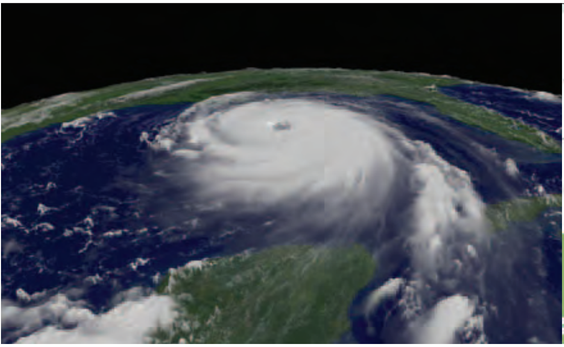
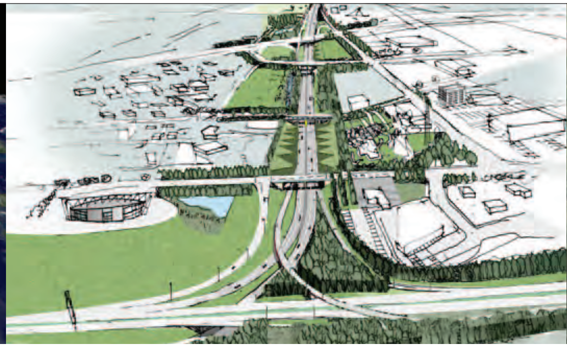
ENVIRONMENTAL PLAN

IMPROVING ENVIRONMENTAL SUSTAINABILITY AND PUBLIC HEALTH IN NEW ZEALAND

VERSION 2 | JUNE 2008





TRANSIT NEW ZEALAND ARARAU AOTEAROA

newzealand.govt.nz

ENVIRONMENTAL POLICY

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Transit New Zealand is committed to:

- being socially and environmentally responsible; and
- improving the contribution of state highways to the environmental and social well being of New Zealand by:

Protecting and enhancing the environment where appropriate

Managing the state highway network provides opportunities to protect and enhance the natural and physical environment. Transit manages these opportunities, where appropriate, for the benefit of current and future generations. Transit has a role in improving quality of life, particularly in urban areas, and aims to do this in partnership with others.

Avoiding adverse effects to the extent reasonable in the circumstances

Constructing and operating state highways can impose adverse effects on communities and the environment. Transit avoids these effects to the extent reasonable in the circumstances. Adverse environmental effects that cannot be reasonably avoided are mitigated by low-impact and, preferably, multi-purpose measures; statutory compliance is a minimum requirement. Working in partnership with others to encourage multi-modal travel and reduce demand for private motor vehicle travel helps reduce adverse effects.

Using and managing resources efficiently

Materials and energy are key components of Transit's business and these resources are used in a manner that recognises supply limitations and lifecycle costs. Particular emphasis is given to reusing and recycling resources. Transit recognises the multiple benefits of using energy efficiently and aims to ensure state highways contribute to improving the energy efficiency of the transport sector and help reduce New Zealand's greenhouse gas emissions.

Considering environmental issues early

Environmental management is most effective when environmental constraints and opportunities are considered early in network planning, design and maintenance. Transit recognises it is also cost effective to consider environmental issues early, alongside other key objectives such as safety, economic development and integrated planning.

Contributing to sustainable outcomes by working with others

Many elements of a sustainable land transport system are beyond Transit's direct control. In these situations Transit aims to influence sustainable outcomes by working with central government, local government, communities, Māori and transport providers.

Continually improving environmental performance

Achieving sound social and environmental outcomes is an integral part of Transit's business. While compliance with legal obligations is inherent in Transit's business, learning from experience, including that of consultants and contractors, is necessary for continual improvement. Transit encourages new ways of improving environmental sustainability and public health.

Signed in the presence of the Transit New Zealand Board, 3 November 2004.

David Stubbs
Chairperson

Rick van Barneveld
Chief Executive

FOREWORD

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One of the National State Highway's five strategic goals is to: *"improve the contribution of state highways to the environmental and social well being of New Zealand, including energy efficiency and public health".*

Large civil engineering projects are a major contribution to the economic well being of a region and country as a whole. However, they are unintentionally disruptive and damaging to the environment and social cohesion of local communities. Transit is dedicated to avoiding whenever possible, enhancing if practicable, mitigating where required and remedying if feasible adverse environmental and social effects from state highway construction and operation. Transit considers environmental and social issues early in the planning phases and promotes good urban design to have the least impact possible. This Environmental Plan specifies how employees and suppliers achieve environmental and social objectives.

Since publishing version 1 of the Environmental Plan (2004) new environmental initiatives appeared in the planning, design, build, maintenance and operation of state highways, including:

- signatory to the NZ Urban Design Protocol, appointment of urban design champions and an *Urban Design Professional Services Guide*;
- *Guidelines for Highway Landscaping* revisions included low-growth vegetation;
- *Memorandum of Understanding* with Department of Conservation and revised *Guidelines for State Highways* within or adjacent to National Parks, Reserves and Conservation Areas;
- contract template providing improved clarity and direction for consultants and contractors on environmental and social responsibilities; and
- allocation of over $2 million per annum to noise improvements, landscaping, stormwater treatment and recycling on existing state highways.

As a work in progress this will always be evolving in response to stakeholders and as our environmental knowledge improves. Over time the Environmental Plan will be converted to a web-based version that will be continuously updated and dynamically linked to references and sources of up-to-date information. Feedback is welcome at any time and I encourage you to contact us.

I commend this Environmental Plan and look forward to working with Transit's partners and stakeholders to achieve results on the ground.

Rick van Barneveld
Chief Executive
May 2008

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1.3 HOW TO USE THIS ENVIRONMENTAL PLAN

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The Environmental Plan is divided into sections by environmental and social impacts such as noise, water, air, culture and heritage. Each impact first states the objectives, then adverse effects are discussed and Transit's role explained, followed by examples of current practices. Next is an Implementation Plan divided into activities such as plan, design, build, maintain and operate as well as national office initiatives. Each Implementation Plan activity has a 'toolkit' with references to sources of policy, guidelines, specifications and standards. Best practices are evolving works in response to understanding of environmental effects, societal expectations and practice informing policy development, a cycle of continuous improvement.

ENVIRONMENTAL EFFECTS

This Plan specifies how Transit staff and suppliers are expected to address key social and environmental impacts:

- Noise
- Air quality
- Water resources
- Erosion and sediment control
- Social responsibility
- Culture and heritage
- Ecological resources
- Spill response and contamination
- Resource efficiency
- Climate change
- Visual quality
- Vibration

ENVIRONMENTAL ISSUES STRUCTURE

In each section, the Plan sets out the following information:

Objectives

Objectives are overall goals that describe long-term environmental performance consistent with the Environmental Policy. Wherever possible they are measurable, either quantifiably, for example noise level measurements; or qualifiedly, like the opinion of key stakeholders in regard to Transit's performance. Transit's social and environmental objectives are reflected in Transit's Statement of Intent, our Triple Bottom Line approach to performance reporting.

Effects

The source of the adverse effects and the nature of the impact are briefly described.

Transit's role

Transit's influence on the effect, and the role of other stakeholders.

Current practice

Recently completed mitigation, partnerships or innovative solutions are showcased in this section. Case studies show how context-specific responses to environmental sensitivity and community concerns resulted in sustainable outcomes.

Performance indicators

Performance indicators assess progression towards objectives. They work best when they are simple, understandable to most people, verifiable and relevant to Transit's activities. Information collection requires a commitment of resources to preserve, manage and track over time. Successful organisations start small, work with what they know and build indicators over time thus gaining experience in evaluating performance. Therefore, not every objective has an indicator at this time. Indicators have been developed for priority areas where information exists to answer them. No single measurement can explain how well we are doing in environmental and social areas.

Implementation plan

Transit functions are broken down into sequential activities: plan, design, build, maintain and operate. The specific environmental and social responsibilities for each activity are stated. Alongside each activity and responsibility you will find a toolkit of appropriate standards, guidelines and references.

2.1 NOISE

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OBJECTIVES

N1 Reduce exposure to high traffic noise levels from the existing state highway network.

N2 Determine reasonable noise requirements when seeking new or altering existing designations including when designating existing local roads by using RMA procedures.

N3 Manage construction and maintenance noise to acceptable levels.

N4 Influence activities adjacent to state highways to discourage noise-sensitive activities establishing in areas adversely affected, or likely to be in the future, by state highway traffic noise.

EFFECTS

A noise-sensitive residence in close proximity to the Auckland Southern Motorway

Road traffic is a widespread source of environmental noise in New Zealand and can adversely affect community health and well being. The World Health Organisation identified a range of health effects associated with exposure to elevated levels of community noise, such as traffic noise, including:

- noise-induced hearing impairment;
- interference with speech communication;
- disturbance of rest/sleep; and
- physiological, mental health and performance effects.

The NZTS acknowledges noise from motor vehicles affects community health and well being, especially in urban areas. At present there is no national environmental standard relating to traffic noise, although a number of local councils have included approaches to address the issue in their district and city plans.

Noise comes from multiple sources associated with the state highway network. Vehicles using state highways generate traffic noise and construction and maintenance activities create noise over short periods of time.

There are two main sources of traffic noise:

- mechanical noise such as engine and exhaust noise; and
- rolling noise resulting from the interaction between vehicle tyres and the road surface.

Traffic noise may be continuous; for example, noise from a busy urban motorway or arterial road, or may be intermittent, like truck noise from a rural road at night. The level of traffic noise audible in a particular location will depend on a range of factors, including:

- traffic composition (vehicle noise standards, type and age of vehicles) and conditions (speed and traffic flow);
- road surface (texture and porosity) and grade (degree of incline);
- driver behaviour (acceleration and braking); and
- surrounding topography (built and natural environment as well as environmental sensitivity).

Construction noise is associated with works to build new or upgrade existing state highways whilst maintenance noise is associated with works to maintain the standard of or repair existing state highways. Both the type of equipment and techniques employed to undertake construction and maintenance works can generate noise.

2.1 NOISE

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TRANSIT'S ROLE

Noise assessments are performed on roads with new or altered state highway designations likely to be affected by traffic noise. In consultation with local authorities, reasonable noise level criteria are generally included in the designation conditions. Design methods to achieve the criteria rely on a number of approaches and will be dependent on local conditions. Methods include physical mitigation measures such as low-noise road surfaces, noise barriers, walls and fences as well as landscaped earth bunds. In addition, road geometric design approaches such as design speed, road grade and intersection layout can be used to influence traffic noise levels.

On the existing state highway network, noise complaints are assessed on a case-by-case basis. If noise levels are above 65dB(A) $L_{eq,24hrs}$, a Noise Improvement Programme is available to fund retro-fitting of noise mitigation measures. Funding is limited and prioritised according to a set of criteria that considers sensitivity of receiving activities, number of properties affected, achievable noise reduction, cost of works including cost-sharing contribution from third-parties, legal risk, years of occupation or establishment of sensitive receiver(s) and number of complaints received. The programme is not intended to ensure mitigation of traffic noise to 65dB(A) $L_{eq,24hrs}$ or less.

Transit's Planning Policy Manual demonstrates how potential reverse-sensitivity noise issues should be managed and places a strong emphasis on working with other stakeholders such as local councils and developers to achieve satisfactory outcomes. Transit seeks to ensure that new noise-sensitive developments establishing in close proximity to the state highway network take into account the existing (and, where possible, projected) traffic noise environment.

Transit also recognises that noise issues associated with construction and maintenance activities on the state highway network can be particularly intrusive and disturbing, especially when undertaken at night. The effective management of such noise is essential in order to avoid unreasonable effects on communities and individuals.

PERFORMANCE INDICATOR

Cumulative increase in vehicle-kilometre-travelled affecting sensitive receiving environments near state highways in urban and peri-urban areas treated with road surfaces that are quieter than a grade 2 chip seal.

2.2 AIR QUALITY

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OBJECTIVES

A1 Understand the contribution of vehicle traffic to air quality.

A2 Ensure new state highway projects do not directly cause national environmental standards for ambient air quality to be exceeded.

A3 Contribute to reducing emissions where the state highway network is a significant source of exceedances of national ambient air quality standards.

EFFECTS

Air pollution in Auckland (Source: Auckland Regional Council)

Motor vehicle exhaust contains an array of air pollutants such as fine particulates (PM_{10}), nitrogen dioxide, carbon monoxide, carbon dioxide and volatile organic compounds.

PM_{10} and nitrogen dioxide contribute to harmful effects on human health ranging from breathing problems caused by lung irritations, to premature death of the seriously ill as a result of increased risk of lung and heart disease. Carbon monoxide at lower levels of exposure causes mild effects that are often mistaken for the flu. These symptoms include headaches, dizziness, disorientation, nausea and fatigue. High concentrations can be fatal. Carbon dioxide is a significant greenhouse gas (see section on Climate Change). Volatile organic compounds are known human carcinogens.

Vehicle exhaust emissions contribute to smog that reduces atmospheric visibility similar to that shown in the photograph. In addition to vehicle emissions, state highway construction and maintenance activities impact on air quality, e.g. dust, odour and spray drift. While individual vehicles may not be particularly important, collectively they represent a major source of air pollution. The Government has indicated in the NZTS and Energy Strategy that reducing the air quality effects of motor vehicle emissions is a high priority.

TRANSIT'S ROLE

Ensuring compliance with the National Environmental Standard (NES) for air quality and managing local air quality in general is the responsibility of regional councils. When Transit seeks a new or altered designation in order to build a new or alter an existing state highway, it must take into account any air quality effects and the requirements of the NES.

Given the complex nature of managing the effects of emissions from motor vehicles, Transit is committed to inter-agency initiatives to tackle these effects by collaborating with relevant stakeholders and contributing to forums such as the National Air Quality Working Group. In addition, Transit has commissioned an air quality monitoring network to investigate relative levels of motor vehicle-related air pollution around the state highway network and to focus limited resources more effectively.

2.2 AIR QUALITY

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In order to minimise other sources of air pollution, for example construction dust and spray drift of chemicals used for vegetation control, Transit requires that its consultants and contractors employ good management practices.

PERFORMANCE INDICATOR

Annual assessment of vehicle emissions from the state highway network gathered from selected sites using diffusion tubes to measure nitrogen dioxide (NO_2) as a surrogate measure. The objective is to monitor a decreasing trend in emissions of NO_2.

EXAMPLES OF CURRENT PRACTICE

Working in partnership

Transit is collaborating with the Hawke's Bay Regional Council to support a fine particulate (PM_{10}) monitoring study in the vicinity of the Meeanee Road intersection upgrade project. Monitoring began in 2005 with the aim of assessing particulate levels before, during and after the roading project. During the construction phase of the project, measured levels of PM_{10} have been compared with records documenting the nature and duration activities, such as earthworks, on the site.

Managing dust during construction

The means used to control dust levels during the build phase of a roading project is a key component of any construction management plan. As part of the approach to manage dust levels around the Wellington inner city bypass project, wheel wash facilities were installed to clean all vehicles leaving the project site. This was part of a package of measures that helped the contractors working for Transit to ensure good community relationships were established and maintained during the construction of the bypass.

Air quality monitoring station near Meeanee Road intersection upgrade project in Napier

Wheel wash facility used to control dust from the Wellington inner city bypass project

2.2 AIR QUALITY

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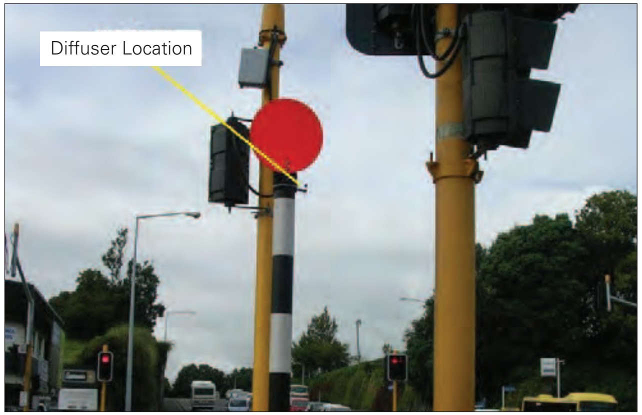
Assessing air quality effects of new projects

Since the introduction of the National Environmental Standards for Air Quality, there has been an increasing focus on understanding the contribution of vehicle emissions to overall air pollution levels in areas believed to be at risk of breaching the standards. This is particularly the case where new projects are proposed in urban areas that experience high levels of congestion and traffic flows. For example, in order to assess the likely effects of the Victoria Park tunnel project in Auckland, a sophisticated monitoring station was set up in a nearby residential area during 2005 and 2006.

Air quality on the state highway network

To obtain information about air quality on the state highway network, over 80 nitrogen dioxide diffusion tubes are deployed across the network and exchanged on a monthly basis. Data from these tubes allows air quality associated with vehicle emissions to be established and tracked over time. Measurements are made near a variety of potentially sensitive locations near state highways throughout New Zealand. These include residences and schools in major urban centres as well as rural centres.



Air quality monitoring site in Tauranga

2.4 EROSION AND SEDIMENT CONTROL

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OBJECTIVES

ES1 Ensure construction and maintenance activities avoid, remedy or mitigate effects of soil erosion, sediment run-off and sediment deposition.

ES2 Identify areas susceptible to erosion and sediment deposition and implement erosion and sediment control measures appropriate to each situation with particular emphasis on high-risk areas.

ES3 Use bio-engineering and low-impact design practices where practicable.

EFFECTS

Adverse impacts include soil slips and landslides where significant amounts of sediment enter waterways resulting in deterioration and destruction of flora, fauna, aesthetic features, structures and water quality.

The two main drivers of erosion are water and wind. **Water:** Water plays a major role in erosion by displacing and transporting soil. In general, there is an increased potential for water erosion where the land slope is greater than 2%.

Water erosion types include:

1. Raindrop erosion: the breaking-up of the soil surface through the direct impact of raindrops. The extent of raindrop erosion is directly related to soil surface cover and the size, velocity and direction of raindrops, and is essentially the start of the erosion process.
2. Sheet erosion: the uniform removal of soil without the development of visible water channels. It is the least apparent of the erosion types.
3. Rill erosion: soil removal through the cutting of many small but conspicuous channels.
4. Gully erosion: the consequence of water cutting down into the soil along the line of flow. Gullies – the result of concentrated flows – develop more quickly in places characterised by furrows and vehicle ruts.
5. Tunnel erosion: occurs in soils with sub-layers with a tendency to transport flowing water more readily than their surface layer.
6. Channel erosion: when the volume and velocity of water in stream systems results in scouring and undercutting of stream banks and beds.

Wind: Wind can move sediment grains over long distances when they are air-borne. Sediments also can be blown along expanses of land, such as beaches, mudflats, unvegetated cropland or construction areas. Obstructions can reduce the wind's erosive capacity; hence windblown sediment is often deposited at these locations.

Windborne dust can pose a significant hazard on the state highway network by reducing visibility.

Lime application (Photo taken by G Ridley, Waitakere, Auckland)

The three key factors that influence the erosion process are climate, soil characteristics (soil texture, organic matter, permeability and structure) and topography. These factors need to be considered when implementing risk assessment, mitigation and control measures; with particular attention being paid to:

- vegetation cover removal;
- control measures during earthworks;
- roading project design;
- unstable or exposed soil;

2.4 EROSION AND SEDIMENT CONTROL

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- stockpile location of soil and other debris including haul road location;
- earth damaged by vehicle passage;
- works carried out during rainy seasons and other wet periods;
- works in areas sensitive to erosion (friable soils, high rainfall, coastal environments);
- local environments characterised by high water flows and subject to high rainfall;
- steep slopes;
- long slope lengths; and
- storms featuring heavy or abnormal rainfall, both forecast and not forecast.

Because erosion and sediment deposition has a detrimental effect on the environment and safe sustainable use of the state highway network, control measures should be planned and implemented early in any project that is likely to cause erosion or sediment deposition.

TRANSIT'S ROLE

Silt fence construction (Photo in Auckland region – compliments ARC)

With careful planning and design, adverse effects of sediment discharges resulting from construction and maintenance activities can be avoided or minimised.

Transit ensures that the above objectives are key in minimising adverse effects of road construction and maintenance. This involves forming partnerships with interested parties – government agencies, consulting and engineering firms, specialist advice and contracting firms. Transit's intention is to lead in the:

- promotion and use of appropriate design methods;
- development and application of practices that minimise risk of erosion and sediment deposition;
- implementation of erosion and sediment control measures;
- identification of risk and problem areas;
- use of best-practice methods unique to each situation to ensure effectiveness;
- early identification of new projects that have a higher risk of erosion;
- identification of and support for new techniques and methodologies including research and implementation as appropriate;
- consultation with council authorities to ascertain problem areas and agree upon solutions; and
- protection of sensitive receiving environments.

PERFORMANCE INDICATOR

None at this time.

EXAMPLES OF CURRENT PRACTICE

There are 10 core best-practice principles for erosion and sediment control to be applied in all projects.

1. Minimise disturbance: some areas of a site should not be disturbed and others should have the impacts on them minimised as much as possible. Projects should avoid working on areas that are steep, wet, have fragile soils, vegetation or are conservation areas.
2. Stage construction: to limit erosion, project sites should use only the areas needed for the immediate activity and construction staging where the site has earthworks undertaken in small units over time, followed by progressive re-vegetation.
3. Protect steep slopes: steep slopes should be avoided, but if necessary, divert run-off from slope and ensure that erosion control measures are put in place immediately the activity is finished.
4. Protect watercourses: preserve riparian margins around watercourses – a vegetative barrier should be maintained and appropriate erosion and sediment control measures implemented around water bodies to minimise contamination.
5. Stabilise exposed areas rapidly: it is important to stabilise each area with vegetation or other appropriate measures after they have been disturbed. Mulch is a material that provides instant stabilisation.
6. Install perimeter controls: placed around the project, these prevent clean offsite run-off contamination.
7. Sediment retention measures: when installed, will capture and minimise the impacts of any sediment run-off where present.

2.4 EROSION AND SEDIMENT CONTROL

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8. Get registered: consult with erosion experts or attain qualifications on erosion and sedimentation, allowing savings on project time and money, as well as facilitating early identification of potential problems. An appropriately qualified and trained contractor enhances achievement of the above objectives.
9. Ensure plan evolution: the project plan should evolve as the relevant variables do. Factors such as weather, changes to grade and altered drainage can require changes to planned erosion and sediment control practices.
10. Assess and adjust: monitor, assess and maintain effective control measures by facilitating adaptation to storm events or changes in project plans.

Transit promotes the use of vegetation as an effective erosion and sediment control measure because it is a low-impact bioengineering alternative. The use of vegetation to manage erosion and to achieve slope stabilisation serves these key functions:

- retain sediment, keeping it out of receiving environments;
- provide permanent slope stabilisation and erosion control with its root structures minimising slip risk; and
- create an aesthetically pleasing roadside environment.

Use of vegetation in erosion and sediment control is an efficient use of capital compared to traditional construction-based alternatives, and can also save staff time, maintenance costs mitigating against future road closures and remedial work.

To effectively utilise vegetative options for erosion and sediment control careful planning and consideration is needed as:

- vegetative options should complement the natural biodiversity of the surrounding area, especially when working in or adjacent to Department of Conservation (DOC) land;
- selection of native species endemic to the area is important because of the impact on the natural character, the species native to the area and plants' ability to flourish in the environment; and
- plants should be locally-sourced and chosen after consultation with experts such as tangata whenua and local DOC personnel.

Sediment retention pond (Photo in Auckland region – compliments ARC)

Orewa Interchange construction, ALPURT B2 Northern Motorway Extension

2.5 SOCIAL RESPONSIBILITY

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OBJECTIVE

SR1 Enhance and contribute to community cohesion.

EFFECTS

Severance effect

Barrier effect

State highways are the main streets of many towns. While only part of the state highway network runs through towns and cities, over 85% of New Zealanders live in these urban communities. The state highway system is an essential part of New Zealand's transport system that provides access to social, educational, employment and recreational opportunities and, in this way, contributes to the well being of communities.

However, state highways can also have adverse effects on the cohesion of local communities. The construction, realignment or increase in numbers of vehicles on state highways can physically or perceptually sever parts of a community from services (such as schools and hospitals) and facilities (such as parks and shopping centres).

The ability of pedestrians and cyclists to move freely and without risk of accidents is affected by traffic and roads. The greater the number of vehicles the more delays and discomfort are experienced by people walking. This is called the 'barrier effect' and is proportional to vehicle kilometre travelled (VKT). New or widened highways impose a 'severance' effect on communities. Together, the barrier and severance effects can reduce community cohesion.

This loss of community cohesion is not intentional but is unavoidable when fast-moving, and/or large vehicles share space with vulnerable road users. Consequently, pedestrians may change routes and take longer to reach their destinations. The increased travel time of pedestrians caused by increased traffic volumes and new roads is currently not formally assessed.

Loss of connectivity promotes increased motorised travel. Numerous studies indicate people would like to walk and bicycle for recreation and transport, but are constrained by heavy road traffic; for example, the proportion of British children walking to school decreased from 80%

2.5 SOCIAL RESPONSIBILITY

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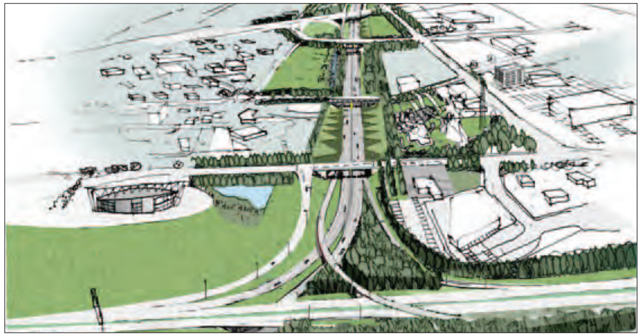
in 1971 to 9% in 1990 partly because of fears of traffic risks. Furthermore, disadvantaged populations bear a disproportionate share of these risks because they are often heavily dependent on non-motorised transport.

Community cohesion is also adversely affected as a result of designations for new or improved transport routes. Once a transportation corridor is 'designated' the residents are placed in a state of uncertainty because the road may not be built for many years. Any improvements made are not compensated once a designation is in place, consequently is it not uncommon for buildings and land to deteriorate.

Severed communities, Auckland



Urban design concept

TRANSIT'S ROLE

Balancing the needs of local communities with national transport requirements can be a difficult and contentious undertaking. Social impact assessments are one of the methods planners use to improve the decision-making process.

Social impact assessments for major roading projects make good sense for several reasons:

- identify and make explicit community cost and benefits;
- consider social cost alongside technical, safety and economic issues;
- reduce costs from unforeseen environmental damages;
- efficient project design and performance by good urban design; and
- ameliorate public opposition.

Roads may also play a useful role in separating incompatible land uses; for example, separating residential areas from wetlands or industry, or restricting land use development to one side of a bypass.

Transport and land use planning decisions affect community cohesion by influencing the location of activities and the quality of the places where people naturally interact, such as footpaths, local parks and public transport, and thus the ease with which neighbours meet and build positive relationships.

There are many ways to support community cohesion and thereby achieve other strategic planning objectives by improving land use accessibility, affordability and transport diversity. For example, transit-orientated development and good urban design maximise the quality of public space and walk ability, reduce traffic speeds and volumes, encourage mixed use buildings and support neighbourhood events and activities such as street fairs and cultural events. In addition, community cohesion can provide indirect benefits, including increased safety, increased property values and economic productivity, and support strategic objectives like urban redevelopment, reduced travel and improved public health.

PERFORMANCE INDICATOR

None at this time.

2.6 CULTURE AND HERITAGE

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OBJECTIVES

H1 Proactively limit the disturbance of significant cultural and heritage features along state highways.

H2 For historic buildings we own, show a respect for them and maintain their integrity.

EFFECTS

Historic house on Tonks Ave, Wellington inner city bypass

The state highway network closely mimics traditional travel paths that connected historical settlements. It is therefore inevitable that state highway activities have the potential to damage or disturb places of cultural, archaeological or historic importance. This includes places of significance to Māori such as pa, marae and wahi tapū.

Once a state highway is operational there may be adverse effects on heritage structures and archaeological sites such as vibration caused by vehicles.

The use of designation processes to set aside land for state highway construction and improvement in urban areas can influence heritage areas where redevelopment does not occur due to an impending project. This can lead to conflicting objectives and expectations about the future of these heritage structures or areas.

There is strong legislative support for the protection of culture and heritage values. For example, the Historic Places Act 1993 makes it unlawful for any person to destroy, damage or modify the whole or any part of an archaeological site without the prior authority of the New Zealand Historic Places Trust.

A number of important cultural and heritage provisions are also included in the RMA, including recognition of the following as matters of national importance:

- the relationship of Māori and their culture and traditions with their ancestral lands, water sites, wahi tapū and other taonga; and
- the protection of historic heritage[1] from inappropriate subdivision, use and development.

TRANSIT'S ROLE

The management of cultural and heritage issues involves a number of different stakeholders. Transit recognises that developing strong relationships and good processes is crucial to ensuring positive outcomes for all parties. Transit has established informal and formal relationships with key parties at both a national and regional level, including iwi and hapū, the Department of Conservation and the New Zealand Historic Places Trust (NZHPT).

These relationships are critical in terms of assisting Transit to meet consent conditions and NZHPT authority requirements, as well as building capacity within Transit to understand the cultural and heritage needs of our stakeholders.

Transit has recently developed Guidelines for Managing Stakeholder Relationships and Consultation with Māori, which set out Transit's expectations and methods for consulting and recording consultation outcomes with Māori. Transit, in conjunction with NZHPT, has also developed generic protocols for the accidental discovery of archaeological sites, koiwi and taonga for use in construction and maintenance projects. Some regions have worked with local iwi and NZHPT offices to develop region-specific accidental discovery protocols.

PERFORMANCE INDICATOR

Avoid loss of cultural, archaeological or spiritually important sites.

1 The New Zealand Historic Places Trust defines historic heritage as natural and physical resources that contribute to understanding and appreciating New Zealand's history and cultures. Places may be significant because they have aesthetic, archaeological, architectural, cultural, historical, scientific, social, spiritual, technological or traditional value.

2.7 ECOLOGICAL RESOURCES

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OBJECTIVES

E1 Promote biodiversity on the state highway network.

E2 No net loss of native vegetation, wetlands, critical habitat or endangered species.

E3 Limit the spread of plant pests.

EFFECTS

New Zealand's ecological resources, in particular indigenous biodiversity, are significant. They provide genetic diversity, habitats for flora and fauna and contribute to our sense of national identity. As a result, the New Zealand Biodiversity Strategy 2000 has identified reversing the decline of indigenous biodiversity as a strategic priority.

State highway passing through a National Park

Furthermore, section 6 of the RMA identifies as matters of national importance:

- preservation of the natural character of the coastal environment (including the coastal marine area), wetlands and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use and development;
- protection of outstanding natural features and landscapes from inappropriate subdivision, use and development; and
- protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna.

State highways can adversely affect ecological resources – habitat is lost to construction, quarries and stockpiles can destroy vegetation and disperse pest species, wildlife can be killed or repelled within an ecological corridor where the state highway passes and occupants of vehicles may drop litter.

TRANSIT'S ROLE

To ensure these adverse effects do not occur or are appropriately mitigated, Transit aims to protect significant ecological resources when planning, designing, constructing and maintaining state highways.

Managing the state highway network provides opportunities to protect and enhance ecological resources. This is especially so where Transit retains ownership of land containing ecological resources. Transit aims to work effectively with concerned organisations such as Department of Conservation, New Zealand Conservation Authority, Forest & Bird and Fish & Game to ensure the state highway can be operated effectively while ensuring potential detrimental effects on ecological resources are avoided, remedied or mitigated. Transit also aims to ensure state highways limit the spread of plant pests into the environment.

PERFORMANCE INDICATOR

Area of habitat loss and restoration.

2.8 SPILL RESPONSE AND CONTAMINATION

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OBJECTIVES

S1 Design stormwater control and retention devices that can accommodate spills in areas of high environmental risk.

S2 Ensure the removal, placement and disposal of contaminated soils is achieved in accordance with best practices.

EFFECTS

Vehicle accidents on the state highway can result in spills, which may enter drinking water aquifers or find their way into rivers, lakes or coastal habitats. Clean-up is often difficult and sometimes impossible. In high-risk areas, such as unconfined aquifers or intersections with heavy tanker traffic, stormwater treatment systems can be fitted with mechanisms to collect and retain spillage.

Contaminated soils are a problem in the acquisition of industrial and agricultural properties, management of excavations and reinstatement of clean fill. If improperly managed, contaminated soils can inadvertently be dumped onto land intended for homes, schools and public places.

TRANSIT'S ROLE

State highways are affected by contamination and spills in two ways, either through land acquisition or vehicle accidents.

Contaminated soils

Contractors moving excavated contaminated soil from either a widening or highway extension need to protect both workers' health and the environment. Transit conducts contaminated site investigations well in advance of construction and in consultation with the regional council, as the conclusions will affect land acquisition decisions and negotiations. Geotechnical and analytical costs and time when determining the nature and extent of contamination are considerable, therefore contaminated sites receive detailed investigation ahead of time.

Spills

Contractors are required to manage spills resulting from construction and maintenance operations.

Spills resulting from vehicle accidents are the legal responsibility of the company and individuals involved. Frequent transport of any substance capable of causing environmental harm means it is foreseeable that a spill of that substance will occur at some time. If a spill leaves the site, the spiller is legally responsible for cleaning and repairing the receiving environment. This may include removing residues from the verge, stormwater systems, stream bed and stream banks, restocking fish and nursing injured bird life. These costs can mount very quickly, and take considerable time.

For major spills, the regional authority or fire service assume the role of incident response management. Transit staff, consultants and contractors assist in whatever way possible, usually by controlling traffic and making staff and equipment available. If residual spilled substances are found alongside the roadway Transit will either request that they be removed, or undertake removal and recover costs from the responsible parties.

PERFORMANCE INDICATOR

None at this time.

2.9 RESOURCE EFFICIENCY

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OBJECTIVES

RE1 Manage energy consumption and waste associated with Transit's business in a cost effective and sustainable manner.

RE2 Make resource efficiency an integral part of all state highway activities.

An office waste audit in progress at Transit's National Office

EFFECTS

The administration, design, construction and maintenance of state highways involve the use of finite resources like electricity, fossil fuels, new aggregate materials and water or hydrocarbon binders.

Road building and maintenance activity resource use affects the society and environment by:

- production and transport of road building materials (such as rock, gravel, concrete and bitumen);
- disposal of waste material generated during excavation, repair and resurfacing works;
- use of fuel by construction and maintenance vehicles;
- use of paint for road markings;
- production and use of plastic and metal materials in road structures, signs, safety devices and markers;
- use of electricity with street lighting, traffic signals and variable message signage; and
- vehicles' use of petrol and oil results in emission of particles and carbon dioxide that affect local air quality and global climate conditions.

TRANSIT'S ROLE

Having direct control over use and disposal of road building materials in construction and maintenance means this is the best place to focus efforts.

Existing office programmes: reduce waste, energy use and paper consumption and report regularly on performance.

The major contribution to improving the energy efficiency of the land transport sector as a whole is managing demand for travel and getting best use of the existing state highway network.

PERFORMANCE INDICATORS

Reducing energy use by 3% per m^2 of office space over the previous 12-month period, and reducing the non-recycled wastage from Transit offices by 5% per staff member, compared with the previous year's waste sort results, by making staff more aware of energy and resource issues and providing facilities to allow recycling to take place.

Annual reporting of the amount of recycled products used in new roading and/or reconstruction utilising cost-effective recycled pavement materials, including glass and aggregate. The trend is for increasing utilisation of recycled materials.

2.10 CLIMATE CHANGE: ADAPTATION AND MITIGATION

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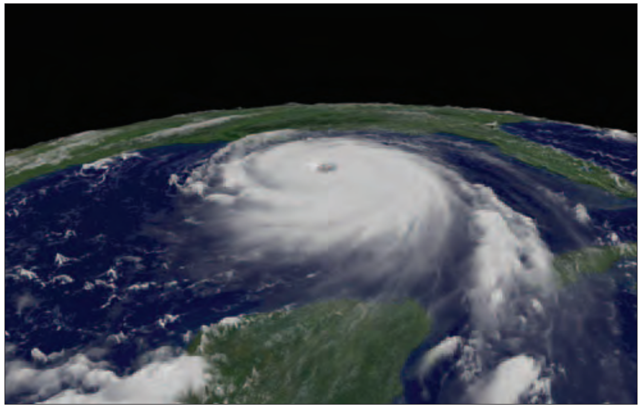
OBJECTIVES

C1 Manage increased hazards of climate change impacts on state highway infrastructure.

C2 Collect and analyse information on greenhouse gas (GHG) emissions and the impact of climate change on the functioning of the state highway to support decision-making.

C3 Mitigate activities associated with the construction, operation and maintenance of state highways to effect a net reduction of GHG from transport.

EFFECTS



Category 5 hurricane

PROBABILITY	EFFECT
virtually certain > 99%	Most land areas will experience fewer cold days and nights, and more hot days and nights, over the course of the 21st century.
very likely > 90%	Frequency of heat waves and very heavy rainfall events will both increase over most land areas.
likely > 66%	Increase of droughts, incidence of extreme high sea level, and intense tropical cyclone activity.

Climate change is the long-term alteration of the earth's climate as a result of human activity. It occurs when heat is trapped in the atmosphere by an over-abundance of greenhouse gases, causing the earth's average surface temperature to rise. As a consequence of global warming, it is predicted that sea level around New Zealand will rise by between 9 and 88 centimetres over the next 100 years.

In 2007 the Intergovernmental Panel on Climate Change (composed of all members of the United Nations World Meteorological Organisation and Environment Program) issued their 4th report, which found climate change will have the following global effects.

The transport sector is both a significant contributor to greenhouse gas emissions (generating 19% of New Zealand's total greenhouse gas emissions and 44% of CO_2 emissions (source: MfE), as well as being exposed to risk from the effects of climate change on the design, location and maintenance of transport infrastructure. For example, changes in temperature will affect pavement surfaces and plant pest management practices.

In New Zealand, climate change is predicted to change rainfall patterns, which will affect water availability, stormwater management and incidences of flooding and landslips. Extreme weather events will be 20 times more frequently occurring over the next century. The rise in sea level and predicted increase in coastal storms will affect protection and location of coastal infrastructure including causeways, bridges and protection works.

2.10 CLIMATE CHANGE: ADAPTATION AND MITIGATION

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Flood-damaged bridge, Wanganui

TRANSIT'S ROLE

Transit has a dual role in responding to climate change: adaptation to extreme weather events and mitigation of greenhouse gas emissions from construction, operation and maintenance of the state highway network. Both roles are emerging and will develop over time.

Adaptation

Amendments to design specifications for bridges and culverts ensure climate change impacts are considered at the design stage. These amendments followed adoption of a position paper, *Climate Change Impacts on the State Highway Network (2005),* which concluded current asset management practices are sufficiently responsive to climate change impacts. Since adopting this position, the certainty surrounding climate change science has improved significantly. It is likely therefore that Transit's position on climate change adaptation will be reviewed as certainty around predictions on climate change effects improves.

Mitigation

Construction

Recently, overseas studies estimate 10% of a national highway's greenhouse gas emissions arise from construction, predominantly concrete, steel and asphalt. Careful selection of materials in the design phase can decrease overall emissions, extend a highway's life and reduce maintenance impacts.

Operation

Operationally, Integrated Planning Travel Demand Management can reduce dependency and frequency of single occupancy vehicle use, reduce congestion and improve optimal traffic flow thus making more efficient use of existing resources.

Maintenance

Substantial costs are incurred by the need to do extensive plant pest removal and large-scale mowing on many sections of the state highway. There are two sides to the current maintenance expenditure – environmental cost and financial cost. Environmentally, the use of agrichemicals and fuel increased greenhouse gas emissions and pollution, especially from overspray. Financially, the cost of mowing equipment represents a significant amount of inherent greenhouse gas from equipment manufacture, operation and maintenance. Low-growth vegetation and native planting can reduce emissions from mowing and chemicals used for vegetation control.

Land use planning

While technology is contributing to improvements through fuel efficiency and cars are becoming cleaner each year, this is often offset by the increase in the number of cars and logged kilometres. The long-term answer may therefore lie in the development of energy efficient liveable communities that foster economic development, mobility, safety and social equity by protecting the environment.

PERFORMANCE INDICATOR

None at this time.

2.11 VISUAL QUALITY

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OBJECTIVES

VQ1 Incorporate multi-purpose landscaping as an integral part of all new state highway construction projects.

VQ2 Improve the visual quality of the existing state highway network.

EFFECTS

As state highways pass through urban, rural and natural landscapes they create visual effects for road users, adjacent land users and on the surrounding environment.

Motorist safety may be at risk if errant vehicles strike hard non-frangible objects on the shoulder of state highways. Road safety barriers and frangible plants can mitigate the risk of hard structures to driver safety.

Motorists need highway landscapes with clear sightlines. Planting provides drivers with visual cues, which interpret the road ahead. Lighting clarifies night vision and personal security for pedestrians and cyclists.

Landscaping affects how state highways complement surrounding scenery. Road and landscape design will affect visual amenity and personal security of communities adjacent to or using a state highway. Landscaping and design elements impact how state highway neighbours, cyclists and pedestrians use facilities provided for them on state highways.

Roadside plantings can add to the biodiversity of surrounding areas if suitable species are selected and maintained well. Landscaped areas can ameliorate vehicle emission impacts on local air and water quality. Planting can enhance slope stability and reduce the need for hard engineered structures to control erosion.

In many areas, grass verges are favoured as roadside landscape treatment, due to the low visual impact, low establishment costs and standardised maintenance regimes. Where access to roadside areas is difficult for maintenance crews, planted areas can reduce capital and maintenance costs by requiring less frequent mowing and pest control and decreasing illegal dumping, vandalism and graffiti of road structures.

TRANSIT'S ROLE

Transit has direct control over the environmental and social effects of roadside plantings and the visual appearance of state highways. Careful road planning, urban design and landscape design should be undertaken to inform site-specific responses.

Highway landscape native vegetation

Section 6 of the RMA recognises the protection of outstanding natural features and landscapes from inappropriate subdivision, use and development as a matter of national importance. As state highways cross the length and breadth of New Zealand, Transit has an important role in meeting this objective.

New construction considers adoption of 'no net loss' principles, which have already been implemented on several projects. For example, if wetlands are filled in or destroyed there should be new wetlands constructed or rehabilitated such that the total amount is at least as great if not more than originally present. New planting should use native species if at all possible and low-growth vegetation must be considered where appropriate in order to reduce long-term maintenance costs and use of agrichemicals.

Transit works with local authorities during planning and design stages to support local planning and urban design objectives and ensure new state highways blend into their surroundings.

Transit consults with adjacent landowners, including custodians of natural areas such as the Department of Conservation, local authorities and Queen Elizabeth II Trust, to support ecological and visual quality values of areas surrounding state highways.

PERFORMANCE INDICATOR

None at this time.

2.12 VIBRATION

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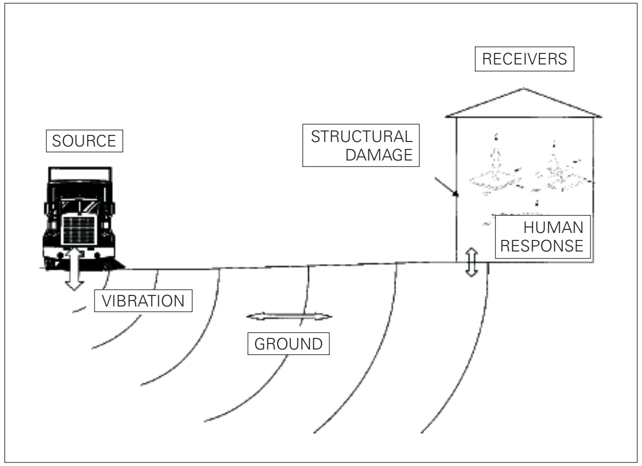
OBJECTIVES

V1 Plan and design new state highways to avoid or reduce adverse vibration effects.

V2 Mitigate vibration where levels are unreasonable and exceed relevant criteria set in New Zealand or internationally accepted thresholds.

V3 Avoid or reduce, as far as is practicable, the disturbance to communities from vibration during construction and maintenance.



Impact of traffic vibration

EFFECTS

Vibrations are low frequency pressure waves that can be annoying, especially to people who may fear that the vibration they are experiencing is damaging their home. However, despite people being able to perceive vibrations, the levels are often well below the minimum threshold to cause damage to properties.

Typically, intermittent or transient vibrations, commonly associated with construction activity, have the most potential to damage buildings and structures. Such damage may be structural, such as cracking of floor slabs and foundations or cracked plaster. The effects of traffic-related vibration are most common near major roads with high traffic flows. If a road surface is uneven, for instance around utility covers and trenches, the effects of vibrations can become more pronounced, especially when heavy vehicles pass by.

Other factors that affect the extent of vibration effects being reported include:

- standard of road construction;
- ground conditions;
- nature and state of road surface;
- vehicle type, weight, speed and suspension; and
- proximity, nature and design of buildings and structures near a highway.

TRANSIT'S ROLE

Transit seeks to avoid or reduce adverse vibration effects when planning and designing new roads by selecting routes that avoid creating adverse traffic vibration effects as well as designing roads which minimise traffic vibration.

The Planning Policy Manual demonstrates how potential reverse-sensitivity vibration issues should be managed and places a strong emphasis on working with other stakeholders such as local councils and developers to achieve satisfactory outcomes. Transit seeks to ensure new vibration-sensitive developments establishing in close proximity to the state highway network take into account the existing and projected traffic vibration environment.

Transit seeks to avoid traffic vibration issues being caused by uneven road surfaces, especially as a result of works around utility covers and trenches, by requiring a smooth surface to be laid after the works are complete.

When constructing new or upgraded state highways, Transit seeks to control and manage the potential adverse effects of vibration through the implementation of project-specific Construction Management Plans. These plans provide for the implementation of measures to minimise the effects of vibration associated with activities such as blasting and the use of certain types of equipment like impact pile drivers and pavement breakers.

2.12 VIBRATION

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PERFORMANCE INDICATOR

None at this time.

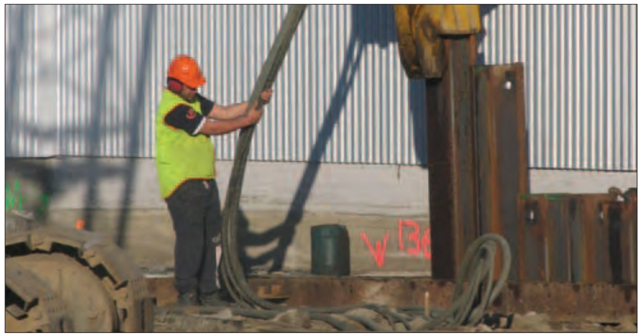
EXAMPLES OF CURRENT PRACTICE

Reducing vibrations associated with pile driving during construction

Vibratory pile drivers are sometimes used during the construction phase of road projects. They advance piles by vibrating them into the ground and are especially effective for soils that are vibratory mobile such as sands and silts. This kind of equipment was used to drive piles to support a temporary platform used during the construction of a new bridge in Grafton Gully, Auckland. The actual device was a 'variable frequency vibro hammer' that allowed the frequency of the hammer to be controlled, reducing annoyance to neighbouring residents during the piling operation.

Surveying properties susceptible to vibration

An important element of any plan to manage potential vibration issues, especially during the construction phase of a road project, is an assessment of buildings and structures at risk from vibration. As part of the Meeanee Road intersection upgrade project in Napier, comprehensive surveys of buildings were undertaken prior to construction commencing. The findings provide a baseline against which assessments can be made of any perceived or actual impacts of any vibration generated during construction on these buildings.



A vibrating hammer being used to drive sheet piles

Meeanee Road intersection upgrade, Napier – properties at risk of potential vibration effects were surveyed prior to construction

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