels.

Stakeholder and User Satisfaction Surveys

Transit's stakeholders are the people who Transit focuses on for guidance and feedback to achieve its aim of excellence in developing and managing New Zealand's state highways. They include everyone who is impacted by what Transit does and how it operates, ranging from governing and monitoring bodies, industry organisations, to motorists, cyclists and pedestrians. Road users travelling on state highways are Transit's most important customer group and comprise virtually all New Zealanders. Transit surveys road users regularly as part of its research strategy and to assess its achievement in meeting its performance indicators.

Transit conducted its first, and now benchmark, road user satisfaction survey in 1998 to help it better understand road user needs, to determine the improvements needed, and to measure their satisfaction with state highways.

A market research consultant undertook 1000 telephone interviews with road users working to the specific objectives of:

- Benchmarking satisfaction levels with the state highway system so changes could be monitored over time
- Understanding which features of state highways influence road user satisfaction
- Measuring satisfaction with these features
- Determining road users' priorities for improvement.

Transit was also interested in examining the survey results by market segment. Results from Transit's seven geographical regions were analysed, along with a breakdown of the satisfaction levels for different types of road users who identified the following key outputs as important to them:

- Safety
- Road system reliability
- Comfort and low stress
- Efficiency
- Price and levels of service.

From this breakdown it became evident that commercial truck drivers had a low level of satisfaction with state highways compared with other road users. In particular, truck drivers rated satisfaction with road surface 17 percentage points below the national average for all road users. Transit followed up these results in a separate survey of commercial truck drivers, specifically tailored to their use of the state highway network.

Survey of Commercial Truck Drivers

Transit undertook the commercial truck driver survey in 1999/2000 to:

- Examine in more detail their dissatisfaction with the state highway road network
- Identify the improvements they would like
- Determine their willingness to pay for these improvements.

The survey was undertaken in two steps.

1. Exploratory Qualitative Research

Initially, four small focus groups explored in detail what influenced truck drivers' satisfaction with the state highway system. These focus groups identified a list of problem topics, one of which encompassed surface characteristics. Of particular interest was their concern with undulations, defined as "*small rises/falls (6cm to 50cm) every 2 to 20 metres over a stretch of 600m to 2kms."*

2. Quantitative Survey

Three hundred individual face-to-face interviews were then conducted with commercial truck drivers. In one part of the survey, truck drivers were told how much each problem cost to fix and were asked to imagine they were the decision maker, given limited funding and asked how they would allocate it.

From this Transit identified 10 top issues:

1. Not enough passing lanes
2. Undulations
3. Corners too sharp
4. Opposite/inconsistent camber on corners
5. Bridges poorly positioned
6. Shoulders too narrow
7. Dips and rises which block visibility
8. Bridges too narrow
9. Passing lanes too short
10. Flat camber on corners.

The survey also asked respondents how much they were willing to pay to address their priorities. Willingness to pay was defined in two ways:

- The amount of extra taxes (specifically RUC - Road User Charges collected from fuel levies and licensing fees) they were willing to contribute to the state highway road network above what they already pay
- How truck drivers would like their existing contribution to state highway funding (i.e. current RUC) to be reallocated.

Twelve percent of owner-drivers said that they each would be willing to pay, on average, $4,386 more per year. This corresponds to an additional $5.5 million in RUC.

Seventy-two percent of all truck drivers surveyed said that they would like to reallocate some existing expenditure, on average $30 million of Transit's total spend in 1998/99, to fund improvements. This was factored down to $21.6 million to account for the 28 percent of respondents who did not want to reallocate existing expenditure.

Combining the additional RUC with the reallocated existing expenditure, the truck drivers' total willingness to pay for improvements amounts to $27.1million. Of this $27.1million, the truck drivers would allocate $2.85 million per year to fixing undulation problems.

Figure 2. Willingness to Pay - Additional RUC

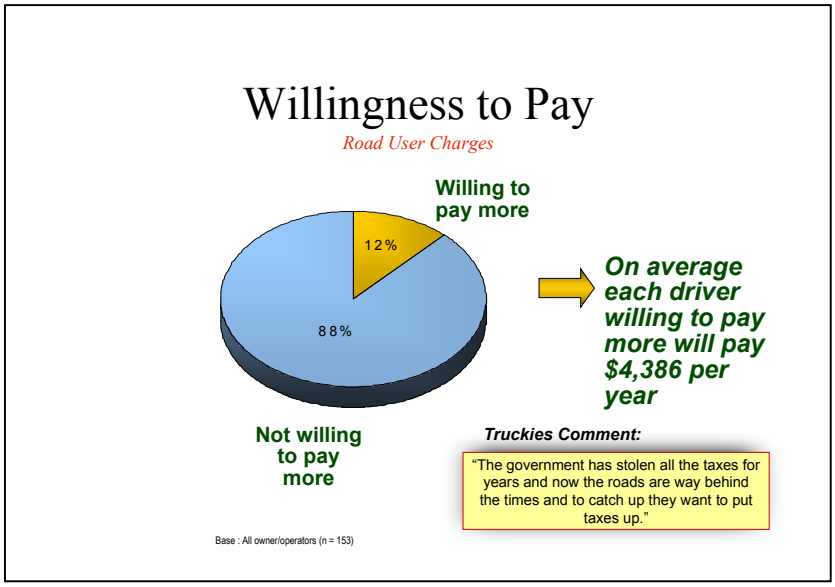
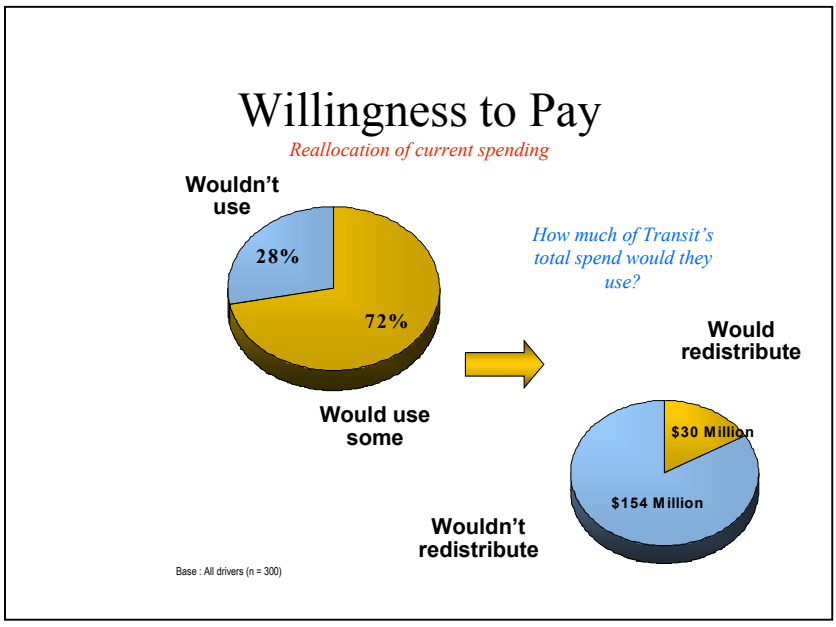


Figure 3. Willingness to Pay – Reallocation of RUC



Undulations

Undulations featured in the survey as a factor contributing to commercial truck drivers' dissatisfaction with the state highway network. While Transit had previously understood there was a ride problem on certain roads, it had been unable to identify from its data how this occurred. The drivers surveyed ranked undulations as their second highest priority for improvement, allocating on average 10.5% of their money to this problem. Transit's solution to this is detailed later in this report.

Communications a priority

Truck drivers have little or no direct contact with Transit or input into improvements on specific state highways. Consultation tends to be through the Road Transport Forums (heavy vehicle industry group), and their various regional branches represent truck drivers' interests. These networks do not necessarily capture the more detailed views of the drivers using highways on a frequent basis.

The second part of the survey investigated this. In the focus group stage, drivers suggested how communication could be improved. These suggestions were put to the wider survey respondents to gauge their level of interest in the initiatives.

Truck drivers expressed most interest in having Transit employees travel with them to experience the problems first hand. A total of 92% of respondents were either *very* or *quite* interested in this initiative. Since the survey, all Transit regional managers and some national staff have accompanied truck drivers on long trips on state highways. Transit engineers now have a better understanding of how trucks perform on the highway network and what causes the most concern to truck drivers.

Delivery of Service

In roading, the translation of service into tangible deliverables is about the physical condition of networks. Tasked with ensuring reliability and durability, road controlling authorities have long used performance measures of road condition as the basis for justifying the need for correction or repair of existing roads, and expenditure on capital works.

Managing the Road Asset

Key issues relating to the physical management of state highway assets are:

- **Pavements:**
  - Determining optimum intervention levels and minimum condition standards
  - Implementing predictive modelling
  - Determining the impact of changing design standards
  - Providing adequate drainage to minimise premature pavement failure
  - Building historical data about pavement structure and residual life
  - Determining optimum rehabilitation cycles.
- **Bridges:**
  - Introducing a condition assessment methodology that allows for predictive modelling
  - Implementing an enhanced bridge management information system
  - Prioritising bridge maintenance works.
- **Minor Structures:**
  - Developing more comprehensive risk management and condition assessment processes
  - Reviewing the allocation of management responsibilities
  - Improving completeness and accuracy of asset inventory.
- **Corridor Assets:**
  - Optimising intervention strategies
  - Reviewing information needs to effectively manage corridor assets
  - Developing improved materials and new products (new signs and markings).
- **Drainage:**
  - Improving the overall standard of surface drainage and culverts
  - Improving knowledge of the scope, condition and performance of drainage assets
  - Introducing a risk based approach for the lifecycle management of drainage assets.

Intervention to Maintain Service Levels

Transit intervenes with structural remedies according to two general criteria:

Safety — Structural deficiencies are corrected whenever safety is compromised and treatments can be achieved at a reasonable cost. Transit assesses this on a component basis against comparable quantifiable benefits.

Life Cycle Cost Effectiveness — Targeting the most economic strategies, typically in response to a net present value analysis, when considering the options to retain structural integrity.

Intervention to correct a structural deficiency is generally motivated by cost effective maintenance, unless safety is compromised. Any published service level targets are established as *investigatory* levels – the level at which safety may become an issue and it is appropriate to consider repair. Transit does not target 100% compliance with these investigatory levels. Unless safety is compromised, the existence of a particular structural deficiency alone is not an indicator of the need for replacement or repair.

Separate life cycle management plans are produced for pavements, bridges, minor structures, corridor and drainage assets. These plans cover the current condition and performance of assets and the associated maintenance, renewal, development and disposal strategies and programmes required over the next 10 years.

Determining the Maintenance Programme

Transit uses a 'bottom-up' approach to compile its annual maintenance programme. The maintenance budget is made up of current contract commitments and careful review of likely future changes. Key inputs into the process are:

- Existing Highway Maintenance contracts
- The Ten-Year Forward Works Programme (NOMAD)
- Pavement Deterioration Modelling outputs and scenarios (dTIMs).

Routine and cyclic maintenance requirements are determined at a network management level using the current rates tendered and an analysis of achievements to date projected over the budget period. For cyclic maintenance work the projection represents a very accurate assessment of the financial needs to maintain the service level specified. This assessment is based on delivering the current specified levels of service reflecting environmental, safety and road user requirements.

Area wide treatments, resurfacing, pavement smoothing and other area wide activity needs such as drainage improvement are assessed based on the projections contained in the Ten-Year Forward Works Programme. Transit reviews this programme at least twice annually based on:

Asset (pavement) condition rating data
Analysis of historic trends and future predictions are used to trigger potential intervention requirements.

Output from the Transfund Treatment Selection Algorithm
This interrogates each unique treatment length, considers the various pavement condition/defects data and provides a first cut of lengths requiring inspection/treatment.

Output from Pavement Modelling (dTIMS) analysis
Transit uses this treatment intelligence as an input for programme development and the tool is being trialled on all of its network management areas.

Transit has achieved a number of objectives in this year's modelling programme:

- Increased confidence that the dTIMS project vision is achievable — predictive capabilities significantly motivating intervention decisions
- Further refinement of business processes to the point where the modelling work is normal business practice

- Significant progress with the calibration sections. First order data is currently being collected and the first analysis of the third order data trends has been completed
- The use of dTIMS outputs in some regions to achieve budget rationalisation
- The influence of dTIMS is reflected in the reduction in resurfacing needs in the annual programme.

Pavement Condition Measures

Pavement condition data for state highways is derived from high-speed data collection output, SCRIM (Sideways-force Coefficient Routine Investigation Machine) surveys and surfacing data held in Transit's Road Asset Maintenance Management (RAMM) system. This data is presented alongside data from previous years to show trends and allow Transit to compare condition. Improved condition predictions are anticipated from dTIMS output in the near future.

Condition Measures

The condition of the state highway network asset is measured in terms of:

Roughness	average NAASRA percentage above threshold levels and smooth travel exposure (network roughness compared against vehicle kilometres travelled).
Texture	average texture depth (in terms of Mean Profile Depth) and percentage less than 0.5mm mean profile depth.
Rutting	percentage of network measured in each wheel path where rut depth is greater than 20mm.
Skid Resistance	average skid resistance, percentage below threshold levels and good skid exposure (related to vehicle kilometres travelled).
Remaining Surfacing Life	average surfacing life remaining.

Uses of Condition Information

Transit uses condition information to:

- Demonstrate stewardship performance (published in Transit's Annual Report)
- Satisfy stakeholder interest in how the network is performing
- Match expectations of condition with physically measured condition factors
- Allow network managers to assess the results of their investment decisions and adjust annual allocations to meet the service levels on network condition.

Factors Affecting Condition

Pavement condition in New Zealand is affected by:

- Foundation and pavement materials on which roads are built vary considerably throughout the country
- Regions of New Zealand experience different temperature ranges, precipitation rates and other varying climactic conditions
- Consistency of the measuring devices over time, e.g. improvements to technology and measuring techniques

- Reliability of the associated data inputs, e.g. surfacing and traffic volumes
- Accepted network condition standards
- Other impacts on the network, such as:
  - Increased traffic loading
  - New highways, either former local roads or new construction
  - Reflection of key performance measures developed for new procurement methods.

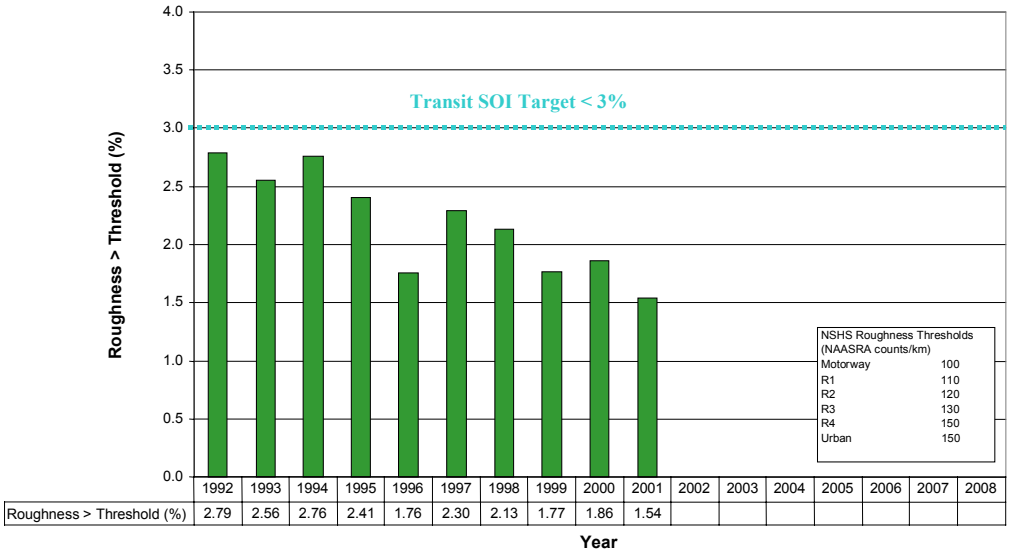
Transit assesses annual network survey results using condition graphs. Trends are derived from the previous and current years' results and show network changes in performance and status for each independent measure. Improvements may not always be achievable or beneficial in the longer term and each measure is considered against current funding levels, network management criteria and accepted levels of service.

The following are examples of pavement condition outputs.

Roughness

The average network roughness is currently 67.3 NAASRA counts (2.59 IRI). This has been consistent since 1999, following a significant drop from 1998. When analysed by roughness greater than the threshold, the network is showing improvement i.e. the trend is downwards. This demonstrates that the investment and construction/maintenance regimes are effective in eliminating the high roughness sites and therefore providing smoother roads for users.

Figure 4. National Roughness Greater Than Threshold, 1992-2001



	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Roughness > Threshold (%)	2.79	2.56	2.76	2.41	1.76	2.30	2.13	1.77	1.86	1.54							

Smooth Travel Exposure

Smooth Travel Exposure is a measure of the amount of traffic exposed to smooth highways (i.e. roughness below the threshold). Current results show a trend of improvement. The traffic growth in the last year was 5.9 percent, and the improvement for Smooth Travel Exposure improved from 97.9 percent in 2000 to 98.7 percent in 2001. This demonstrates that investment to improve roughness is targeted to where it is most needed.

Skid Resistance

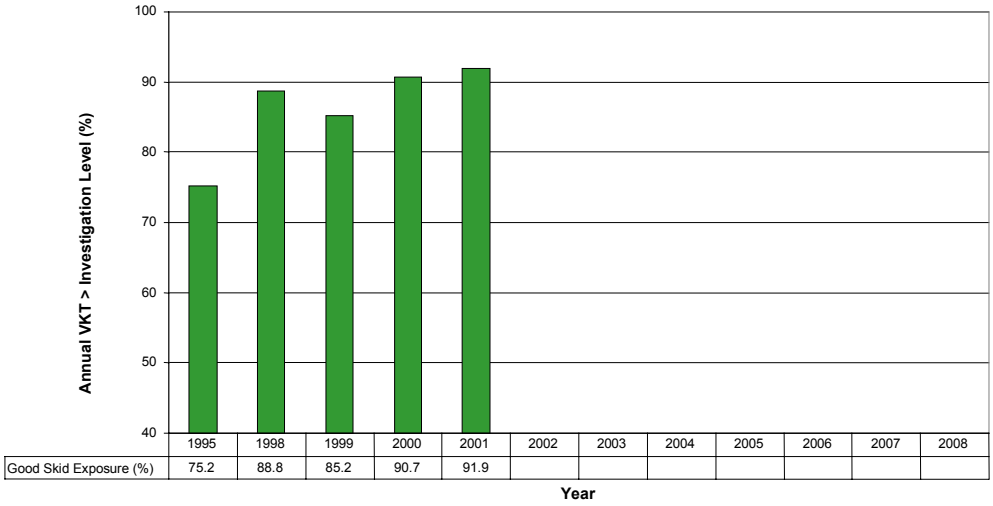
Transit has increased its focus on improving the skid resistance of road surfaces over the last five years. Initial results were extremely positive with a significant reduction noted in wet road crashes. Transit has now implemented a policy that takes a proactive approach to providing a surface that retains good skid resistance for the life of the surface.

Good Skid Exposure

Good Skid Exposure, a new Transit reporting measure, reflects the volume of traffic exposed to highway lengths currently above the threshold value and therefore providing good skid resistant road surfaces. Transit has made significant investment in this area over the last six years and is now realising the benefits with a significant decrease in wet road skidding related crashes.

Good Skid Exposure has improved over the survey period (1995 - 2001) with a 1.2 percent improvement in the last two years. Being a new measure and one not currently in use in other parts of the world, Transit is not able to benchmark this performance against others.

Figure 5. National Good Skid Exposure, 1998-2001



	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Good Skid Exposure (%)	75.2	88.8	85.2	90.7	91.9							

(No surveys undertaken in 1996, 1997)

Innovation in Condition Data Use

Transit's experience shows that, far from being onerous, the employment of user expectations in both determining service levels and measuring performance is a catalyst for innovation. Specifically, the results of the commercial truck drivers' survey spurred the development of an innovative programme that defined the user expectations and paved the way to deliver on them.

The Transit Truck Ride Indicator (TRI)

Limitations of Existing Road Roughness Surveys

The methods available for the measurement of road condition, which organisations use to justify correction, are based on the ride experience of a car passenger. The condition measures of International Roughness Index (IRI), which measures individual wheel path, and NAASRA roughness, which measures the road lane, focus on 'short wavelength' variations in the longitudinal profile of the road (i.e. variations spaced at intervals of 5m or less). These measures tend to overlook 'long wave' pavement variations (i.e. variations spaced at intervals between 12 and 25m) and warping between left and right wheel paths. Trucks, with their longer wheelbases, higher roll centres, and less damped suspensions than cars, are particularly sensitive to both these longitudinal and transverse characteristics.

With truck drivers delivering a clear message in the survey, Transit determined to develop a measure to adequately represent the response of a truck to complement traditional IRI/NAASRA pavement roughness measures. Transit also wanted to quantify the value that road users attach to reducing unpleasant truck ride and handling sensations through 'willingness-to-pay' surveys. This was to enable previously uncaptured user preferences, such as comfort and fatigue; to be included in economic decision making associated with pavement rehabilitation works targeted at improving truck ride and handling.

The Need for Improved Service

The potential detrimental effects of poor ride for trucks include:

- Driver discomfort
- Premature driver fatigue
- Increased vehicle operating costs
- Damage to goods
- Increased risk to other users as a result of vehicle/trailer sway
- Longer journey times whenever trucks have to slow to reduce in-cab vibrations to acceptable levels
- Accelerated pavement deterioration.

After identifying undulations in the state highway network as a high priority for this key segment of road users, Transit set out to:

- Identify problematic truck ride sites on the state highway network
- Develop a strong-validated ride index better attuned to the truck drivers' experience

- Apply the index to assess the extent of the problem
- Develop a strategy to address the problem
- Implement projects to improve truck ride quality.

The recognition Transit has received for this project reinforces the innovation and success of this idea to meet the specific needs of a key group of road users.

Identifying Problem Road Sections

Transit sought nominations from members of the Road Transport Forum (RTF) – the truck drivers' organisation – for road sections with unpleasant truck ride and handling sensations. Road sections having the following characteristics were excluded:

- Bridges
- Bridge approaches
- Unstable ground
- Slip affected
- Roughness levels satisfying Transfund's *Rehabilitation* criterion.

Typically, any undulations associated with the five features above are funded under existing criteria.

The remaining road sections had either long wavelength deformations that promote pitching motion, and/or elevation differences between left and right wheel path profiles, which promote roll motion. Sites that were eligible to be addressed within Transit existing maintenance budgets were further eliminated.

Determining Priorities

Truck drivers indicated in the survey that they saw better value in eliminating undulation problems on existing roads, than funding new road construction projects meeting the complying benefit/cost ratio (BCR) rating. (Truck drivers wished to reallocate 42% of Transit's current expenditure from construction of new roads, Transit's biggest area of expenditure, to address undulations.) At the time (the 1998/99 year), construction projects achieving a BCR of 3 received funding. Because truck drivers were willing to reallocate money to a new maintenance regime associated with correcting road undulations affecting truck ride and handling, it was plausible to infer that the BCR for spending $2.85 million on this maintenance activity is higher than the cut-off of 3.

Transit, therefore targeted $3 million for truck ride and handling improvements for road sections that were:

- Specifically identified by the road transport industry as requiring improvement
- Independently assessed by Transit or its consultants as being suitable to receive funding under this special category.

These sites had variable roughness over a significant length (greater than 200m) and, due to insufficient traffic volumes, did not qualify for rehabilitation on standard economic grounds of reduced vehicle operating costs and travel timesavings.

Establishing the Preliminary Measure

Selected road sections were analysed to identify significant correlations between truck driver experiences and measures, derived from Transit's RAMM database of roughness data. These measures included 20m maximum and minimum wheel path roughness values, mean lane roughness over 100m, and coefficient of variation (i.e. ratio of standard deviation to the mean) over 100m. Transit limited the correlation factors to standard RAMM inputs so that it could readily carry out analysis of the entire state highway network to establish priorities and to define the extent of substandard sections for truck ride and handling.

The roughness condition that correlated 100% with truck driver experiences was a 100m lane roughness of 105 NAASRA counts/km or greater, together with a difference of 5 or greater between the maximum and minimum 20m wheel path IRI roughness values within the 100m length. The maximum and minimum wheel path values are irrespective of whether they occurred in the same wheel path or opposite wheel paths. Note that:

- A lane roughness of 105 NAASRA counts/km is less than the 110 and 130 used to trigger rehabilitation on rural roads carrying 1000-4000 and $<$ 1000 vehicles per day respectively
- A wheel path IRI of 1 corresponds to 28 NAASRA counts/km.

Time constraints prevented Transit from using 2D and 3D truck models and spectral analysis methods to carry out a network level assessment of truck ride quality. The above roughness condition was adopted by Transit as an interim Truck Ride Indicator (TRI).

Quantifying the Extent

Application of the TRI identified that approximately 1% of the state highway network (213 lane/kms), presented road profile characteristics that may induce unpleasant truck ride and/or handling sensations.

Confidence in the proposed TRI was confirmed because sections of the state highway network displayed existing 'Uneven Road Surface' signs. These signs are erected where unstable foundations deform pavement surface and constitute a hazard to motorists. Transit calculated that 16 of the 213 lane/kms fell within this category. The total funds required to fully address all these sites was estimated to be in the order of $21 million.

Long-Term Application

Following on from the initial truck driver concerns and subsequent reprioritisation of funds, a Truck Ride Indication Model has been developed and trialled. This model allows Transit to use existing pavement condition data (collected annually for the entire network length) to identify potential truck ride undulations.

The model generates a list of road sections that are then inspected by field engineers before Transit determines the appropriate treatment and cost. With the current change in the economic climate and availability of road improvement funding, projects with a BCR greater than 4 are nominated for funding. A correlation exercise comparing actual truck response on rough and smooth sections of highway with outputs from the model has proven very successful, confirming that the use of existing data is sufficient.

Success to Date

Works targeted at improving truck ride quality have significantly improved the level of service provided. Transit has received very positive comments from truck drivers who have appreciated and benefited from improvements to ride quality. Further, the work has contributed to the effective implementation of the results of Transit's commercial truck driver survey, receiving international recognition with awards from the Australian Transport Forum - David Willis Memorial Prize, the Transit New Zealand/Works Infrastructure Road Innovation Award, and most recently, the Supreme Award of the Market Research Society's Market Research Effectiveness Awards. The project also won the Social and Community, and Innovation award categories in the Market Research Society awards.

Other Transit Innovations

Increasing service delivery to road users is the focus of a several key initiatives Transit is currently implementing, some of which directly respond to stakeholder and road user feedback.

Transit Free Phone Information Line

Feedback from the national road user survey identified that road users wanted more road information, and this also follows a general international trend for the establishment of highway information centres. The follow-up survey of truck drivers identified the easy availability of relevant road information as a key area of interest. Transit established a regional trial free phone information line in 2001, and will progressively introduce the service nationwide over the next year.

The free phone will provide:

- A one-stop point of information that is more convenient than the many points of current contact for Transit customers.
- A standard level of service to all Transit customers.
- A national system for gathering and identifying complaints that can identify key areas for priority action.

The free phone service is only one part of an integrated traffic management system, utilising the worldwide web and other technologies.

Code of Practice for Temporary Traffic Control at Work Sites

Transit developed this new code working jointly with industry and local authorities to reflect best practice in traffic management around worksites on all roads. The code is specifically designed to deliver an appropriate level of risk management – for both road users and road workers – at an affordable price. The new code identifies three separate levels of traffic management according to traffic volumes and associated risk. The code outlines the minimum requirements for temporary signage, traffic control and management, including detailed traffic management plans to be implemented by trained personnel.

Advanced Traffic Management Systems (ATMS)

Transit is currently operating and expanding its ATMS facilities on the Wellington and Auckland motorways, and has recently completed a National Intelligent Transport System (ITS) Strategy for State Highways. Several initiatives are underway as part of this national strategy, including the development of a National ITS Architecture, integration of existing rural ITS facilities, integration of ITS telecommunications systems and the development of a national Traffic and Road Information System linked to a 24-hour free phone information service.

Another key initiative is the integration of traffic management systems in the Auckland region, bringing together the operation of the region's motorway ATMS and urban traffic signal systems.

Incident Management

The capacity of the New Zealand state highway network cannot match the current growth rates in traffic, particularly in the more densely populated Auckland and Wellington regions. Transit believes the most appropriate technology and methodology should be used to manage traffic on the existing network. In 2001 Transit benchmarked highway incident management against international best practice, and is planning to implement a number of improvements in conjunction with New Zealand Police. Developing a much closer working relationship at incident sites and improving communication is the main focus.

Environmental Strategies

Transit aims to do more than comply with environmental legislation and policies; strategic environmental management of the state highway asset is a current priority. Environmental issues such as air-quality, water-quality, greenhouse gas emissions, biodiversity and noise are becoming more important, nationally and internationally. Transit aims to be proactive about environmental matters that are increasingly likely to impact on its operations in the future.

A new initiative is Transit's plant pest management strategies. These strategies identify the noxious plants on road reserve and Transit's obligation to remove them. The estimated cost of bringing the network up to the required standard is expected to reduce over time, as the practice becomes business as usual.

To encapsulate its aims Transit is developing a national environmental strategy. Other initiatives involve finalising and implementing Transit's environmental management system, performing strategic environmental assessments of all Transit contracts and policies, and increasing the amount of environmental reporting Transit does.

Transit's environmental focus is part of its broader commitment to sustainable development. Transit has begun implementing initiatives to integrate the three components of sustainability (economic growth, environmental management and social equity) more fully into its business. A key initiative to date is the adoption of triple bottom line reporting, a method of sustainable development reporting.

Recent awards for environmental achievements

Transit received the 2002 International Road Federation Global Achievement Award for Environmental Mitigation for *Securing the Link*, major projects on an important tourist route through Arthur's Pass National Park.

In 2000 Transit was awarded the International Road Federation Global Achievement Award for Environmental Mitigation for the Waipoua Forest State Highway 12 seal extension.

In 1997 Transit won the Environmental Section of the Institution of Professional Engineers New Zealand and Tranz Rail Engineering Excellence Award in recognition of innovation and excellence in engineering and technology.

Transit's Otira Viaduct (in Arthur's Pass) development won the Institution of Professional Engineers Engineering Award for Environmental Excellence in 2001. Transit's ALPURT project north of Auckland was also a finalist.

Procurement Strategy

To achieve its organisational purpose effectively, a road controlling authority must determine which functions will be undertaken in-house versus those it will procure. If a professional services function is being carried out full time each year for a number of years, it may be prudent to consider retaining a greater in-house role. The functions of design and supervision of projects are unlikely to fit this requirement. Physical works - both maintenance and construction - are likely to be more efficient when sourced from a competitive market.

Transit chooses to operate with a bare minimum of in-house resources to carry out its client role as a road controlling authority.

Long Term Procurement Strategy

Transit launched its Long Term Procurement Strategy (LTPS) in 2000 following the successful trial of several performance-based contracting concepts. These concepts have produced a suite of contract models that encourage competition, innovation and efficiency and deliver better risk management.

Transit's overarching goal in introducing the LTPS was to enable it to specify performance targets that more directly meet road user's expectations. More specifically, Transit's objectives were to:

- Identify a sustainable mix of procurement models
- Encourage a competitive market
- Allocate risk to the party best able to manage that risk
- Engage suppliers who have a track record of good quality service
- To increase the quality and focus during the development phase of capital projects
- To improve the way risk is managed on capital projects
- To establish an environment where greater use is made of effects-based consents for capital projects.

Transit's LTPS explains the alternative procurement models, how it intends to purchase services in future and how services are to be delivered for both maintenance and capital projects.

Maintenance Procurement

A traditional approach to procuring maintenance is for the client (road manager) or a consultant working for the client to instruct a contractor on what maintenance to do, followed by measure up and management based on the work done. At the other end of the scale is the long-term facilities management contract where considerable onus is placed on the contractor to maintain the road to a certain standard over a long period of time. Clearly there are options in between these two extremes.

Previously, only the conventional form of contracting was used. Three years ago Transit established a number of Performance Specified Maintenance Contracts (PMSC). These contracts are outcome-focused, lump sum contracts awarded to a single organisation to maintain specified highways for 10 years. Since the introduction of PMSCs, Transit has achieved 15-20 percent real savings over savings already obtained from other maintenance contracts.

Construction Procurement

Transit has developed a similar lump sum contracting option for capital works, in addition to the existing Measure and Value and Cost Plus options. The key considerations for selecting construction contract options include:

- The assignment of risk to the party best able to manage it. The Lump Sum contract form is an effective tool to deliver this
- Elements that cannot be quantified or scoped or that are not best managed by the supplier will remain as Measure and Value or Cost Plus
- The Lump Sum form will apply in the development phase where a project can be adequately scoped, otherwise Measure and Value or Cost Plus options apply
- The Lump Sum form will be used in the delivery phase immediately for projects valued over NZ $1 million and introduced over time for projects valued under $1million.

Implementation and Monitoring

Transit has established best practice groups to oversee the implementation and monitoring of the LTPS for both capital projects and maintenance. The groups are also responsible for ensuring the business improvement projects necessitated by the introduction of the strategy are implemented and monitored. A strong focus of Transit's ongoing evaluation of the LTPS is to monitor the strategy's deliverables in terms of value creation and competition in the roading industry.