



# Bridging the gap

NZTA URBAN DESIGN GUIDELINES



NZ TRANSPORT AGENCY  
WAKA KOTAHI

New Zealand Government

## Acknowledgements

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## OUR PURPOSE

# CREATING TRANSPORT SOLUTIONS FOR A THRIVING NEW ZEALAND



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**The NZTA is part of, and contributes to, the Safer Journeys programme.**

Safer Journeys is the government's strategy to guide improvements in road safety over the period 2010-2020. The strategy's vision is a safe road system increasingly free of death and serious injury. It is a co-ordinated effort across partner agencies to improve each aspect of road safety - better behaviors, a safer road environment, safer speeds and higher vehicle standards.

For more information visit [www.transport.govt.nz/saferjourneys](http://www.transport.govt.nz/saferjourneys)

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## FOREWORD



The New Zealand Urban Design Protocol provides a platform to make New Zealand towns and cities more successful through quality urban design. As a signatory to the Protocol the NZTA is working to ensure it plays its part in providing excellent outcomes for New Zealand from its infrastructure projects. This requires our projects to be developed and delivered utilising urban design best practice to achieve positive urban design outcomes.

NZTA projects have included roading upgrades, new highways, motorways, bridges, tunnels, busways, mainstreet improvements, pedestrian, bicycle and public transport facilities.

Many of these initiatives have resulted in increased community satisfaction with our projects and have received recognition and awards for design quality and excellence.

The NZTA has and continues to learn a lot. *Bridging the gap* summarises some of the lessons we have learnt and aims to firmly establish good urban design as a standard working practice for the NZTA. This document should be a source of inspiration to the teams responsible for the design and implementation of NZTA infrastructure projects and for others in the NZTA whose actions affect urban design outcomes.

I am proud of what we have achieved to date. This document demonstrates the NZTA's commitment to urban design, to our concerns for the natural and built environment and impacts of infrastructure on surrounding communities. I support and look forward to the continued application of urban design to transport infrastructure and to the NZTA's contribution to high quality built environments in urban and rural areas.

Colin Crampton  
Group Manager Highways and Network Operations  
NZTA Urban Design Champion

## OVERVIEW

### THE NZTA'S COMMITMENT TO GOOD URBAN DESIGN

Roads and streetscapes form an important part of a place's character and influence the living environments of New Zealanders. As we develop our transport networks, we're working to ensure that the transport solutions we implement follow quality urban design principles. For us this means ensuring:

- transport networks fit in sensitively with the landform and the built, natural and community environments through which they pass
- all systems of movement along and across the transport corridor are integrated into the design of projects with good connections and access to communities
- the design contributes to the quality of the built environment, public space and the road user experience.

Our commitment to good urban design in all of our activities is enshrined in our Environmental and Social Responsibility Policy, our urban design objectives and our endorsement of the New Zealand Urban Design Protocol.

### RESPONSIBILITIES FOR URBAN DESIGN

Achieving good design is a collaborative effort both within project teams and across the NZTA. It involves many areas of expertise including project management and asset management and encompasses a wide range of disciplines such as:

- urban design
- landscape architecture (including visual impact assessment)
- architecture (bridges and structures)
- civil and structural engineering
- planning and transport planning (including walking, cycling and public transport)
- noise and air quality specialists
- stormwater/coastal/environmental engineering
- ecology
- property
- civic art

The NZTA's Environmental and Urban Design team provides technical expertise and guidance to NZTA employees and consultants in the implementation of our urban design commitment. This team should be consulted for any transport project that has the potential to affect the quality of the built and natural environment.

### DOCUMENT PURPOSE

*Bridging the gap* is a guideline to be adopted by project managers and consultants responsible for the planning, design and implementation of NZTA transport projects. It is also to be adopted by others in the NZTA whose work and actions affect urban design outcomes. The document provides policy and guidance for NZTA projects, projects funded by the NZTA and planning as it relates to the integration of land use and transport.



## INTRODUCTION

**'Urban design is concerned with the design of the buildings, places, spaces and networks that make up our towns and cities, and the way people use them. It ranges in scale from a metropolitan region, city or town down to a street, public space or even a single building. Urban design is concerned not just with appearances and built form but with the environmental, economic, social and cultural consequences of design. It is an approach that draws together many different sectors and professions, and it includes both the process of decision-making as well as the outcomes of design.'**

NZ Urban Design Protocol 2005

Within the NZTA, urban design has evolved over the last decade. A milestone in this progression was the signing of the New Zealand Urban Design Protocol by the NZTA in 2005. The protocol is a voluntary commitment by signatories that aims to make our towns and cities more successful by using quality urban design.

Further to this commitment, the NZTA established an urban design team charged with facilitating good urban design outcomes through:

- assisting in building a stronger urban design culture within the NZTA
- helping to create an organisation that delivers best practice urban design through its project work and in its engagement with investment partners.

Since 2005, the NZTA has pursued various initiatives such as staff training, establishing a register of preferred urban design consultants, and developing various pieces of guidance material in order to embed urban design into its business.

The purpose of this document is to pool these learnings and build on this momentum to firmly establish good urban design as a working practice for the NZTA. The document demonstrates an evolving understanding and commitment to the ongoing pursuit of design excellence by the NZTA.

### AIM OF THESE GUIDELINES

*Bridging the gap* presents the NZTA's urban design objectives and requirements. It sets out 10 fundamental urban design principles which should guide the development of transport projects and contains best practice on detailed design aspects.

These guidelines seek to improve the understanding of what good urban design means in a transport project. The guidelines are intended for consultants, contractors, project managers, stakeholders and the community who participate in the planning, design, construction and maintenance of our transport networks. They are also intended for other NZTA staff whose work and actions affect urban design outcomes.

### WHAT IS URBAN DESIGN?

Urban design is broadly defined as 'the art of making places for people.'

This spans from the placement of transport networks and landuses at the regional level, to the detailed design of streets and public spaces at the local level. In the context of NZTA projects, urban design generally seeks a balance between transport improvements and the need to maintain or enhance the amenity and liveability of the local community.

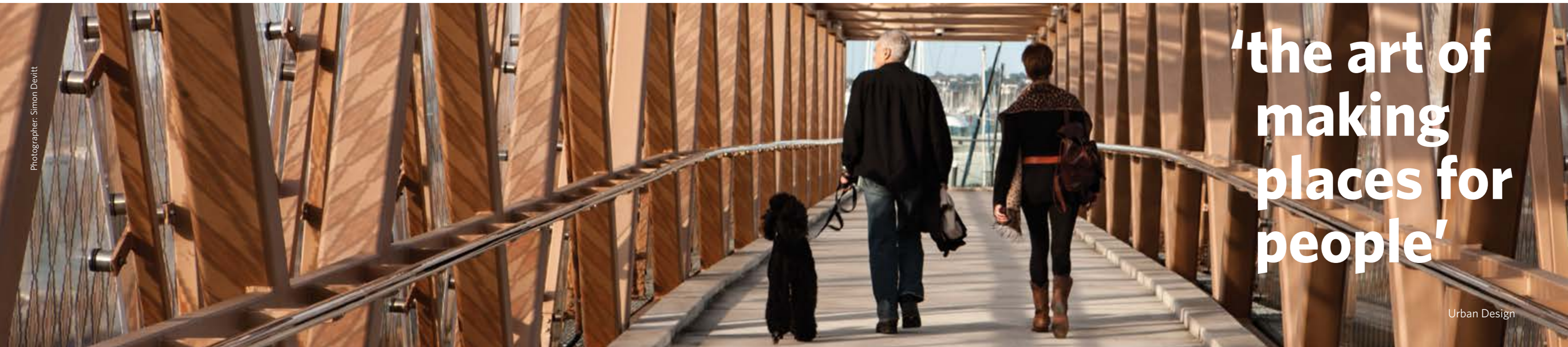
Urban design is often perceived as anti-car. This is not the case but it is based on finding a medium between ensuring there is the opportunity for social and economic activity at a community level whilst allowing for goods and people to get to or from their points of destination.

For the NZTA, urban design starts at the strategic phase of a project and continues through to the route selection and the design of a preferred alignment all the way through to detailed design. Urban design applies to all man-made elements of the transport network in both rural and urban environments.

Transport infrastructure is important to the design of urban and rural environments in a number of ways:

- Road networks provide the basic structure of a town or city, the underlying grid which orders and connects all physical development.
- Road networks accommodate different modes of movement such as public transport, walking, cycling, private vehicles and, in places, horse riding. They connect places, communities and land uses in a number of ways.
- Road networks support thriving economic activities. However, they can also erode the economic vitality of areas if poorly integrated with the adjoining land uses.
- Roads and all related infrastructure such as bridges are major visual features in urban and rural environments. They can make a positive contribution to the identity of a place but, if poorly designed, they can be a visual blight from near and afar.
- Roads provide a window into our urban and rural environments and frame the way we see and experience these places. They affect visitors' perception of our landscapes and settlements. They contribute, either positively or negatively, to our ability to find our way around a place.

- In many town centres across New Zealand, the road is the main focus of commercial and community activity. It is a place where residents and visitors shop, stroll, cycle, access public buildings, eat and drink. In such settings, the road is an important public space.
- Roads can sever communities or separate community facilities from their catchment area. Where this happens, roads can have enduring social and economic impacts.



**'the art of making places for people'**



Cobham Drive, SH1, Wellington

Urban design in transport infrastructure projects responds to all these considerations. This involves integrating a number of disciplines and satisfying requirements beyond the engineering and vehicular safety aspects of road design.

The business cases for NZTA projects consider a wide range of matters beyond travel time savings. Depending on the location, these matters may include the economic vitality of town centres, wider economic benefits such as tourism and impacts of transport improvements on the liveability of adjoining areas.

Every aspect of planning, designing and managing the transport network has urban design implications – whether developing a network plan, assessing potential route options for a new road, developing the design of a preferred route, locating a new bridge, developing the detailed design of junctions, structures and earthworks, locating signage or maintaining roadside planting.

### THE VALUE OF URBAN DESIGN

Good urban design can enhance the amenity and vitality of urban environments, minimise the impact of infrastructure on rural environments and add market value to commercial development. The benefits of good urban design are sometimes quantifiable but are often intangible or external. Such benefits, generally social or environmental, may be difficult to quantify but they remain significant.

In highway projects, urban design can help ease the planning consent process by minimising social impacts and community objection. Urban design can also help shape a road design so it better meets project objectives. However, for urban design to deliver the greatest benefits for the least cost it must be considered from the project planning stage.

Good urban design can sometimes cost more than the cheapest compliant design, especially when it is not considered at the right time or properly integrated with the other design disciplines. However in many cases by applying design skill and imagination, elements that were always to be provided can be configured to achieve a better outcome without any increase in cost. The right mix of skills and an interdisciplinary approach are fundamental to achieve good results.

The cost of good urban design should be assessed against whole-of-life costs. For example, selecting robust, hard wearing materials may cost more upfront but result in reduced maintenance costs and extended lifespan. Similarly, selecting the right mix of planting and hard surfaces may cost more than grassing large areas but will significantly reduce the maintenance burden and cost in the long run.

The added cost of good urban design, if any, should be considered against the risks associated with poor planning and design. Transport infrastructure has a long life. The location of roads and junctions very rarely change once they are built. Even individual components of the road network such as bridges and retaining walls are unlikely to change for long periods of time. Getting a good outcome first time around is therefore essential.

**'The land use and urban form of cities are... fundamentally shaped by priorities in transportation... the essential character of a city's land use comes down to how it manages its transport.'**

Peter Newman & Jeffrey Kenworthy

## BRIDGING THE GAP: 10 PRINCIPLES FOR URBAN DESIGN

This document contains 10 principles which capture the key elements of urban design in transport projects. These principles reflect the NZTA's expectations for the integration of urban design in all phases of highway projects and the desired interdisciplinary approach to addressing urban design issues.

These principles are generic in nature and are the starting point for more project-specific urban design objectives and principles. They can also form the basis for evaluating designs. The principles should not be considered in isolation but as an inter-related framework for decision-making.

teno

The 10 urban design principles are:

1. Designing for the context
2. Integrating transport and land use
3. Contributing to good urban form
4. Integrating all modes of movement
5. Supporting community cohesion
6. Maintaining local connectivity
7. Respecting cultural heritage values
8. Designing with nature
9. Creating a positive road user's experience
10. Achieving a low maintenance design

**USING THESE GUIDELINES**

*Bridging the gap* is divided into four sections. Each section outlines the key considerations regarding urban design which should be taken into account at each phase of project development and delivery.



**SECTION 1: POLICY**  
Presents the policy underpinning urban design within the NZTA, including statutory requirements.



**SECTION 2: URBAN DESIGN REQUIREMENTS AND PROCESS**  
Sets out the NZTA's urban design requirements and outlines how urban design must be addressed and integrated with other activities throughout the process of planning, designing, implementing and maintaining highway projects.



**SECTION 3: URBAN DESIGN PRINCIPLES**  
Describes 10 key principles of urban design for transport projects. The purpose of these principles is to guide decision-making on fundamental rather than detailed aspects of transport projects.



**SECTION 4: DESIGN OF HIGHWAYS**  
Supplements the high level design principles of section 3 by providing detailed guidance on specific components of transport projects such as highway structures, noise barriers, pedestrian and cycle facilities and highway furniture.

In addition to the body of the guidelines, further reference material is provided within six appendices.



**APPENDIX 1: USEFUL DOCUMENTS AND REFERENCES**  
Lists selected reference material from New Zealand and abroad.



**APPENDIX 2: URBAN AND LANDSCAPE DESIGN FRAMEWORKS GUIDELINE**  
Outlines the purpose and content of Urban and Landscape Design Frameworks (ULDF) or Master Plans (ULDMP).



**APPENDIX 3: URBAN DESIGN ASSESSMENT GUIDELINE**  
Sets out NZTA's preferred approach for the assessment of urban design effects of highway projects for the purpose of obtaining RMA designations and consents.



**APPENDIX 4: GENERIC URBAN DESIGN SPECIFICATION**  
Sets out standard minimum requirements for tenderers for urban design inputs and outcomes at the detailed design stage.



**APPENDIX 5: URBAN DESIGN CONSIDERATIONS IN BRIDGE DESIGN**  
Sets a framework to guide urban design decisions in relation to bridges



**APPENDIX 6: URBAN DESIGN AND LANDSCAPING REVIEW TEMPLATE**  
Standard template for design quality control, inspections and approvals

**Status of document**

This document has the status of guideline as defined in the NZTA *standards and guidelines manual*. Guidelines contain recommended good practice suitable for use on state highways as determined by NZTA Highway and Network Operations. Guidelines become legally binding when invoked in contractual documents. Any substantial departure from the guideline should be justified and recorded in consultation with the NZTA project manager and Environmental & Urban Design team.

# GN FRAMEWORK

Technical Report 1  
Mackays to Peka Peka Expressway



Mackays to Peka Peka Expressway

## SECTION 1: POLICY





Photograph courtesy of Stephen J Patience

## 1.0 NZTA URBAN DESIGN POLICY

### 1.1 INTRODUCTION

Highway infrastructure, including the road itself, its location and all associated structures such as bridges and highway furniture, has a major influence on the current and future form, function and character of our urban and rural environments. All these elements are part of the urban design remit.

As an organisation the NZTA is responsible for planning land transport networks, investing in land transport, building and managing the state highway network and providing access to and use of the land transport system. In undertaking all of these activities, the NZTA influences the shape of urban and rural environments. The NZTA and its service providers need to consider the broad environments that are affected by transport infrastructure and how the infrastructure contributes to the future character and function of these environments.

The suite of policy documents which underpin urban design within the NZTA aims to ensure that transport projects contribute positively to the environments they sit in. These documents are outlined below.

### 1.2 LAND TRANSPORT MANAGEMENT ACT 2003

The legal foundation of the NZTA is the Land Transport Management Act.

The Act established the NZTA and states that the objective of the NZTA is to undertake its functions in a way that contributes to an effective, efficient, and safe land transport system in the public interest.

The Act contains operating principles for the NZTA. These specify that in meeting its objective and undertaking its functions, the NZTA must exhibit a sense of social and environmental responsibility.

### 1.3 RESOURCE MANAGEMENT ACT 1991

The Resource Management Act (RMA) promotes the sustainable management of natural and physical resources. The state highway network and the various environments it traverses are resources that fall within the remit of the RMA and need to be sustainably managed. The RMA has a particular focus on ensuring that the adverse environmental effects of activities are avoided, remedied or mitigated.

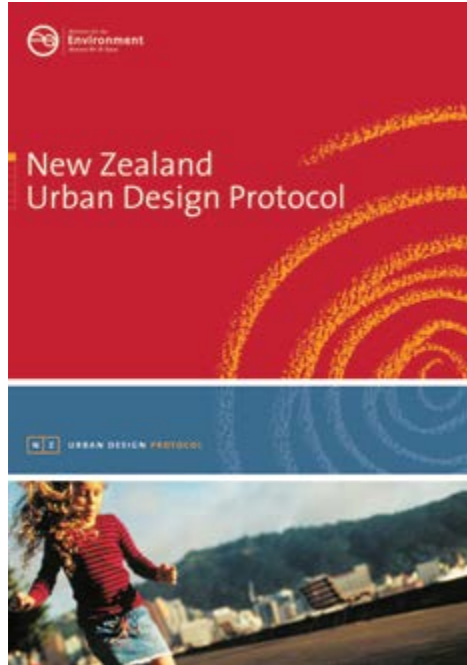
The RMA does not specifically refer to urban design nor does it currently focus on the urban environment. Nevertheless, urban design is implied in the requirements of part 2 of the RMA (purpose and principles), as follows:

- The overarching consideration of people and communities providing for their social, economic and cultural wellbeing and for their health and safety while sustaining resources, safeguarding life supporting elements, and avoiding, remedying or mitigating effects (section 5).
- Efficient use and development of resources (section 7(b)).
- Amenity values (section 7(c)) defined as the qualities and characteristics of an area that contribute to people's appreciation of its pleasantness, aesthetic coherence, and cultural and recreational attributes.
- The quality of the environment (section 7(f)).

Urban design is also required in addressing the 4th schedule of the RMA (Assessment of effects on the environment) which sets out matters that should be considered when preparing an assessment of effects on the environment:

- Any effect on those in the neighbourhood and, where relevant, the wider community including any socioeconomic and cultural effects.
- Any effect on natural and physical resources having aesthetic, recreational, historical or cultural value for present or future generations.
- Any physical effect on the locality, including any landscape and visual effects.

The assessment of the environmental effects (AEE) of a project, including urban design effects, is a fundamental part of the process of obtaining route designation and resource consents for a highway project. See appendix 3 for guidance on the assessment of urban design effects.



#### 1.4 NEW ZEALAND URBAN DESIGN PROTOCOL (2005)

At a national level, the primary guiding document promoting good urban design is the *New Zealand Urban Design Protocol*. The Protocol aims to ensure New Zealand's towns and cities are successful places for people, as explained below:

'The design of our towns and cities affects almost every aspect of our lives - we all live and work in buildings, and use streets, public spaces, transport systems and other infrastructure. We need to ensure that what we design meets people's needs and aspirations, and that people want to live there.

We need to ensure our towns and cities are successful places that contribute positively to our identity as a nation.'

NZ Urban Design Protocol 2005

The Urban Design Protocol is a voluntary commitment by central and local government, property developers and investors, design professionals, educational institutes and other groups to undertake specific urban design initiatives.

The protocol has been a powerful tool in drawing attention to the importance of good urban design to the quality of life in New Zealand's towns and cities.

In recognising the impact the transport network has on our urban and rural environments, the NZTA was among the first group of organisations to become signatories of the protocol in 2005. Further to this commitment, the NZTA has established an urban design team and adopted a number of internal policies to implement its commitment.

#### 1.5 NZTA ENVIRONMENTAL AND SOCIAL RESPONSIBILITY POLICY (2011)

The NZTA is committed to acting in an environmentally and socially responsible manner. The NZTA's *Statement of Intent* (2013) (SOI) sets out principles to guide its decision making and day-to-day operations. It includes the promotion of an accessible and safe transport system that contributes positively to New Zealand's economic, social and environmental welfare; and to act in an environmentally and socially responsible manner.

In addition to the SOI the NZTA Environmental and Social Responsibility Policy further clarifies this commitment by the NZTA to act in an environmentally and socially responsible manner by:

- protecting and enhancing the natural, cultural and built environment
- enhancing the quality of life for New Zealanders by improving community liveability including land transport safety
- taking appropriate account of the principles of the Treaty of Waitangi
- providing meaningful and transparent engagement with stakeholders, customers and the general public
- providing customer focused services that are fair, trusted and efficient

The policy commits the NZTA to a number of actions one of which is to 'integrate good urban design into all our activities.'

The full version of the *Environmental and Social Responsibility Policy* can be found at: [www.nzta.govt.nz/resources/environmental-and-social-responsibility-manual/index.html](http://www.nzta.govt.nz/resources/environmental-and-social-responsibility-manual/index.html)

#### 1.6 NZTA URBAN DESIGN OBJECTIVES AND METHODS (2013)

The NZTA's commitment to good urban design through its Environmental and Social Responsibility Policy and as a signatory of the NZ Urban Design Protocol translates into the following urban design objectives and methods:

##### Urban design objectives:

- Transport networks fit in sensitively with the landform, built and natural environment and communities through which they pass.
- All systems of movement along and across the transport corridor are integrated into the design of projects with good connections and access for communities.
- Design contributes to the quality of the built environment, public spaces and the road user experience.

## Objectives

##### Urban design methods:

To achieve its urban design objectives, the NZTA will:

1. integrate urban design in all processes to plan, design, build, maintain and operate the state highway network by NZTA staff, consultants and contractors
2. consider urban design outcomes from the initial phase of a project and continue integrating urban design throughout the development, implementation and maintenance phases
3. integrate urban design with the engineering and other design disciplines of transport projects in a multidisciplinary approach from network planning to detailed design
4. set, through its Environmental and Urban Design team, the urban design documentation requirements for any state highway upgrade or new build. These requirements will be tailored to the scale and complexity of the project and the sensitivity of the surrounding environment
5. include funding for urban design investigation, design and capital works as part of the state highway projects budgets
6. include urban design requirements in all tender documents and principal requirements relating to the planning or design of the state highway network
7. actively and meaningfully engage with persons and organisations affected by state highway projects or interested in good urban design outcomes
8. seek whole-of-life value for money by taking into account urban design outcomes in the design of projects
9. provide its employees with the skills, awareness and leadership to achieve good urban design outcomes.

## Methods

#### 1.7 GUIDELINES FOR HIGHWAY LANDSCAPING (2006)

Landscape is a major factor in the integration of the State highway network within New Zealand's environment. The NZTA Guidelines for Highway Landscaping outline how the hard and soft landscape treatments shall be integrated within new projects and the wider network considerations including operations and maintenance.

The Guidelines will be re-released in 2014 and shall be read in conjunction with *Bridging the gap* as they are interrelated in the outcomes they seek to deliver.

#### 1.8 TRANSIT PLANNING POLICY MANUAL (2007)

This document supersedes the parts of the *Planning Policy Manual* which relate to urban design.



### 1.9 SAFE SYSTEM

The government's long-term goal for road safety in New Zealand is a road system increasingly free of death and serious injury based on the international 'Safe System' approach.

This approach involves:

- making the road transport system more accommodating of human error
- managing the forces that injure people in a crash to a level the human body can tolerate without serious injury
- minimising the level of unsafe road user behaviour.

The Safe System focuses on creating safe roads, safe speeds, safe vehicles and safe road use.

Of particular relevance to urban design are the objectives to:

- develop new approaches to safety on urban mixed-use arterials
- design roads which are self-explaining ie which encourage safe travel speeds and behaviours
- lower speed limits in urban areas – this can be implemented through the use of urban design tools
- make walking and cycling safer.

For more information on the 'Safe System' approach go to [www.saferjourneys.govt.nz](http://www.saferjourneys.govt.nz)

### 1.10 STATE HIGHWAY REVOCATION POLICY (2012)

This policy applies to situations where changes to the state highway network create duplicate sections of state highway serving the same function (eg as result of realignment or construction of a bypass), and it is established that part of the road is no longer required as a state highway. If the road is still required as a local road, the NZTA must recommend to the Ministry of Transport that the state highway status of the road be revoked.

Once the state highway status is revoked, the ownership and control of the road transfers to the territorial authority.

The NZTA must adopt a strategic approach when considering the implications of the revocation, for the state highway network, the local road network and surrounding land use. Matters that may be considered include:

- The current and future relationship of the revoked road to the wider road network
- The strategic outcomes for the area served by the revoked road eg current and future land uses, including any urban design and landscape issues
- Opportunities for optimising the operation and use of the network, including improving pedestrian and cycle access
- Linkages to strategy and planning documents, eg structure or master planning documents.

This strategic planning process may identify a package of works that could be undertaken on the revoked section of state highway to give effect to future strategic outcomes. This may entail, for example, works to reduce the speed environment, provide greater lateral access at junctions, support on-street parking and provide increased pedestrian and cycle access. The implementation of these works is likely to be shared with the appropriate road controlling authority, with their funding subject to the usual NZTA funding and assessment processes. However, the NZTA must ensure that the revoked section of state highway will be fit for purpose at the time of handover.

Agreements between the NZTA and the territorial authority in relation to revocation shall be documented in the NZTA project documentation and Urban and Landscape Design Framework.

### CASE STUDY: STATE HIGHWAY 1 RECONFIGURATION

As part of the Mackays to Peka Peka Project work was undertaken to scope and cost the revocation of the existing state highway to the local authority Kapiti Coast District Council. The design for this reconfiguration responds to the different environments through which it passes including town centres at Waikanae and Paraparaumu and rural areas.

#### The scope of work for the town centres generally include:

- Constructing new kerb lines and raised medians to form single lanes (and cycle lanes) each way.
- Reducing kerb radii at intersections for pedestrian crossing safety.
- Relocating services, altering drainage and resurfacing roads as required.
- Constructing raised medians, traffic islands and carparks.
- Widening and improving pedestrian footpaths and installing pedestrian safety measures.
- Creating a specialist pavement to encourage pedestrian crossings to Paraparaumu train station.
- Enhancing pedestrian connections from Waikanae train station to the shops opposite.
- Creating bus stops on SH1 between the train station, street and shops.
- Street furniture improvements.
- A new signalised intersection at Ngaio Street, Waikanae.
- Landscape treatment including tree planting in medians and road edges between carparks.
- Stormwater run-off treatment swales in some areas.

#### The scope of work for the rural areas generally includes:

- Narrowing of the road width to 11-12 metres and removal of redundant road pavement width.
- Reuse of unrequired traffic road width for walkways.
- Road surface remediation as required.
- Creating new roundabouts at Raumati Road and Ihakara Street.
- Painting new cycle lanes and road markings.
- Reducing speed limits – new signage.
- Providing off-road pedestrian and cycling paths.
- Improving pedestrian/cycling across the Rimutaka Street rail bridge.
- Improving pedestrian/cycling across the Waikanae River bridge.
- Landscaping and tree planting, particularly where road pavement has been removed.
- Forming stormwater run-off treatment swales in some areas.



Source: MacKays to Peka Peka Urban and Landscape Design Framework



SECTION 2:  
URBAN DESIGN  
REQUIREMENTS  
AND PROCESS



## 2.0 URBAN DESIGN REQUIREMENTS AND PROCESS

### 2.1 INTRODUCTION

Urban design in highway projects involves creating infrastructure that is sensitive to its context, serves communities well and has a unified architecture. For these outcomes to be achieved, this requires a process in which urban design is considered from the earliest stages of a project and fully integrated with the other disciplines involved in the planning and design of the highway.

This section sets out the requirements and process to achieve the NZTA's desired urban design outcomes.

### 2.1 ROLE OF THE NZTA URBAN DESIGN TEAM

The NZTA's urban design staff sit within the Environmental and Urban Design team at National Office. They have the responsibility to support NZTA staff, consultants and contractors in the planning of network and corridor activities, and to assist project managers to optimise urban design in all project stages. Their involvement in projects across the country promotes the sharing of good practice and a consistency of approach to urban design issues.

In particular, advice and assistance is provided on:

- defining urban design requirements and scope of work for the purpose of procuring urban design professional services as part of a project's tendering process
- assessing urban design consultants' offers of services
- reviewing a project's urban design objectives and principles
- reviewing the urban design aspects of a project's deliverables including consent documentation and urban and landscape design frameworks/master plans
- contributing to multidisciplinary design workshops such as route options and noise mitigation assessment workshops
- recommending known successful design solutions and products.

### 2.2 REQUIREMENTS FOR PROJECT MANAGERS

#### Start early

The project manager must take urban design into consideration from the early planning stages of a project. A common misconception is that urban design need only be considered in the latter stages of the project to influence the detailed design of specific components of the highway.

On the contrary, urban design is a discipline which spans from the strategic - where should a new road or junction be located? - to the detailed aspects of a highway project and therefore needs to be considered during all project phases:

- From defining objectives to inform fundamental decisions in network and corridor plans
- To route option assessment and preliminary design
- To RMA designation and consenting process
- Through to the development, implementation and maintenance of detailed designs.

Urban design is to be considered early on in relation to all projects small or large.



Source: Boffa Miskell

### Interdisciplinary working

The project manager needs to build a multidisciplinary project team including urban design specialists to ensure that the urban design work is closely integrated with that of the roading engineers, bridge designers, acoustic specialists, ecologists, landscape architects, transport planners, heritage and cultural advisors and other environmental specialists. These disciplines need to work together rather than in isolated silos.

### The right skills

On a small or simple project it may be that the NZTA's Urban Design team can provide advice directly to the team.

On large or complex projects, specialist urban design consultants will be required as part of the project team working alongside engineers, bridge architects, landscape architects, ecologists, noise consultants and other specialists.

On such projects an urban design expert witness is likely to be required to assess the urban design effects of the project and provide evidence in court. A post-graduate urban design qualification and/or significant practical experience is needed to act as an urban design expert witness for the NZTA.

### Register of urban design consultants

It is essential for the project manager to appoint suitably qualified and experienced urban design professionals for large or complex projects. Such professionals will usually be planners, landscape architects or architects who have extended their expertise into the field of urban design, who have skills and experience in infrastructure design and who understand urban and regional planning. Most will hold a post-graduate qualification in urban design.

The NZTA's Urban Design team maintains a register of urban design consultants with experience in transport projects. This should be used in identifying potential consultants for a project and assessing tenders for professional services.

Different project types and locations may require different urban design responses and expertise. The NZTA's Urban Design team can help the project manager evaluate tender bids to ensure that these demonstrate the right set of skills for the particular project.

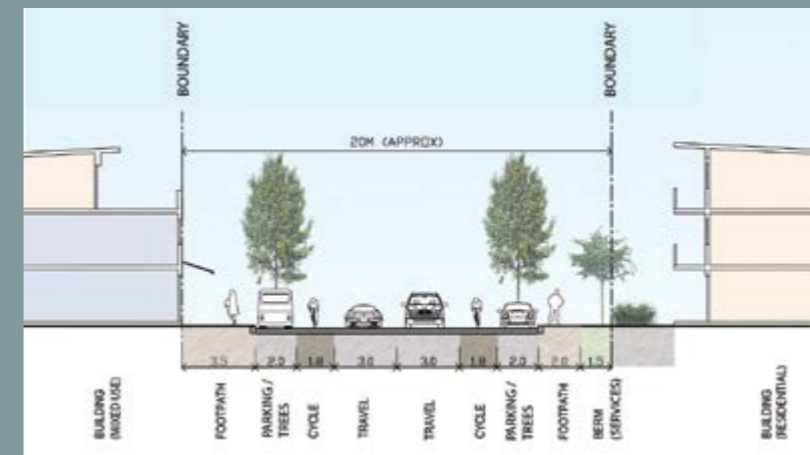
### Adequate resources

The urban design work needs to be appropriately resourced. Consideration shall be given to:

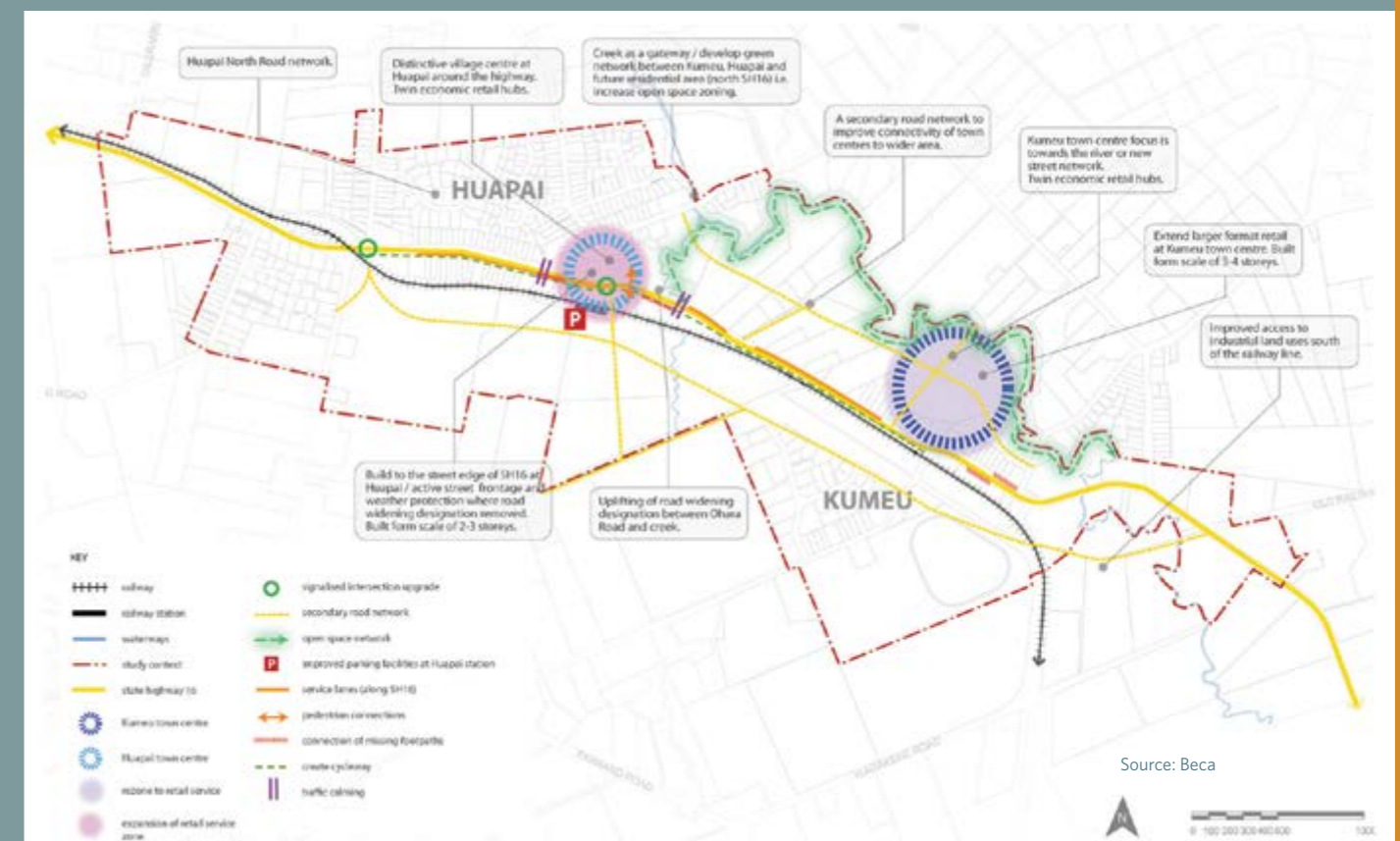
- the time required for attendance at briefings, team meetings, multidisciplinary workshops, presentations and consultation events
- the time and resources required for site visits, site analysis and interdisciplinary working with the engineers and other disciplines
- design reviews and iterations
- the preparation of artist's impression, photomontages, 3D models and drive-through simulations, as may be required to inform the design
- the preparation of urban design documents including urban design assessment and urban and landscape design frameworks, urban and landscape design master plans and input into other documents
- time required for quality control, including site inspections and the preparation of post-construction reviews.

## CASE STUDY: KUMEU/HUAPAI – AN URBAN DESIGN OUTCOME

The Kumeu and Huapai townships are located on SH16, around one kilometre apart. The highway is both a regional route of strategic importance (connecting West Auckland to Wellsford and the north) and a main street for the townships. The conflicting functions result in increased traffic delays and community severance. In addition to existing issues around congestion, safety, and pedestrian and cycle amenity, Kumeu and Huapai were identified for future urban growth, with associated increased travel demand. In 2009 the NZTA commissioned an integrated transport, land use and urban design study with the aim of improving the SH16 route and the sense of place for the Kumeu and Huapai centres. At that time the Annual Average Daily Traffic was 18,266 vehicles, with approximately 11% of this being heavy goods vehicles, and the Level of Service during morning and evening peak periods was 'approaching unstable flow'. As well, a 2008 crash reduction study confirmed a high number of crashes relating to turning movements along the highway. An historic, wide highway designation had resulted in a poor interface between the highway and the buildings edging it and was a barrier to redevelopment.



Concept for proposed northern link road



Source: Beca

The study was innovative in considering the relationship between future growth, land use and transport requirements (both transport modes and land transport network performance). The preferred option introduces a new transport link parallel to SH16 in recognition of the lack of sufficient permeability in the local network. As well as reducing weekday traffic on SH16 (by around 14% - 21% depending on direction), it:

- Separates strategic traffic (including freight movements) from local traffic, reducing conflicts as well as delays;
- Reinforces that there are two distinct centres;
- Connects a new Kumeu Town Centre with the area planned for residential growth in Huapai North;
- Improves accessibility and amenity for pedestrians and cyclists;
- Provides for improved access to the area of employment growth to and from the highway;
- Rationalises access to properties along SH16;
- Supports the development of a transport hub at Huapai and increased opportunities for public transport; and
- Improves safety and connectivity through the signalisation of key intersections.

### Design continuity

Projects are developed in stages and can take many years to complete. Throughout the life of a project different design teams may be involved. Good design solutions can become diluted over time, if not altogether lost. This may reduce the quality of the built outcome or use up significant sums in re-design.

It is important to ensure continuity of urban design across all stages of the project. While the finer details of a project will understandably evolve over the life of a project, the broader principles underpinning the design should not be changed without due consideration of impact on the design outcomes. Contractors undertaking the detailed design and construction phases of a project should not remove components of the project which contribute to good urban design. Items such as pedestrian footpaths and bespoke bridge design may have been agreed through consultation and be considered important by the local community or be part of a wider network or concept which will be undermined by their removal.

Good documentation of urban design objectives and proposals at each stage of the project will help subsequent teams continue the work of their predecessors. The preparation of an Urban and Landscape Design Framework is the recommended practice to capture the outcomes of the urban design process. This document can evolve from high level principles early on in a project and be added to at each stage of the design development.

Using the same urban design personnel throughout a project is another way of ensuring design continuity.

### Project phases

The NZTA's *Environmental and Social Responsibility Standard* (2013) provides direction to NZTA project managers and their teams on how to implement the urban design requirements at each phase of a highway project.

The level of urban design input will be commensurate with the scale and complexity of the project or the sensitivity of the surrounding environment.

It is important that as a project progresses, the urban design objectives and concepts developed during the earlier phases are carried through to the next one to avoid duplication of work and to build on previous analysis and public engagement activities.



## 2.3 URBAN DESIGN PROCESS

### Contribution to the wider team

Urban design consultants are expected to:

- carry out the contextual analysis, often in collaboration with the landscape consultants, and set down the project's urban design objectives and principles
- contribute to the design of the project both at the broad and detailed scale in collaboration with engineers and other team members
- contribute to the assessment of project options
- contribute to the preliminary and full Assessment of Environmental Effects (AEE) for the project
- help the project avoid or minimise adverse effects through design and if adverse effects are unavoidable, contribute to the development of appropriate mitigation measures and consent conditions
- take part in engagement activities and help communicate the project's urban design principles and proposals to communities and other stakeholders
- follow a rigorous and transparent methodology which is integrated with the wider project design process and clearly explains the rationale behind the design proposals, with a logical sequence from strategic decisions to detailed design
- contribute to quality control through active involvement in the construction phase of the project including post-construction evaluations and reporting back at various stages of the project process.

### General methodology

The design of a highway project is developed in increasing detail from the initial strategic work, through to the development stage, and then into detailed design. It is important that urban design is considered early in the life of a project because as a project advances through the various stages, the opportunities for significant changes which can minimise adverse effects or deliver benefits will gradually reduce.

The basic components of the urban design methodology are consistent across all stages of a project. They include the following:

- Contextual analysis.
- Urban design objectives and principles.
- Design development.
- Design implementation.
- Assessment of outcomes, effects, costs, maintenance requirements.

Design is an iterative rather than linear process so a number of feedback loops operate between these broad tasks, for example, the assessment stage will help refine the proposed design and the definition of urban design objectives will help hone in the contextual analysis on specific aspects of the surrounding environment.

### Contextual analysis

The understanding of the multiple layers that constitute a project context is the foundation of a good urban design outcome. These layers include the corridor and project objectives, the strategic and local planning frameworks and the physical environment within which the project sits.

A full appreciation of the functioning and character of the project area is essential to underpin design decisions. This will include an understanding of the values (connectivity, heritage, landscape, visual, cultural, community) of an area and the identification of those aspects which are important to protect and respect.

The contextual analysis may be broad during the early stages of a project when the focus is on identifying potential corridors for a new route, and be refined as the preferred route and alignment are developed. The amount of detail to include in the contextual analysis at each stage should be limited to what is relevant to the project design. The analysis should also be tailored to the size and complexity of the project and the sensitivity of its context.

### Urban design objectives and principles

The urban design objectives for the project should flow on from the contextual analysis and reflect the values which have been identified as being important. During the early stages of a project, urban design objectives are likely to be included as part of broader environmental and social objectives. They should be compatible with the overall project objectives and can help to refine those which are narrowly focussed around traffic outcomes.

Urban design principles bridge the gap between the environmental and social objectives and the design proposals. They provide the general design direction, or design brief, for specific aspects of the project and set the framework against which detailed design can be developed and assessed.

There may be a number of different design solutions that satisfy the stated urban design principles. The development of design principles provides flexibility in the early stages of a project by not limiting the design to one specific solution. Design principles are also helpful to planners and non-designers by spelling out the key issues a particular aspect of the design is seeking to address and the intention behind the design.

### Design development

The concepts developed by the urban designers should be fully integrated with the engineering design and the work of environmental specialists such as acousticians and ecologists. All the disciplines involved in the design of the project should work collaboratively to develop a balanced and cohesive design.

Mangere Bridge School Workshop, Old Mangere Bridge Project (2012)  
Photographer: Russel Meek



Laura Ridley Photography



### RMA Consent Process

Projects that require RMA approval will need to undertake an Assessment of Environmental Effects (AEE), including an Assessment of Urban Design effects.

The assessment of environmental effects is not a separate process which occurs after a design (consenting phase) has been developed. It is an integral part of the design development process through which adverse effects are avoided or minimised where possible and mitigation measures are developed which are multi-functional or at least compatible with the outcome sought by the various design disciplines.

Depending on the location, urban design effects to be covered in the AEE can include effects on amenity, local accessibility, urban form, landuses and personal safety. Guidelines on NZTA's preferred approach for the preparation of Assessment of Urban Design effects are presented in Appendix 3 of this document.

### Value Engineering Process

The value engineering process must also be integrated with the design development process through the sustained awareness of value for money when making design decisions. The full life cycle costs, including ongoing maintenance and replacement costs should inform the design process.

### Corridor approach

Where a network strategy leads to the upgrade or construction of significant segments of new state highways, a corridor urban design strategy may be required. Examples of this situation are the roads of national significance (RoNS) projects where the design of numerous segments of new or upgraded state highway has necessitated the need for whole-of-corridor urban design coordination.

#### A corridor-wide urban design approach and objectives can:

- inform the individual projects to ensure a consistent and appropriate outcome for the corridor
- help avoid unnecessary duplication of design work on each project in the corridor and reduce costs
- assist in the strategic location and design criteria of facilities required along the corridor, for example, rest areas
- help minimise the types of different road components such as light columns by providing a unified palette of highway furniture and landscape elements, thus reducing maintenance complexity and cost.

Corridor-wide approach: The Urban and Landscape Design Framework (ULDF) for the Western Ring Route (Waterview section) outlined the design concept for State Highway 20 as the 'volcanic highway' which draws inspiration from the area's unique geological, natural and cultural history.



#### Corridor-wide urban design strategies recognise that:

- corridors traverse diverse community, landscape and ecological areas.
- road users will experience the various segments of a highway corridor in succession and their travel experience should be seamless and logical rather than reflecting the arbitrary boundaries of the individual projects within a corridor
- while the corridor design should be unified, local circumstances may affect the form, function and character of part of a corridor and may warrant a different treatment from the rest of the corridor
- designing each segment of a corridor separately may be costly, visually incoherent and confusing for road users.

#### Design implementation - quality control

The urban designer's (or urban design team) role does not end once the contract has been awarded. They shall not solely be used to win the project. The experts that make up the urban design team must be actively involved during the detailed design phase of a project, right through construction, until the project is completed and handed over to the NZTA. This is vital to ensure the quality of the project is not undermined during design iterations and to ensure that the right experts are involved in the construction phase to guarantee that the NZTA gets a high quality product.

#### Designer review and sign off

The form and quality of any urban design should be commensurate with the guiding principles set out within the project's urban and landscape design framework. As a quality control check to ensure that these agreed principles have been enacted, the NZTA has developed a designer review template. Refer to Appendix 6. The template shall be completed by the designer prior to practical completion of all construction works associated with both landscape and urban design. The final completed review shall not simply cover the key aspects of the project but shall be relative to the scale and complexity of the project. The forms shall be co-signed by both the main contractor and the designer to determine to what degree the project has delivered on the design intent. The completed form shall be submitted to the NZTA's Environmental and Urban Design team for their review.

## 2.4 URBAN DESIGN TOOLS

This section presents the various documents which are produced to support new or altered State highway projects. The requirement to produce specific documents will depend on the scale and complexity of the project as well as its stage of development. Below is a brief description of these various documents. Additional guidance is contained in the appendices to this document.

### Urban and Landscape Design Framework (ULDF) [Appendix 2]

An ULDF shall be developed on urban projects or large or complex projects in the consenting phase once a preferred route has been chosen. The purpose of an ULDF is to ensure that the urban and landscape design concepts of the project are appropriately defined, developed and implemented. The ULDF describes and explains the various design elements of a project and ensures that the design proposals from various disciplines within the project are integrated.

It should cover the following items:

- Project objectives
- Planning context – identifies how the project might support other agencies' future plans for the area.
- Physical context – describes the key features of the urban or rural area within which the project is located with particular emphasis on identifying the features which the project needs to integrate with or be sensitive to.
- Design objectives and principles – presents the guiding objectives and principles for the design of the road alignment, earthworks, median treatment, bridges, tunnels, underpasses, retaining walls, noise barriers, landscaping, wetlands, swales, passenger transport facilities, pedestrian and cycle facilities, highway furniture (lighting columns, sign gantries, signage, guard rails, etc) and land use reinstatement plans, as appropriate.
- Design concepts or proposals – presents the preliminary design of highway components which influence the urban design outcomes including interchanges and junctions, bridges, underpasses, walking and cycling networks.

Appendix 2 outlines the NZTA requirements in detail.

### Urban and Landscape Design Master Plan (ULDMP) [Appendix 2]

The purpose of an ULDMP is to provide detailed plans for the urban and landscape design elements of the project on which the construction drawings will be based. The ULDMP will evolve from the ULDF and will be in general accordance with the design principles and proposals contained in the ULDF.

It should cover the following items:

- Detailed designs for the concepts presented in the ULDF, including location plans, text and drawings (plans, sections and/or elevations, as required).
- Colour, material and plant specifications.
- Maintenance requirements.

### Assessment of urban design effects [Appendix 3]

The purpose of this assessment is to identify and assess the urban design effects of the project. It will feed into the wider assessment of environmental effects (AEE) document in support of the RMA process.

The urban design effects to be assessed stem from Part 2 section 5 of the RMA which defines the purpose of the Act as the promotion of the sustainable management of natural and physical resources and links sustainable management to the ability of communities to provide for their social, economic, and cultural well-being and for their health and safety. Part II section 7 of the RMA specifies that in achieving the purpose of the Act, consideration must be given to a number of matters including –

- (b) the efficient use and development of natural and physical resources;
- (c) the maintenance and enhancement of amenity values;
- (f) maintenance and enhancement of the quality of the environment.

In relation to the above considerations, the urban design effects can be defined as:

- **urban form and land use effects** ie the effects of the project on the efficient use and development of land
- **amenity effects** ie the effects of the project on the qualities and characteristics of an area that contribute to people's appreciation of its pleasantness, aesthetic coherence, and cultural and recreational attributes
- **connectivity effects** ie the effects of the project on pedestrian, cycle and local vehicular movement as well as the perceived severance effects associated with loss of visual connection to community facilities, neighbouring areas or the wider landscape.

Refer to Appendix 3 for Assessment of urban design effects guidelines.

### Conditions [Appendix 3]

On all projects being consented through the RMA, urban design conditions shall be put forward by the NZTA.

Councils, communities and stakeholders place a lot of emphasis on the urban design and landscape conditions that form an important part of the Notice of Requirement (NoR).

Early commitment to the ULDF in draft conditions has reduced the scope of additional conditions and minimised re-litigation of urban and landscape design issues in later stages of the project development. It is important that the NZTA has a clear and consistent position on urban design conditions to avoid unmanageable conditions or unintended implications from them.

Appendix 3 includes model urban design conditions to be used in the consenting of NZTA projects.

### Specifications [Appendix 4]

On all capital projects the NZTA provides minimum standards and requirements as a framework or instruction to outline project expectations.

Appendix 4 includes model urban design specifications to be used on NZTA capital projects. It is noted that the specifications may be altered as required to suit the individual project. This shall be done in consultation with the Environmental and Urban Design team.

## Victoria Park Urban and Landscape Design Framework

In 2006 the Draft Victoria Park Tunnel Urban Design Framework was finalised. The document set out the urban design approach for the project and sat alongside the engineering design and planning requirements.

Conditions of the designation, granted in 2006, required the NZTA to provide council with an Integrated Urban Design and Landscape Mitigation Plan based on the draft Urban Design Framework. The plan was to consist of the Final Urban Design Framework depicting the overall urban design concept, the design intent, layout and mitigation proposals for key components and areas of the project as well as detailed design plans consisting of an overall master plan.

An urban design team which included urban designers, architects, landscape architects, artists, heritage architects, iwi and the design manager, worked closely with council, including the Urban Design Panel, and the community through the development of the master plan to gain their approval and buy-in. The master plan built on the work contained within the draft framework. This was a highly interactive process in a very visible and contentious part of Auckland City.

The framework and subsequent master plan proved to be a valuable tool to communicate the project to the community and stakeholders in that it captured those parts of the project that are understood and experienced by the community and goes beyond the hard engineered elements of the road.

The project is now completed and the master plan evident on the ground.



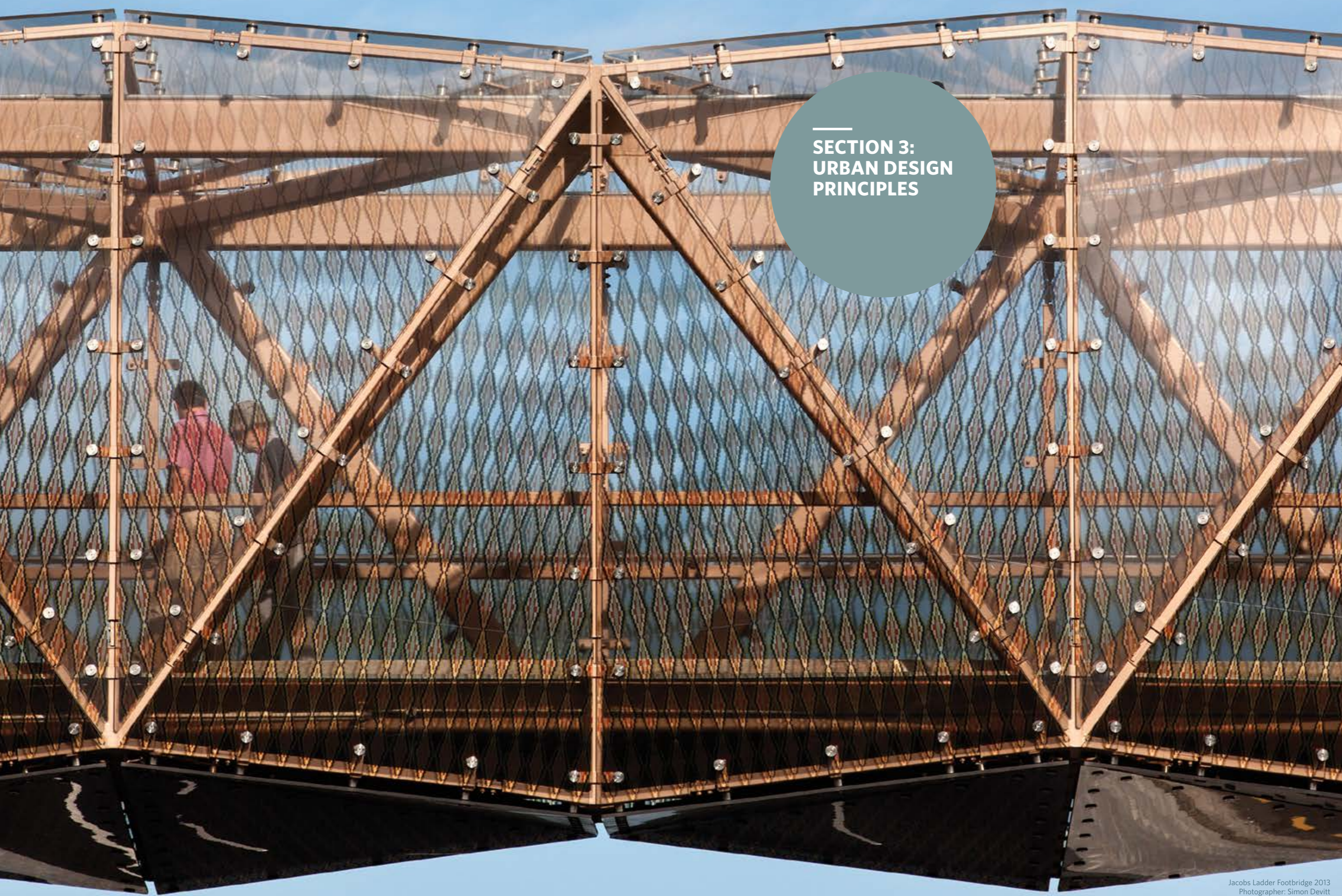
Three possible design approaches were identified in the initial draft Urban Design Framework for the pedestrian bridge including this Gantry Bridge Option. Source: Vic Park Tunnel Draft Urban Design Framework October 2006



The Master Plan further refined the bridge design including detail relating to cladding materials, colour and lighting of the footbridge. Source: Vic Park Tunnel Urban Design Master Plan March 2010.



Jacobs Ladder Footbridge 2013  
Photographer: Simon Devitt



SECTION 3:  
URBAN DESIGN  
PRINCIPLES



Rob Roy Hotel and Wai-atarau Plaza (Wai-atarau, which means 'place of reflecting waters.')  
Photographer: Simon Devitt

## 3.0 URBAN DESIGN PRINCIPLES

### 3.1 INTRODUCTION

This section presents ten principles which capture the key elements of urban design in highway projects. These principles reflect the NZTA's expectations for the integration of urban design in all phases of highway projects and the desired interdisciplinary approach to addressing urban design issues.

The principles are applicable to all highway projects from the large and complex to the small and simple.

The principles should be used in the early stages of a project to assist with the design of route options. As the design evolves, these principles should be adapted and turned into context and project-specific design objectives and principles.

The principles should not be considered in isolation but be pursued in parallel as they are closely inter-related. A project which dismisses one or more principles entirely is unlikely to lead to satisfactory urban design outcomes.

# teno

The 10 urban design principles are:

1. Designing for the context
2. Integrating transport and land use
3. Contributing to good urban form
4. Integrating all modes of movement
5. Supporting community cohesion
6. Maintaining local connectivity
7. Respecting cultural heritage values
8. Designing with nature
9. Creating a positive road user experience
10. Achieving a low maintenance design

### 3.2 DESIGN FOR THE CONTEXT

Whether a scenic country road, a planted avenue through a town centre or an elevated urban motorway, roads have an impact on the character of their surroundings. For this impact to be positive, or at least minimal, roads need to be designed for the specific environment they sit within.

When designing a new highway or altering the design of an existing one, consider both the project's local and wider context.

The wider context includes the type of environment (urban, suburban or rural) the highway traverses, the character of the landscape and the role of the highway in the transport network.

In rural areas, a context sensitive design will involve selecting an alignment which hugs the existing landform, minimising the need for large earthworks, avoiding areas of significant vegetation and positioning structures carefully to minimise disruptions to the environment. In urban areas, a context sensitive solution may involve selecting the right design speed for the road and minimising land take and the need for highway related paraphernalia such as noise walls, median barriers and large signage gantries.

The local context covers the immediate environment in which the project sits, including the pedestrian and cycle desire lines, the palette of local materials and vegetation, specific views or landmark of value to the community, features of cultural significance and the history of an area, amongst others.

The design of the entire highway corridor will influence how the road integrates in its context. This includes:

- the vertical and horizontal alignment of the carriageway
- the width of the carriageway
- the width and treatment of medians
- the type of junctions
- the location and treatment of pedestrian and cycle facilities
- the location and design of bridges, retaining walls and earthworks
- the location and landscape treatment of stormwater swales and wetlands
- the location and design of noise barriers
- the selection and arrangement of highway furniture
- the landscape treatment of the corridor.

Designing for the context is a guiding principle that spans the entire planning and design stages of a project. It starts at the strategic level with the selection of a suitable route and continues to the development and implementation of the finer details of the design such as landscape planting.

### CASE STUDY: NOISE WALLS THAT INTEGRATE WITH THEIR CONTEXT

#### Wellington Inner City Bypass, Wellington

An important consideration when designing the appearance of the noise barriers on the Inner City Bypass project in Wellington was fitting with the surrounding urban and architectural context. This was particularly important in the heritage precinct where a noise barrier was required close to existing timber cottages. In this instance the noise barrier was designed to match existing elements and materials found within the area. A corrugated steel fence with timber trim was used, painted in traditional heritage style colours. At another location, although cost and safety issues restricted the use of real bricks (considered too expensive and also unsafe if hit by a heavy vehicle), a solid concrete plastered noise barrier with capping and piers was designed to emulate the form of an old brick wall.



The outer faces of the barriers have been used to form the backdrop for new public and private spaces along the route, including a new walk/cycleway installed as part of the project. The visual effects of the concrete noise barrier as seen from the nearby dwellings were mitigated with climbing plants and hedges at the base of the barriers. Recesses were included in the design of the barriers where pillars were required. Trees were also planted to assist in reducing the apparent scale of the barriers in the longer term. Planting of climbers on long stretches of concrete barrier had the effect of both visual enhancement and graffiti deterrence. Ongoing maintenance considerations included plant pruning and vegetation removal alongside noise barriers to maintain access. If required painting of the corrugated steel fences and plastered concrete walls will be undertaken for graffiti removal and also for longer-term maintenance.

From a design perspective, the main objective was to blend the noise barriers into their surrounding urban context so they appeared less as 'barriers', and more as an element of the urban fabric that would be seen elsewhere in the city. To this end the walls were designed specifically for each section or precinct to tie into their surroundings to good effect, with fences and planting designed to be similar to other elements found in the vicinity. When viewed from the residential areas, the barriers blend in successfully without appearing out of scale or proportion to their surrounding urban context.



State Highway 6 Queenstown to Kingston  
Photograph courtesy of Tourism New Zealand

### 3.3 INTEGRATE TRANSPORT AND LAND USE

Compact settlements make best use of the limited resource that land is. They also enable the efficient use of other resources such as fuel (through reduced travel distances; the ability to walk or cycle to places; and by making public transport viable) and costly infrastructure (utilities and roads). The location of new roads and interchanges can support existing land uses and facilitate access to new areas identified for urban growth. In the wrong location, roads and interchanges can have detrimental effects by facilitating uncontrolled development, also called 'urban sprawl.'

Changes to existing roads can also influence landuses. In urban areas identified for intensification around existing centres and main transport corridors, road capacity improvements involving widening, removal of on-street parking, the reduction of direct access and generally promoting through movement can deteriorate the amenity, economic vitality and liveability of those very places where intensification is sought.

When planning a new or altered highway, consider the regional and local spatial plans or growth strategies and ensure that the design of the highway supports these strategies by refraining from opening up land for development where this is not sought and conversely minimising the erosion of the amenity and liveability of established or planned urban areas through changes aimed at improving the efficiency of through movement.

#### CASE STUDY: INTEGRATED THINKING

##### Hamilton Southern Links

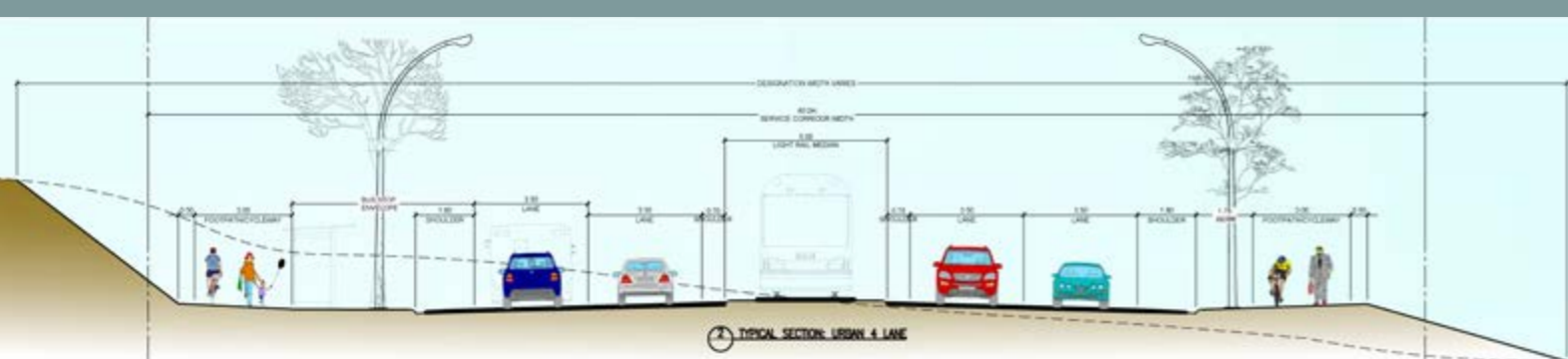
The Southern Links project involves 32km of future transport network, including 21km of state highway and 11km of urban arterial roads in the city's Peacocke structure plan area.

The project proposes a network of integrated state highway and urban arterial routes linking SH1 from Kahikatea Drive in Hamilton City to Tamahere and the Waikato Expressway in the south, and SH3 from Hamilton International Airport to central and east Hamilton. The urban arterials will establish the key transport network within the Peacocke growth cell and become the building blocks for future urban development.

The aim of the project is to plan for the long-term needs of the city, particularly the projected growth and development in the Peacocke, Tamahere and Hamilton Airport area. Identifying and protecting the future transport network will enable good long-term planning to be carried out for the city.

This project is a good example of the NZTA and Hamilton City Council (HCC) working together to ensure that the future state highway routes will be well integrated with local roads and the planned residential and industrial developments.

The Southern Links project has been integrated into the Waikato region's Future Proof strategy, which aims to optimise the planning of land use, regional growth and key infrastructure in and around Hamilton. Future Proof is a partnership between Environment Waikato, HCC, the Waikato and Waipa District Councils and Iwi, with the NZTA as a key stakeholder.



Typical section through Peacocke's major arterial. Source: Opus

### 3.4 CONTRIBUTE TO GOOD URBAN FORM

Highways are more than corridors for the efficient movement of people and goods. As well as meeting transport needs, the road network has a fundamental influence on urban form. In particular:

- roads define the geometry of settlements, including the main axes, focal points and public spaces
- main road junctions often act as a magnet for retail and community activities
- the spacing between roads and junctions creates the basic structure of a town or city, the 'urban grid', and influences the form of subdivisions and types of activities likely to take place
- the road hierarchy influences the direction of urban growth and the location of economic activities
- the existence of congestion is part of a sustainable settlement ie successful main streets. Too much traffic dispersal and unrestrained traffic flow can be as detrimental on a settlement as too much congestion
- the scale and placement of highway infrastructure, particularly elevated structures, bridges and retaining walls in urban environments, influences urban form and function.

When designing a new highway or altering the design of an existing one, consider the purpose of the highway in the structure of the settlement and tailor the design to fit this purpose. Is the highway a main urban arterial, is it the main shopping street for the settlement or does it bypass a settlement and operate independently from it? The answer to these questions should inform the geometry of the road, design speed, selection of median treatment, type of junctions and type of pedestrian and cycle facilities.

#### CASE STUDY: INFLUENCING URBAN FORM

##### Newmarket Viaduct Master Plan

Auckland's Newmarket Viaduct sits within a complex urban area, steeped in history with a variety of land uses from historic residential villas to modern car yards, boutique retail outlets and thriving commercial activities. The Viaduct represents a significant infrastructural investment and feature of the area. It defines the skyline of Newmarket, provides a landmark and currently creates an edge to, or element of containment for the retail and lifestyle activities that characterise the area.

The NZTA's statutory responsibility is the safe and efficient operation of the state highway network. However, the NZTA also understands that the Newmarket Viaduct Project provides an opportune time to identify the potential of further development in the Southern Newmarket area, thus supporting the region's desire for growth in Newmarket and enabling an integrated transport system.

The Newmarket Viaduct Landscape and Urban Design Framework (LUDF) November 2008 was developed to conform to the conditions of Designation. The document provided an urban design assessment and solutions for key areas as required by the designation conditions. The LUDF specified the development of a Southern Newmarket Master Plan that is intended to provide 'a detailed three dimensional plan which sets out the intended layout of the area. It represents a vision for development along with comprehensive proposals for building spaces, movement and land use.'

Development of the Master Plan has taken into account the Public Works Act, District Plan controls, maintenance and safety requirements and market indicators. The land uses proposed, provide for a mix of commercial and office space, active retail frontages, carpark buildings and multi-functional open space. In addition to this, the NZTA project team has been working with Auckland Transport to provide a layover area for buses and with Vector Ltd to provide for the Vector Newmarket substations.

The success and quality of the built development beneath the Newmarket Viaduct requires collaboration with landowners and stakeholders.

The Master Plan formulates a comprehensive vision for this part of Newmarket. The document sets out a strategy to guide the future development of the Newmarket Viaduct land and direct surroundings.



Source: Boffa Miskell



Source Isthmus Group

### 3.5 INTEGRATE ALL MODES OF MOVEMENT

As well as meeting the needs of general traffic, roads support movement by other modes, including walking, cycling and public transport. The location and design of roads can facilitate access to train stations and bus stops and encourage people to walk or cycle thus reducing the reliance on travel by private vehicle.

Both the layout and the level of amenity of the road corridor including carriageways, cycleways, footpaths, junctions, crossings, medians, planting and public transport stops and lanes will influence the degree to which the road facilitates alternative modes of movement.

When designing a new highway or altering an existing one, consider:

- pedestrian desire lines and provide safe pedestrian links that match the desire lines as much as practicable
- cycle movements, both commuting and recreational, and provide facilities where appropriate
- public transport and how this can be accommodated in the state highway network.

#### CASE STUDY: UPGRADING ALBANY HIGHWAY

The upgrade of the 4.7km stretch of Albany Highway in Auckland between the Upper Harbour Motorway and Dairy Flat Highway aims to reduce congestion, improve safety for all road users and encourage the use of all modes of transport. The arterial serves an industrial estate, five schools, Massey University, and a cluster of residential estates, therefore it was critical that the four-laned highway integrates with the existing urban context. The design includes a connected network of pedestrian and cycle pathways to benefit the local community and make cycling or walking to school or college easier and safer.

A 2m wide separated cycle path runs along both sides of the highway, apart from at intersections, bus stops and constricted points where cyclists share a 3m wide path with pedestrians. This cycle path forms a safe route for younger riders, while more experienced cyclists can use the highway and choose to transition onto the separated cycle lanes at each intersection. To assist with legibility and reduce visual clutter, super-graphics will be painted on the ground in preference to signs mounted on poles. Along with a material change, the graphics clearly demarcate the pedestrian, cycle and 'share-with-care' lanes.

### 3.6 AVOID SEVERING COMMUNITIES

Wide or busy roads through urban areas can deter social interaction by severing visual, physical, social or cultural linkages. Even when it is physically possible to cross a busy road, high speeds, heavy traffic, noise, poor air quality, perceived danger, pedestrian delay and the general unpleasantness of the experience may lead to a reduction in local trips and community participation. This effect is generally referred to as 'community severance', the opposite of community connectedness.

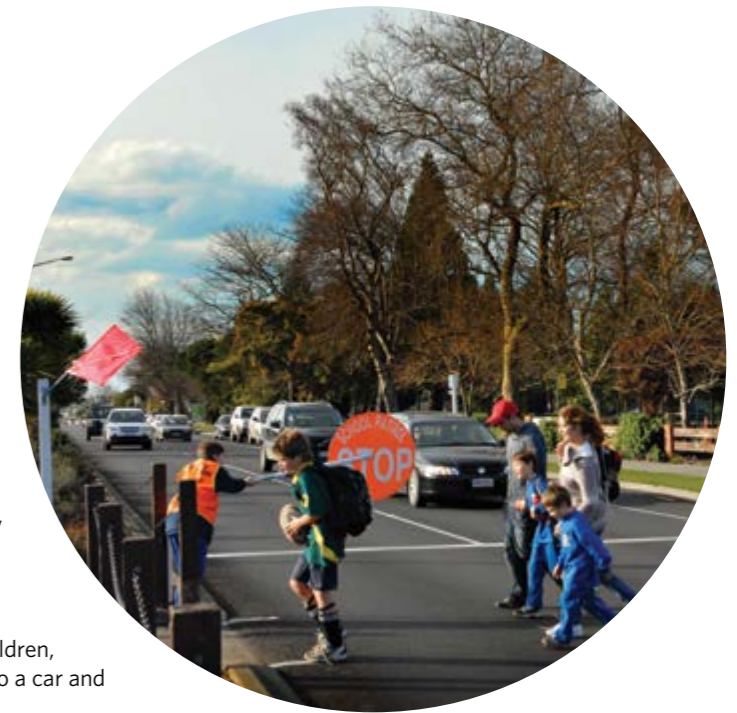
The burden of community severance falls most heavily on those groups of low mobility for whom walking is the principal form of transport and on vulnerable road users. These groups include children, the elderly, people with disabilities, people without easy access to a car and people on low incomes.

Both the location of roads and their design, including design speed, can help minimise community severance.

When planning and designing a new highway, avoid eroding the natural boundaries of individual neighbourhoods and severing the links between the neighbourhood and its facilities and recreational areas.

When altering an existing highway, there may be opportunities to retrofit past highway designs that have severed neighbourhoods. Such opportunities to re-establish lost linkages or improve accessibility should be pursued.

The widening of an existing highway corridor has the potential to affect community connectedness by requiring property removal, removing frontage access and generally creating a gap in the urban fabric. Together, these changes can reduce the accessibility between adjoining areas and the opportunities for social interaction and should be minimised.



#### CASE STUDY: MENDING SEVERED CONNECTIONS - ONEHUNGA FORESHORE RESTORATION

For generations the beach was an important part of life for Onehunga residents in Auckland. This changed when State Highway 20 was built across Onehunga Bay in the 1970s. Since then, the community has sought to reconnect with the sea.

Their wish is about to be realised as the Onehunga Foreshore Restoration project was granted resource consent in March 2012. The NZTA will contribute \$18 million towards the \$28 million project as part-mitigation for the widening of the motorway associated with the Manukau Harbour Crossing project.

The aim of the project is to replace what is now a 900m straight and rocky stretch of waterfront next to a widened motorway with 1.5km of curving coastline. Sandy beaches for swimming will be interspersed with gravel or shell 'pocket' beaches and the development will be delineated at each end by headlands pointing into the harbour. These will enable large grassy areas to be developed as buffers against the motorway, with vegetation including pohutukawa trees, and a wilderness area to be developed at the eastern end of the project.

A new bridge will make it possible to walk and cycle between the new waterfront and the existing park around Onehunga lagoon, which is within walking distance of Onehunga's main street and railway station.



Swimming at Onehunga Bay, about 1950.  
Source Auckland Council

# 'The role of the street is social as well as utilitarian.'

Andres Duany

## 3.7 MAINTAIN LOCAL CONNECTIVITY

Connectivity refers to the directness of routes and the frequency of links in the transport network for vehicles, public transport, cycles and pedestrians. Local connectivity refers to local movements.

Good connectivity to facilities such as schools, open spaces and neighbourhood centres is an important contributor to the quality of life in a community. The location and design of highways can have a significant impact on local connectivity and needs to be addressed early on in a project. Good connectivity requires balancing the needs of through traffic against the community needs for access. This will include maintaining local road, pedestrian and cycle connections across and along the highway especially where such links provide access to community facilities.

Poor connectivity means longer travel distances which cause delays and can deter movements. Pedestrians are particularly sensitive to delays as their travel range is limited. Poor connectivity can also result from physical links that are not used due to poor amenity or perceived safety issues. Children, the elderly, the disabled, parents with prams and people without access to motorised transport modes are disproportionately affected by poor connectivity.

When designing a new highway or altering an existing one, aim to:

- achieve a balance between regional movement and local connectivity for the community the road traverses.
- provide connectivity along the corridor by locating and designing junctions to serve town centres and other key destinations.
- provide connectivity across the road corridor, especially where the road runs between or through urban or recreational areas.

**'With over 40,000 cars travelling down Broadway every day, not to mention our busy bus lanes, too many people risk their lives on a daily basis crossing that end of Broadway near our only post office. This crossing will not only be great for safety, but good for business and will help urban renewal long-term.'**



Source: Boffa Miskell

## CASE STUDY: CONNECTING NEWMARKET

Broadway is Newmarket's busiest thoroughfare in Auckland.

As part of the NZTA's Newmarket Connection: Viaduct Replacement Project the NZTA explored opportunities to enhance the local environment. Given that the viaduct straddles a busy retail hub surrounded by numerous schools, the NZTA made a commitment to improve the local pedestrian connectivity.

A new signalled pedestrian crossing was installed at the junction of Broadway and Clovernook Road in January 2010. The facility provides a much needed crossing point midway between the Great South Road intersection and Westfield's 277 shopping mall.

The new crossing has been welcomed by the local business community.

'We have talked about the need for a signalled pedestrian crossing around this part of Broadway for many years, so we are absolutely delighted that the NZTA is installing this public amenity as part of the Newmarket Connection project,' said the Chief Executive of the Newmarket Business Association.

'With over 40,000 cars travelling down Broadway every day, not to mention our busy bus lanes, too many people risk their lives on a daily basis crossing that end of Broadway near our only post office. This crossing will not only be great for safety, but good for business and will help urban renewal long-term.'

## 3.8 RESPECT CULTURAL HERITAGE VALUES

Cultural heritage sites in New Zealand include:

- historic buildings and structures
- archaeological sites
- places of significance to Maori including waahi tapu (sacred places) - these may include natural features such as trees, springs, rivers or mountains which were associated with historical or cultural activities or events but which have no known physical remains of those activities or events
- the surroundings of buildings, sites and places.

Cultural heritage sites may have significant values and be appreciated by the local community and wider public for their contribution to New Zealand's history and identity.

Archaeological sites and historic buildings in particular constitute a unique and irreplaceable record that contributes to our understanding of the history and culture of New Zealand and are often significant elements in the landscape. Once destroyed or damaged, the record is lost and the landscape disrupted. If a place of significance to Maori is destroyed or damaged the cultural relationship between tangata whenua and the place is impacted.

The location and design of a road has the potential to affect the value of these items and avoidance of impact and preservation of cultural heritage sites is always the preferred option.

When designing a new highway or altering an existing one, seek to:

- identify cultural heritage values early on in the process
- locate and design the road to avoid destroying, impacting or severing cultural heritage sites
- locate and design the road to minimise the visual impact on items of cultural heritage significance
- incorporate cultural heritage sites or structures as landmarks and provide suitable access
- locate rest areas to take advantage of cultural heritage sites or structures.



Campbell Kindergarten: historic building restoration for adaptive reuse, as part of the Victoria Park Tunnel project, Auckland.  
Photographer: Simon Devitt

## CASE STUDY: NEW ERA FOR HERITAGE BUILDING

The NZTA has welcomed a new era for the heritage building originally known as the Rob Roy Hotel. The hotel first opened its doors in the 19th century and has served Aucklanders for over 127 years.

The hotel, now known as the Birdcage, is owned by the NZTA and became the conservation symbol of the recently completed Victoria Park Tunnel project. Despite its age and brick construction, the hotel was successfully moved twice during the tunnel's construction. Hydraulic jacks pushed and pulled the hotel 44 metres from its original site. It was then moved back to its original position, which is now located above the tunnel's southern entrance.

The NZTA restored the building and landscaped the plaza area in front of it. It has now been leased to a local restaurant and will continue to be a social meeting place for the community. The top floor of the Birdcage is leased to commercial interests.





### CASE STUDY: RESPECT FOR CULTURAL HERITAGE VALUES - TAKIROA ROCK ART

The Takiroa Maori rock art site located just west of Duntroon and beside State Highway 83 is a significant landmark in the traditions of Ngai Tahu Whanui, attracting between 20,000 and 30,000 visitors a year. The historic area is of exceptional cultural and traditional significance due to its association with the early Maori inhabitants of the South Island, the outstanding rock art preserved in situ and the archaeological rarity of the site. In recent years due to a steady increase in visitor numbers and traffic volumes concerns have been raised over visitor safety. Visibility was restricted at the entrance to the site where visitors often walked across the highway or turned around to park. When plans were unveiled to upgrade the site, including the entrance, the NZTA saw an opportunity to improve safety on the highway.

In conjunction with Ngai Tahu's Maori Rock Art Charitable Trust a plan was developed to enhance and improve the safety of the site by moving the entrance and constructing a carpark and walkway. The NZTA lodged an application to alter the existing state highway designation, so a landscaped carpark, walkway and picnic area could be constructed. The design evolved in close consultation with iwi and the end result is a safer and more attractive and welcoming access for tourists, located in a central position between two bends for improved visibility. The improvements have been welcomed by all parties and the site is now attracting many more visitors who are able to safely park and view this historic area without having to cross the state highway.

In using these images the NZTA acknowledge Ngai Tahu

# URBAN DESIGN INFORMED BY MATAURANGA MAORI

The implementation of Maori values and principles are important to the process of developing methodologies for effective design. Mātauranga Māori refers to the framework of knowledge that Maori communities, iwi, hapu and whanau have retained since the advent of Polynesian arrival to Aotearoa New Zealand. This knowledge is place-based, and founded in empirical observation and interaction with the environment and the natural world in which Maori have existed for generations.

Mātauranga Māori can inform urban design practice to allow Maori aspirations to be fulfilled while complementing and improving NZTA's urban design outcomes. The following steps will help to ensure the successful implementation of Mātauranga Māori, including kaitiakitanga (stewardship), in the design of new and existing projects within New Zealand's state highway network:

1. Ensure outcomes informed by Mātauranga Māori are context specific and drawn from local sources of knowledge and interpretation. Early engagement with local mandated iwi representatives at the inception phase of the project is important.
2. Formation of an iwi working group/key stakeholders that can advise on the implementation of Mātauranga Māori based design solutions, such as environmental management, landscape design, artworks, construction methods, cultural heritage management (wahi tapu/wahi taonga).
3. Adequately assess Maori expectations pertaining to kaitiakitanga (stewardship) such as monitoring requirements, plant species selection, cultural harvest, mahinga kai, bio-diversity, ecological enhancements and protection of mauri (life force).
4. Ensure the group is well resourced to contribute and provide inputs into the design and implementation phases of the project.
5. Design responses should be tailored to addressing specific issues within specific areas. Local iwi, hapu or whanau will provide the guidance on how this can be achieved.



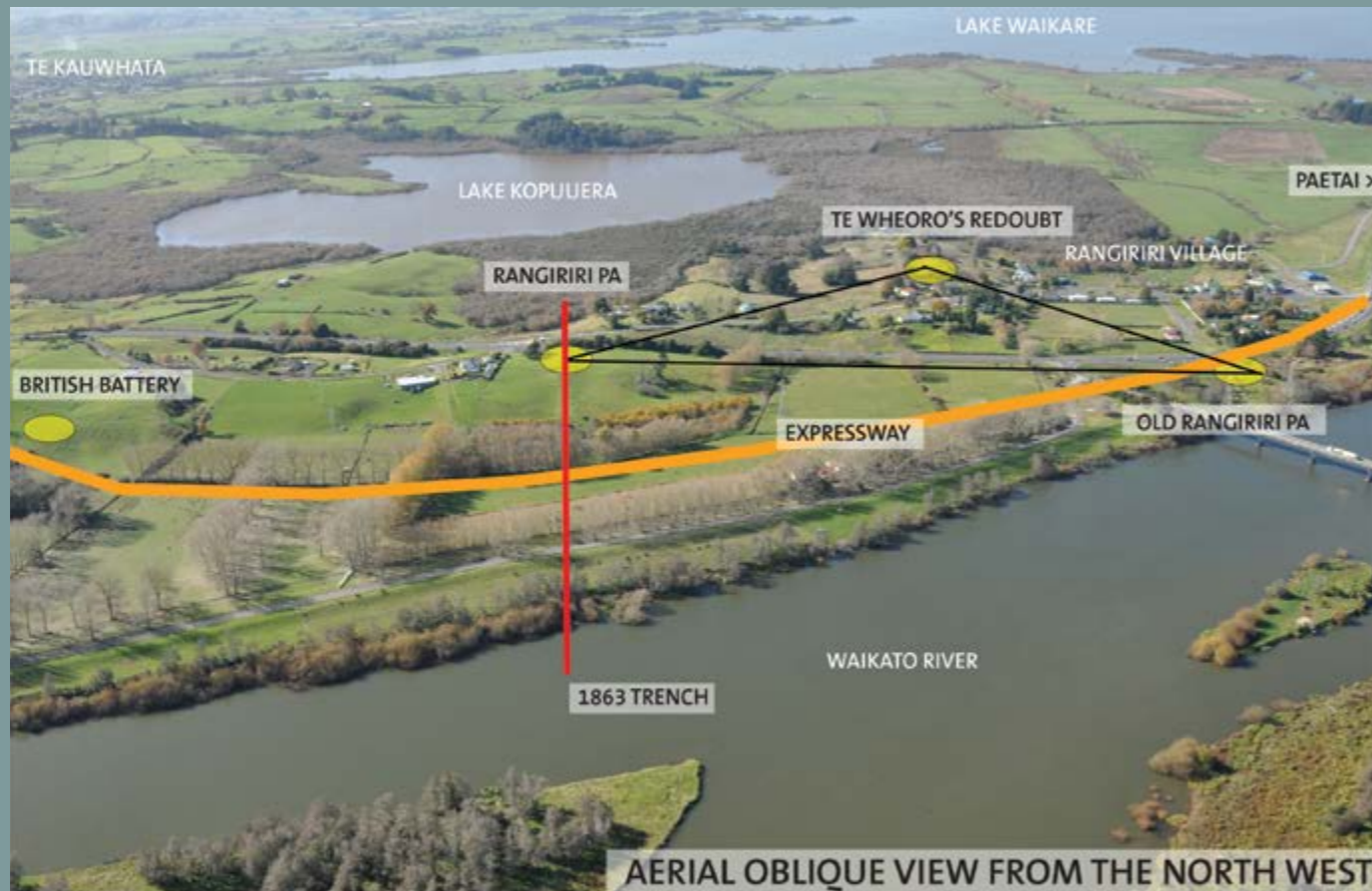
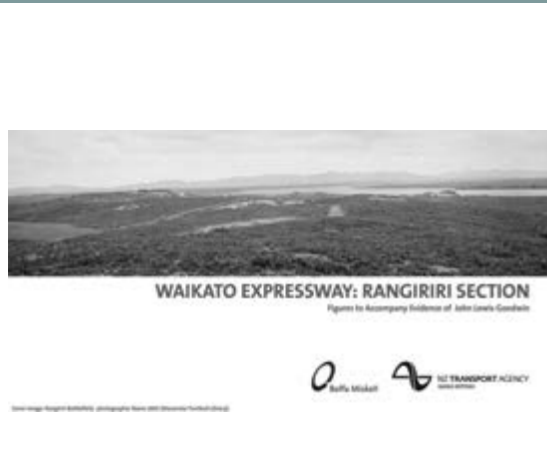
### CASE STUDY: RANGIRIRI BYPASS

In 2009 the NZTA began working in partnership with Waikato-Tainui to restore the Rangiriri Pa site and to remove the section of state highway running through the central redoubt of the Pa as part of the Waikato Expressway: Rangiriri Section project.

The site of the 1863 Battle of Rangiriri is a place of significance in New Zealand history, whilst also being an area that has a rich ecological and cultural heritage landscape character of particular importance to Waikato-Tainui. In recognising this place, the design concepts for the project were prepared in close collaboration with Waikato-Tainui.

The working relationship between the NZTA and Waikato-Tainui has been critical to the success of the project. Of particular importance has been the involvement of a liaison person from the local hapu who has provided regular feedback on designs and plans throughout the duration of the development phases of the project. Waikato-Tainui's inputs have assisted in appropriately reflecting mana whenua history of the area. In addition to this the landscape design, planting plans, and cultural interpretation aspects of the project are consistent with mana whenua expectations. These include aspects of local ecology; stormwater management and waterway restoration, to enhance and protect the local environment. The restoration and protection of the significant archaeological features and historic riverside and wetland ecology is reflective of the cultural landscape story and will act as a memorial to the battle.

The Rangiriri Bypass and restoration works are scheduled to begin by the 150th anniversary of the Battle of Rangiriri, in November 2013.



### 3.9 DESIGN WITH NATURE

The location and design of a highway has the potential to diminish or destroy the natural environment, including natural processes and ecological value. In addition to supporting environmental sustainability, natural systems contribute to the structure and character of an area and can provide a visual experience of value to the local community, road users and visitors.

When designing a new highway or altering the design of an existing one, consider the underlying natural environment and ecosystems so as to minimise adverse effects on these. This will include consideration of the:

- local topography and geology
- vegetation patterns, particularly native vegetation
- local drainage systems, including waterways and flood plains
- wildlife habitats and corridors.

Landscape planting is an important component of the highway corridors. It has the potential to provide habitat and shade, minimises erosion on road verges, cuttings, embankments and swales, screen traffic, enhance the experience of road users and absorb carbon dioxide. Designing with nature involves selecting suitable plant species, including the use of local provenance native vegetation and rare or endangered plants where possible.

### CASE STUDY: BRIDGE THAT TOUCHES THE EARTH LIGHTLY

#### Otenerua Eco-Viaduct, Northern Gateway

The 256m long, 32m high bridge provides an ecological corridor between two areas of regionally significant bush land that the new motorway would have otherwise bisected. In elevation the Viaduct is barely visible to the public and for motorists it provides them with fleeting glimpses of the coast between stands of regenerating Manuka and Podocarp forest.



### 3.10 CREATE A POSITIVE ROAD USER EXPERIENCE

The design of a road impacts the experience of people travelling along it both in terms of safety and amenity. The design of a road can influence a driver's behaviour by creating clear transitions on an approach to a junction or a different speed zone, by keeping the driver alert and by creating features which help road users know where they are. Roads are also a window onto our rural and urban landscapes which are enjoyed and valued by tourists and locals alike. Most overseas visitors experience New Zealand by car and the protection and enhancement of scenic roads contributes to this important component of our economy.

When designing a new highway or altering an existing one, seek to:

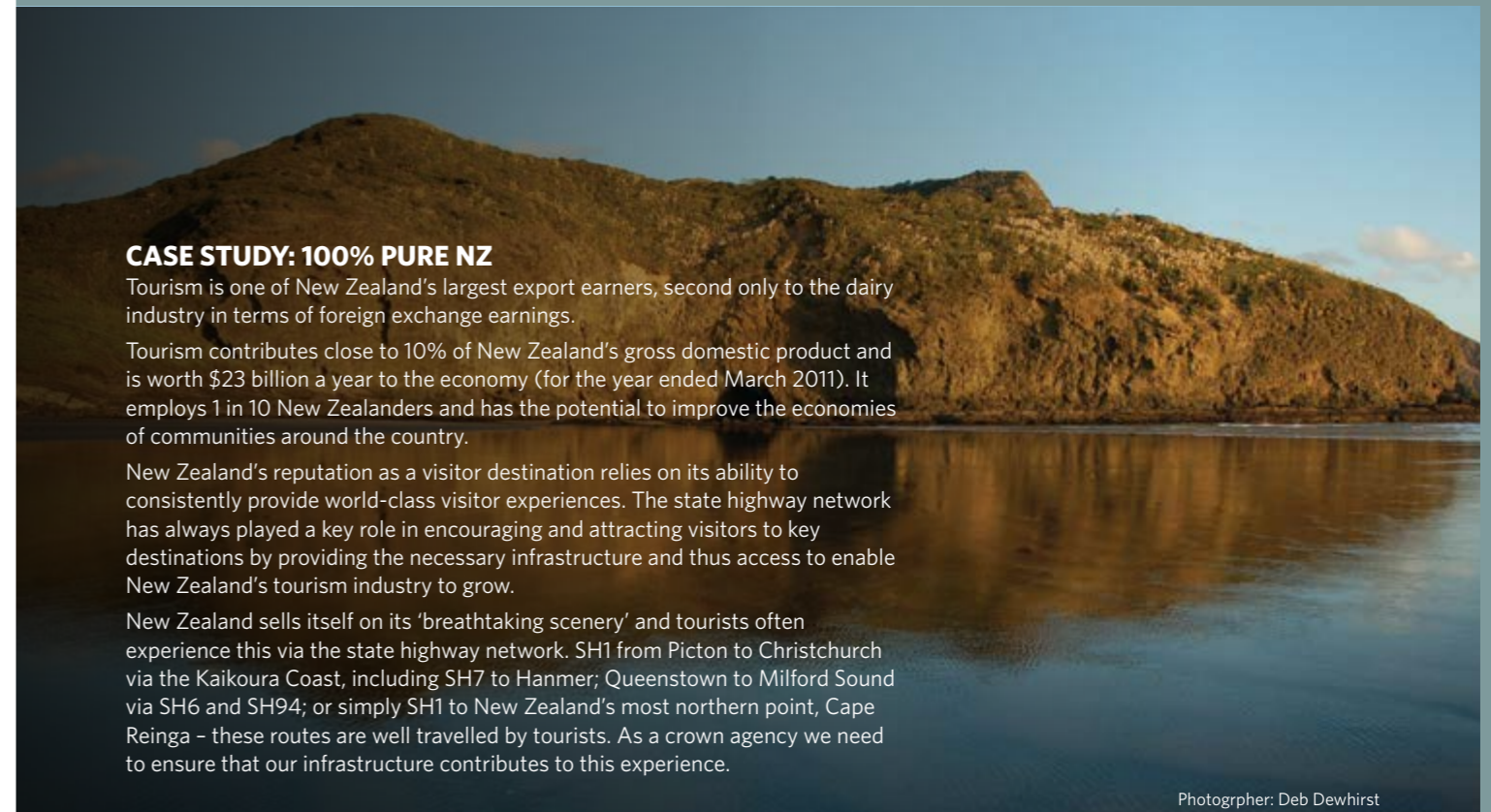
- maximise the views of the surrounding landscape or urban environment from the road through careful vertical and horizontal alignment, the selection of appropriate roadside and bridge barriers, the independent grading of carriageways in appropriate locations and the careful location of planting and structures
- create landmarks in key locations through distinctive over-bridges, interchanges or landscape treatments
- design major rural intersections to provide milestones along the journey, indicate the presence of communities and enhance way-finding
- encourage safe driving through a legible and consistent layout which conveys the function of the road and its speed limit
- create transitions in the character of the road to alert drivers when approaching a different environment or a junction
- protect and enhance the character of scenic routes.

### 3.11 ACHIEVE A LOW MAINTENANCE DESIGN

Maintenance is a large and costly component of expenditure for the NZTA and must be considered early on in the design of all projects. Low maintenance and good aesthetics can be achieved through early consideration and good design.

When designing a new highway or altering an existing one, seek to:

- select designs which are neat, uncomplicated and coordinated
- elect designs which are practical, cost-effective and require minimal maintenance
- use robust and durable materials which are fit for purpose and appropriate for the context
- allow for easy and safe maintenance access where required
- use long-lived, hardy plant species with good weed suppression capability
- minimise opportunities for vandalism
- deter graffiti through planting along noise barriers and retaining walls and the use of textured finishes
- minimise the number of different highway furniture elements
- limit the number of noise and retaining wall panel types.



### CASE STUDY: 100% PURE NZ

Tourism is one of New Zealand's largest export earners, second only to the dairy industry in terms of foreign exchange earnings.

Tourism contributes close to 10% of New Zealand's gross domestic product and is worth \$23 billion a year to the economy (for the year ended March 2011). It employs 1 in 10 New Zealanders and has the potential to improve the economies of communities around the country.

New Zealand's reputation as a visitor destination relies on its ability to consistently provide world-class visitor experiences. The state highway network has always played a key role in encouraging and attracting visitors to key destinations by providing the necessary infrastructure and thus access to enable New Zealand's tourism industry to grow.

New Zealand sells itself on its 'breathtaking scenery' and tourists often experience this via the state highway network. SH1 from Picton to Christchurch via the Kaikoura Coast, including SH7 to Hanmer; Queenstown to Milford Sound via SH6 and SH94; or simply SH1 to New Zealand's most northern point, Cape Reinga - these routes are well travelled by tourists. As a crown agency we need to ensure that our infrastructure contributes to this experience.

Photographer: Deb Dewhirst

### CASE STUDY: THE VIEW FROM THE ROAD

#### Orewa Interchange Bridge

Since the bridge is very visible to motorists, careful attention was given to its appearance. The 25m span length is significantly larger than needed for the 10.6m wide motorway to pass underneath. However it was desirable to have a larger span for aesthetic and economic reasons. By pushing the spans out to 25m, the abutment fills are minimised and clearance underneath the bridge opens up a wide field of vision for the motorway user. The long spans also give a more aesthetically pleasing span/height ratio than would have been achieved if the minimum span length had been used. Attention to aesthetic detailing can be seen with the curved outer deck beam and the corrugated finish on the concrete edge barriers.



### CASE STUDY: SIMPLE BARRIERS, HIGH MAINTENANCE

Unpainted timber noise barriers are not appropriate along the highway network - As they are vandalised maintenance crews paint out the graffiti leading to a disparate appearance.



SECTION 4:  
DESIGN OF  
HIGHWAYS

« Crescent

KEEP LEFT

Tay St »»

## 4.0 DESIGN OF HIGHWAYS

### 4.1 INTRODUCTION

This section provides direction on specific aspects of the highway corridor. For each topic, a brief description of common issues is provided followed by design guidance to support positive urban design outcomes.

The section is divided in three parts:

**Part 1**  
**Highways in special contexts:** This covers state highways that have a dual role due to their location within a city street network or through a town centre as well as highways which play an important role in the tourism industry such as scenic routes.

**Part 2**  
**Supporting walking and cycling:** This addresses the provision for non-vehicular highway users including pedestrian and cycle paths, crossings, bridges, underpasses, lighting and consideration of personal safety.

**Part 3**  
**Highway components:** This covers the remainder of physical components which can be found within highways corridors and which influence urban design outcomes. These include bridges, retaining walls, earthworks, tunnels, junctions, noise barriers, highway furniture, drainage facilities, landscape planting.

## PART 1 - HIGHWAYS IN SPECIAL CONTEXTS

There are situations where the state highway needs to do much more than just carry traffic. This is particularly the case in urban areas where the highway is part of a complex network of movement and activities. It is also the case along highly scenic routes which are an intrinsic part of our tourism industry. The sections below cover the main types of 'special' highways commonly found in New Zealand.

### 4.2 URBAN ARTERIALS

#### Key design issues

Arterials are major urban roads. They have high traffic volumes, cross many intersections and are used by a mixture of transport modes travelling at different speeds. Arterials can also pass through busy centres with commercial and community services which add to the complexity of the environment.

Traditionally, the engineering approach to managing the competing activities along urban arterials has been to restrict direct vehicular access from properties facing the road using limited access road status, removing on-street parking and in some cases installing median barriers in an effort to separate different modes of movement and reduce conflicts. Such measures have often undermined the economic and social vitality of the areas traversed.

It is no longer appropriate to simply describe arterials in terms of conventional engineering-based hierarchies and codes. These leave too many important spatial outcomes and design innovations to chance. Internationally the design and retrofit of urban arterials is changing significantly in keeping with best practice movements in street design such as Living Street, Complete Streets, Great Streets etc which focus on place and movement.

The place and movement approach recognises that design of the street is a response to both its movement function and the adjacent activity. It also reflects the integration of land use and transport.

The place and movement approach gives greater recognition that streets are a key component of the public realm and a major influence on the economic viability of an urban area

Under the Safe System approach to highway design, an arterial's through traffic function is balanced with its mix of uses and with the way the adjacent land is used. The road layout and speed limit is designed accordingly.

*A predict and provide strategy of network capacity improvements and widening is spatially and financially unsustainable. Guides such as Auckland's Liveable Arterials and Street Design Manual for Palmerston North are leading the way in NZ in redefining the role and design of arterials. These, including best practice international guides should be sourced for further guidance specific to the design of urban arterials.*



Jervois Quay, Wellington.  
Photographer: Stephen J Patience

### Urban design guidance

The following guidance should inform the design of urban arterials:

**Balance:** Seek to achieve a balance between transportation needs, supporting economic activities on adjacent landuses and the amenity of surrounding areas, including access and character.

**Multi-modal:** Address the needs of all road users including pedestrians, cyclists, public transport and private vehicles.

**Pedestrian amenity:** Provide safe and attractive facilities for pedestrians including regular dedicated crossings, sufficiently wide footpaths on both sides of the street capable of accommodating prams and mobility scooters (minimum 2 metres), trees for shade and other landscape elements compatible with the urban context.

**Cyclist amenity:** Provide safe and convenient facilities for cyclists including dedicated or shared cycle lanes, toucan signals and advanced stop boxes at traffic signals.

**Built-in speed management:** Design the road corridor to clearly communicate to drivers the appropriate driving speed. This includes minimising the width of the carriageway, limiting building setbacks and using street trees to reduced the perceived width of the corridor.

**Character:** Urban arterials are key components of the urban fabric and should contribute positively to the local character. This can be achieved through appropriate paving and landscape measures such as street trees and the selection of highway furniture elements. Street lighting should be functional as well as aesthetically pleasing; it should benefit the carriageway and footpath.

**Connectivity:** Connectivity between streets, local services and surrounding features shall be encouraged. Regular, safe and controlled at grade crossings should be provided

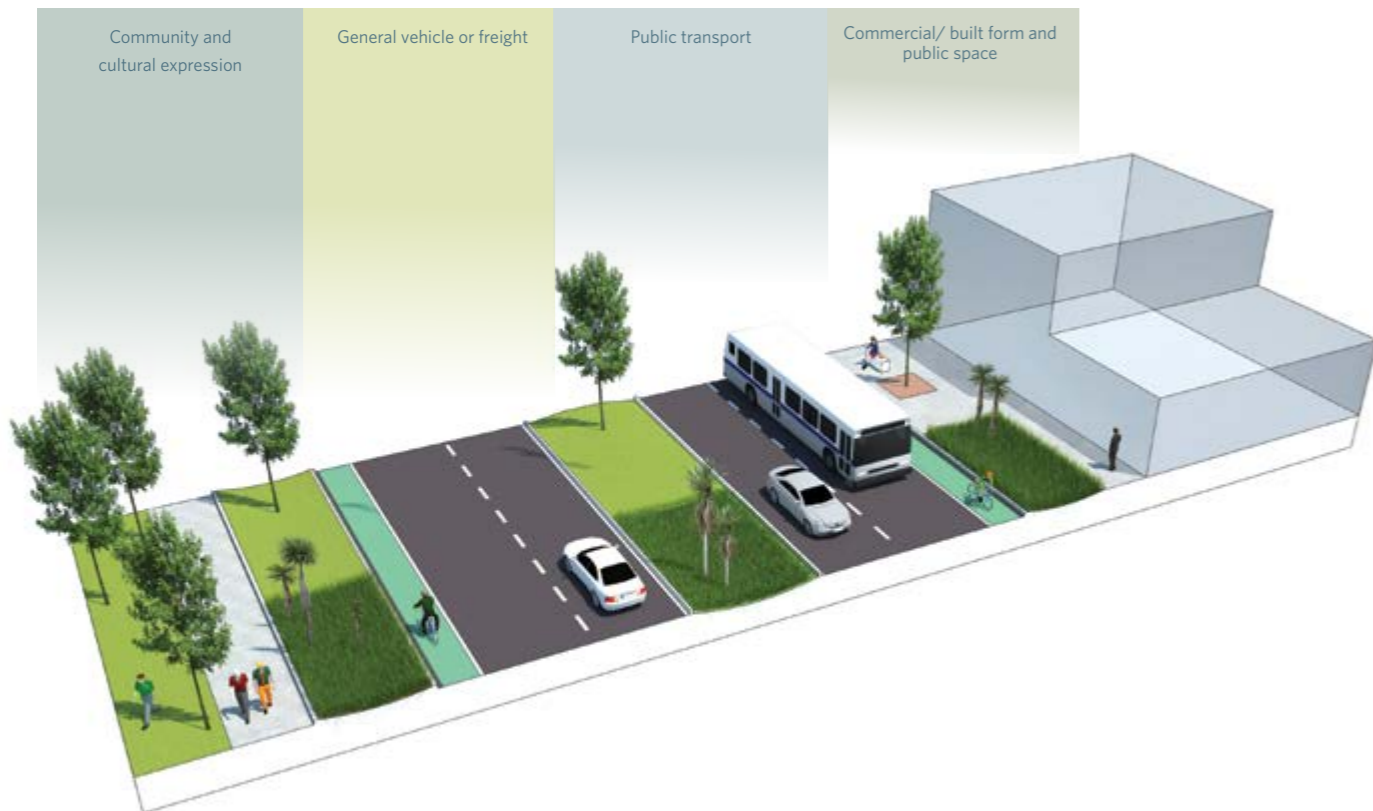
**Soft Landscaping:** Use street tree planting to promote streetscape values, character and amenity. Use low level planting to provide storm water infiltration and bio-retention functions. Street furniture should contribute to the streetscape quality.

**Parking:** Parking should be provided on street. Clear zones in peak hours should be used in preference to removing parking altogether.

**Limited access roads (LAR):** Where an urban arterial has "Limited Access Road" status, consider the use of slip lanes or parallel access roads to facilitate access to adjoining land uses. These can support active frontages along the arterial, minimise the incidence of internally focused development, improve accessibility for pedestrians and cyclists and generally provide for a better streetscape by minimising blank façades and rear fences fronting the arterial.

### URBAN ARTERIAL CROSS SECTION

Attributes of an urban arterial:



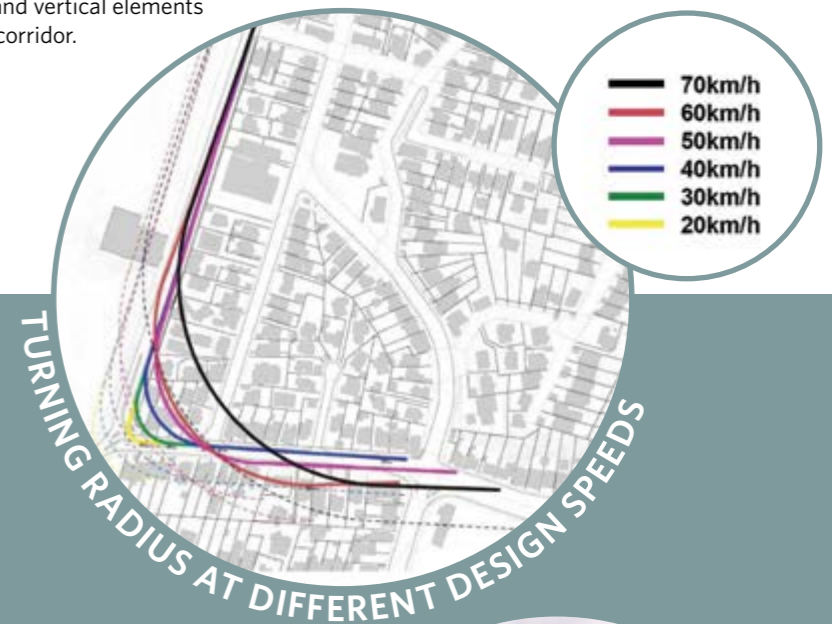
### Detailed guidance: Designed-in speed management

A combination of measures should be used to encourage safe driving speeds along urban arterials including:

- design speed should be 50-60Km/h
- using narrower travel lanes that cause motorists to naturally slow their speeds
- using physical measures such as kerb extensions and medians to narrow the carriageway
- using design elements such as on-street parking to create side friction
- using visually contrasting surface or stripping of shoulder and cycle lanes
- minimising or eliminating offset between the inside travel lanes and the median kerbs
- minimising camber
- eliminating shoulders, except for cycle lanes
- reducing kerb radii at intersections
- eliminating free left-turn or reconfiguring them to include a pedestrian crossing
- using paving materials with texture detectable by drivers as a notification of the possible presence of pedestrians (eg at the entrance into a town centre)
- placing street trees and other vegetation between the edge of the carriageway and the footpath
- creating enclosure through the location of buildings and vertical elements such as lighting columns on either sides of the road corridor.



Napier



### CASE STUDY: DESIGN SPEEDS

#### Implications on urban environment.

The design speed impacts the footprint of a road need to meet safety requirements. As such it is necessary to consider the implications of speed and its subsequent geometric requirements on the urban fabric.

### CASE STUDY: GREENING THE QUAYS

#### Jervois Quay, Wellington

The planting of 60 Maori Princess pohutukawa trees and more than 400 native shrubs along a 1.1km section of urban arterial has changed the face of Wellington's waterfront.

The project began in July 2006 with the creation of a two metre-wide central median strip. The median strip was then planted with pohutukawa trees between the Jervois Quay/Cable Street intersection and Bunny Street. The work also included the installation of irrigation and feature lighting. The project was completed in June 2007. The final cost of the project was \$2.5 million, \$900,000 below budget.

The tree planting did not affect the number of traffic lanes along the quays. As part of the installation work, the existing lanes were realigned and the lane widths reduced.

'If public feedback is anything to go by, the trees are a huge hit,' said the Mayor. 'It is incredible how a simple line of trees has transformed one of the country's busiest streets into a more attractive, safe place for both drivers and pedestrians.'



Jervois Quay Photographer: Stephen J Patience

### 4.3 MAIN STREETS

#### Key design issues

State highways that double up as main streets serve the dual purpose of carrying through traffic and serving the needs of the local community. These two roles have conflicting requirements, especially in terms of vehicular flows and pedestrian convenience. Main streets are usually the focal point for shops, restaurants, cafes and community services and the economic hub of a community. These activities are best served when vehicles can easily stop and park, when there is space for shops and cafes to spill out onto the pavement and when pedestrians can wander from one shop to the next and from one side of the road to the other. Clearly, this requires a road design which sets the needs of pedestrians on par with those of vehicles.

Such a balance can be achieved through the appropriate provision for public transport, cycling and walking through the main street to encourage modal shift from the private car. Enhancing the main street environments through a high quality public realm incorporating materials and street furniture suitable for the local context, removal of clutter and pedestrian barriers, generous pedestrian crossings and enhanced street lighting will encourage more local movements on foot and by cycle rather than by car and support the economic vitality of the centre.

Main streets need to be accessible from both the local and the wider road networks to thrive. In places, this may mean allowing more lateral connections between the state highway and the local streets than would normally be the case. Lower speeds through main streets help support the safety of more frequent junctions and high pedestrian volumes. Traffic calming devices, pedestrian crossings, traffic signals and other elements that help reduce the traffic speed should be accepted as essential features of a main street.



Source: Hamilton NZTA Pedestrian Planning and Design Guide

#### CASE STUDY: LOWER HUTT HIGH STREET

Source: Isthmus

Isthmus Group were engaged in 2004 by Hutt City Council to develop a strategic Masterplan (in collaboration with Urban Perspectives) for the upgrade of the public realm in the Lower Hutt CBD with the aim of creating a high quality livable CBD with a unique and sustainable identity. The framework prioritised the development of a hierarchy of spaces and destinations through the enhancement of the public realm.

Stage 1: Margaret Street 2005-2006 | The western side of the pavement was increased to six metres with car parking reduced and through traffic slowed down through a narrowing of the vehicle carriageway. General improvement to the evening and night time street scene is provided through large high quality lighting columns, giving better colour rendering to improve visual amenity and safety and the blue markers create a visual reference.

Stage 2: High Street 2007-2008 | The High Street upgrade aimed to bring life back into the main shopping street and improve the retail environment.

The High Street layout encourages occupation of the street through an increased footpath width on the sunny (south) side of the street. Car parking was re-oriented from 45 degrees to parallel to allow for informal pedestrian crossing from one side of the street to the other. A pair of markers which incorporate signage, information and artwork are located in the centre of the street; these act as beacons to aid way finding and add vibrancy to the street. A clean and legible layout was designed to echo the modernist architectural style found in many of Lower Hutt's buildings and to create an enduring framework for activities and city life to occur within. A palette of high quality materials and contemporary furniture was developed for the High Street that has become the standard for the CBD.



#### Urban design guidance

The following guidance should inform the design of main streets:

**Convenience:** To be successful, main streets need to provide a pleasant community environment and convenience for those who frequent them. This is likely to include on-street parking and frequent pedestrian crossing points. On-street parking is essential for a main street and provides a source of short-term parking for adjacent retail and service uses, buffers pedestrians from traffic, creates friction that slows traffic and encourages a higher level of street activity.

**Built-in speed management:** Design the road corridor to communicate a low speed environment and warn drivers of the presence of pedestrians. Manage the speed environment to deliver 40km/h maximum vehicle speeds.

**Character:** Main streets may include public space designs and elements of public art which define the character of the settlement they serve. The design of the public realm should be of high quality and have a level of detail which reflects its civic role.

**Footpaths:** Main street should have wide footpaths which can support outdoor seating, social interactions, strolling and window shopping. Ensure sufficient queuing space at pedestrian crossing points.

**Cycle facilities:** Main streets should cater for cycle access and provide cycle parking.

**Safety:** The design of main streets needs to reflect the principles of crime prevention through environmental design for

example, minimising the opportunities for concealment and entrapment. On-street parking and street trees can also improve the safety of pedestrian by shielding them from moving traffic and guiding them to safe crossing points.

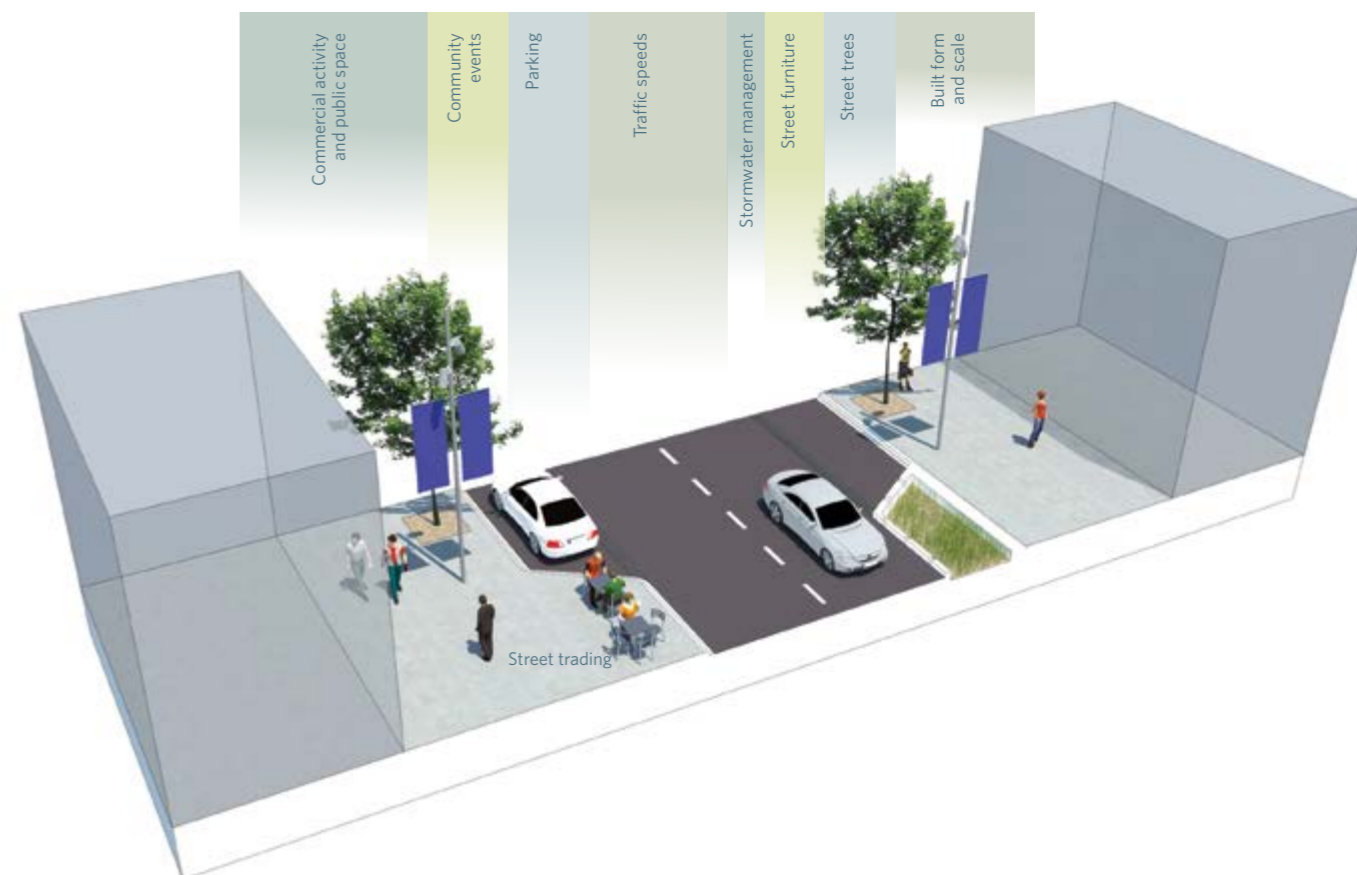
**Intersections:** Design intersections to slow traffic down and allow safe pedestrian crossing. This will usually involve making the intersection as compact as possible to minimise crossing distances potentially through the use of kerb extensions.

**Crossings:** Ensure that there are regular breaks in the traffic flow (such as can be created by cars manoeuvring into or out of parking spaces) to facilitate pedestrian crossings and relief from traffic intensity.

The NSW Transport Roads and Maritime Services *Sharing the Main Streets* provides a practitioners guide to planning, design and implementation of main street proposals

#### MAIN STREET CROSS SECTION

Attributes of a main street:



## CASE STUDY: FROM STATE HIGHWAY TO MAIN STREET

### Orewa Boulevard project

State Highway 1 once separated Orewa Beach and the town centre. Through the consenting process for the Northern Gateway project the NZTA committed funding of around \$1million towards the creation of Orewa Boulevard, a project to 'give the beachfront back to the town' through traffic calming and creating a pedestrian friendly environment to complement Orewa's greatest asset - the beach.

Until then, the coastal highway had been the main route for vehicles travelling north from Auckland. The resulting environment along the section of the highway between the town centre and the beach was vehicle dominated and unpleasant for pedestrians. The noise and dust from passing heavy vehicles had resulted in many of the shops, along what should have been Orewa's main street, keeping their front doors closed, with some even opening up onto a rear lane instead. It was evident that due to the unpleasant environment and resultant lack of pedestrian activity shops on the highway were struggling, while one block back they were thriving.

The Northern Gateway project was anticipated to take a significant portion of vehicles, including most of the heavy vehicles, off the Hibiscus Coast highway. Rodney District Council seized the opportunity to work with the NZTA to reclaim Orewa's Main Street and reconnect the town centre to the beach.

A key aspect of the design was the actual and perceived narrowing of the carriageway to create side friction and reduce vehicle speeds. A major challenge in providing this was the need to retain the corridor's function as an over-dimensional route, requiring an 11 metre wide clearance. These competing demands were balanced by providing a 3.5 metre wide footpath/cycleway levelled with the road.

The project delivered:

- significantly widened footpaths
- a 40% reduction in carriageway width
- footpaths levelled with the carriageway and no kerb separating the two
- coloured, exposed aggregate concrete carriageway contrasting with the road surface outside the town centre
- minimal line markings
- removal of a signalised pedestrian crossing in favour of less formal crossing points
- boulevard tree planting to create side friction
- street furniture
- speed tables on side roads and tightened turning radii
- different paving across carriageway at pedestrian crossings
- provision of on-street parking.



# 'encounter every essential New Zealand experience along the way.'



## 4.4 SCENIC ROADS

### Key design issues

Most international and national tourists visit New Zealand to soak up its natural beauty. Given the remoteness of some of our key tourist destinations, many visitors will spend a considerable proportion of their time travelling by road. The journey to the destination can be as important as the destination itself in influencing the visitors' experience. Good road architecture along scenic routes is essential to allow visitors to view the landscape while they travel and to enable them to stop safely and enjoy the unique environment they have come to see.

The key challenges in the design of scenic roads are to minimise the impact of the road and associated paraphernalia (road signs, lighting columns, earthworks, retaining walls, etc) on the landscape, to maximise the view from the road and to accommodate stopping in a safe and pleasant manner.

Creating a good scenic road means understanding the qualities of the surroundings and incorporating them in the road experience. Scenic roads should be aligned and designed to allow the key characteristics of the landscape to be visible, enhancing the journey experience for travellers.

## CASE STUDY: A HOP STOP AND A JUMP

### The great kiwi road trip

'Pack up the car, fill up the tank and get on the road to explore New Zealand from top to bottom with AA Travel's *Great kiwi road trips*. Over the whole length of the land, from Northland to Invercargill, our beautiful country has the most breathtaking scenery, beaches and activities.'

AA Travel has created 23 road trips, largely using the state highway network, so that tourists can 'encounter every essential New Zealand experience along the way.'

We need to ensure that not only are these trips safe but that our corridors contribute to this experience. This means ensuring that the design of highways in scenic areas respect and enhance views and the landscape.



Courtesy of AA Tourism

### Urban design guidance

The following guidance should inform the design of scenic roads:

**Route selection:** Select a route which minimises the intrusion into undisturbed, high quality landscape. Generally, the route that least damages the landscape will be one that respects the existing landform and avoids disruptions of major topographical features. A route which requires the least earthworks will often be the cheapest and best fit.

**Let the landscape be the feature:** The design of the road and structures should be subservient to the surrounding landscape. In particular, the design of bridges should generally seek to make the bridge as simple and elegant as possible to complement rather than compete with the landscape.

**Maximise the view from the road:** The road should be aligned and detailed to allow the main features of the landscape to be visible from the road. Avoid blocking views to important landmarks such as peaks, lakes, beaches and historic

structures with planting, safety barriers, signage or structures. Avoid blocking views from bridges across waterways and gullies.

**Minimise visual clutter:** Highway furniture such as signposts and barriers can add significantly to the impact of the road on the landscape and should be kept to the minimum which satisfies standards, both in terms of the number of items and their size. Consider using clear zone instead of roadside barriers when the conditions are suitable. Where barriers are required, their visual impact can be mitigated with landscaping.

**Provide safe stopping places:** An important aspect of a road trip is frequent stops to appreciate the landscape and snap that all important photo. Stopping places should be provided at key lookout points where visitors are likely to try to stop. The stopping place allows them to do so safely and without hindrance to other road users.

**Provide convenient rest areas:** In addition to stopping places which may be as simple as a pull out bay on the side of the road, visitors on long road trips also need places to stop for a meal, a rest or to use the washroom. Those accompanied by young children or dogs may benefit particularly from open grounds located away from the highway traffic.

**Announcing settlements:** Major rural intersections should be designed to provide milestones along the journey and indicate the presence of towns and villages. If the highway traverses the settlement, create a transition in the road character on the approach to signal the proximity to a community and change in driving environment.



### Detailed guidance: Maximising the view from the road

A combination of measures can be used to maximize the view of the landscape from the road including:

- minimise the height of solid concrete barriers on bridges by using designs with a steel top rail. This is particularly effective where a 1.1m high solid concrete barrier can be substituted for an 800mm solid barrier with top railing
- consider variations in curvature and independent grading of carriageways to allow views to be opened up for both directions of travel
- expose important views through the design of roadside elements such as safety barriers
- avoid blocking views with planting
- when designing sidling cuts, flatten small left-over earth bunds on the 'valley' side of the cut which obstruct views of the landscape
- when designing earthworks, minimise the need for benches which can look out of place in the natural environment and round the edges of benches to avoid a hard geometric profile
- minimise the profile of bridges to allow the landscape to dominate the view and be appreciated from all viewpoints.

Source: Di Lucas



### CASE STUDY: SCENIC ROUTES AND INFRASTRUCTURE

Both of these bridges are located in key tourist areas of New Zealand. We need to ensure that our infrastructure contributes to the journey experience and quality of these environments. The lower structure undermines this experience. We need to ensure that we get the design brief right and work with other agencies to ensure the delivery of context sensitive infrastructure.



### CASE STUDY: SCENIC VS SAFETY CAN WE HAVE BOTH?

#### Tasman Valley Road Upgrade

In designing transport routes through any landscape it is crucial to understand the landscape character and dynamics. It is also important to understand the road purpose. The Tasman Valley Road is a 7km dead-end through the Aoraki Mount Cook National Park. Branching off SH80, the Tasman Valley Road extends up to the Tasman Glacier, Aotearoa NZ's longest glacier. It is a special purpose road within a World Heritage Area. The large lake at the glacier snout is an important visitor destination.

From SH80, the Tasman Valley Road climbs onto and sidles along the steep mountain toe-slope to the Mount Cook Range. This 1.8km elevated length is vulnerable to avalanches and rock falls. The narrow, winding gravel formation is also accident prone. To reduce the accident rate and road maintenance costs, a replacement route was proposed to be located on the currently stable floodplain below - a standard two-lane, sealed route with a 90km/h design speed.

Landscape architects Lucas Associates were engaged to help identify a solution that would balance the needs to protect the route's highly scenic qualities with the safety requirements of a highly travelled tourist road.

They proposed to retain the route up along the mountain-slope as a one-way up-valley access, and to create a gravel road down the floodplain of the braided Tasman River for the one-way return.

They argued that return road would wind carefully across old channels with minimal construction works. Speed would be discouraged through the scale, character and alignment of the route, including signs and road-paint largely avoided, to respect this precious and vulnerable natural place. A benefit of this option is that in the event of disruption by rockfall or river encroachment, one of the two routes would likely remain accessible.

When working on highly scenic and special places ordinary engineering solutions must be challenged and adapted for the context. It is the role of the landscape architect or urban designer on the team to do so.

## PART 2 - SUPPORTING WALKING AND CYCLING

The benefits to society of increasing the number of people who regularly walk or cycle are many and various. They include

- improved health
- increased transportation options and accessibility
- greater quality of life and community interaction
- reduction of the negative environmental impacts of other transport modes
- positive economic effects for individual and local enterprises.<sup>1</sup>

The propensity to walk and cycle is influenced not only by distance, but also by the quality of the experience. Pedestrian and cycle-friendly infrastructure and environments are required to ensure that walking and cycling are attractive and practical options.

Suitable pedestrian and cycle facilities make the road safer for all users. Pedestrian and cycle paths and crossings remove the need for pedestrians to take risks and cross in dangerous locations and for cyclists to compete with general traffic for road space.

Further detailed information on this topic can be found in the NZTA's Pedestrian Planning and Design Guide and Cycle Network and Route Planning Guide.



1. NZTA Research Report 405

The propensity to walk and cycle is influenced not only by distance, but also by the quality of the experience.



Photographer: Ken Downie

## CASE STUDY: MODEL COMMUNITIES

The NZTA initiated a project called 'model communities' to promote walking and cycling in urban environments. Through this project, the NZTA funded initiatives that fully integrate walking and cycling in urban transport networks and deliver safe environments that suit novice users commuting to school or to work.

New Plymouth and Hastings were selected to be New Zealand's first walking and cycling model communities. As a result, New Plymouth District Council and Hastings District Council received a combined investment of \$7.3m from the NZTA 2010/11 and 2011/12 financial years.

The purpose of this investment was to help create an environment that makes walking and cycling easy transport choices for people in New Plymouth and Hastings. Through this funding the NZTA was also encouraging councils to integrate walking and cycling into their transport planning and other initiatives.

The package of activity in the New Plymouth District Council proposal included:

- shared pathway projects prioritised for maximum impact
- complementary local and state highway on-road cycle improvements
- ongoing opportunities for expanding the network – Waitara and beyond
- an active transport hub
- the New Plymouth 'Dream street' concept and shared space within the city centre
- a complementary education programme including cyclist skills training, kids involved in driving down speed, Share the Road, Pathways and Captain Car Door campaigns, Wild West Bike Fest, car free days, school gateway projects, travel planning, surveys, modal mapping and a new movement website.

The package of activity in the Hastings District Council proposal included:

- a focus on four key arterial routes into the city centre, completing routes and linking communities and modes
- complementary on-road cycle improvements on key collector routes
- shared pathway projects
- footpath renewal, connectivity and lighting
- a network of information signs, bike stands and seats
- a complementary education programme including cyclist skills training, Share the Road campaigns, promotional campaigns for 'Walk and cycle to school', 'Walk and cycle to work', 'Walk and cycle to the shop' and 'Walk and cycle for fun', and safety programmes.

In addition to the health and accessibility benefits of active transport modes, the model community project is expected to improve the contribution of walking and cycling to the reduction of congestion in urban areas.

The NZTA is continuing to work with other councils to assist them on their model community journey.



## 4.5 PEDESTRIAN PATHS

Walking is a form of transport and for some groups it is their primary means of moving around their community independently. The right to walk is a fundamental element of society and particularly in urban environments.

Guidance on local area pedestrian planning is covered in detail in the NZTA Pedestrian Planning and Design Guide. This should inform any State Highway project.

### Key design issues

The main issues associated with pedestrian paths relate to the lack of correlation between desire lines and the layout of the pedestrian route provided, the amenity of the route and the perception of poor personal safety. The amenity of the route covers aspects such as the general landscape treatment of the route, changes in levels, poor lighting conditions after dusk, traffic noise, air pollution and views of heavy or fast moving traffic.

**'All truly great thoughts are conceived by walking.'**

Friedrich Nietzsche

### Urban design guidance

The following guidance should inform the design of pedestrian paths:

**Provision:** Pedestrian paths should be provided on either sides of the state highway in all urban areas except along motorways and expressways where off-road paths are more suitable. In rural areas, off-road pedestrian paths should be provided where they help connecting communities or serve as commuting and recreational routes.

**Alignment:** Pedestrian paths should be direct and convenient to use with gradients minimised and meanders smoothed out. Pedestrian routes should match desire lines as closely as possible, including across junctions, unless site-specific reasons preclude it.

**Amenity:** Pedestrian paths should provide good user amenity with adequate path width and separation from the carriageway. A berm can be used to provide separation but should be wide enough to accommodate planting.

**Safety:** Paths should be located where they will be visible from nearby roads or buildings. The height of earth bunds and density of planting should be limited so as to allow some passive surveillance of the path.

**Junction type:** Roundabouts tend to push crossings for pedestrian and cyclists away from their desire line and make it inconvenient and unsafe for these users to cross the road. In urban environments, signalised junctions may be a more appropriate option.

**Connectivity:** Pedestrian networks need to be connected. Where paths cross the road network, adequate crossing facilities should be provided, preferably at grade.

**Sightlines:** Good sightlines and visibility towards the destination and intermediate points are important for way-finding and personal security. Shared pedestrian and cycle paths should be aligned to minimise the potential for pedestrian-cyclist conflicts by providing sufficient forward visibility.

**Multi-modes:** In urban environments, pedestrian should generally be accommodated on multi-functional streets rather than on routes segregated from vehicular traffic.

**Width:** As a rough guide, pedestrian footpaths should have a clear width (ie clear of obstructions such as vegetation, street furniture, sign posts or light columns) of no less than 1.8m. Near major pedestrian generators such as schools or parks, the minimum clear movement width should be 2.4m.

**Obstructions:** Highway furniture on footpaths can be a hazard for pedestrians. The number of highway furniture items in footpaths should be kept to an absolute minimum and the items should generally be located in a single strip between a clear pedestrian zone and the kerb.

**Lighting:** Clearly define intended and desired pedestrian routes and match the lighting provision to encourage usage of these routes.



### Safety Audit

**Safety Audits sometimes do not consider the pedestrian and cycle environment or aspects of a project, yet it is important to ensure any design is 'fit for purpose' and safe for all modes. If the safety audit fails to address pedestrians and cyclists then a non-motorised user audit should be undertaken. Guidance on this can be found in the NZTA Pedestrian Planning and Design Guide**

## CASE STUDY: WALK THIS WAY

### Coastal Walkway, New Plymouth

What do Changxing in China, Greystones in Ireland, and New Plymouth in Taranaki have in common? They were all recognised on an international stage for their city's liveability which includes quality of life, efforts on sustainability and healthy lifestyles. In fact, New Plymouth was awarded the highest honours and named the most liveable place for cities under 75,000 people.

During the same International Awards for Liveable Communities New Plymouth's 'iconic coastal walkway' was named the world's best environmentally sustainable project for 2008.

The walkway is an 11km path that forms an expansive sea-edge promenade stretching from the port all the way to Bell Block. It includes a wide pedestrian promenade, seating, feature lighting, integrated signage and artwork. The project was part funded by the NZTA as part of the Bell Block state highway project.

The Coastal Walkway has been designed to suit the coastal landscape using robust and simple materials with strong lines and textures to stand up to, and reflect on, the character of the west coast.

The promenade is designed without a seaward edge, to accentuate the sense of being on the edge of the sea, while the curved seawall and location of the path provide protection from the waves. The seawall is also punctured by finger piers, which are designed for people to view and enjoy the open coastline.

The walkway was designed by Isthmus Group with Richard Bain Landscape Architects.

Source: Isthmus



Photographer: Nik Kneale

## 4.6 PEDESTRIAN CROSSINGS

### Key design issues

Pedestrians' perception of their walking experience is largely focused on difficulties crossing roads and any problems with this can cause delays and create a sense of insecurity. Therefore, correctly designing, building and signing appropriate crossing facilities should be a major consideration when developing pedestrian routes<sup>2</sup>.

All crossing points should be designed to minimise pedestrians' crossing distance, which means ensuring:

- they are at right angle to the direction of the road
- the roadway is as narrow as possible at the crossing point.



2. NZTA's Pedestrian planning and design guide, Chapter 15

### Urban design guidance

The following guidance should inform the design of pedestrian crossings:

**Provision:** The frequency, location and design of pedestrian crossings should respond to the type of environment, pedestrian flows and desire lines. In urban areas, road crossings should be provided at each intersection and in other locations as needed to connect with public transport, cycle networks, through block pedestrian links and other desire lines.

**Location:** Where possible, crossings should be located on the pedestrian desire line. Where this is not possible or unsafe, the design of the footpath and roadside should guide pedestrians to the crossing point. Other road users should be able to predict the route of pedestrians and adjust their driving accordingly.

**Junction:** The choice of junction and crossing type at a particular location should be made after considering all of its functional requirements, including both movement and place functions, and not just capacity and road safety. In urban areas, pedestrian crossings should be provided across all junction arms.

**Grade separation:** Crossings that involve grade separation (underpasses and overbridges) are undesirable and should only be used where unavoidable due to traffic speeds and volumes. Grade separated crossings have perceived safety issues, are much less convenient for pedestrians and therefore less likely to be used. These types of crossings are also much more costly than at grade solutions.

**Countdown timers:** Countdown timers at signalised pedestrian crossings are helpful in letting pedestrians know how much time they have left to cross and minimising the instances of pedestrians still crossing the

junction when the lights change in favour of vehicles.

**Zebra crossing:** Zebra crossings offer advantage to pedestrians as they give them priority over all other traffic. Zebra crossings can result in lower delays to traffic flows than signalised crossings, except where pedestrian flows are heavy. They are only suitable where the traffic speeds are relatively low. Raised zebra crossings have the added benefit of including a physical speed deterrent and increasing the visibility of the pedestrian to approaching traffic.

**Signalised crossings:** Vulnerable road users such as children, the elderly and people with a visual or mobility impairment can feel more secure at signalised crossings as these provide greater certainty when crossing. Signalised crossings can cause more traffic delay compared with zebra and uncontrolled crossings, depending on the level of pedestrian activity. Pedestrian activated signalised crossings can be used to balance traffic delays against pedestrian waiting time.

**Dropped kerbs:** Uncontrolled crossings such as dropped kerbs are suitable in areas with low volumes of traffic where frequent gaps in the vehicle streams will allow pedestrians to cross safely. They do not provide priority to pedestrians but signal suitable locations for crossing and allow mobility impaired people to cross to and from the carriageway. They also signal to drivers where pedestrians can be expected to cross.

**Medians and refuge islands:** Central medians and refuge islands are useful features in urban areas to enable

pedestrians to cross the highway in two stages whether as part of a designated crossing or elsewhere. They need to be of sufficient size to accommodate groups of pedestrians, prams, wheelchair users and cyclists. The design of refuge islands can include contrasting paving materials and street furniture to highlight the location of the crossing for drivers. The design of medians can affect the character of the highway and enhance the sense of place. In urban areas, medians should be left unfenced so that pedestrians can cross at any point, unless there is clear safety case for not doing so.

**Staggered crossings:** Crossings can be divided using a refuge island and staggered, if needed, for safety reasons. However, staggered crossings cause delay to pedestrians and can hinder the movement of mobility impaired, parents with prams and dismounted cyclists. They can also cause waiting pedestrians to feel exposed to high speed vehicles, wind, sun and rain, and unsafe. The length of the stagger should be kept to a minimum.

**Kerb extensions:** Kerb extensions can be used on their own or in combination with refuge islands to minimise the crossing distance for pedestrians and generally slow traffic down and make the location of the crossing obvious to drivers.

**Raised crossing:** All types of crossings can be provided on a raised surface, so that pedestrians cross between footpaths on a level surface. This has the advantage of slowing vehicular traffic on the approach, making pedestrians more visible and facilitating the movement of people with a mobility impairment.

## CASE STUDY: NZ'S FIRST PUFFIN PEDESTRIAN CROSSING

### Hutt City Council

Lower Hutt City Council installed the country's first Puffin (pedestrian user friendly intelligent crossing) signalised pedestrian crossing in 2009. The technology behind Puffins is widely used in Britain and some Australian states but was not approved for use in NZ until this trial.

The pilot was installed at the crossing on Railway Ave near Hutt Central School. Through their school travel plan Hutt Central School identified a need for a safer way to cross Railway Avenue, a busy arterial route outside their school. With a major new interchange recently opened in the vicinity, traffic flows on the avenue increased 30% overnight.

Puffin crossings replace the confusing red flashing light phase of traditional signalised crossings with a solid red or green man. This removes pedestrians' temptation to dash across the road at the sight of a flashing red man. The signal's visual display is only located on the near side of the road (at the pole where the pedestrian starts crossing), and not visible once the pedestrian is crossing the road, removing the signal distraction once on the crossing. The display is also angled so that pedestrians see oncoming traffic while they wait for the green signal.

Puffin crossings can also benefit pedestrians by providing smart pedestrian tiles which trigger the request to cross and also activate a cancellation once the pedestrian is gone. They can provide more rapid interruption of traffic and reduce pedestrian delays. Lastly, they are easier to see for partially sighted people.

The pilot project includes six weeks of camera monitoring of pedestrian behaviour at the crossing, before and after the Puffins' installation. Monitoring results showed a 60% improvement in legal pedestrian behaviour, well exceeding expectations.

Source: ITS Group



## 4.7 CYCLE LANES AND PATHS

### Key design issues

Except along motorways, cycling is a legitimate transport mode and cyclists are legally allowed to use the state highway. Consequently, they can rightly expect to be able to cycle safely.

The primary issues associated with cycle paths and lanes relate to the perceived safety and amenity of cyclists which is influenced by the proximity to high speed or high volumes of traffic, the degree of physical separation from moving vehicles (ie the presence of kerbs, berms, crash barriers, trees, etc), the width of the path, the quality of the riding surface, the absence of obstructions (eg signposts) and the forward visibility.

Not all cyclists are the same. Commuters and sports cyclists prefer direct routes, usually on or alongside the carriageway. Recreational and less confident cyclists (eg children) prefer greater separation from the highway which is best provided through an off-road path. Cyclists and pedestrian can share off-road paths but these need to be designed with this dual-use in mind to minimise the potential conflicts, particularly between high and low speed users.



Source: Barbara Holloway  
Precinct Manager  
The Karangahape Road Business Association

# Not all cyclists are the same

### Urban design guidance

The following guidance should inform the design of cycle lanes and paths:

**Provision:** Cycle lanes and paths should be considered as part of state highway projects in all urban environments. In rural environments, they should be provided where there is an existing usage of the corridor by cyclists or where cyclists can reasonably be expected in the future due to planned development such as a residential subdivision. A suitably paved 2m shoulder in rural environments can cater for cyclists.

**On-road facilities:** In general, cycle lanes are the preferred treatment for cyclists on urban roads. Where required on two-way streets, cycle lanes should be provided on both sides of the road so that cyclists can use them in the same direction as motor vehicle traffic.

**Off-road facilities:** Where traffic speed or volume is high, or where recreational cyclists and children can be expected to use the route, off-road paths are likely to be a safer option and should be preferred over

cycle lanes.

**Alignment:** Cyclists prefer direct, barrier-free routes that do not require them to dismount. Routes should correspond to desire lines and have minimal gradient and meanders.

**Connectivity:** Cycle lanes and paths should provide convenient connections between trip generators and destinations, and link seamlessly with the wider cycle network.

**Junction design:** Junctions should be designed to accommodate cyclists' needs. Over-generous corner radii that lead to high traffic speed should be avoided. In urban environments with high cycle usage, advanced stop boxes should be provided for cyclists at signalised junctions.

**Amenity:** Cycle lanes and paths should be well designed, attractive and comfortable to use. They should have a good riding

surface, preferably sealed although unsealed surfaces may be appropriate in some rural locations.

**Shared facilities:** Shared pedestrian and cycle facilities should be safe for all users, be accessible from the highway at junctions, avoid frequent 'give ways' and be at least as convenient for cyclists as the on-road equivalent.

**Width:** As a rough guide, shared pedestrian and cycle paths should generally have a clear width of no less than 3m. Cycle lanes should have a minimum clear width of 1.5m along 50km/h roads to be increased to 1.8m if the cycle lane runs next to parallel parking<sup>3</sup>. 2m is the minimum width that will enable cyclists to overtake each other without encroaching into the adjacent traffic lane. Designers should not regard minimum widths as design targets.

3. For detailed guidance on widths, refer to SP/M/025 New Zealand supplement To Austroads Guide to traffic engineering practice - Part 14: Bicycles (2008)





Auckland's Western Cycleway: Inadequate facilities for pedestrians and cyclists on bridge.

4. Austroads Research Report AP-R410-12: Cycling on higher speed roads (2012)



### Detailed guidance: Cycling on High Speed Roads <sup>4</sup>

Designing facilities for cycling on roads with speed limits of 70m/h or more can be challenging. The difference in speed and mass of cycles and vehicles make cyclists particularly vulnerable road users. Where possible the best solution is to separate cyclists from high speed vehicles. However, cyclists are legitimate road users and they shouldn't be prevented from using roads unless an alternative is provided which has lower speed, is equally direct and does not present a higher risk to cyclists.

Measures to improve the safety of cycling on high speed roads include:

- Providing exclusive cycle lanes. These should be at least 2m wide, increasing in width for higher vehicle speeds. Cycle lanes wider than 2.5m should be separated from the general traffic lane by painted buffer or raised separator to discourage drivers using the cycle lane as a general traffic lane
- Providing sealed shoulders. These should be at least 2m wide, increasing in width where there are a large number of heavy vehicles
- Continuing cycle lanes and shoulders through intersections, ensuring the side road stop line and median are set back by at least 2m from the edge of the traffic lane
- Reducing the number of conflict points by grade separating cyclists from other traffic where necessary
- At signalised intersections, providing advanced stop lines and assistance in turning right
- At roundabouts, considering signalling the intersection, providing cyclists with a separate path, slowing vehicles or providing cyclists with an alternative route
- At diverge and merge points such as slip lanes and on and off-ramps, diverting cyclists to a crossing point in advance of the merge point or along the off-ramp so that they are not trapped between two lanes of high speed traffic
- Considering the most appropriate delineation type for the situation: standard line marking, painted islands, raised lines, raised rubber separators or raised traffic islands.



### CASE STUDY: LET'S GO CYCLING!

#### New Plymouth - Bell Block path

The New Plymouth-Bell Block path extends the Coastal Walkway 4kms and includes the stunning Te Rewa Rewa Bridge across the Waiwhakaiho River. It has quickly become a potent cultural symbol for the local community and tangata whenua who have embraced it as a destination, recreation asset, tourist attraction, marketing tool and landmark. It has contributed to the local economy and greatly impacted on the quality of life and wellbeing of the community. The stunning Te Rewa Rewa Bridge has gained significant international recognition and its success has contributed to building the reputation of New Zealand engineering and design.

The path provides a much-needed route for commuters to travel easily and safely to and from the city. The path is used by people walking, running and cycling, using bikes, trikes, scooters, wheelchairs and mobility scooters, walking dogs and pushing buggies. The project provides a safe and enticing alternative to the busy highway for people to travel to and from work or school and for recreation. It has significantly increased the number people choosing to use sustainable transport and to exercise.

The path is used by everyone and it's a common sight to see children learning to ride a bike and many of the community's older population getting back on bikes - all because they have a safe place to ride.

The path has been a key factor in the opening of the first cycle touring route under Nga Haerenga, The New Zealand Cycle Trail (NZCT) - the 180km ride from Taumarunui to New Plymouth which uses this link.

The Coastal Walkway and this project greatly contributed to New Plymouth being named a Model Walking and Cycling Community by the NZTA in 2010 with associated funding by the NZTA of \$3.7 million to develop further walking and cycling initiatives.

Source: Isthmus with Richard Bain

### CASE STUDY: A MODEL WALKING AND CYCLING COMMUNITY

#### Hastings's iWay project

iWay is a scheme aimed at increasing the number of people walking and biking to work, school or for fun in the Hastings district.

It began in June 2010 when Hastings District Council was one of two councils (the other was New Plymouth) awarded a combined \$7 million over two years by the NZTA as part of the Model Community Project. Model communities are urban environments where walking or cycling is offered to the community as the easier, good quality transport choice. The project involves a package of works funded by NZTA and local partners to 'fast track' a community that can change travel behaviour through improved transport choices.

Two years on, the iWay project has delivered the following tangible results:

- Approx 50km of cycle lanes completed.
- 150 intersections upgraded.
- Cycling education in schools - over 500 kids trained .
- Targeted travel planning & marketing with key user groups (work, school, shops and for fun).
- Over 600 bikes fixed up.
- Numerous walking events such as 'bike to work' day and 'try a bike' day.

The project has also delivered a 25% increase in cyclist numbers on selected routes and local businesses connected with cycling report a significant growth in business. Total number of crashes involving pedestrian/cyclists has reduced and there is a significant increase in perception of safety for walking and cycling. Annual bus patronage is also up an impressive 8%.

Source: Hastings District Council



Photographer: Nik Kneale





Onepoto footbridge, Auckland. Beca

## 4.8 PEDESTRIAN AND CYCLE BRIDGES

### Key design issues

At grade crossings, particularly when they connect to local road and recreational path networks, are preferred by pedestrians and cyclists over elevated structures and underpasses. Where a grade separated option is necessary, a pedestrian bridge may be considered. Compared with underpasses, bridges offer the opportunity to maintain the visual connections with adjacent land uses and road, and can offer attractive views for pedestrians and cyclists. For these reasons bridges can offer a safer and more pleasant experience than underpasses.

The issues often associated with poor pedestrian bridge design relate to accessibility (where changes in level create physical obstacles), amenity (where the width, finishes and detailing make the bridge uninviting), and safety (where isolation, lack of surveillance, poor lighting and length of travel create unsafe connections).

Pedestrian and cycle bridges should be located and designed to make them safe and easy for people to use, to reduce travel time, and to create inviting connections along routes that people want to use.

### Urban design guidance

The following guidance should inform the design of pedestrian bridges:

**Location:** Pedestrian bridges should be located to serve identified desire lines. This will ensure that the use of the bridge is maximised. User safety and opportunities to reduce the length of approach ramps by making use of the topography should also be considered in determining suitable location for pedestrian bridges.

**Form:** Pedestrian bridges carry lighter loads than road bridges which allows more flexibility to the form of the bridge and the choice of materials making sleeker, more elegant structures possible. If needed, safety screens should be integrated in the overall bridge design. Materials, texture, colour and lighting of the bridge can play an important role in highlighting all or part of its form.

**Integration:** Bridges are elements within the wider urban fabric and should be integrated into their context. This includes relating the structures to the character and scale of the surrounding urban form or landscape to ensure that the design fits in well. It also includes seeking opportunity to create new connections to existing cycle and pedestrian networks.

**Accessibility:** Bridges should be accessible to all pedestrians and cyclists, including the mobility impaired.

**Landmark design:** Bridges can be prominent structures offering opportunities to create new landmarks and to incorporate the cultural and historic values of the area into the design. A landmark structure will not be appropriate in all situations.

**Experience:** Pedestrians and cyclists travel slower than traffic, spend more time on a bridge and are more likely to stop to appreciate a nice view. For these reasons, pedestrian bridges should seek to create an interesting experience for their users. This includes maximising or framing views and using street furniture and other design features to create an attractive environment.

**Approaches:** Approach ramps should be design as part of the bridge composition and integrated in the landform and landscape. Wherever possible minimise the length of ramps and staircases by taking advantage of topography or noise bunds and earth mounds as landings.

**Safety:** The safety of users must be considered in the bridge location and design. If the bridge is to be used by cyclists as well as pedestrians, the bridge should be wide enough to accommodate both groups and it may be necessary to provide separate paths.

**Lighting:** Except in remote locations, pedestrian bridges are likely to be used at night and therefore lighting should be provided to ensure the safety of users. Bespoke lighting can be used as a design feature but care must be taken to avoid light spilling into surrounding environment.

**Detailed design:** Pedestrian and cycle bridges are seen at close range by their users so should have good quality detailing and finishes.

**Landscaping:** Well considered, low maintenance planting can be a feature of pedestrian bridge design. This can include planting on the bridge itself which can be beneficial when integrated a bridge into a landscape setting. Planting can also be used to good effect at the ends of pedestrian bridges in order to reduce the visual impact of ramps and associated structures.

**Colour:** Colour provides opportunities to give consistency to a family of bridges and to reinforce the landmark quality of a stand alone structure. When used to highlight particular elements it should form part of a coherent composition. Colour must be used carefully as it draws the eye, especially in a rural setting.

## CASE STUDY: AN AWARD WINNING BRIDGE

### Clarks Lane Footbridge

Clarks Lane Footbridge is one of the more visible built elements in the SH18 Hobsonville Deviation / SH16 Brigham Creek Extension motorway project, opened in August 2011.

The SH18 part of this project was conceived as the 'Gallery Route', supporting the Council's aspirations for a 'Creative City'. The arts brief developed for the project included the Clarks Lane footbridge route as the 'Clay Carpet', acknowledging the underlying clay strata, the proximity of Auckland's early brick and pipe industries located in this part of the upper Waitemata harbour, and a future route linking the remarkable heritage Clark House, slated as a future ceramics museum.

Reconnecting the ends of Clarks Lane severed by the new motorway, the Urban and Landscape Design Framework for this bridge envisaged it as providing both a landmark along this stretch of motorway and a viewing point for users.

A symmetrical cablestayed design solution was developed, its central steel pylon providing a jagged exclamation point, one of few vertical statements between the dual airbases of Hobsonville and Whenuapai. The A-shaped pylon supports a bridge deck for pedestrian and cycle use.

The steel box beam structure was fabricated and painted offsite, requiring just two site welds on erection. Care was taken to integrate the cable support beams with the box beam and in the detailing of the pedestrian barriers and the pylon itself. The adoption of the efficient box beam with angled sides and cantilevered steel 'wings' carrying the deck has the added advantage of reducing the visual depth of the structure.

The steelwork is painted yellow to reflect the 'Clay carpet' arts theme, set off by polished stainless steel handrails, zinc/aluminium coated mesh barrier infill and the black HDPE-encased cables. Purpose made ceramic tiles from commissioned artists provide a border to the exposed aggregate deck finish and inventively continue the themes of movement and of local history.

It is enhanced at night by linear lighting under the box beam for motorists and pylon-mounted lighting and yellow buttons set along the deck centreline for pedestrians - and red lights atop the pylon for the RNZAF.

This bridge sets out to provide a visual setpiece for the 'Gallery Route' which is economical in both structure and cost. Jasmx and the NZTA received an Auckland Architecture Award for this project from the NZIA in 2011 in the Urban Design category.



Source: Jasmx





Photography courtesy of Donna Rutherford [http://www.flickr.com/photos/donna\\_rutherford/5104007116/in/set-72157625089736855](http://www.flickr.com/photos/donna_rutherford/5104007116/in/set-72157625089736855)

## CASE STUDY: A MEANINGFUL ICON

### Te Rewa Rewa Bridge

Te Rewa Rewa Bridge is an elegant white bridge that curls above the New Plymouth landscape. As part of New Zealand's new built heritage, the footbridge does more than provide a pedestrian/cycleway across the Waiwhakaiho River. Some liken its form to a wave, others to a rib, albatross feathers or a korowai (cloak). The design resonates with a number of elements: the environment of New Plymouth's Coastal Walkway, which the bridge helps to extend northward, and the history and evolving human culture of the area.

Peter Mulqueen of Novare Design Ltd designed the bridge. He wanted the design to honour the site and the meaning it holds for local iwi. The area adjacent to the bridge is significant for Ngati Tawhirikura hapu, Te Atiawa iwi and other residents in the district. On the northern side (Rewa Rewa) there is a historic pa site and purportedly a burial ground (urupa) where a major battle and many deaths occurred during the Musket Wars.

To design the iconic bridge Peter drew on many sources. The coastal winds and the works of James K Baxter, in which topography and theological themes are linked, brought him inspiration and the possibility of cross-cultural connections. 'The wind is a metaphor for the wairua of the deceased,' Peter says. 'So the bridge is also about making those connections between the physical and the emotional, between Pakeha and Maori, tupuna and mokopuna.' Michelangelo, whom he quotes as saying, 'Bridges should be built as though they were cathedrals', was another source of inspiration.

For Peter, the aesthetic spans time, linking Pakeha and Maori cultures, land and sea. With ribs yielding to the prevailing wind, the bridge is aligned to Mt Taranaki. 'The sacred mountain is framed within the skewed arch, which you see while leaving the sacred ground - promising what is eternal.'

The bridge was partly funded by the NZTA.

International Footbridge Award 2011

Source: Helen Frances, Heritage New Zealand Summer 2011





Photographer: Simon Devitt

## 4.9 UNDERPASS DESIGN

### Key design issues

At grade crossings are preferred by pedestrian and cyclist as they provide continuity of route, minimum change of levels, greatest visibility and perceived safety. Wherever possible, they should be chosen in preference to grade separated options. However, there are situations where this is not possible and an underpass provides the most suitable choice for a pedestrian and cycle link.

The issues usually associated with poor underpass design are related to personal safety, amenity (dark, uninviting and poorly maintained facilities), and the physical obstacle created by the change of level. These can be avoided by considering the underpass location and design in the early phases of a transport project. A well thought out and designed underpass can:

- Make it easier and safer for people to cross the road.
- Reduce travel time for pedestrians and cyclists if the underpass provides a direct route.
- Be easier to negotiate than an over-bridge due to smaller level difference.
- Lead to positive outcomes for pedestrians, cyclists and road users alike.

### Urban design guidance

The following guidance should inform the design of underpasses:

**Planning:** Underpasses must be considered in the early planning of the project. They must have appropriate design and capital budgets. On-going maintenance costs must be factored into the benefit/cost ratio and inform the design of the underpass.

**Integration:** Underpasses must be integrated with the wider pedestrian and cycle network, and with the adjacent land uses. The design of the underpass must be integrated with the earthworks, structures, stormwater, landscape and public art proposals of the project.

**Location:** The underpass must be located to serve an identified desire line and it must be designed in a way that encourages people to use it; secluded locations should be avoided. There should be no additional delay in travel via the underpass compared with the equivalent at grade crossing.

**Safety:** The walls of the underpass should not feature recesses where litter might accumulate or someone might hide.

**Alignment:** The underpass should offer a straight route so that one end of the underpass is visible from the other. Bends and angles in the underpass should be avoided as they create hidden places which encourage vandalism, crime and anti-social behaviour.

**Surveillance:** The design of the underpass should allow people to see activity within the underpass from the outside. Where possible the entrance of the underpass should be overlooked by adjacent buildings. Crime Prevention Through Environmental Design (CPTED) principles should guide the design and location of the underpass.

**Dimensions:** Underpasses should be as wide and high as possible to maximise light penetration, visibility and amenity. Any tunnel effect should be minimised. To provide pleasing proportions, the underpass should have a height approximately two-thirds of its width.

**Multi-modal:** Underpasses should be designed to accommodate multiple modes such as walking, cycling and where possible car movements. As long as the safety of pedestrians and cyclists is not compromised, low speed car movement will add activity and surveillance in the underpass. Depending on the width of the underpass and level of usage, pedestrians and cyclists may need to be separated due to their different travel speeds.

**Approach:** The paths leading to the underpass must be direct and straight so that the underpass is clearly visible on the approach. The underpass should be

at grade with the surrounding land where possible. If necessary the road above should be elevated to minimise change of level in the underpass. The approach ramps must be gradual enough to accommodate wheelchair users. Planting around the underpass entrance should not obscure sightlines to and from the underpass.

**Lighting:** Good lighting must be provided both inside and at the entrances of the underpass. Median skylights should be considered to provide day lighting midway through the underpass.

**Maintenance:** Robust, long-life, vandal proof materials and lighting should be used in the underpass to minimise maintenance.

**Interior:** Murals, art, backlit advertisement, feature paving, lighting and surface treatments should be considered to create a pleasant environment in the underpass. Any internal treatment should complement the underpass' external components.

**Drainage:** A good drainage system must be provided to allow for satisfactory disposal of runoff and prevent flooding and pooling.

## CASE STUDY: A SAFE UNDERPASS – KAMO

### Clearly visible

Surveillance is a key safety issue when designing an underpass. One way of achieving this is to cater for all modes in the underpass. As part of the Kamo bypass project an underpass was required in order to retain access for the community. The bypass is 5m wide and provides a slow environment for vehicles as well as pedestrians and cyclists. The horizontal and vertical alignment has been designed to provide a straight route so that one end of the underpass is visible from the other. The road above has been elevated to minimise the change in level and to largely keep it at grade with the surrounding land and therefore clearly visible. Local artists were commissioned to paint the underpass in order to improve the amenity of the underpass and to help deter graffiti.





## 4.10 LIGHTING

### Key design issues<sup>5</sup>

Lighting in the public domain has traditionally been designed to address the needs of motorists, but pedestrians' and cyclists' needs are different.

The Australia/New Zealand standard *Lighting for roads and public spaces, part 3.1: pedestrian area (category P) lighting – performance and design requirements* (AS/NZS 1158.3.1:2005) defines adequate and acceptable lighting practices. That is, if someone wants to walk in an area during the hours of darkness, the lighting design's compliance with the standard ensures that enough light is provided to make walking safe. However, a different approach is required to make walking not only safe, but also more attractive, thus positively encouraging people to walk.

Pedestrian lighting can also influence perceptions of personal security. This effect needs to be considered and managed to ensure the pedestrian lighting scheme communicates the appropriate message to pedestrians about the use of a pedestrian area during the hours of darkness.

Urban designers should work alongside lighting specialists to devise the lighting plan or strategy for a highway project. This will involve identifying the areas which need to be lit for pedestrian safety and amenity reasons; deciding on the position, spacing and height of light columns; and selecting the appropriate fittings (light pole and luminaire) to fit the architectural design and other requirements of the highway corridor. In the right context, the lighting can become a strong feature of the design in its own right.

5. NZTA Research Report 405, *Public lighting for safe and attractive pedestrian areas*.

### Urban design guidance

#### The following guidance should inform the design of lighting for pedestrians:

**Safety:** Pedestrians should be able to see clearly enough to negotiate possible obstacles, obstructions and the physical terrain. To minimise the risk of near misses or collisions, pedestrians should be easily visible to all other users of the space, such as motorists, cyclists, and other pedestrians.

**Personal security:** Enhancing actual or perceived levels of personal security for pedestrians increases the likelihood that people will walk. Lighting can reduce the incidence of antisocial behaviour and likelihood of pedestrians being mugged or assaulted. Lighting levels should be sufficient to enable a pedestrian to recognise a known face at a distance of approximately 15m.

**Attractiveness:** Attractive public lighting can have a positive effect on pedestrians and contribute to their enjoyment of the walking environment. Lighting can be used to enhance an area's atmosphere and as part of a public art initiative.

**Orientation:** Pedestrian lighting can assist navigation. At night, public lighting should enable users unfamiliar with an area to select an appropriate route. This means, for example, not lighting the first part of a path through an isolated area which is not intended for use during the hours of darkness as this may draw them into a

dangerous environment. At night, it may be more appropriate to direct pedestrians towards lit roads and pedestrian safe routes rather than towards isolated off-road paths.

**Colour:** Colour appearance refers to the colour of the light source itself while colour rendering refers to the way colours are perceived when illuminated by the light source. Good colour rendering provide viewers with a more accurate sense of natural colours, size and shapes of objects. At low light levels, the human eye is more sensitive to white light than yellow light. White light is considered to provide greater night time visibility and better colour rendering than yellow light.

**Uniformity:** Lighting uniformity is important to pedestrians. It can be managed through luminaire output, mounting height and spacing. Lighting uniformity can be increased by shortening the spacing between luminaires, which means increasing the number of luminaires used, but potentially allowing a reduction in the output of each.

**Hard shadows:** Pedestrians' general comfort can be adversely affected by sudden transitions into hard shadows which exacerbate the perception of lack of lighting uniformity. Shadows can also influence the apparent three-

dimensionality of objects. The extent of shadows can be managed through the use of multiple light sources, the height and angle of incidence of lights and the intensity of light sources.

**Glare:** Glare occurs when light is seen as too bright, relative to the ambient brightness that the viewer has adapted to. Glare should be avoided as it can affect vision and be distracting as, at night, the human eye is drawn to the most luminous element in its field of vision.

**Spillage:** Spillage occurs when illumination is provided outside of the target area. Illumination can also spill upwards, creating 'sky glow' which in certain areas can affect wildlife habitats and behaviours.

**Trip hazards:** To minimise the risk of trips and falls, pedestrian lighting must highlight hazardous locations such as obstacles, edges of walkways, and changes of grade. Sufficient ambient illumination can assist this task. Additional lighting at a mounting position close to the critical surface should be considered and installed carefully to manage glare and potential for vandalism.

**CCTV:** Where CCTV systems are used, adequate light levels must be provided for the footage to be of sufficient quality to serve its purpose.

## CASE STUDY: TURNING LIGHT INTO ART

### The Terrace Tunnel lighting

Opened in 1978, the Terrace Tunnel is recognised as a gateway to Wellington CBD.

The NZTA undertook a comprehensive refurbishment of the tunnel in 2010/11. The upgrade included a new deluge system, jet fans, lining, lighting and a new traffic management system outside the tunnel.

Artist Gina Jones was engaged to develop a concept to enhance the experience of driving through the tunnel. The brief to the artist was to create an artwork for the Terrace and Mount Victoria tunnels which unified them both.

The concept developed is that of the rainbow with a single colour for each tunnel and major overhead structures between the Wellington Airport and Ngauranga Gorge. The colours follow the sequence of the rainbow spectrum and are also selected to relate to the identity of the area traversed. The colour orange was selected for The Terrace Tunnel in reference to the lively Cuba Street quarter.

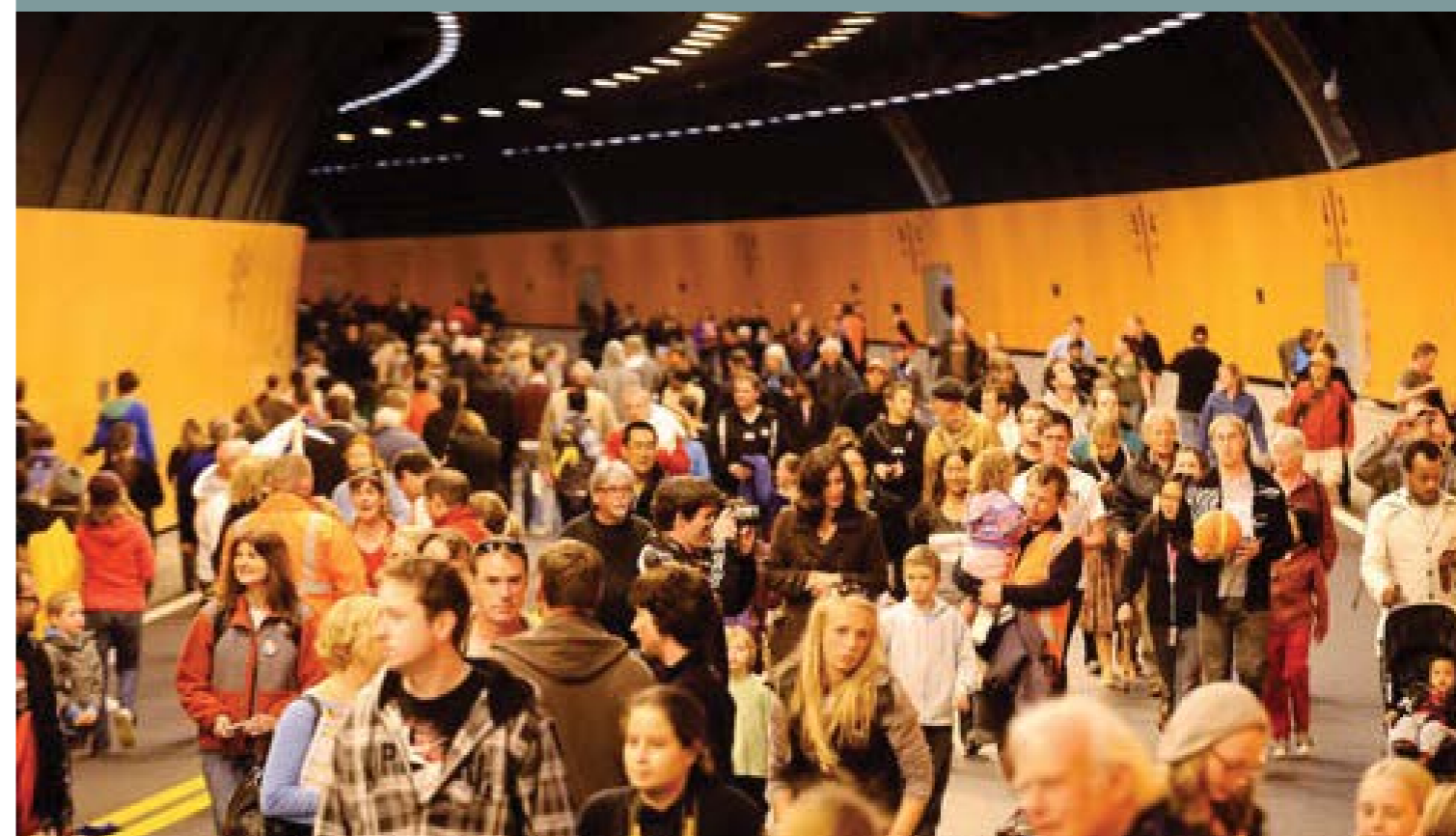
The artist's concept has translated into the following features for the Terrace Tunnel:

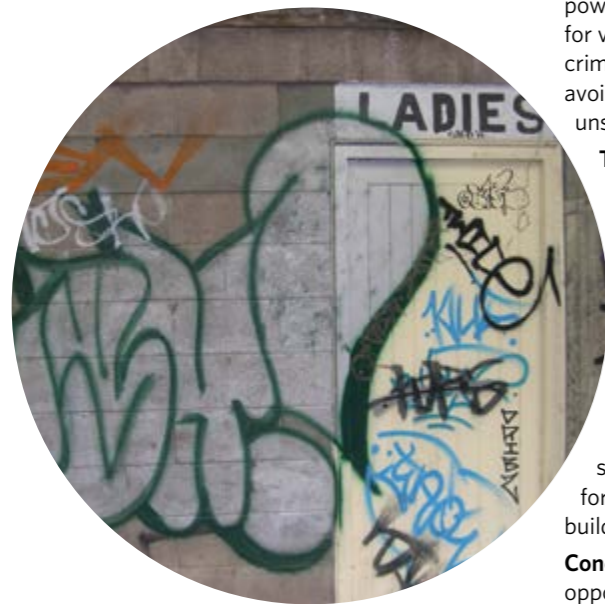
- Wall panels 3m high in California orange.
- Ground mounted LED uplighting of both the tunnel portals in orange.
- Lighting of the interior wall panels for the first 20m or so of the tunnel at both ends to produce a 'glow' effect.
- Change to the standard interior white lighting to produce a 'warm' light effect instead of the usual 'cold' effect.

Lighting consultant Rick Morrison (Aecom) established a full suite of lights operated by a special control system that adapts the lights in the tunnel according to what outside lighting conditions are like. Daylight levels are measured by special sensors, which then adjust the amount of light near the entrances of the tunnel. This means drivers' eyes can adjust more seamlessly between tunnel lighting and daylight.



Feature lighting: Ormiston Road Bridge, Auckland  
Lighting needs to be thought about in the early phases of a project, to ensure that it is captured in the business case and funded.





## 4.11 CRIME PREVENTION

### Key design issues

Personal safety is important to encourage walking, cycling and public transport usage. Real and perceived risks of crime and anti-social behaviour can be powerful deterrents to making short trips by modes other than the car, especially for vulnerable people such as the elderly and children. Crime and the fear of crime can also have important economic consequences as people choose to avoid certain areas, such as parks and local centres, which they perceive as being unsafe, irrespective of their mode of travel.

#### The following features in the public realm increase personal safety risks:

**Movement predictors:** These are predictable or unchangeable thoroughfares that provide limited opportunities with which to exit.

Examples of movement predictors are pedestrian underpasses, narrow passageways, stairwells and pedestrian bridges. Movement predictors allow criminals to single out potential victims and restrict the victim's ability to escape.

**Entrapment areas:** These are small confined areas, shielded on three sides by some sort of barrier such as walls or landscaping which may be used by criminals to trap potential victims. The physical enclosure of an entrapment spot is used by criminals to control their victims by inhibiting their opportunity for escape. Entrapment spots include loading zones, leftover spaces between buildings, clearings within landscaping and recessed entrances.

**Concealment:** These are spaces that are not easily visible and provide the opportunity to conceal potential criminals, their victims, illegitimate uses, antisocial activity and crimes. Any situation that allows concealment may serve as a point from which the criminal can wait and pick out potential victims, or attack them.

**Isolated areas:** These are places where it would be hard for a person in difficulty to summon assistance or to attract the attention of passers-by or other people in the vicinity. Criminals may use isolated areas to their benefit, knowing that they are out of public view. Isolated areas are usually well screened from the view of adjoining buildings and away from activities that draw people near for natural surveillance.

### CRIME PREVENTION THROUGH ENVIRONMENTAL DESIGN (CPTED)

Crime Prevention through Environmental Design (CPTED) provides a framework for incorporating crime prevention within quality urban design by focusing on reducing the opportunity to commit crime, therefore lessening the motivation to offend.

The Ministry of Justice's National Guidelines for Crime Prevention through Environmental Design in New Zealand [www.justice.govt.nz] identifies seven qualities of safer places. These qualities are:

**Access:** Safe movement and connections

Places with well-defined routes, spaces and entrances that provide for convenient and safe movement without compromising security.

**Surveillance and sightlines:** See and be seen

Places where all publicly accessible spaces are overlooked, and clear sightlines and good lighting provide maximum visibility.

**Layout:** Clear and logical orientation

Places laid out to discourage crime, enhance perception of safety and help orientation and way-finding.

**Activity mix:** Eyes on the street

Places where the level of human activity is appropriate to the location and creates a reduced risk of crime and a sense of safety at all times by promoting a compatible mix of uses and increased use of public spaces.

**Sense of ownership:** Showing a space is cared for  
Places that promote a sense of ownership, respect, territorial responsibility and community.

**Quality environments:** Well designed, managed and maintained environments.

Places that provide a quality environment and are designed with management and maintenance in mind to discourage crime and promote community safety in the present and the future.

**Physical protection:** Using active security measures  
Places that include necessary, well designed security features and elements.

### Urban design guidance

The following crime prevention principles apply to highway projects:

**Surveillance:** Locate pedestrian paths so they benefit from informal surveillance from adjoining buildings and passing vehicles. In most places, pedestrian paths are best provided along the road in full view of passing traffic. Avoid 'hiding' pedestrian paths behind earth bunds and dense landscape strips. Avoid sending pedestrian paths to the back of properties or in between two property fences.

**Lighting:** Adequate lighting can influence pedestrians' perception of safety and reduce their fear of crime. However, lighting is not a substitute for good design and should not be relied on in isolation to prevent criminal or anti-social behaviour. Lighting can be used to complement other crime-prevention techniques by increasing visibility which in turns increases the effectiveness of natural surveillance from members of the public and monitoring by CCTV cameras. Key pedestrian routes should be well lit at night.

**Graffiti deterrence:** Preventive measures such as designing structures and gantries to minimise unauthorised access and using planting to shield retaining walls and noise barriers should be employed to prevent graffiti from happening in the first instance. Where access cannot be prevented, the use of textures which make tagging and graffiti difficult can be used as a deterrent and anti-graffiti coating can be applied to facilitate removal. As a last resort, the prompt removal of graffiti can be effective in discouraging further offences.

**Visibility:** Pedestrian and cycle paths should be designed with long sightlines to help navigation and monitoring of danger spots. Physical elements such as continuous solid fences, blank walls or planting beside footpaths that impede sightlines and reduce opportunities for surveillance should be avoided. Blind corners and sudden changes of grade also limit visibility and should be minimised.

**Usage:** Well used pedestrian routes and spaces have better surveillance and feel safer than poorly used ones. The location, number, and layout of pedestrian routes as well as their relation to the adjoining land uses should be considered to maximise usage. Attractive, convenient and direct pedestrian routes are more likely to be used than convoluted ones.

**Grade separation:** Wherever possible, keep pedestrians and vehicles at the same level. Elements such as footbridges, tunnels and underpasses restrict the opportunity for a victim to escape and should generally be avoided. Where these are unavoidable, other measures to reduce vulnerability such as increased visibility (eg exit ways that are visible from the entry), lighting, and activity at and around these spaces need to be considered.

**Integration:** Pedestrian and cycle paths should be physically integrated into surrounding areas to avoid predictability of movement and provide pedestrians with a choice of routes.

**Stewardship:** People's perception of order or disorder within an urban area affects the way they use it. An area that is neglected provides the conditions that can motivate criminals and provide better conditions for crime. Involving the local community in decision-making about public space planning, design, management and maintenance is an effective way to develop pride in a place and a sense of ownership. Features such as public art can also help to foster a sense of local identity and encourage the community to care for their space.

**Robustness:** The physical robustness of the elements of public space including landscaping, lighting, paving and street furniture will determine their susceptibility to damage. The existence of damage will in turn influence the public image of the area. Durable, robust, vandal-proof materials and fittings should be selected in preference to more fragile options.

**CCTV:** CCTV should not be considered as an alternative to getting the design right in the first place. While no substitute, CCTV can supplement 'harder' forms of security. CCTV can be an effective crime prevention measure when combined with appropriate lighting, targeted at particular offences, and supported by good management, monitoring and adequate response.



Photographer: Simon Devitt

### CASE STUDY: ONEHUNGA UNDERPASS

#### Foreshore Access

Located on the SH20 Manukau Harbour Crossing (MHX), the underpass has been a connecting element under the Manukau Harbour Bridge between Mangere Bridge township and Onehunga Mall. The underpass sits above Onehunga Harbour Road with Onehunga Mall at one end and Mangere Bridge walkway at the other. Now closed, the Mangere Bridge walkway provided a covered linkage under the bridge. It was a graffiti and litter filled environment that ended in a graffiti filled underpass on a 90 degree angle thus excluding views into the underpass from the walkway. It looked dangerous and attracted anti-social behaviour at all hours of the day. For accessibility reasons it was not deemed appropriate by stakeholders or the community to close the underpass. Therefore the project team was challenged to remediate the environment to improve its safety. Provision of a bridge to connect the Old Mangere Bridge over Onehunga Harbour Road to the underpass meant that the Manukau Harbour Bridge walkway could be closed and effort put into making the underpass safe, attractive and meaningful to the community that uses it.

The underpass is one of several key linkages provided by the MHX Alliance to improve connectivity between communities, parks & reserves, land and water and walkways & cycleways.

The design achieved:

- straightening of approaches at each end of the underpass to extend lines of sight fences either side at each end of the underpass to provide a longer area of perceived safety
- canopies at each end of the underpass to extend shelter and provide portals that give the underpass more presence
- a 45m long mural by local graffiti artists who were briefed to provide images that are relevant to local youth culture. This is a colourful and engaging mural that depicts local historical and cultural events, myths & legends, and ecology
- laser cut steel panels attached to non-mural wall to match portal fences and canopies - Pohutukawa forest concept
- repaint and repave all other surfaces
- improved lighting - brighter, better colour render, vandal resistant
- provision of the Onehunga Harbour Road bridge to provide a high quality pedestrian and cycle linkage between Old Mangere Bridge and the underpass
- additional Pohutukawa planted at ends to provide a park like environment
- alternative route if underpass is perceived as unsafe.

Source: Jasmx

### CASE STUDY: GRAFFITI PREVENTION

#### Well covered

Greenhithe noise walls - The stencil applied to the noise wall helps to deter graffiti while giving the plants time to grown and eventually fully screen the wall.



## PART 3 – HIGHWAY COMPONENTS

Part 3 covers a wide range of physical elements which together form the highway corridor. For each element, the key design issues are identified and high level urban design principles are provided. Given the wide range of different contexts surrounding highway projects, these principles can only provide a general design direction. Each project should be designed to reflect the specificities of its particular location.

### 4.12 ROAD BRIDGES

#### Key design issues

At their most pragmatic, bridges exist to connect transport networks. However they can also support linkages between communities, offer new opportunities for viewing and appreciating the landscape, and be strong landscape features in their own right. Bridges can have a significant impact on the driving as well as the viewing experience and good bridge design will enhance both.

In the bridge design process, a key issue is often the balance between cost and design quality. Design quality is more than aesthetics. It includes appropriate form and scale for the specific location, amenity for road users and others who may travel over or under the bridge, accessibility for pedestrians and cyclists, the integration of abutments in the landscape, personal safety and resource efficiency. Cost should be considered over the life of the bridge and in relation to the environmental, social and cultural benefits offered.

A well considered bridge will create a well connected transport facility which incorporates good landscape design and enhances views. It will make a positive contribution to surrounding communities as well as to road users.

Appendix 5 includes an Assessment Matrix to assist in the identification of urban design factors that will inform the bridge design.



#### Urban design guidance

The following guidance should guide the design of road bridges:

**Location:** Bridge design starts with its location. Bridges that span waterways can dramatically change the landscape and bridges within or next to residential areas can appear out of scale and out of character. The role of the bridge in the overall project must be established from the early stages of route selection as it can influence the alignment.

**Context:** Bridges should complement their context. This means considering the topography, the rural or urban setting, any existing structures, visibility of the bridge and the distance and height to be spanned. Where a series of bridges will be seen in succession by road users, they should be consistent in form and recognizable as a 'family' of structures with individual variations reflecting the requirements of their specific settings. Feature bridges are suitable for special places, where they can act as landmarks.

**Views:** Bridges are both viewed objects and viewing platforms. The bridge can frame a new and unexpected vista contributing to appreciation of the surrounding landscape. Optimising views to, through and from the bridge will also help with orientation on the journey. This can be achieved by making the bridge design as slender and open as possible, and minimising the height of solid barriers by using a top metal rail. Bridges that are highly visible from roads and public spaces should be designed for these views.

**Underbridge experience:** Where pedestrians and cyclists are likely to travel under a bridge, the treatment of the soffit, piers and abutments should provide a safe, convenient and attractive environment. In urban areas with high levels of foot traffic, the underbridge experience will be particularly important and justify architectural treatments and feature lighting.

**Overbridge experience:** Where a bridge provides an elevated viewpoint from which the wider landscape can be appreciated or crosses an important landscape feature (river, gully, etc), the overbridge experience should be carefully considered. This may involve using a metal top rail to minimise the height of solid bridge barriers and maximize the view from the bridge for motorists. If pedestrians and cyclists are likely to travel over the bridge, it may be desirable to provide space where they can safely stop and enjoy the view.

**Form and proportion:** The height of the bridge, number of supports, distribution of spans and size of the various components should be carefully considered to create a simple, elegant whole and to minimise the bridge profile. Structural integrity, where the forces at play in the bridge are clearly reflected in its design, generally results in pleasing composition.

**Light and shadow:** A play of light and shadow on a bridge can reduce the apparent mass and bulk of the structure and balance its vertical and horizontal proportions. Sloping all or part of the outer face of the parapet outwards to catch the sunlight, and recessing beams to create a shadow line, will reinforce the horizontal lines in the bridge. Surface texture on barriers and retaining walls will create a finer level of detail.

**Texture:** Barriers should have minimum embellishments, with any surface patterns reinforcing the clean lines of the bridge. Any textures on retaining walls and barriers should relate to the speed of travel. Abstract, repetitive patterns are suitable to add interest, while not distracting driver. Where abutments will be visible by slow moving traffic, textures can be used on retaining walls to provide a finer level of detail and can reference the area's cultural or historical significance.

**Colour:** Colour offers opportunities to provide consistency to a family of bridges and to reinforce the landmark quality of a standalone structure. When used to highlight particular elements it should form part of a coherent, ordered composition. Colour must be used carefully as it draws the eye, especially in a rural setting.

**Lighting and drainage:** These bridge components must be considered early and integrated in the design of the structure. The external surface of the bridge should be free of drainage pipes or services. Lighting at night, like colour during the day, can be used to highlight all or parts of a feature bridge. Lighting design and selection should incorporate protection against vandalism.

**Maintenance:** It is important to select durable materials and finishes that do not significantly degrade in appearance over time. Where required, anti graffiti coating should be applied as part of the bridge construction phase to the full extent of piers and barriers to prevent patchy application and appearance at later stages.

**Barriers:** Barriers must be designed to respond to the bridge setting and to achieve a smooth transition between the structure and its approach. Barriers should have continuous lines that are not obscured or interrupted by non-structural elements. Their depth must be carefully proportioned in relation to the deck and superstructure. Barriers should be extended past the abutments to anchor the bridge in the landscape. Sloping the top of the barrier inwards towards the deck will minimise water staining on the outer face of the barrier.

**Abutments:** Open abutments should generally be used in rural areas to optimise views of the landscape. Landscaped sloped abutments are less likely to attract graffiti than retaining walls. In urban settings or when the corridor width is constrained, near vertical or vertical retaining walls are the most practical abutment options. The design of these retaining walls must present a high quality appearance if visible to approaching traffic, pedestrians and cyclists.

**Headstock:** These substructure elements should not be designed in isolation. Their design is integral to the overall form of the bridge. Structural systems that eliminate the need for headstock can lead to simpler, more elegant solutions.

**This guidance should be read in parallel with the NZTA Bridge Manual**



### CASE STUDY: ELEGANCE AND PURPOSE

#### Waiwera Viaduct : Northern Gateway Toll Road

The 537m-long, 31m high Waiwera Viaduct is a dominant feature in the Waiwera Valley and as such was afforded significant attention to its appearance.

Span lengths were dictated to some extent by the obstacles on the ground that the piers had to avoid. These included an ecological corridor on the side of Johnstones Hill, the Waiwera River, Weranui Road and an archaeological site. Within these constraints a maximum span length of 76m was selected. Near the southern abutment where the structure gets closer to the ground, span lengths were reduced to avoid the obstacles mentioned and within the constraints imposed by the balanced cantilever construction method. This variable span arrangement gives a more uniform span to depth ratio for each span along the bridge leading to a more balanced appearance, when viewed in long section, than compared to the alternative of uniform pier spacing.

Pier columns have been given a slight taper in elevation, reducing in width at the top. Although very subtle, the taper accentuates the height of the viaducts. It also emphasises the logical flow of structural forces, that is the columns are visually (and actually) stronger at their base. The tapered piers complement the linear lines on the viaduct bottom flange. The clean lines of the viaduct are assisted by the design decision to fully bury the pile caps.

A top rail on the edge barriers has been provided for extra protection to prevent a person falling from the viaduct. To maximise the views from the viaduct a slim-line aerofoil top rail was selected to provide the least disruption to the motorist's views.

Top: Bespoke railing, Waiwera Viaduct  
Below: Tapered piers and haunched girders, Waiwera Viaduct  
Photographer: Greg Kempthourne



### CASE STUDY: BRIDGE DESIGN COMPETITION

#### Memorial Avenue and Russley Road, Christchurch

The Memorial Avenue and Russley Road interchange is located adjacent to Christchurch International Airport. For many, this location is a key gateway to Christchurch City, and the South Island. In 2010, the NZTA, Christchurch City Council and Christchurch International Airport Limited set a competition brief and invited five consultant teams to submit urban design concepts for the interchange.

Design competitions are an effective process for developing innovative solutions for structures in roading projects. In the case of the interchange design competition collaborative thinking was required to generate an integrated and iconic solution, which sits firmly at the intersection of urban design, architecture, engineering and landscape architecture. The engineers and the architects combined to achieve an elegant synthesis of context, form, function and structure.

A key factor in the success of design competitions is in the ideas generated and the technical innovation that is fostered by the competition process. For a competition to be successful the design intent and technical innovation generated needs to be carried through to design development and into the final construction.

Lessons learnt from the Christchurch experience include:

- early stakeholder involvement is fundamental to informing the brief and ensuring that the design entries meet the project objectives, principles and expectations
  - multidisciplinary project teams engender a greater level of design and innovation at an early stage
  - competitions generally lead to creative design solutions
  - competition designs are likely to require additional technical and design development, to support the 'design intent' of the competition entry through to delivery
  - where specialist skills and technical expertise form part of a proposal these must be factored into the evaluation of the entries and delivery of the project.
- The winning design team included Boffa Miskell, Warren and Mahoney, Holmes Consulting Group and Traffic Design Group.

Source: Boffa Miskell



### CASE STUDY: POOR BRIDGE AESTHETICS

Unsympathetic to the environment in which it sits and lacking integration between piers and embankment, between the bridge barriers and the adjacent landform and between the various material used.



### 4.13 RETAINING WALLS

#### Key design issues

Retaining walls are often necessary in steep topography, in constrained highway corridors and in grade-separated junctions.

The main design issue associated with retaining walls is their visual impact, especially where tall walls are required or where walls are viewed at close range by pedestrians or road users. In rural areas, careful earthworks design can minimise the need for retaining walls. In urban environments, the use of retaining walls often cannot be avoided. Where these line the state highway, adjoin local roads, pedestrian or cycle paths or are visible to nearby residents, they should have good architectural design and finishes. Both the experience of highway users and the perception of the surrounding community should be considered in the design of the retaining wall.

Another issue related to retaining wall is vandalism in the form of graffiti and tagging. The risk of such damage can be reduced through good wall and landscape design.



SH1, Westhaven Drive, Auckland  
Photographer: Ken Downie

#### Urban design guidance

The following guidance should inform the design of retaining walls:

**Location:** In rural environments the use of engineered fill planted to match adjacent vegetation can be more appropriate to the context than retaining walls.

**Height:** In sensitive locations, a series of low retaining walls stepped up a cut or fill batter can be preferable to a single high wall. Multiple walls with terraces provide space for planting which reduce the visual impact of the wall.

**Integration:** Visually integrate the retaining wall materials and finishes with the landscape design and the design of bridge structures, with pedestrian and cycle paths and the immediate highway context.

**Landscaping:** Planting at the base or top of a retaining wall can soften the appearance of the wall, reduce its perceived mass and help integrate it in the wider landscape.

**Coherence:** Where applicable, detail and finish the retaining walls to create a consistent family of structures with the noise walls on the project. This is particularly relevant in urban environments or where noise walls are located on top of retaining walls.

**Detailing:** Modular systems such as pre-cast concrete panels should be carefully detailed. This may involve casting the top of the panels to follow the slope of the structure or soil behind and achieve a neat straight line rather than stepping or cutting units on site.

**Materials:** Local materials should be used where possible as they will integrate with the local colours and textures and reinforced the local sense of place. Local aggregates can be used in pre-cast concrete panels.

**Patterns and textures:** For walls located next to the carriageway simple, bold patterns and textures can help reduce visual monotony and staining. Blasting to expose aggregate and moulded patterns can be used to good effect and can help reducing the risk of graffiti.

**Fencing:** Design safety barriers and fencing together with the wall, aligning joints and posts, and locating fixings so as not to compromise the appearance of the wall.



#### CASE STUDY: INTEGRATING RETAINING WALLS

Retaining walls are often built in conjunction with noise walls, fencing or pathways and therefore their design should not be undertaken in isolation of these other highway elements.

Main photo: Bespoke fencing on the SH20 Maioro project designed in keeping with the volcanic theme for the project and to integrate with the retaining wall design.

Left circle: SH16 design concept WRR ULDF. This image shows how all these various elements needed on roading project complement each other and integrate with the design of the overall road corridor.

Centre circle: Retaining walls in a natural environment - A discreet rock retaining wall, SH 94 Milford.

Right circle: Lack of design integration between retaining and noise walls.



**CASE STUDY: TRENCH ARCHITECTURE**

**Wellington Inner City Bypass**

Completed in 2007, the Wellington Inner City Bypass (WICB) remains an example of good trench architecture.

The trenched section of the road posed design and construction challenges in view of the variable soil conditions, high seismicity of the area, complex groundwater regime and confined site. A cost-effective solution here has involved a propped trough section flanked by sections with soil nailed retaining walls. The soil nailed walls are some of the largest of their type in New Zealand and incorporate a post-grouting technique to enhance bond strength.

The clean lines of the retaining walls, the silver colour of the flying beams and their rhythmic shadows create a fitting transition between the urban environment of Te Aro and The Terrace Tunnel entrance.

Source: Opus

Photographer: Stephen J Patience



**4.14 EARTHWORKS**

**Key design issues**

When selecting a road alignment, options that least disturb the natural topography and require minimum earthworks can be the most appropriate and cost effective as they can also minimise the need for slope stabilisation, retaining walls and bridges.

The key urban design issues of earthworks relate to their potential visual impact, their integration in the surrounding landform, their suitability for planting and their footprint which can impinge on surrounding land uses.



**Urban design guidance**

The following guidance should inform the design of earthworks:

**Location:** To minimise the visual impact of earthworks, select an alignment which avoids cutting through spurs and ridgelines but follows hillsides and, if necessary, aims for saddles. Consider curving the road alignment in cuttings to avoid creating a notch on the skyline.

**Alignment:** Where the topography allows, independently grade carriageways on hillsides to minimise earthworks, reduce deep cuttings and visually break up the width of the road corridor.

**Grades:** Adopt earthworks grades to fit the surrounding topography ie shallower grades in flatter or undulating landforms and steeper grades in hilly landforms.

**Benching:** Benches can be visually dominant. To reduce their impact, minimise the number of benches, maximise the height between the road and the lowest bench and between the highest bench and the top of the cutting.

**Rounding:** Round off the tops, bottoms and ends of cuttings and embankments to avoid sharp angles which look alien in natural landforms and reduce frittering of soil from the edges.

**Slope stabilisation:** The need for shotcrete should be avoided. Bolted wiremesh can sometimes be used to catch falling debris and support progressive vegetation of the cut face. Where unavoidable, shotcrete use should be minimised and methods such as pigmentation and surface treatment to achieve a good finish should be considered.

SH1 Northern Gateway  
Photographer: Greg Kempthorne



## CASE STUDY: GEOTECHNICAL CONDITIONS INSPIRE INNOVATIVE BRIDGE SOLUTION

### The Pukeko Bridge

Motorway geometrics called for the SH1 Northern Gateway Toll Road to be set 25m below the Hillcrest Road ridge. A number of scenarios to maintain the local road were investigated including tunnelling, a 'land bridge' and more conventional bridging over a range of excavation/retaining options for the motorway. The 100m, five span structural solution eventually employed arose from the possibility of a top down construction. This allowed formwork for the concrete box beam to be economically erected on the original ground, with sacrificial bored piles to permit excavation. The key to the compositional elegance of the bridge was the opportunity provided by geotechnical considerations which permitted a steepening of the cut from 1:2 to 1:1 at the point where permanent foundations were feasible. From these points, piers were splayed to facilitate the spans. Once the bridge superstructure was complete, final excavation to the carriageway level was undertaken.

While the primary purpose of the bridge was to maintain Hillcrest Road, the design approach taken has capitalised on its potential to become a highway sculpture and landmark feature of the route. The three dimensional layout of the splayed piers interacts with the snaking motorway alignment to provide a bridge which changes shape as motorists pass underneath.

Key aspects of the bridge's performance in this regard are:

- slenderness of structural elements promoting visual lightness
- shape of bridge composition in space and integration with the site
- use of materials and especially colour to provide visual impact.

Slenderness is achieved by use of the box beam form, the concrete barriers kept low and employing horizontal lines, heightened by tone variation.

The distinctive sag of the bridge, following the original ground form, interacts with the pier form to create and resolve the visual tensions produced by the shape of the excavated ground.

Simple concrete abutments and the smooth line of the in situ concrete box beam structure are offset by the white painted concrete of the integral barriers (with inset grey corrugated profile) and shaped pilecap and circular ground beam elements. The circular section steel piers celebrate their materiality in red. The bridge structure contrasts with the ochre of the cut ground faces, weathering without the usual softening of green.

This bridge was relatively cheap to construct and while use is limited to serving one property, its value as a landmark feature makes up for this.

The Pukeko Bridge, named after its beautiful red legs, is one of the first of an increasing number of recent bridges in New Zealand to have captured the public's imagination.

The Pukeko Bridge designed by Jeff Wells, Jasmx and Peter Lipscombe (URS) is recognised internationally and loved by Auckland. It has received urban design awards from the New Zealand Institute of Architecture - an Auckland Architecture Award and Resene Colour Award in 2010 and a New Zealand Architecture Award in 2011.

## 4.15 NOISE BARRIERS

### Key design issues

Traffic noise is an issue that should be considered in the earliest stages of a road project. Careful route selection, including horizontal and vertical alignment, can help minimise the need for noise walls. Noise walls are costly and can have significant visual impacts. Other noise control methods such as low noise road surface, design speed, solid safety barriers and earth mounds should be considered as alternatives to the use of noise walls. Planning can assist in directing major highways away from residential areas or encouraging the development of less noise-sensitive land uses near the road corridor, thereby reducing the need for noise mitigation. Determining what represents the most appropriate noise mitigation solution for any given location requires a range of expert input, including advice from acoustic engineers and urban designer.



### Urban design guidance

The following guidance should inform the design of noise barriers:

**Alignment:** Noise walls should generally run parallel to the road edge. However, where the road sits above or below the level of surrounding properties, it may be necessary for the wall to follow the property boundary rather than the road edge to achieve the required noise reduction. The transition between the road edge and the property boundary should be smoothed out and abrupt changes of directions avoided. Consider tapering the ends of wall into adjacent landforms.

**Height:** Consider limiting the height of the noise wall to balance noise and visual impacts. Separating and overlapping walls can help accommodating necessary changes in height, horizontal alignment, form and material.

**Views:** Noise walls should avoid blocking significant view of the surrounding area both towards and from the road. In special circumstances transparent walls can be used to open up views to special vistas. Competing demands to maintain views and provide appropriate noise mitigation need to be balanced.

**Proximity:** Noise walls should avoid overshadowing properties and blocking sightlines for surveillance purposes. A balance needs to be struck between reducing the noise from the road and enclosing private property or public footpaths in ways which will create opportunities for crime.

**Integration:** Noise walls should be integrated with the design of the overall road corridor and complement the road bridges, retaining walls, landscape treatment and any public art elements of the project.

**Top edge:** The top edge of the wall is one of strongest visual elements along a road corridor and requires careful consideration. Avoid irregular stepping of the top of the wall as this can be visually jarring. If steps are required, ensure they are small and regular. Alternatively, slope the top of the wall to reflect a change in height or level.

**Mounds:** In suburban or rural environments, landscaped earth mounds can be more suitable to the context than noise walls. Mounds can be used on their own or with a low noise wall on top. Mounds provide an opportunity to utilise excess fill from a project and can also be used to integrate pedestrian and cycle paths into a project.

**Form:** Consider noise walls as three-dimensional pieces of design with two faces performing separate functions. The inner-face is viewed at speed by road users. Their perception is fleeting and only bold designs, geometric patterns and the overall shape of the wall will be viewed. The outer face is viewed from the landscape or surrounding urban area, the noise wall form a static, permanent feature in the environment and depending on the proximity of viewers, construction and design detail may be visible.

**Verticality:** A slight lean outwards can bring considerable improvement in the visual impact of noise walls on road users, particularly reducing the tunnelling effect where noise walls are needed on both sides of the highway. Care needs to be taken to avoid reducing the effective height of the wall and its acoustic performance.

**Surface treatment:** The road face of a noise wall should not feature fine details that could distract drivers. However, oversimplification and monotony should also be avoided. A system of simple, abstract patterns can be very effective on the road face. If the outer face of a noise wall will be viewed from an adjacent residence or pedestrian route, it requires quality design and detailing. Surface finishes are very important for amenity and maintenance reasons. They include a combination of colours, textures and patterns.

**Artworks:** If artworks are to be included these should be integral to the design rather than an addition to a wall designed purely on engineering grounds.

**Planting:** Planting can be used to complement or screen a noise wall. Planting is especially important on the outer-face of the noise wall where it can help integrate the wall with the wider landscape and provide an attractive interface with nearby properties, public spaces, footpaths and cycleways. Tall planting behind wall can reduce the visual dominance of the wall. Planting must allow for access to the wall for maintenance.

**Materials:** When selecting materials, consideration should be given to their acoustic performance, durability, weathering, ease of maintenance and vandal and graffiti resistance. Noise walls should be designed to retain their noise attenuation performance for a minimum of 20 years.

For more specific advice relating to the design of noise barriers including acoustic aspects, please see the NZTA State Highway Noise Barrier Design Guide which can be viewed at [www.acoustics.nzta.govt.nz](http://www.acoustics.nzta.govt.nz)





**CASE STUDY: MAIORO NOISE WALLS, AUCKLAND**

A requirement of the Maioro Street project in Auckland was to use where possible existing barriers in order to keep costs down and to replace and build new barriers where the realignment of the road required it. The project also gave the NZTA an opportunity to retrofit what were recognised as visually substandard barriers to achieve a better visual outcome for the local community and road users. The design concept was developed by Dave Little as part of the Urban and Landscape Design Framework (ULDF) for the Western Ring Route and was based on a 'volcanic highway' theme of overlapping and contrasting materials and textures, with red, orange and gold colours on a black background.

Prior to the construction of the new interchange, the existing barriers comprised unpainted sheet plywood panels just on the road side of timber framing fixed between steel posts. The road side of the panels also had vertical wooden strips applied. Over time as these barriers had been tagged, maintenance teams had painted out the graffiti. Where these barriers have remained, they have been integrated with the new barriers by painting on the road side with the black, red, orange and gold colour scheme of the ULDF. As shown in the photographs, work was also undertaken to remove the large visually jarring steps from the top of the noise wall to provide more regular and smaller changes in height.

A robust specification led to the use of a proprietary engineered barrier product that, compared with simple custom-made sheet plywood barriers, has better durability, is less prone to warping or developing gaps, and is 'finished' on both sides.

Inset: Before  
Below: After



**CASE STUDY: DOUBLE SIDED NOISE WALLS**

In designing noise barriers it is imperative to consider the visual appearance of both sides of the noise wall. Below are two such examples on the state highway network. On the Manukau Harbour Crossing project the rear side of the wall was painted and planted and a path helped integrate the fence with the adjacent environment. On the other project, sloppy contract requirements meant that the contractor delivered a substandard outcome.



Onehunga Bay Reserve

**CASE STUDY: TRANSPARENT NOISE BARRIERS**

**Victoria Park Tunnel project, Auckland**

As well as buffering motorway noise from adjacent housing and recreational areas, the Victoria Park project transparent acrylic panels allow motorists to enjoy views of the historic pohutukawa clad cliffline as well as views out to the Westhaven Marina, Waitemata Harbour and Harbour Bridge for residents. A popular community dog walking and recreation area also lies between the noise barriers and cliffs and by using transparent materials, light could still penetrate the space and vehicles on the motorway can continue to play a key surveillance role addressing the safety and amenity issues faced when using noise barriers.

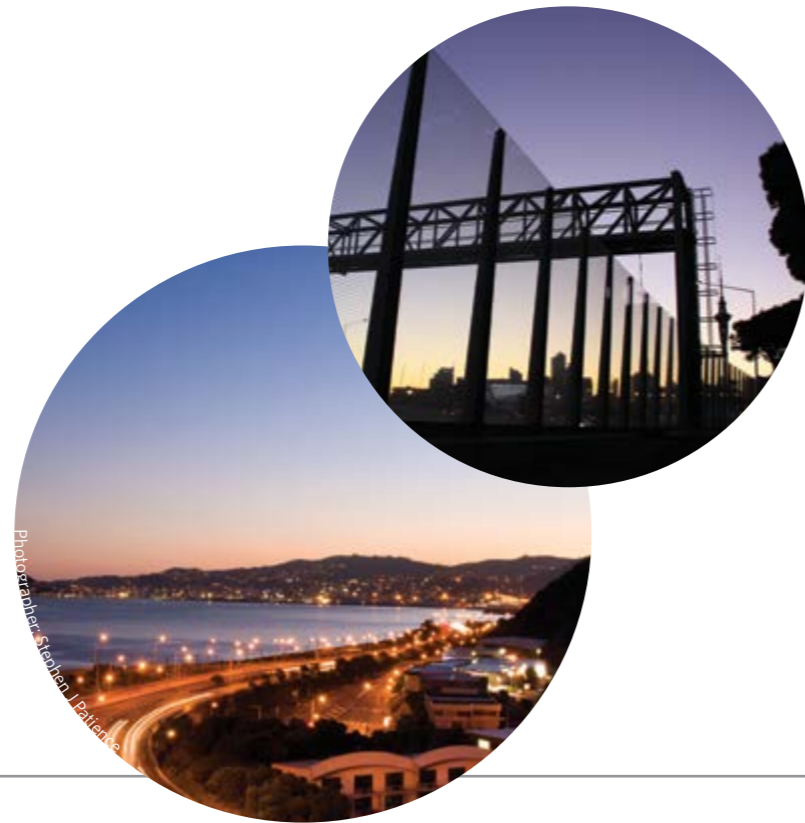


Photographer: Ken Downie

## 4.16 HIGHWAY FURNITURE

### Key design issues

The full range of elements that surround highways such as light columns, sign gantries, signage posts and crash barriers can create visual 'noise' and add to the visual impact of the highway. The alignment of highway furniture within the road corridor can also obscure important views, create obstacles for pedestrians and cyclists and generally clutter the environment.



### Urban design guidance

The following guidance should inform the selection and location of highway furniture:

**Coherence:** Select all highway furniture elements within a corridor to form a coordinated palette eg by limiting the number of different materials and finishes and by using a single type of geometric detail (eg angular or curved light columns and gantry joints). Elements of highway furniture should also fit in with the context.

**Integration:** Integrate the location and appearance of highway furniture elements with the overall design of the project. Coordinate the design of highway furniture along the alignment with the treatment on bridges and inside tunnels. Integrate the highway furniture of new highway segments with the existing suite of elements where practicable.

**Location:** Signage for road users should not be mounted on pedestrian overbridges. Signs mounted on road bridges shall be limited to the name of the local road and integrated with the design of the bridge barrier.

**Transitions:** Provide suitable transitions between different types of elements, for example between steel or wire barrier and solid barrier on the approach to a bridge. Taper the height of solid barriers down to match the height of steel barriers or indent the end of the solid barrier to create a neat detail where the steel barrier terminates.

**Selection:** All elements of highway furniture should be simple in design and require minimum maintenance. Avoid fussy, overly complicated designs.

**Clutter:** Minimise visual clutter by limiting the number of different elements and materials, combining supports where possible and using earth bunds and clear zones where practicable to reduce the extent of guardrail. Signage should be combined onto fewer mounting posts and into fewer sign panels wherever possible.

**Scale:** Minimise the scale of gantries and signs, especially in urban environments where traffic speeds are lower and the elements will be experienced at close range by pedestrians, cyclists and the community.

**Placement:** Place individual highway furniture elements to achieve a simple and consistent arrangement, for example aligning sign posts and lighting standards setbacks to avoid unnecessary variations. Highway furniture elements should not impede pedestrian and cycle movements.

**Colour:** Highway furniture should 'blend in' with the background and not be a dominant feature of the road. In order to do so, limit the number of different colours and select recessive colours which will disappear against the background.

**Vandalism:** Consider the risk of tagging and vandalism when selecting and locating highway furniture. Avoid designs which facilitate unauthorised access to bridges and other structures.

**Views:** The location and design of gantries shall avoid obstructing notable long-distance views and minimise their visual impact generally.

**Proportions:** Signage support posts should be as slender as possible. Signage spanning girders should be designed to minimise their vertical depth. As much as practicable, signage should be visually contained within the depth of the spanning girder, through integrated design of girders and signage panels.

**ATMS:** Illuminated electronic signs can introduce foreign elements in rural environments, obscure views which are important for way finding and local character, and add to clutter and message overload in urban environments. When considering the use and placement of ATMS, the need for driver information should be balanced against the visual impacts of the signs.



### CASE STUDY: MAKORORI IMPROVEMENTS

The NZTA received a strong response from the community following the completion of safety improvements at Makorori near Gisbourne. The NZTA had removed the ability for people to park alongside the highway which was a hazard both for motorists and for people getting in and out of their vehicles and placed a barrier to protect motorists from a steep drop-off on the side of the highway. Unfortunately it was felt that these safety improvements were undertaken in isolation and without consideration of the visual impact nor input from beach users. A number of members of the community wanted the barrier removed altogether.

Through various public meetings and by working with the community the matter has now been rectified. The barrier has been moved in part to provide better access to the beach. In a rest area at the top of the hill the barrier has been replaced with a rock wall to provide a better visual appearance. The NZTA also undertook prep work and provided the necessary materials so that a community planting exercise could take place to assist with mitigation of the visual impact of the steel barrier. This was to ensure community ownership and acceptance of the project as well as to prevent theft and vandalism which had been a real issue in the past.

The community planting exercise which has also included NZTA staff has been a success in that a small group has been established that meets at the site from time to time to maintain the plants. The group is now raising funds to continue to carry out this maintenance and extend the planting. There has also been a zero loss of plants from theft.

When placing barriers alongside the highway, consideration needs to be given not only to how these barriers look and integrate with the surrounding landscape but also what impacts they have on views out from the highway and as such the driving experience. Accessibility is also a key issue and barrier placement needs to consider the access needs of all modes, destinations and desire lines.

Right: safety concerns from parked vehicles before placement of the barrier.

Left: The rock wall was used in place of a w barrier to provide the necessary safety measures while recognising the significance of the view for users.

### CASE STUDY: SLENDER W BARRIER SUPPORTS

W barriers supported by steel provide a more slender and streamlined solution with less visual impact than those supported by timber which are more bulky.





### 4.17 STORMWATER MANAGEMENT DEVICES

#### Key design issues

Stormwater runoff during the construction and operation of roads has a range of effects on receiving environments. The road corridor can convey harmful contaminants such as suspended particulate, soluble metals and hydro carbons which are carried by the road runoff and accumulate in the receiving environment when treatment does not occur.

NZTA typically requires stormwater drainage to use a treatment train approach, catering for conveyance, attenuation and treatment prior to discharge.

The best practicable option for the treatment of stormwater runoff aims to minimise runoff's adverse impacts on the environment by imitating a site's pre-development hydrology through the use of design techniques that infiltrate, filter, store, evaporate, and detain runoff close to its source. This approach involves methods such as roadside or median swales, wetlands, ponds, sand filters, filter strips and oil/water separators.

This approach has numerous benefits over the conventional 'channel and pipe' stormwater management approach. By expanding on the natural drainage and landscape features of an area, it can help:

- reduce flooding
- improve water and air quality
- reduce expenditure on stormwater infrastructure
- enhance the visual quality of highway projects
- enhance the amenity of adjoining properties
- contribute to habitats and biodiversity outcomes.



#### Urban design guidance

The following guidance should inform the design of stormwater devices:

**Planning:** Low impact drainage can have greater land requirements than conventional approaches to stormwater management. It should be considered early in the consenting and design process to ensure that sufficient land is designated to accommodate devices such as swales and wetlands, that adequate consent conditions are in place and that whole-life-cycle costs including operational and maintenance costs have been considered.

**Integration:** Designers should work alongside local authorities to share drainage facilities to create an integrated catchment management approach. Such approach is common in greenfield projects where roads are built to allow for further land use development.

**Location:** The location of drainage devices will be strongly influenced by site constraints such as median and berm widths (for swales), other space available within the designation (for wetlands and ponds), slope, depth to groundwater, infiltration rates and whether it is possible to discharge into other surface bodies. Public safety and maintenance access requirements are also important considerations. To minimise hazard to road users, wetlands and ponds must be located outside of clear zones. Where drainage devices are proposed in public open spaces, they will require careful design to meet community expectations.

**Multi-functional:** Swales, ponds and wetlands should be located and designed to perform the multiple roles of stormwater conveyance and treatment, landscape amenity feature and ecology habitat, as may be appropriate for the specific location. The need to routinely 'dig up' ponds to dispose of the contaminants collected should be factored into the design, for example through the design of a sacrificial forebay.

**Connectivity:** Low Impact Design (LID) devices should integrate with the surrounding pedestrian and cycle networks. This can involve providing a footpath or boardwalk link along a wetland or ensuring that swale locations do not obstruct informal footpaths or pedestrian desire lines through open spaces.

**Safety:** Shallow wetlands are preferred over deeper ponds as they minimise drowning hazards. The edge of the wetland or pond should be shallow and vegetated to prevent accidental access while reducing the need for fencing.

**Space:** Avoid squeezing stormwater devices into small areas which would result in the use of steep banks, retaining walls and safety fences which can be unsightly and difficult to maintain.

**Aesthetics:** Swales, ponds and wetlands should respond to the natural landform and landscape character and integrate with the project's proposed landscape design. The shape, size and planting of wetlands and ponds should satisfy engineering and operational requirements but also provide visual and amenity benefits. In certain cases, this may involve creating a larger wetland area than is strictly needed to satisfy the stormwater management requirements and 'naturalising' the pond shape and edge treatment.

**Planting:** The landscape treatment of stormwater devices must be compatible with the wider landscape concepts for the project. Plant swales, wetlands and ponds' edges with locally sourced species which require minimal maintenance once established and are suitable in the local context. To maximise planting success, avoid soil compaction, select healthy plants, monitor plant health and allow for re-application of mulch.

**Maintenance:** Maintenance access needs to be integrated in the design of wetlands and swales. Maintenance accessways should be positioned safely off the state highway.

The NZTA Stormwater Treatment Standard for State Highway Infrastructure provides guidance to assist practitioners with the selection and design of stormwater management practices.

## CASE STUDY: DESIGN OF STORMWATER WETLANDS

### Hobsonville Point Wetland

Wetlands need not be engineered, fenced, no-man zones. If planned and designed with the right intent they can integrate positively with surrounding land uses and add environmental, ecological and educational value to a community.



## 4.18 SIGNALISED JUNCTIONS

### Key design issues

In New Zealand, signalised junctions tend to be used mostly in urban environments where a balance is needed between vehicular and pedestrian movements or where the highway corridor is too constrained to accommodate a roundabout of sufficient size for the volume of traffic.

Signalised junctions generally occupy less land than roundabouts, depending on the number of approach and turning lanes. Their geometry is more suited to the orthogonal street grid of many urban environments and can be designed to minimise the loss of valuable development land and the disruption to continuous street frontages. This is particularly important in shopping streets where a wide gap in street frontage can impact the viability of the shops which are separated from the main group.

Signalised junctions are generally better suited than roundabouts to accommodate pedestrians and cyclists on their desire lines, although this advantage reduces as the size and complexity of the junction increases. Even where traffic signals do not include pedestrian phases, pedestrians can still cross more easily at a signalised junction than at other locations on the network when traffic streams are stopped by red signals.

The key design issues related to signalised junctions relate to the visual impact of the traffic lights themselves, the street clutter which can result from numerous signs and poles, the poor integration of pedestrian and cycle movements and the footprint of the junction, particularly where numerous turning lanes are provided.



Photographer: Stephen J Patience

### Urban design guidance

The following guidance should inform the design of signalised junctions:

**Planning:** The type of junction suitable for the particular context should be considered from the early phases of a project taking into consideration not only the traffic throughput but other aspects such as pedestrian needs and land take. Often, roundabouts are selected by default on traffic grounds alone where signalised junction would offer a more balanced solution between the needs of through traffic and those of the local community.

**Footprint:** The number and width of the traffic lanes, including turning lanes, should be kept to a minimum to limit the impact of the junction on the surrounding urban fabric, encourage safe driving speeds and reduce pedestrian delays.

**Turning radii:** Tight corner radii make it easier for pedestrians to cross by slowing traffic speed down and reducing the length of road to be crossed. Select the smallest turning radius that satisfies the junction's functional requirements.

**Free left turns:** Junction layouts which include a segregated left turn lane make pedestrian crossing more difficult and less safe, adding an extra crossing which can increase the overall crossing time. They can also add to the number of lights and signs required and increase visual clutter. The need for free left turns should be balanced against these other considerations.

**Advanced cycle box:** Traffic signals in urban areas should generally incorporate advanced cycle stop lines to allow cyclists to position themselves ahead of the traffic queue where they are more visible and safer.

**Clutter:** In dense urban environments, excessive number of signs and lights can lead to information overload and poor highway legibility. In less urban environments, multiple lights and signs can be alien to their context. Keep the number of signs and lights to the minimum which satisfies safety requirements. Combine signs and lights onto as few poles as possible.

## CASE STUDY: A NEW GENERATION OF TRAFFIC SIGNALS

### Queen Street, Auckland

Auckland's most famous street, Queen Street has been transformed into a world-class, people-friendly street fit for its position at the heart of Auckland CBD.

Planning for the Queen Street upgrade began in 2003 and included extensive market research and consultation with CBD residents, businesses, organisations and visitors. Construction began in January 2006 and the upgrade was completed in May 2008.

A priority of the upgrade was to provide greater pedestrian safety given more than 40,000 people walk along Queen Street every day. In recognition of this, the speed limit in Queen Street was lowered to 30km/h between Customs Street and Mayoral Drive.

A key component of the upgrade was the trial of pedestrian countdown timers in two of the busiest signalised intersections in the city: one in the heart of the retail precinct (Queen Street / Victoria Street), and one opposite the public transport concourse (Quay Street, Ferry Building).

Countdown timers advise pedestrians how much remaining time they have to cross the road safely. The purpose of the timers is to reduce the number of crossings made outside the pedestrian phase, thus increasing pedestrian safety and driver efficiency.

Significant improvements in pedestrian crossing behaviour followed the introduction of pedestrian countdown signals at the Queen Street / Victoria Street intersection indicating that such systems are capable of favourably affecting pedestrian behaviour, if placed in suitable locations.

The countdown timer has now been approved by the NZTA, as a 'compliant device'.

Source: Traffic Systems Ltd and Auckland Council



Source: Boffa Miskell

## 4.19 ROUNDABOUTS

### Key design issues

Well-designed roundabouts can help manage vehicular speeds and contribute positively to the movement network. These roundabouts respond to their context, position in the street hierarchy, speed environment and intended level of vehicular and pedestrian movement.

In urban and suburban environments, single lane, low speed roundabouts are suitable in areas of low traffic volumes where frequent breaks in traffic streams allow pedestrians to cross safely and cyclists to share the road with vehicles. Multiple lanes, higher speed roundabouts are suitable in environments where pedestrians and cyclists are either not present or catered for separately and safely from the vehicular traffic.

Not surprisingly, roundabouts are not found in our main city centres. In low speed environments where high levels of vehicular traffic and pedestrian movements are present, signalised junctions perform better than roundabouts by providing pedestrians with a dedicated crossing phase. Also, the large land requirement and circular geometry of roundabout do not sit comfortably in constrained urban areas.

The main issues associated with roundabouts relate to their use in the wrong context, their design speed, the lack of provision for safe pedestrian crossing and the conflict between vehicles and cycles.

In urban and suburban environments, roundabouts with wide entry and exit points allow vehicles to negotiate the roundabout without much reduction in speed, can make pedestrian and cycle movements precarious.

Many roundabouts have minimal provisions for pedestrians. Where designated crossings are provided, they are often placed well away from desire lines. In areas of high pedestrian movement, such roundabouts can be a significant barrier to pedestrian movement.

Finally, the signs and road markings associated with roundabouts can be visually intrusive in certain contexts.



"Roundabouts should be designed to ensure low entry and exit speeds - Palmerston North CDB"

Source NZTA Pedestrian Planning Design Guide  
Photographer: Shane Turner

To be read in conjunction with Austroads - Guide to Road Design.

### Urban design guidance

The following guidance should inform the design of roundabouts:

**Location:** At busy urban junctions requiring multiple approach lanes and where high levels of pedestrian activity are expected, signalised junctions generally provide a safer environment for pedestrians and cyclists than roundabouts. Where posted speeds are higher than 80km/h however, the use of traffic signals is not recommended.

**Integration:** Where multiple-lane roundabouts are required, consider the use of grade separated pedestrian and cycle paths or the addition of signals to the roundabout.

**Connectivity:** All footpaths leading to roundabouts should link to clearly indicated pedestrian crossings. Pedestrian refuges can be incorporated into splitter islands between approaching and exiting traffic lanes. Pedestrian paths must be as direct as possible.

**Cycling:** Where cycle lanes are proposed, the approach lane should be designed to allow the cyclist to either 'claim the lane' and proceed through the roundabout as a vehicle or exit the roadway prior to the roundabout on an off-road cycle or shared pedestrian and cycle crossing facility. Vehicular speeds on entry and exit of the roundabout are a key safety issue for cyclists and need to be appropriately

managed through the design of the roundabout.

**Visibility:** The approaching driver must be able to see the roundabout from a distance. The design of central islands on smaller roundabouts should not obstruct drivers' visibility beyond the roundabout to any pedestrian crossing points. Any planting along the approaches to the roundabout or on the central island should be of an appropriate height to maintain visibility.

**Diameter:** In urban environments, the overall diameter of the roundabout should be kept as compact as possible to minimise land take. This will also help reducing the disruption to pedestrian movements and encourage lower speeds.

**Deflection:** Sufficient deflection on the entry and exit points must be provided to reduce vehicle speed where pedestrians and cyclists are expected.

**Free left turns:** Left turn slip lanes (free left turn) are sometimes used to increase traffic capacity at roundabouts. In urban environments, these create an additional barrier for pedestrians and are a particular hazard for cyclists who find themselves between two live traffic lanes when exiting the roundabout. In urban environments, these should only

be used where a separate cycle path is provided.

**Landmark feature:** Large roundabouts provide opportunities to create special features which can help wayfinding and enhance local identity. This may take the form of large scale public art, feature lightings or distinctive planting.

**Amenity:** The central island is primarily a visual element. It should be designed to create a distinctive visual effect and require minimal maintenance.

**Landscaping:** On small roundabouts, the central island can be difficult to maintain without interfering with traffic movements. Robust, low maintenance planting or paving should be used to minimise maintenance requirements. On larger roundabouts, clear stem trees may be appropriate, as long as they do not obstruct drivers' visibility. Wide concrete edging should be used in conjunction with landscaping to reduce maintenance needs and minimise weed spraying. A wide hard standing area around the edge of the central island should be used to provide safe space for maintenance and minimise the need for weed spraying. Planting in the splitter islands within 50m of the roundabout should be avoided as it is difficult to safely maintain.



## CASE STUDY: LANDMARK ROUNDABOUT DESIGN

### Whanganui Gateway

Artwork and landscape treatments can help create gateways along the State highway network, transition vehicles to a slower speed environment and in this case also assist with mitigating effects created by bypassing an urban centre.

The job of designing a fitting entrance to the city of Whanganui had elements of traffic, urban and landscape design, and civil engineering. The intersection had to be safer, the highway crossing had to be easier for pedestrians and cyclists, and traffic had to be slowed and encouraged off the State highway 3 bypass and into the heart of the city. Planting, paving, sculpture, lighting, the 50km speed threshold and a new roundabout are all elements in the design solution.

The centrepiece is the roundabout itself. Partially raised and planted, it's paved with black polished concrete that is inset with shells from nearby beaches. Slightly off centre is the 'Encounter sculpture' - two upstanding metal shapes greeting each other and lit from within at night using LED lighting.

As cars approach the roundabout from the south the planting intensifies creating a threshold.

At the southern end of the roundabout is a second sculpture from three sets of three vertical poles with stainless steel strips painted a vivid blue and also lit at night. The sculpture was inspired by navigation lights, sets of former wharf piles in the Whanganui river and also by the three hapu (Maori subtribes) of the river.

*'Encounter sculpture' Putiki at the southern entrance to Whanganui was and remains a place of encounter between Maori and later settlers. The sculpture represents the idea of encounter between local Maori, with the Takarangi spiral motif designed by Judd Bailey of the local Iwi with a history of meaning relating to the river movement and the joining together of two separate elements. The other shape represents European settlers through the proportions of the grid pattern of the Whanganui city streets.*

Art and Sculpture: Mark Southcombe Victoria University, with Judd Bailey

Source: Landscape Architecture NZ Magazine Autumn 2011

Photographer: Leigh Mitchell-Anyon

The Tatuanui Roundabout at the intersection of SH26/27



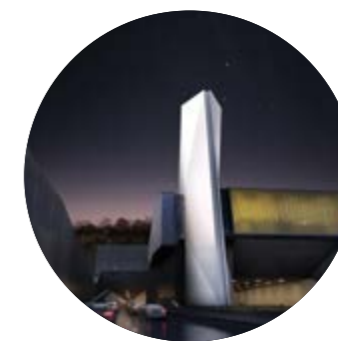
## 4.20 TUNNELS

### Key design issues

Tunnels are generally used in areas of steep topography where large open cuts are not practical or prohibitively expensive. They can also be used to minimise the impact of new highways on established urban areas, such as the Waterview tunnel in Auckland or the Terrace tunnel in Wellington. Finally, they can be used in areas of high ecological value where large earthworks would have significant impacts, such as the Johnstones Hill tunnels on the SH1 Northern Gateway.

The main components of tunnels which require urban design considerations are the tunnel approach and portal, the tunnel interior and, where present, the tunnel control building and ventilation stack.

The tunnel portals are the thresholds between the tunnel interior and exterior. They mark the transition from the day-lit highway to artificially lit tunnel. The design of the tunnel and portals should contribute to safe driver behaviour, integration with the surrounding area and visual interest for road users.



Artistic Impressions  
Waterview tunnel portals and  
vent stack structure  
Source: Boffa Miskell

### Urban design guidance

The following guidance should inform the design of tunnels:

**Integration:** The treatment of cut faces on the approach to the tunnel, the massing and architectural design of the tunnel portals and the treatment of the portal surrounds are critical to their successful integration in their context.

**Tunnel interior:** Design the tunnel interior to reinforce a clear, safe path of travel, maintain driver attention and create a pleasant driving experience. Subject to safety and lighting requirements being met, the wall panels of the tunnel can integrate geometric patterns, colours and large fonts to add interest. Feature lighting can also be integrated in the tunnel walls, ceiling and portal to create a distinctive experience for tunnel users.

**Transition:** Ensure that the portal and tunnel design allows for a suitable transition from external light levels to the lower internal light levels of the tunnel.

**Ventilation stack:** Where present, ventilation stacks should be located and designed to minimise their visual impact on the surrounding community. It is generally best to locate the stack close to the tunnel portal to minimise the spread of infrastructure in the surrounding environment and limit visual effects to a single location. Where stacks will be visible, the exterior of the stack should be architecturally designed and use materials and colours which are visually recessive.

**Control buildings:** Small control or ventilation buildings should be architecturally designed to complement the portal and integrate with the surrounding area. Where large service buildings are needed, bury them below ground level and create a usable space above them. Where it is not possible to submerge all or part of large service buildings, locate and design them to integrate with their surroundings or screen them from adjoining residential or community uses with bunding and planting. Minimise the area of parking and hard paving around service buildings.

**Pedestrian and cycle access:** Except in remote areas or where the highway is designed to motorway standards, pedestrian and cycle movements generally need to be catered for in tunnels. A shared pedestrian and cycle path should be separated from the road by a rigid barrier, level difference or transparent wall. Traffic noise, air quality and the proximity of moving traffic will impact the usage of the tunnel by pedestrians and cyclists and should be factored in the design from the earliest stage.

**Personal safety:** In long tunnels, pedestrians and cyclists can be vulnerable to crime and have few options to escape a potential attacker. Ensure that pedestrian and cycle paths have long sightlines and are visible to moving vehicles which provide a level of informal surveillance. Additional measures such as emergency phones and security cameras may be needed to deter crime.

## CASE STUDY: JOHNSTONE'S HILL TUNNELS

### Northern Gateway Toll Road - dig deep for an optimal outcome:

The construction of the Johnstone's Hill tunnels began in early 2006 and was completed in October 2008. The tunnels are each 385m long, 12m wide and 9m in height. Each tunnel can accommodate two lanes of traffic, but there is currently only one northbound lane until future extension of a dual carriageway past Puhoi.

Initial plans for the route proposed the traversing of Johnstone's Hill via a deep cut. Further development of the design led to the selection of a tunnel as a preferred option. Tunnelling through the hill avoided a 60m cut and retained an important wildlife corridor connecting Wenderholm Regional Park to its hinterland.

Amenity and landscape integration played an important part in the engineering of the tunnel. As the southern portals are located in an environmentally sensitive area, responsive construction methods were critical. This was achieved while removing the minimum amount of vegetation possible to create a platform for the tunnelling machine.

The portals were designed to reflect the natural slope of the hill. By extending the portals 20m beyond the hill side and cutting back into the slope for tunnelling purposes the natural contour of the hill could be reinstated and the slope revegetated. This design saved on costly soil engineering and resulted in an attractive outcome for the portals.

The tunnel project was consecrated during construction with a kohatu stone, placed at the foundation of the tunnels by Ngati Whatua. The stone acts as the Kaitiaki (guardian) for the highway landscape.



#### Lessons learnt

- The tunnels concept and construction process reduced the footprint of earth works; protecting Johnstone's Hill and an important ecological corridor.
- The integration of the tunnels with the adjoining hillsides achieved landscape and engineering cost efficiencies.
- The portals shape and design contributes to the legibility and road user experience.
- The highway designation was altered to achieve the outcomes sort.

#### Team:

Northern Gateway Alliance: NZTA, Fulton Hogan, Leighton Contractors, URS New Zealand, Tonkin and Taylor, Boffa Miskell, VSL, United Group.



## 4.21 STOPPING PLACES

### Key design issues

New Zealand is a beautiful country offering world-class and diverse scenery. As state highways traverse many different natural and built landscapes stopping places at regular distances are integral to the culture of New Zealand roads. Highway stopping places should be located, designed and maintained to a high quality to encourage road users to take regular breaks along their journey to safely get out and refresh before continuing.

Stopping places include rest areas, service centres, parking bays, information bays, heavy vehicle areas, tolling pay areas and commercial service centres. Stopping places would not normally be formed near a city or town as there are suitable stopping facilities on the local road network.

Stopping places are suitable areas of road reserve that form an attractive and safe off-road parking place with safe exit and entry points readily negotiable by cars and trucks and in some circumstances cyclists. Heavy vehicle drivers need to check loads and observe breaks to conform to statutory regulations for driving hours and rest breaks.

#### Factors to be considered in determining the appropriate location and spacing include:

- Traffic volumes, types and predominant trip length
- Proximity to existing stopping opportunities such as towns and villages
- Potential co-location benefits ie development in pairs on either side of double carriageway
- The frequency of quality stopping places

**The NZTA Highway Stopping Places Strategy provides further NZTA policy and guidance in this space.**



Source: Tourism New Zealand

### Urban design guidance

#### The following guidance should inform the design of stopping places:

**Planning:** Stopping places should be developed in a sensitive manner through careful planning. Consider the needs of road users, neighbouring communities and the surrounding natural environment when locating and designing a stopping place.

**Context-sensitive design:** The design of a stopping place must respond to its particular context including the local topography, existing trees, natural features, scenic views or heritage. The design should incorporate locally relevant materials or features where possible. Where suitable, interpretation boards and look-out points should be provided.

**Uses:** Stopping places may be used by people travelling with young children or dogs which need space to run around to break up the journey. Ensure that driveways and parking areas within the stopping place are clearly delineated to minimise conflicts between moving vehicles and pedestrians and to prevent vehicles parking in unsuitable areas. Also ensure that picnic tables are well away from moving vehicles.

**Facilities:** Facilities such as toilets are to be provided at all hours of the day and every day of the week to a clean and tidy standard to encourage drivers to take breaks. Picnic tables should be durable and low maintenance. Additional facilities may be required on a case-by-case basis, including tourist information, toll collection facilities, refreshments, showers or play areas.

**Noise:** The design, layout and landscape treatment of stopping places should create pleasant, tranquil spaces. The use of earth bunds to reduce traffic noise within the stopping place should be considered and balanced with the need for visibility and passive surveillance.

**Visibility:** Sites are to be well signed and visible to approaching traffic to encourage the driver to stop.

**Size:** Sufficient space should be provided in rest areas to create a park like character, with ample space away from the road. A rest area should provide open areas for passive recreation and tree areas for shade in the summer.

**Landscape design:** Provide a simple, locally suitable landscape design that is easy to maintain and attractive for users. Where possible, rest areas should have some topographic separation from the highway and meandering access to keep speeds down.

**Materials:** Select robust, durable, vandal-proof materials that require low maintenance.

**Surveillance:** Ensure that the stopping place is safe by allowing passive surveillance from the highway and clear views under clear stem shade trees.



#### CASE STUDY: REST AREAS

Not only are rest areas important for safety reasons, along our scenic routes they also provide opportunities for tourists to be able to stop and enjoy the view, including photograph it, as well as visit areas of interest such as a site of cultural or natural significance. In some instances it may be appropriate that the NZTA provides rest areas in partnership with our stakeholders, like the local council, DOC or NZHPT.

Source: Mirror Lakes Rest Area



Source: Destination Rotorua, TourismNZ

#### 4.22 LANDSCAPE PLANTING

##### Key design issues

Landscaped areas in state highway corridors perform a number of functions including:

- Providing a visually pleasant environment for road users
- Integrating stormwater systems such as swales and wetlands
- Integrating noise attenuation devices such as bunds and walls
- Providing clear zones for road safety
- Supporting habitats for birds, reptiles, amphibians and insects
- Providing areas for native and rare plants to grow relatively undisturbed
- Providing safe stopping places for maintenance crews, police and road users
- Separating the operational parts of the road from adjoining properties

A well-considered landscape treatment is a fundamental component of good infrastructure design. It can contribute to the character of an area, help integrate the road with the surrounding environment, facilitate way-finding for road users, encourage safe driver behaviour and become a valuable ecological asset.

NZTA roadsides have many environmental, historic and cultural values that need to be considered in the design of landscape treatments. Unlike private land, they have largely been protected from agriculture and development, thus often contain:

- Areas of significance to Maori and European heritage,
- Remnant native vegetation,
- Habitat and movement corridors for native fauna.

The design of landscape treatments needs to fit in with the surrounding environment and land uses. The effects of plant size and form at maturity, seasonal changes, textures and colours all need to be considered in the design. Plant growth rates and the length of time required for planting to reach the desired visual screening or aesthetic effect should also influence plant selection.

The issues usually associated with poor landscape treatment are complicated designs that are expensive and difficult to maintain; poor plant selection and soil quality leading to low success rates; planting blocking views for drivers or pedestrians; and poor maintenance arising from poor accessibility for contractors.

Good landscape designs is a relatively inexpensive element of our state highways that only improves with age. Wherever situated, roads and their settings are enhanced by the presence of vegetation.



Photographer: Greg Kempthorne



## Urban design guidance

The following guidance should inform the design of landscape planting:

**Planning:** Landscape proposals must be integrated in the planning of the wider transport project. Specify appropriate design and capital budgets from the early stages of a project. Consider on-going maintenance requirements in the preparation of the landscape design.

**Character:** Landscape design contributes to the character and legibility of the rural and urban environment and the road users' experience. It can provide landmarks along a journey, frame interesting views and highlight the presence of communities.

**Plant selection:** Plants should be selected to fit the specific context of the project. A mix of locally sourced native species can support local biodiversity and landscape distinctiveness and help create connections between remnant native vegetation. Avoid single species mass planting which has low biodiversity value and low resilience. Aim to include 1% of indigenous rare species appropriate for the area as part of the planting mix.

**Buffer:** In urban environments, designate a green buffer or planted strip to separate the carriageway from the footpath. This lowers the perceived traffic noise and provides some protection from moving traffic for pedestrians, creating a more comfortable environment.

**Earthworks:** Earthworks should generally blend in with the surrounding topography and avoid geometric profiles which look unnatural, especially in rural or scenic areas. Minimise the need for benches which can be visually jarring and create areas that are hard to maintain. Cut and fill batters should be feathered into the natural landform.

**Safety:** Landscape treatments must be safe to implement and maintain, and safe for road users and pedestrians. Locate trees outside clear zones and away from utilities. Ensure that the performance of crash barriers is not adversely affected by plants. Select plants of the right height which will not obstruct sightlines at maturity.

**Soil:** Topsoil compaction, inadequate topsoil depth and mixing of topsoil and subsoil will reduce plant success and plant resilience to drought and waterlogging. Design for a minimum 300mm rooting depth for shrubs and 500mm for trees. Avoid using weed mats as they can lead to plant failure and hinder natural succession - instead use organic, living or gavel mulches.

**Screening:** Integrate the infrastructure project in the landscape or screen specific elements through selective planting. Planting along retaining or noise walls can be an effective tool to deter graffiti, vandalism and unauthorised access. Select plants that will screen to the required heights and density with minimum maintenance requirements. Screen planting should not obstruct important views.

**Inspection:** The plants and topsoil must be inspected prior to planting to ensure quality of product and alignment with the planting plans and specifications. A minimum of two year defects and maintenance period should be required with inspections by the landscape architect at the end of summer and winter, and remedial work undertaken in spring and autumn.

**Space:** Allocate adequate space for landscape treatment. Narrow strips of land for verge and medians will generally result in poor landscape outcomes.

**Ecological services:** In addition to its amenity and screening purposes, landscaping is required to support ecological processes, augment existing habitats, reinstate wildlife corridors and connections, filter stormwater runoff and improve air quality. Benefits can also be gained from recycling and reusing materials such as top soil and mulching on-site where possible.

**Maintenance:** Project specific maintenance plans should be developed alongside the landscape plans. Recreating natural landscapes can minimise long term maintenance requirements and increase their ecological value. Consider hardscape treatments under crash barriers and highway furniture and delineate mowing areas from the carriageway with concrete strips to minimise the need for weed spraying.

**Low impact design:** Low impact stormwater devices such as swales, wetlands, ponds, rain gardens and bio-filtration systems help attenuate road runoff and remove pollutants. Integrate stormwater devices with the landscape design to connect open spaces, be compatible with pedestrian and cycle networks and contribute to local amenity and ecology.

The NZTA Guidelines for Highway Landscaping should be read in parallel with this document and provides best practice guidance on landscape treatments as it relates to the various phases of an NZTA project

Right: SH1, Te Rapa  
Source: Opus



## Detailed guidance

### USE OF GRASS

Grassing extensive areas of corridor as part of a new project may minimise the initial landscaping costs but will significantly increase NZTA's whole of life maintenance costs, particularly if costly traffic management is required to undertake maintenance works.

Much of the maintenance costs associated with vegetation are for grass mowing including areas unable to be tractor mown and requiring costly hand mowing with weed eaters. This often results in significant losses of network efficiency as lane closure are implemented. For this reason, grass should not be used in medians and narrow areas such as gores.

Steep slopes are hazardous to mow and should generally not be grassed. A slope of 1:5 or shallower is ideal for safe mowing.

Medians narrower than 7m between the edges of the live lanes should not be grassed as they are difficult to maintain and often dry out in summer resulting in unsightly brown strips.

### WEED SPRAYING

Avoid planting under barriers and at the base of highway furniture (light poles, signpost, etc) which will require weed spraying. These sprays can be corrosive to the steel and leave unsightly dead vegetation. Use flush concrete pads at the base of highway furniture to facilitate mowing. Delineate the edge between pavement (shoulder) and vegetation with a flush kerb to minimise the need for weed spraying.



### CASE STUDY: ONEWA INTERCHANGE

Onewa Interchange has undergone extensive roading improvements sparked by the construction of the Northern Busway.

The interchange is located on the edge of Shoal Bay, on the flats of reclaimed land and at the junction of three key elements; cliffs, flats and water. The planting scheme has adopted these basic elements in the selection of pohutukawa and coastal flaxes of the embankments (cliff), the saltmeadow planting (flats) and the wetland pond and swale planting (water).

The new interchange has two overbridges with a new dedicated bus lane and bridge. Bridge structures have been kept low and incorporate sweeping visual lines. Fish patterns have been imprinted onto the bridge structures to reflect local iwi historical use of this area.

The new bridging arrangements have increased the complexity of visual elements within the interchange. To balance this effect, a strong, simple hierarchy of planting has been created that will unify these elements and give visual cohesion to the complicated arrangement of off ramps, on ramps and overbridges.

The planting patterns in association with the creation of wetlands and ponds, also seeks to soften the previously hard interface between land and water and instead acknowledges and embraces the coastal edge, the water and specific location on Shoal Bay.

Views from Onewa Road entering the interchange towards Shoal Bay, Auckland City and Takapuna are recognised as some of the most stunning vistas on the motorway. New planting species were selected and plants have been located with these views in mind to minimise and avoid disruption.

#### Planting under bridges - new designs.

**Problem:** Very dry areas under bridges means no water for plants to survive. The bridge creates a rain shadow area of dry ground where planting struggles to succeed.

**Solution:** tap into existing stormwater collection chambers through the use of soft piping and direct water from these chambers to dry areas. Water released through drip emitters has recharged soil moisture levels. A noticeable increase in plant survival and improved health has been observed in a short time.

Source: Opus

### CASE STUDY: LANDSCAPE NOISE BUNDS - ROLLESTON

Landsaped noise bunds are particularly successful in more rural environment and where space allows. Excess fill from the earthworks on a project can be used rather than trucked off-site. Once the planting is established it is a low-maintenance design solution.



### 4.23 PUBLIC ART

#### Key design issues

Public art can be successfully integrated in the design of highway corridors to deliver a number of benefits. Public art can:

- Create a sense of arrival, a memorable event along a journey or a distinctive marker to help road users know where they are
- Bolster the local community's identity and sense of civic pride
- Help integrating infrastructure elements such as noise walls and retaining walls into their context
- Engage the community by celebrating the local heritage, cultural identity and themes which are relevant to the locality
- Integrate Maori heritage and values in the design
- Make public spaces more interesting and attractive
- Provide a commentary on contemporary issues.

In addition, participation in the process of selecting or developing artworks can strengthen connections between community groups, encouraging a dialogue about community life. Communities are often proud of their achievements and have a strong sense of ownership of successful artwork.

Public art in NZTA projects includes sculpture, planting, lighting, earthworks, the use of colour and the architectural design of structures. Artists may be involved in the design of noise walls, pedestrian and road bridges, retaining walls, tunnel portals, ventilation stacks, underpasses, boardwalks, interpretative signage and other aspects of highway projects.

Issues can arise with artworks where they have not been appropriately designed or located for the context leading to shorter than expected lifespan or where they require complex maintenance which has not been appropriately planned or budgeted for. Both these issues can be overcome through good planning.



'Sinton House Window' John Radford, SH18, Auckland

'Colours of our History' Artist: Miriam Van Wezel, Victoria Park Viaduct Column project  
Photographer: Simon Devitt



## Urban design guidance

The following guidance should inform the integration of public art into highway projects:

**Art strategy:** Prior to engaging an artist, an arts strategy identifying potential art opportunities and suitable locations for public art should be developed for the project. This strategy will usually be integrated in the Urban and Landscape Design Framework. The strategy will allow ideas to be explained and can be easily circulated to stakeholders. It may also be used as a background document for the artist's brief.

**Art coordinator:** Complex art projects need co-ordination and management if they are to be a successful part of a highway project. The lead urban designer on the project can generally act as public art coordinator. A group may also be convened to provide specialist input and advice at an early phase in a project. The group may provide community or art-based feedback, advocate on behalf of the project and offer structured commentary on the creative process.

**Community involvement:** Explore opportunities to involve the community in the selection, design and placement of the artwork, possibly through representation on the art coordination group.

**Selection:** Selecting the right artist to work on a public art project is central to a successful outcome. There are a number of ways an artist can be engaged to undertake public art by:

- › Interview
- › Short listed artists to develop concept
- › Commissioned artist with particular expertise
- › Engaging artist with experience in working with communities or specific cultural groups.

**Budget:** Good public art requires sufficient budget. Develop individual artworks in response to a known budget allocation. Once identified the budget should be a stand-alone line item in the project budget and not be subsumed in landscape or other budgets.

**Local authority:** Public art projects may require support and cost-sharing by the local authority. Prior to the submission of the arts strategy and concept designs the arts coordinator and the project team should meet with the local authority to present ideas and directions and confirm the approach. Some local authorities have a public arts panel which can help selecting an artists and developing the brief.

**Design Development:** Understanding how the completed work will look on site and how it will function is an important part of accepting the artwork. The artist should be given every opportunity to explain the work, show selected textures, colours and materials, and demonstrate special design effects such lighting components. The artist may prepare models, images, and drawings to make this process easier. The project team may discuss their response and raise any concerns or issues in relation to the function, costs, safety, maintenance or other matters. A formal sign-off of the final design should be in place prior to the fabrication phase of the artwork.

**Fabrication:** Art-making is a customised process and there are many methods and approaches to fabricating the final artwork. Whether fabricated off-site or in situ, there is a need for clear lines of communication regarding decision making, responsibilities and contractual obligations. These need to be resolved prior to fabrication commencing.

**Safety:** Public art must not create a hazard for road users or a distraction for drivers. The artwork must be positioned outside the 'clear zone' and forward sight lines. Avoid reflective materials and flashing lights which may distract drivers. The artwork must be positioned so it can safely be accessed for maintenance.

**Maintenance:** Public art should be robust and long-lasting. This requires the same attention to detailing, maintenance and repair as other structures along the State highway network. Appropriate routine maintenance works such as cleaning, repair, replacement of loose, damaged or vandalised elements should be included in the project's maintenance plan and asset management manual. The involvement of the artist in both repair and maintenance should be specified.

**Decommissioning:** Public art has a finite lifespan. Circumstances may arise where the artwork requires removal; a plan should be prepared in consultation with the artist to confirm the appropriate steps for the removal. Disposal of the work or relocation to another area should be undertaken in consultation with the artist.

## CASE STUDY: NZTA SHOWCASES NZ HERITAGE IN HARBOUR BRIDGE LANDSCAPING

The NZTA has mixed nuts and bolts with some of New Zealand's best written and spoken words to complete the first stage of a landscaping project under the northern end of the Auckland Harbour Bridge.

Words spoken or written by a prominent Maori chief from Auckland/Tamaki Makaurau and seven of New Zealand's well known writers have been painted on piers supporting the box girder that carries northbound traffic above Stokes Point.

'Given the importance of the bridge as the critical transport link across the Waitemata Harbour, it is fitting to recognise these eight New Zealanders who themselves have links with the harbour and the North Shore,' says the NZTA's Asset Manager for Auckland and Northland, Steve Mutton.

The paintings include excerpts of poetry and prose written by Janet Frame, Bruce Mason, Frank Sargeson, A.R.D. Fairburn, Maurice Duggan, Kendrick Smithyman and Robyn Hyde (Iris Wilkinson). There is also a quotation from the Waitakere chief, Te Waatarauhi, speaking in 1860 of his relationship to the area.

The paintings are known as 'The Trestle Leg Series' - engineers describe the piers supporting both box girders (clip-ons) at Stokes Point as trestle legs.

The NZTA project team is lead by landscape architect, Cathy Challinor from the design and environmental consultancy, Boffa Miskell. Local iwi representatives and literary experts and artist Catherine Griffiths contributed to the series, and specialist signage companies, Signright and Designcraft, installed the work.

'It's a unique opportunity to showcase heritage important to Auckland and New Zealand in such a special and public place,' says Cathy Challinor.

The NZTA made a commitment to the Stokes Point community that the area would be landscaped when its project to strengthen the box girders on either side of the harbour bridge was completed.

'Our neighbours give us fantastic support, and we hope the new look outside their front doors will be welcomed by them and by visitors to the area,' Mr Mutton says.

Stage 2 of the project includes landscaping, improved lighting and paving, and more recognition of natural and cultural landmarks acknowledging that Stokes Point was previously home to a busy Maori community at Te Onewa Pa.

'It is our wish that all the landscaping will reflect the importance Stokes Point has had, and continues to have, to many, many different generations: a place to live, and a place to celebrate a wonderful part of Auckland's natural environment, as well as its cultural and engineering heritage,' Mr Mutton says.



**'It is our wish that all the landscaping will reflect the importance Stokes Point has had, and continues to have, to many, many different generations: a place to live, and a place to celebrate a wonderful part of Auckland's natural environment, as well as its cultural and engineering heritage.'**



## CASE STUDY: INTEGRATING ENGINEERING AND ART

### Victoria Park Tunnel, Auckland

The Victoria Park Tunnel project required two emergency egress structures to provide stair access to and from the tunnel, and house electrical and mechanical services to operate the tunnel. The egress structures are critical to the safe operation of the tunnel however were a challenge to the project team in that they needed to be housed in the regionally significant Victoria Park. The team rose to the challenge and through, engineering, architecture and art transformed essentially utilitarian, concrete structures into distinctive park features.

The southern egress structure in particular has been highly successful. Through innovative design the structure was minimised in size and as such effect by stacking of the equipment. The artists developed a kuta (native reed) pattern to cloak the structure on three sides which is lit at night. On the fourth side, due to its prominent location next to Victoria Street and facing the intersection with Franklin Road a back-lit 'art box' displays a piece of art that simply represents the history of the site, being water, while incorporating the tukutuku pattern utilized elsewhere on the project.

Through innovation, what could have been a negative addition to the park has successfully being turned into something that adds value.



## 4.24 PUBLIC OPEN SPACES

### Key design issues

Open spaces can provide a green backdrop to a neighbourhood and a focal point for the community. They can be used for active or passive recreation or just passing through. They can also be of cultural significance to the community and support biodiversity. There are many reasons why communities feel a strong connection to their local open space. This means that highway projects which impact on public open spaces are also likely to impact the local community.

Where a new or widened highway encroaches into existing public open spaces, it may impact the quantity and quality of open space, including the functionality of recreational facilities such as playing fields. The highway may also impact the accessibility of the open space, its ecology, personal safety and amenity. In such cases, it will be necessary to mitigate these adverse effects of the project through the provision of replacement open spaces. These opportunities should be seized on and maximised as part of the project in order to provide a highly valued and positive community asset.

There are two conceptual approaches to the replacement of open space. The 'network approach' seeks to mitigate the loss of open space through improvements to the quality, usability and accessibility of the remaining open space network. This may include upgrades to existing parks, pathways, facilities, and vegetation in the general area of the project. The 'land for land' approach seeks to replace the amount of open space lost with a similar land area in a suitable location.

Where a realigned or widened highway comes close to an open space, it may affect its amenity through vegetation removal, exposure to noise or exposure to views of infrastructure or moving traffic. Various design measures can be adopted to mitigate such effects.

There may also be situations where new open space is created as part of State highway projects. The ultimate function, ownership and responsibility for the on-going operational and maintenance requirements of the new space are issues which require early consideration.



Kuaka Park has become a popular community play space.  
Source: Boffa Miskell

## Kuaka Park was developed for the local community by the NZTA as part of the Waterview Connection project



## Urban design guidance

The following guidance should inform the integration or reinstatement of open spaces in highway projects:

**Planning:** Any changes to existing open spaces need to align with the local and regional authorities' open space policies and management plans.

**Connectivity:** Open spaces should not be considered in isolation but as physically connected networks and continuous green corridors which provide a range of benefits including recreational activities such as walking and cycling, ecological connections, and protection of natural features.

**Accessibility:** Open spaces need to be integrated with the surrounding walking and cycling networks. In urban areas, open spaces should have good links to schools, commercial and community facilities, and public transport.

**Visibility:** In urban environments, open spaces should be visible from the surrounding street network and adjoining neighbourhoods. Visibility is important in deterring crime and anti-social behaviour.

**Active recreation:** Facilities for active recreation, such as sport pitches, have specific functional requirements such as minimum dimensions, orientation, drainage, safety zones, space for spectators, support buildings, parking and

vehicular access which cannot be altered without compromising their usability. These requirements need to be considered if an open space is to be reduced in size or reconfigured.

**Passive recreation:** Passive recreation includes activities such as picnicking, bird watching, kite flying and walking. The quality of open spaces provided for passive recreation is influenced by the tranquillity of the space, the ambient noise level and the absence of discordant visual elements such as moving traffic or glare. These factors need to be considered when designing or reconfiguring open spaces intended for passive recreation.

**Multidisciplinary approach:** The design of open spaces is interlocked with ecology, drainage, landscape, vibration, noise, air quality and construction issues. An interdisciplinary approach is needed to address these issues holistically.

**Legal aspects:** Some open spaces are provided and managed as reserves under the Reserves Act to protect a range of special features or values, including recreational, historical and community ones. Changes which compromise such a reserve's special features or values will

have consenting implications which need to be understood at an early stage in the project.

**Ownership:** Where a new open space is created as part of a highway project, it can either be vested with the local authority or retained by the NZTA. The ultimate owners of the open space should be involved in its design and in decisions which influence the on-going operational and maintenance costs associated with the new space.

**Safety:** New and reconfigured open spaces need to be designed to minimise the opportunities for crime and anti-social behaviour.

**Vegetation:** When reconfiguring an existing open space, minimise the removal of established vegetation as it takes time for replacement vegetation to grow and provide screening effects. The removal of vegetation may also undermine existing ecological habitats.

**Watercourses:** Avoid modifying or channelling natural watercourses. Highway projects may create opportunities for naturalising and daylighting previously channelled or culverted waterways. These opportunities should be considered early on.



## CASE STUDY: A PARK FIT FOR A CENTENARY

### Memorial Park, Wellington

In August 2012, the Prime Minister announced funding to put the Buckle Street section of SH1 (between Tory and Taranaki Streets in central Wellington) underground and create a new, unified memorial precinct at the New Zealand War Memorial. The new park will be ready in time to serve as the centrepiece for the centenary commemorations of the Gallipoli landings in April 2015.

The National War Memorial was erected on its prominent location in 1919. The site had been used as a pa by Te Ati Awa and for military purposes by the Government since 1847. The original intention was to create a boulevard from the Memorial to the waterfront but this never eventuated and the Memorial precinct became isolated over time and is now divided by State Highway 1.

The Memorial Park project involves lowering part of State Highway 1 into a trench and roofing it over with an overhead support system (a 'cut and cover'). Memorial Park will then be built on top, and the road safely integrated back into the surrounding network.

The Park will unite the elements of the national memorial precinct, including the Tomb of the Unknown Warrior, the National War Memorial, the Hall of Memories and the National Carillon.

Image: Wraight + Associates and Athfield Architects

## CASE STUDY: DEVELOPING A WORLD CLASS SKATE AND CYCLE PARK

As part of the Victoria Park Tunnel project in Auckland, the skate park had to be closed to allow for construction of the project. However, the temporary loss of the park allowed for its redevelopment into a world class facility which is now actively used and enjoyed by the community.

Designed as an urban plaza, elements in the park are styled to look like natural street terrain with stairs and benches. It features a bowl, a BMX jump box, a mini ramp and two quarter pipes. Concrete benches and planter boxes provide seating for visitors wanting to enjoy the action and the northern egress structure from the Victoria Park Tunnel has been successfully integrated into the space.



Photographer: Ken Downie



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**APPENDIX 1:  
USEFUL  
DOCUMENTS  
AND REFERENCES**



**NZTA documents:**

- Lester, T (2010) Public lighting for safe and attractive pedestrian areas, NZ Transport Agency research report 405.
- Land Transport NZ (2005) Cycle network and route planning guide, LTNZ, Wellington.
- NZ Transport Agency (2013) Bridge Manual 3rd Edition, NZTA, Wellington.
- NZ Transport Agency (2010) Erosion and sediment control standard for state highway infrastructure, NZTA, Wellington.
- NZ Transport Agency (2012) Guide to assessing cultural heritage effects for state highway projects (Draft), NZTA, Wellington.
- NZ Transport Agency (2007) Pedestrian Planning and Design Guide, NZTA, Wellington.
- NZ Transport Agency (2010) State Highway Noise Barrier Design Guide, NZTA, Wellington.
- NZ Transport Agency (2010) Stormwater Treatment Standard for State Highway Infrastructure, NZTA, Wellington.
- Smith, P, Wilson, M and Armstrong, T (2011) 'I'll just take the car' Improving bicycle transportation to encourage its use on short trips, NZ Transport Agency research report 426
- Turner, S (2011) Benefits of new and improved pedestrian facilities - before and after studies, NZ Transport Agency research report 436.
- Vallyon, C and Turner, S (2012) Reducing pedestrian delay at traffic signals, NZ Transport Agency research report 440.

**Other New Zealand documents:**

- Austrroads (2012) Austrroads Research Report: Cycling on Higher Speed Roads. Australia / New Zealand: Austrroads.
- Austrroads (1999) Guide to traffic engineering practice: Part 14: Bicycles. Australia / New Zealand: Austrroads.
- Ministry for the Environment (2002) People, places, spaces: A design guide for urban New Zealand.
- Ministry for the Environment (2005) New Zealand Urban Design Protocol.
- Ministry of Justice (2005) National guidelines for crime prevention through environmental design in New Zealand.
- Ministry of Transport (2005) Getting there: on foot, by cycle.
- Ministry of Transport (2010) Safer journeys: New Zealand's road safety strategy 2010-2020.
- Palmerston North City Council (2013) Street Design Manual

**Overseas documents:**

- Institute of Transportation Engineers (2010) Designing Walkable Urban Thoroughfares: A Context Sensitive Approach. Washington, USA: Institute of Transportation Engineers.
- Jones, P (2007) Link & Place: A Guide to Street Planning and Design. London: Centre for Transport Studies, University College London.
- Roads and Traffic Authority of NSW (2000) Sharing the Main Street: A practitioner's guide to managing the road environment and traffic routes through commercial centres. Australia: New South Wales Government.
- Roads and Traffic Authority of NSW (2003) Bridge Aesthetics: Design guidelines to improve the appearance of bridges in NSW. Australia: New South Wales Government.
- The Chartered Institution of Highways and Transportation (2010) Manual for Streets 2.



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**APPENDIX 2:  
URBAN AND  
LANDSCAPE  
DESIGN  
FRAMEWORK  
GUIDELINE**



### INTRODUCTION

The following outlines the process to be followed through the planning, design and construction phases of a state highway project when an Urban and Landscape Design Framework (ULDF) or Master Plan (ULDMP) has been commissioned.

ULDFs and ULDMPs are generally required for all urban and large or complex projects. This includes most greenfield projects or significant widening in rural environments and all projects in urban environments where there are potential impacts on the community. The National Office Urban Design Advisor will provide advice on when an ULDF or ULDMP should be produced.

The document shall be prepared by a suitably qualified urban designer and landscape architect.



## URBAN AND LANDSCAPE DESIGN FRAMEWORK

### PURPOSE OF URBAN AND LANDSCAPE DESIGN FRAMEWORK

The integration of large scale and/or complex road infrastructure projects into the surrounding environment involves a range of issues that need to be addressed to ensure that the best possible project is delivered for the benefit of all users. The purpose of an ULDF is to ensure that the urban and landscape design concepts for these projects are appropriately defined, developed and implemented. It provides a forum to capture and integrate the various elements of a project, and to ensure that the expertise of different members of the project team are working together. As such, an ULDF should encompass a wide range of disciplines including but not limited to:

- urban design
- landscape architecture (including visual impact assessment)
- architecture (bridges and structures)
- civil and structural engineering
- planning and transport planning (including walking, cycling and public transport)
- noise and air quality specialists
- stormwater/coastal/environmental engineering
- ecology
- property
- civic art.

An ULDF is used as a technical document to support the Notice of Requirement for the designation of a route and is a key tool for the NZTA in identifying how the project gives effect to the New Zealand Urban Design Protocol, which the NZTA is a signatory to. It is also used as an instrument for consultation and engagement with stakeholders and the community through the life of a project.

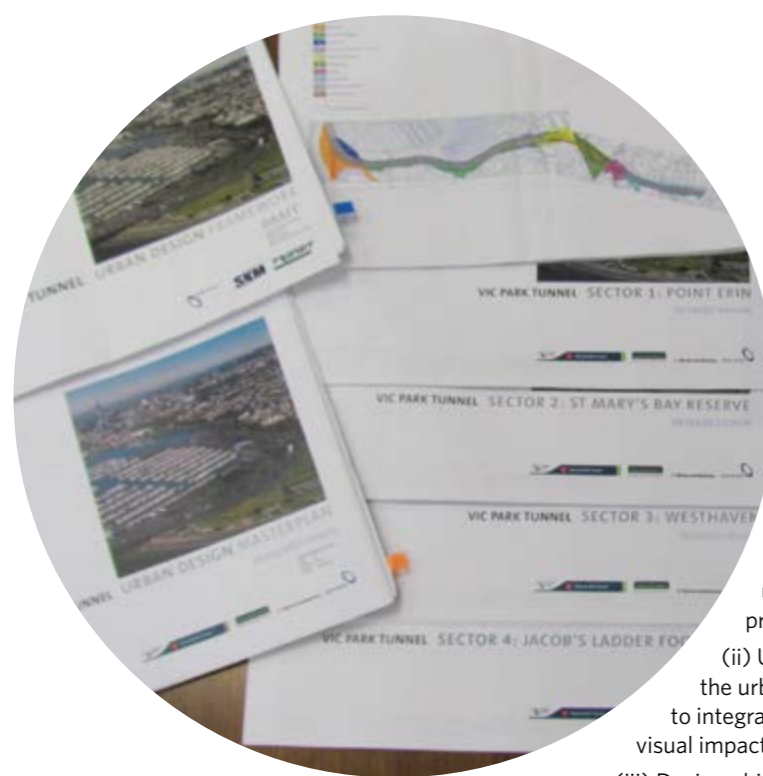
An ULDF will evolve through the planning, design and construction phases of a project and will need to be structured and designed in a manner that is specific to the project to which it is being applied. For projects that are mainly focused on route protection, the ULDF may focus on high level urban design objectives and principles for the state highway project and opportunities in the immediate surrounds of the project which could support other agencies' plans for these areas. Detailed designs developed during further stages of a project should be consistent with the objectives and principles presented in the ULDF. The objectives and principles should allow flexibility for a number of different solutions to be adopted in future stages of a project.

For projects that are likely to make use of an Outline Plan of Works Waiver or progress quickly from route protection to construction, the ULDF will need to be more specific and developed in the form of an Urban and Landscape Design Master Plan (ULDMP) - refer below. This will require design concepts to be prescribed in detail and designed to such a level to support the documentation for lodgement as well as guide the further phases of a project. Themes and solutions for delivery of the project through the detailed design and construction phase must be defined and implementation of concepts managed through the process.

From experience in New Zealand and overseas, this form of ULDF has been proven to be the best method to ensure quality control in the delivery of roading project as the risk from ad hoc design solutions and underestimated design costs are minimised through the specimen design, tendering and design and construct phase. This form of ULDF will better safeguard design commitments made to stakeholders and the community through the consenting phase of the project as they will be clearly reflected in the ULDF and will be incorporated within specimen designs, specifications and tender documentation. It will also enable the urban and landscape components of a project to be specifically priced and a provisional/tendered sum set aside to ensure that through the construction phase this money is secured and not reallocated to other areas of a project.



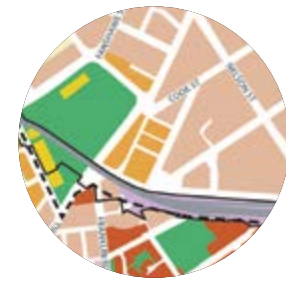
Figure 8-1: Route experience



**STRUCTURE OF URBAN AND LANDSCAPE DESIGN FRAMEWORK**

Numerous ULDFs have now been developed for highway projects and are available to view on the NZTA urban design webpage. Each ULDF is specific to the project and its context, however the following is an example of what an ULDF would typically address:

- (i) Strategic context - identifies the strategic planning context for the project and how the project might support other agencies future plans for the subject area. The ULDF will articulate the urban design logic of a State highway project and identify how the project will integrate and give effect to the strategic planning context.
- (ii) Urban/rural context - summarises key elements that compose the urban/rural context of the project and which the project will need to integrate with or be sensitive to. This is supported by the landscape and visual impact assessment.
- (iii) Design objectives/principles - identifies the design objectives and principles for the project, including:
  - › Road Design - a sensitive and cost effective design will help reduce visual, noise, severance and environmental impacts on the surrounding environment and communities. The ULDF will identify how this can best be achieved.
  - › Pedestrian and cycle facilities - road projects can result in the severance of communities and landuse. The ULDF ensures that the design provides for pedestrian and cycle movement and amenity. This includes suitable pedestrian and cycle crossing facilities as well as measures to improve the amenity and connect the network on either side of the road.
  - › Structures - the ULDF will identify how bridges, retaining walls and underpasses complement their context. This means considering the topography, the rural or urban setting, any existing structures, visibility of the structure and the length of its span, pedestrian and cycle access.
  - › Highway furniture - elements such as lighting, sign gantries and signage, guard rails, fences, wire rope barriers and median barriers should respond to the scale and character of the areas through which the project passes. The ULDF will identify how this will be achieved as well as how these difference elements will form and support a consistent and integrated design.
  - › Noise barriers - these must integrate with the design of the overall corridor and complement the motorway structures, landscaping and roadscape elements while being sensitive to adjacent land uses. The ULDF will provide principles to guide how this is to be achieved.

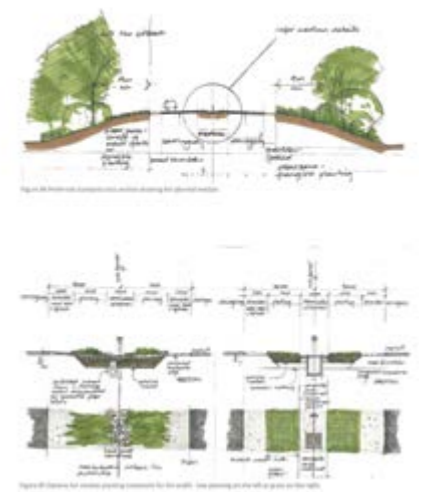
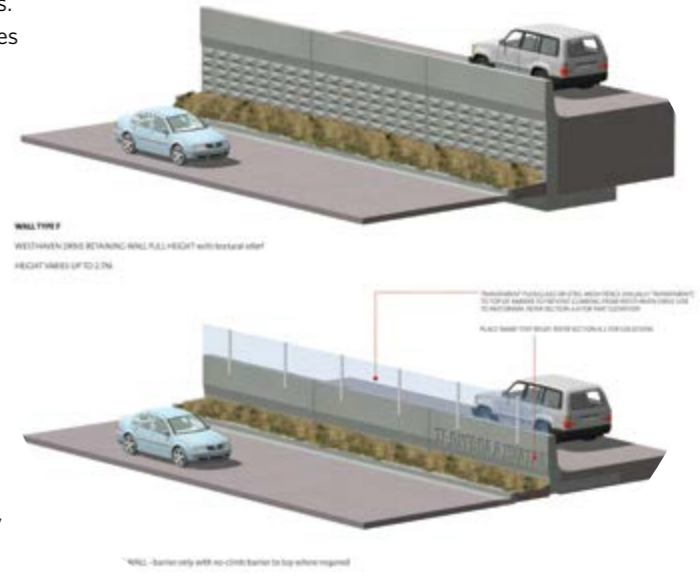


- › Landscaping - landscaping is an important component of road design. It is valuable in terms of public space planning, restoring and enhancing biodiversity, screening and softening undesirable views of roads and traffic, filtering air and water pollutants and suppressing weed growth. The ULDF will capture the landscape concepts for the project and consider future maintenance implications.
- › Stormwater - stormwater wetlands, ponds and swales are required to treat/retain surface waters before they are released in nearby waterways. Beside their drainage function, wetlands, ponds and swales should contribute to native biodiversity and create attractive amenity features.
- › Tunnels, portals and ancillary structures - the ULDF will identify how these elements can contribute to legibility, drivers' behaviour, integration with the surrounding area and visual interest for road users.
- › Integration with land uses and passenger transport - a key purpose of an ULDF is to capture how a project will integrate with the surrounding land use and how it will support and provide for passenger transport, through enhanced infrastructure provision. Understanding the strategic, urban and rural context of a project will assist in determining how the project will achieve this.
- › Land use reinstatement - often on projects there is an opportunity for reinstatement/rezoning of commercial, residential or open spaces land uses in suitable locations. Such reinstatement/rezoning reduces the long-term impact of a project on the surrounding communities. With stakeholders the project team should identify how this is to be achieved and outline the process in the ULDF.
- › Public space planning - the ULDF will assist with identifying how the road itself will be designed as a public space. Where parks, pedestrian and cycle facilities are provided as part of the project the ULDF shall identify the design concepts and ensure integration with the landscaping, stormwater treatment and roadscape elements of the project.

Where possible, design elements should have multiple functions. Using stormwater treatment as an example - the wetland treats the stormwater, creates an amenity feature, increases biodiversity and can assist with visual mitigation of the roading infrastructure.

**PURPOSE OF URBAN AND LANDSCAPE DESIGN MASTER PLAN**

An Urban and Landscape Design Master Plan (ULDMP) will evolve from the ULDF. The ULDMP is generally developed during the detailed design phase of the project and illustrates the urban and landscape design elements of a project. The ULDMP supports the Outline Plan of Works required under the RMA; any further engagement with stakeholders; and will be the plans on which the construction drawings are based.



### STRUCTURE OF ULDMP AND DETAILED ULDF

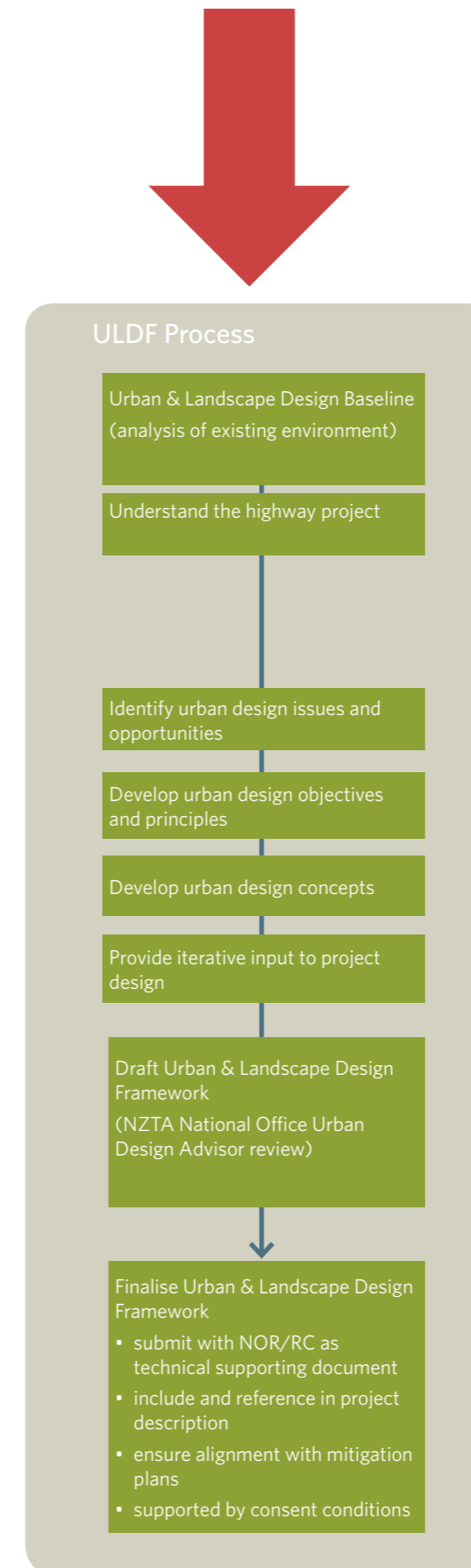
The following is a list of a number of key features that may be included in an ULDMP and a more detailed ULDF. These features will be defined through text, location plans and drawings – plan/section/elevation as required. The level of detail should remove any ambiguity from the design and build on any previous work from the ULDF.

- Pedestrian and cycle facility plans including street furniture and network connectivity
- Bridge and structure designs
- Landscape and planting plans
- Noise barrier designs
- Open space plans including any stormwater measures such as wetlands; earth bunds etc
- Passenger transport facilities such as bus stop infrastructure, including bus shelters
- Highway furniture such as barriers, fences, lighting, signage gantry and sign plans
- Land use reinstatement plans
- Artworks
- Colour and material specifications
- Maintenance requirements and graffiti resistance measures

### TYPICAL URBAN AND LANDSCAPE DESIGN PROCESS

The ULDF will guide the detailed design phase of the project to ensure that the concepts developed and submitted as part of the statutory process are fully implemented and coordinated with the final design of the project.

Following is a typical process to be followed when an ULDF is developed. This includes the advice and review role of the National Office Urban Design Advisor.



APPENDIX 3:  
NZTA URBAN  
DESIGN  
ASSESSMENT  
GUIDELINE

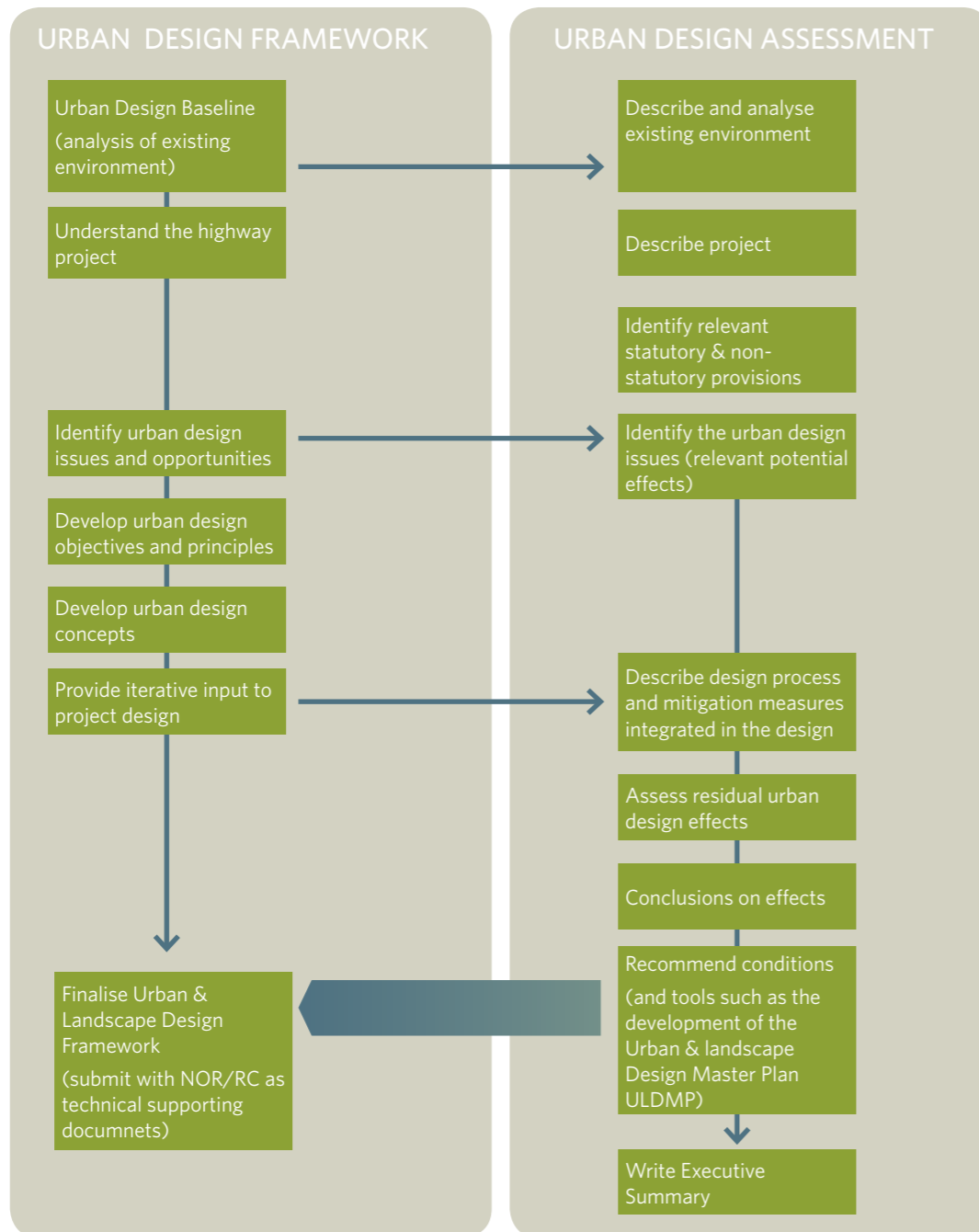


## 1.0 INTRODUCTION

These guidelines cover urban design assessments (UDA) for New Zealand Transport Agency (NZTA) projects. The NZTA's Environmental and Social Responsibility Policy requires good urban design to be integrated into all of the NZTA's activities.

UDAs are technical reports that form part of the Assessment of Environmental Effects (AEE) for resource consent applications and Notices of Requirement (NoR). UDAs are therefore focused on RMA processes. They are a parallel 'work stream' to that of the Urban Design and Landscape Framework which is focused on design input to the project. However, the two work streams are necessarily closely interwoven as illustrated by Diagram 1.

Diagram 1: Urban Design Framework and Urban Design Assessments



## 1.1 PRINCIPLES

The purpose of an UDA is to assist the RMA decision-makers. It should be:

- tailored to the relevant RMA issues;
- tailored to the specifics of the project;
- succinct and readable;
- integrated with the design process (so that the project design itself seeks to avoid, remedy and mitigate adverse effects as far as practicable and opportunities are taken to incorporate positive effects as part of the design) and linked to other disciplines (such as landscape, ecology and civil engineering);

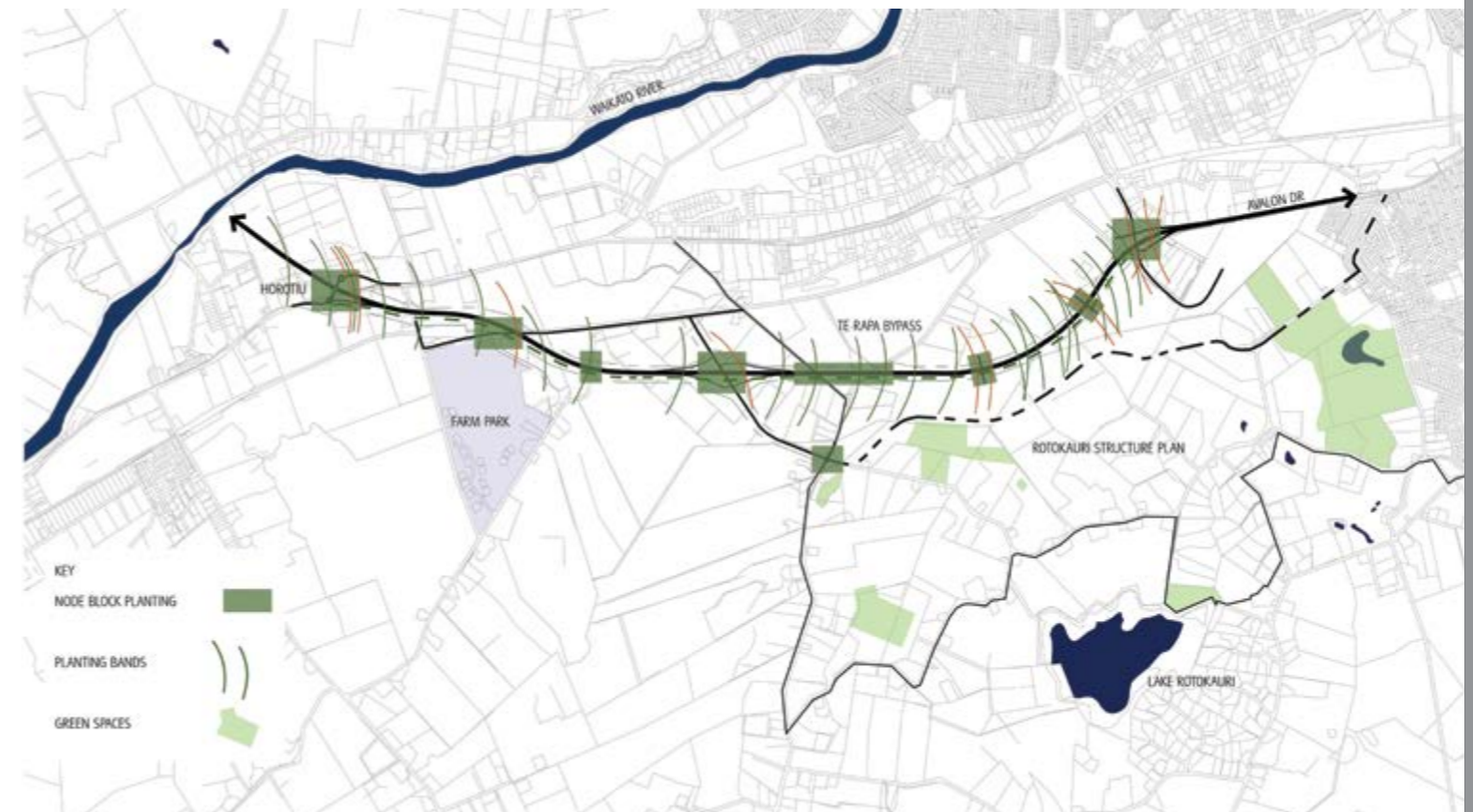
## 1.2 CONSISTENCY WITH CODE OF CONDUCT

An UDA should also be consistent with the Code of Conduct for Expert Witnesses because the assessment may provide the foundation for subsequent evidence. In summary it should therefore:

- be impartial;
- include all relevant matters (including those detrimental to the client's case);
- explain the facts, assumptions and reasons behind the opinions expressed;
- list any literature relied on;
- describe the methodology.

## 1.3 LEVEL OF DETAIL

The level of detail should correspond to the scale and significance of the urban design effects the activity may have on the environment (following the principle set out in RMA s88). An UDA for a project with minor potential effects should be brief, whereas complex or large scale highway projects with potentially significant effects require a more comprehensive assessment.



## 2.0 CONTENTS OF AN ASSESSMENT

Organise the UDA under the following main headings:

- Executive Summary
- Project Description
- Relevant Statutory and Non-Statutory Provisions
- Existing Environment
- Alternatives
- Design Methodology and Mitigation Measures integrated in the design
- Assessment of (Residual) Urban Design Effects

Such a structure incorporates the matters to be included in an AEE set out in RMA Schedule 4(1). While the UDA is a technical report, the AEE will draw on material from the UDA so it is helpful if the UDA adopts a similar structure.

However the sub-headings and content should be tailored to the specifics of each project. For instance, the sub-headings under 'Existing Environment' and 'Urban Design Effects' should reflect the particular context and the urban design issues specific to the project. Avoid following a formulaic approach that does not focus on the pertinent issues. Such an approach is often the result of an uncritical reliance on templates. While the main headings listed above provide a basic structure, an intelligent approach needs to be taken to the sub-headings and content.

Use appendices to keep the main UDA succinct. Detailed analysis and background material are best placed in appendices. Similarly the UDA might refer to more detailed material included in an Urban and Landscape Design Framework which can be attached to the UDA.

The UDA should also outline the role of the author (or the author's firm) in the project. Urban design should be an integral part throughout the planning and design of a highway project. It is desirable for the UDA author (and person who will subsequently give evidence) to be involved in the design development process.



NZTA projects in the context of Auckland central

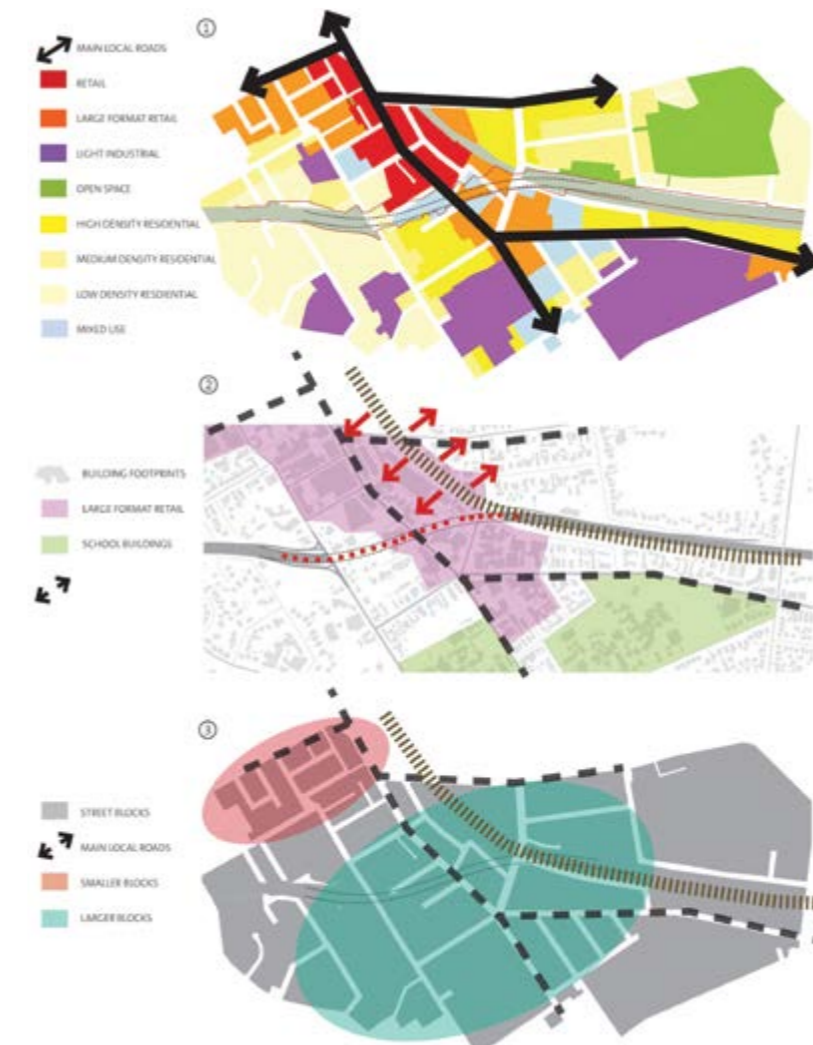
## 3.0 THE EXECUTIVE SUMMARY

Include an executive summary to assist the decision-makers:

- identify the main urban design issues (potential effects relevant to RMA considerations);
- summarise any alternatives considered
- summarise the design measures incorporated into the project to avoid, remedy or mitigate potential adverse effects, and similarly summarise measures incorporated into the design that may achieve positive urban design effects.
- summarise the (residual) urban design effects (their nature and magnitude);
- provide a conclusion with reasons on each urban design issue.

The Executive Summary should be a coherent stand-alone statement. It may be extracted straight into the AEE, and may be the only part of the UDA some people will read.

An executive summary should be approximately 1-3 pages depending on complexity of the project.



Land use zoning and urban structure defined within the Newmarket Viaduct Landscape & Urban design Framework



The TeRapa Section of the Waikato Expressway, and it's urban and rural context

## 4.0 PROJECT DESCRIPTION

Briefly describe the physical works proposed project, highlighting those aspects relevant to urban design. Such aspects are likely to include the general road alignment and basic parameters, intersections with the local road network, structures, and pedestrian and cycle provisions. The description should not simply repeat the official Project Description (PD) (usually prepared by the Planners or Engineers). Rather it should:

- Be concise (it may be as short as a paragraph and should be no more than 1 page);
- Focus on elements relevant to urban design; and
- Refer to the official project description with which it should be consistent.

## 5.0 RELEVANT STATUTORY AND NON-STATUTORY PROVISIONS

Because the role of the urban design assessment is to assist the decision-makers, it should be written in a way that addresses the matters the decision-makers will consider under the RMA. It is important, therefore, that the author understands and correctly summarises the RMA context. It is recommended that the relevant RMA context be discussed and clarified with the project planner or lawyer.

As a general guide, matters to be considered when deciding an application for resource consent or a NoR are set out in RMA s104 and s171 respectively, and those relevant to an UDA include:

- urban design effects of the proposal;
- provisions of policy statements or plans relating to urban design issues;
- alternative locations or methods; and
- other relevant matters (eg non-statutory documents such as structure plans, urban design policies)

The matters listed above are subject to Part 2 of the RMA which has the overriding purpose of promoting the sustainable management of natural and physical resources, the definition of which includes the ability of communities to provide for their social, economic and cultural well-being and for their health and safety. Those sections of Part 2 likely to be most relevant to an UDA are listed below.

Section 5	Purpose and principles of the RMA
Section 7 (b)	The efficient use and development of natural and physical resources
Section 7 (c)	Maintenance and enhancement of amenity values
Section 7 (f)	Maintenance and enhancement of the quality of the environment

Recommended wording to use in relation to the relevant provisions of the RMA is included in the side bar. Seek further advice from the project's planner on the relevant provisions of policy statements and plans.

This section of the UDA should typically be 1 to 2 pages long, highlighting the most pertinent points. More detailed material can be placed in an appendix.

It is stressed that the UDA is not a planning assessment: It is the planner's role to assess the project against the relevant provisions. The purpose for identifying provisions in the UDA is so that the assessment is framed in a way that focuses on the urban design matters that the decision-makers will consider.



Example of a design response to future land use at the TeRapa Section of the Waikato Expressway

### RECOMMENDED STANDARD TEXT FOR THE PART OF THE 'RELEVANT STATUTORY AND NON-STATUTORY PROVISIONS' SECTION WHICH ADDRESSES THE PROVISIONS OF THE RMA ITSELF

'Both a notice of requirement for a designation and an application for resource consent must, among other things, provide information as to the effects that a proposed Project would have on the environment and the ways in which any adverse effects would be mitigated. For resource consent applications this assessment

- is required to be undertaken to a level of detail which corresponds with the scale and significance of the effects that the activity may have on the environment; and
- is specifically required to include consideration of effects on both the immediate neighbourhood and, where relevant, the wider community.

When considering a notice of requirement for a designation or an application for resource consent a Council, Board of Inquiry or the Environment Court must, 'subject to Part 2 of the RMA', consider (among other things):

- the effects on the environment of allowing the requirement or activity.
- any relevant provisions of an operative or proposed RMA plan or regional policy statement; and
- any other matter they consider relevant.

Under Part 2 of the RMA they must, among other things:

- Have particular regard to:
  - › the maintenance and enhancement of amenity values
  - › the maintenance and enhancement of the quality of the environment.
  - › any finite characteristics of natural and physical resources.

### NZTA POLICIES AND GUIDELINES

The following NZTA documents are relevant to urban design matters:

NZTA DOCUMENTS	DESCRIPTION
Environmental and Social Responsibility Policy	High level policy which includes NZTA's over-arching goal of promoting an accessible and safe transport system that contributes positively to NZ's economy, society and environment, and a commitment to acting in an environmentally and socially responsible manner.
Bridging the Gap: NZTA Urban Design Guidelines	Guidelines covering a wide range of issues related to urban and landscape design.
NZTA Guidelines for Highway Landscaping	Guidelines covering aspects of landscape design, construction and maintenance in State highway projects

## 6.0 EXISTING ENVIRONMENT (DESCRIPTION AND EVALUATION)

### Defining 'Urban Design'

Include a definition of the term 'urban design'.

A recommended definition is contained in the NZ Urban Design Protocol of which NZTA is a signatory:

'Urban design is concerned with the design of the buildings, places, spaces and networks that make up our towns and cities, and the ways people use them. It ranges in scale from a metropolitan region, city or town down to a street, public space or even a single building. Urban design is concerned not just with appearances and built form but with the environmental, economic, social and cultural consequences of design. It is an approach that draws together many different sectors and professions, and it includes both the process of decision-making as well as the outcomes of design.'

The definition highlights that urban design addresses a range of elements and systems (eg circulation networks) that make up urban areas, that it spans different scales, that it is concerned with the functioning of such elements and systems (not just their appearance), and that it is a design process integrating a number of disciplines. NZTA's Urban Design Policy contains the following definition that covers similar matters, and also defines urban design in a way that covers aspects of rural as well as urban settings.

'Urban design involves the design and placement of buildings, roads and open spaces in towns and cities to create desirable places in which to live, work and play. On a large scale it is concerned with urban and rural structure, the pattern of buildings, open space, and movement networks. On a small scale, it is concerned with urban and rural character and function and how roads, open space, and buildings interact, appear and function.'

### Describing the Existing Urban Design Environment

Describe and analyse the existing urban design environment highlighting those aspects relevant to the project. Determining which aspects are relevant requires critical judgement. Where relevant, refer to the more detailed assessment of the urban and rural context in the Project's Urban and Landscape Design Framework. The following table lists typical factors that might be relevant.

#### Role of Urban Design and Landscape Frameworks

NZTA policies require ULDFs to be prepared for major projects as part of a commitment to high quality landscape and urban design outcomes including integration of NZTA projects with the landscape and urban environments through which they pass. The UDLF typically contains principles and design concepts or guidelines. It is the framework for the urban design (and landscape) component of the project at the NoR or consenting phase, and is also intended to guide the further development of the design during subsequent design stages.

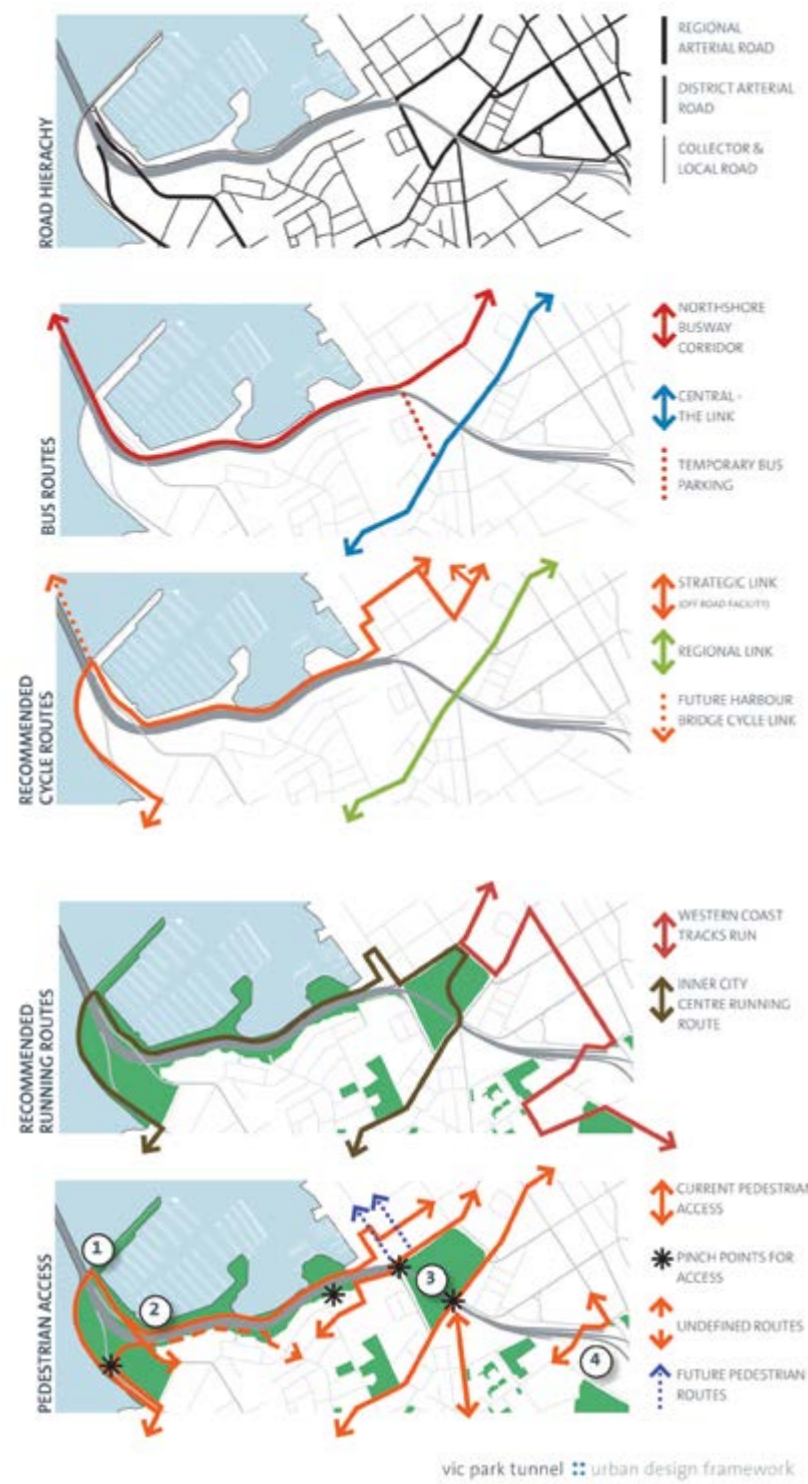
The role of the UDLF in relation to the UDA includes the following:

- The UDLF explains and describes the urban design principles incorporated in the project design (ie to the 'Project Description');
- The UDLF explains the context for the Urban Design Plans that are referred to by the recommended Conditions;
- The UDLF provides a framework (including principles and guidelines) to guide further development of subsequent design stage of the project, and a benchmark against which such design development can be 'certified';
- The UDLF provides a framework for such devices as Urban Design Management Plans, and a benchmark against which such Management Plans can be certified;
- Sufficient flexibility needs to be retained in an UDLF to enable:
  - Design development, or evolution, during subsequent stages of the design process (for instance during design development as part of a Public Private Partnership (PPP), or design development in consultation with stakeholders);
  - Incorporation of long term visions that may extend beyond the timeframe of an immediate project; and
  - Incorporation of development by other parties (such as Local Authorities).

**'Urban design is concerned with the design of the buildings, places, spaces and networks that make up our towns and cities, and the ways people use them. It ranges in scale from a metropolitan region, city or town down to a street, public space or even a single building. Urban design is concerned not just with appearances and built form but with the environmental, economic, social and cultural consequences of design. It is an approach that draws together many different sectors and professions, and it includes both the process of decision-making as well as the outcomes of design.'**

TYPICAL SUB-HEADINGS	TYPICAL FACTORS
Underlying natural environment	<ul style="list-style-type: none"> <li>• Topography, geomorphology, streams and coastal edges</li> <li>• Vegetation</li> <li>• Natural features</li> <li>• Landmarks (relevant in terms of way-finding legibility and views from the highway)</li> </ul> <p>This overlaps with the Landscape and Visual Assessment. However, it is likely to be relevant to explain the relationship between the built environment and the underlying natural setting in urban areas, and between settlement and road patterns in rural areas.</p>
Circulation	<ul style="list-style-type: none"> <li>• Circulation patterns (main destinations and generators, neighbourhood centres and catchment boundaries)</li> <li>• Existing network and pattern of streets (eg grid, curvilinear, following topography) including existing connectedness or severance</li> <li>• Pedestrian and cycle circulation (including consideration of existing routes, local generators such as schools and shopping areas)</li> <li>• Public Transport (including routes, stops &amp; connections)</li> </ul>
Activities	<ul style="list-style-type: none"> <li>• Nature and spatial distribution of land use activities</li> <li>• District Plan zoning</li> <li>• Functional aspects (reliance on access to or visibility from highway, reliance of a commercial area to passing traffic or to connections with a customer catchment)</li> <li>• Character</li> </ul>
Built Form	<ul style="list-style-type: none"> <li>• Street types (for instance urban streets with building frontage to the property boundary, suburban streets with typical front and side setbacks, rural roads)</li> <li>• Grain (characteristic lot size and pattern, and extent of building coverage -may include figure/ground analysis)</li> <li>• Buildings (typology, materials, scale, characteristic age and design)</li> <li>• Rural land use type, typical elements and scale of land units.</li> </ul>
Amenity	<ul style="list-style-type: none"> <li>• Visual quality (including 'townscape')</li> <li>• Tranquillity</li> <li>• Perceived safety (eg separation of pedestrians from fast moving traffic)</li> <li>• Sun exposure (especially where the Project will create shading effects)</li> <li>• Aspect and views</li> </ul>
Heritage	<ul style="list-style-type: none"> <li>• History (how historical development is reflected in current urban form)</li> <li>• Heritage sites and features (this is likely to be covered in a separate heritage report to which the urban design assessment should refer)</li> </ul>
Tangata whenua	Aspects or features of significance to tangata whenua (as above, this is likely to be covered in a separate 'Cultural Impact Assessment' (CIA) to which the urban design assessment should refer where relevant)





Victoria Park Tunnell connectivity

### Evaluating the Existing Urban Environment

Make an overall evaluation taking into account the factors listed above. For instance:

- What are the characteristics that give the urban environment its particular value;
- How significant is that value; and
- What are the reasons for your overall judgement?

The description and evaluation of the existing environment should be more than simply a catalogue of factors. The writer should exercise judgement in highlighting the pertinent factors; those that are important to the functioning and character (or 'sense of place') of an area. Also, focus on those aspects likely to be relevant to assessing the effects of the project.

As discussed above, the sub-headings of this section of the UDA should reflect the particular context, and are likely to vary from one place to another.

The 'Existing Environment' section of an UDA should typically be 2 - 5 pages depending on the extent and complexity of the project area. It might usefully refer to diagrams and photos contained in the Project's ULDF illustrating aspects such as circulation, land use, and built form. The description should reference overlapping disciplines, in particular the landscape and visual assessment, to avoid unnecessary duplication.

## 7.0 ALTERNATIVES

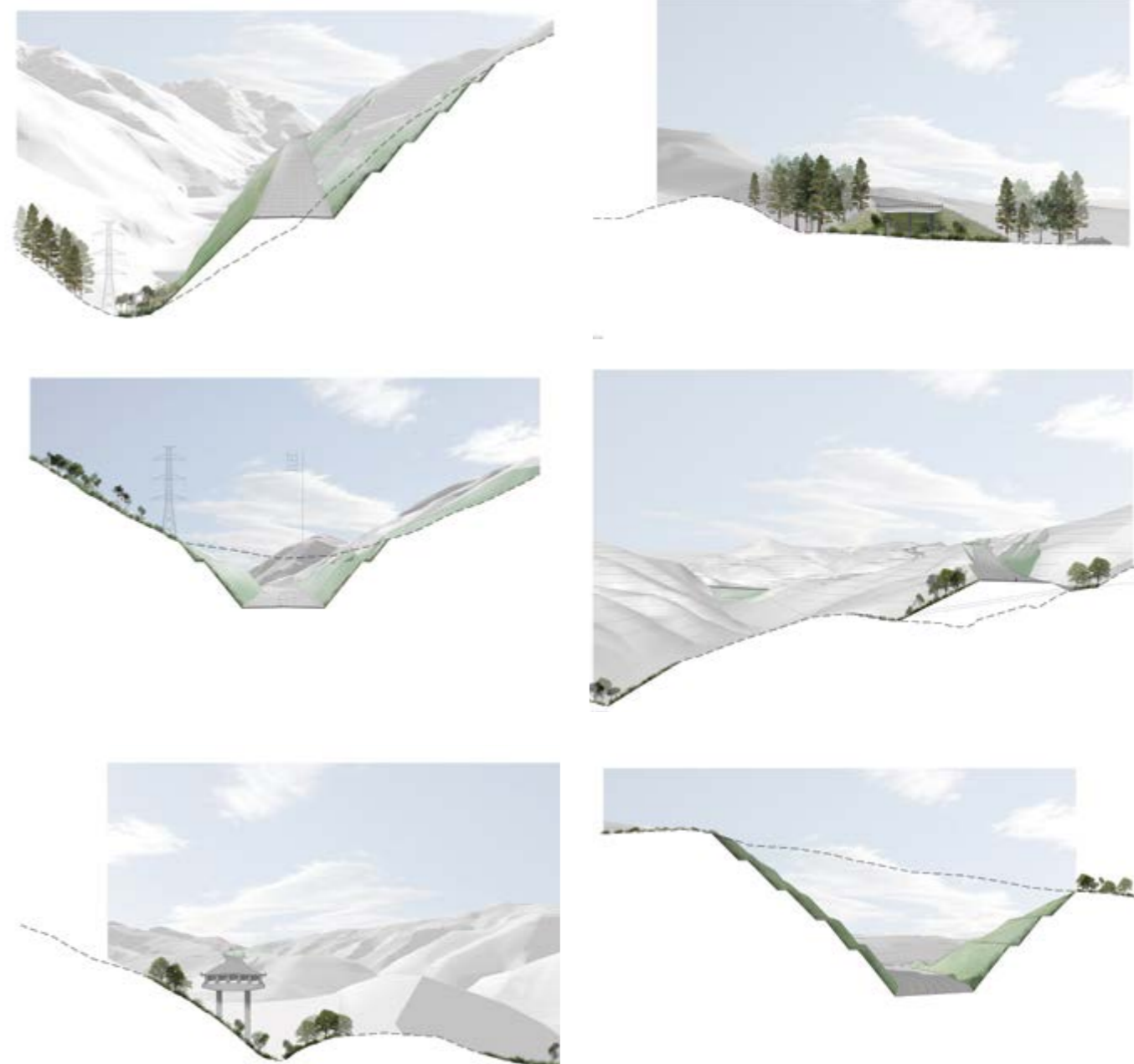
The RMA requires that alternative locations and methods be taken into account where there will be significant adverse effects of a proposal on the environment.

The alternative locations (eg route alignments) and methods (eg bridge v tunnel) that may have been considered should be included where such matters fundamentally affect the urban design assessment. For instance, assessment of alternative alignments will be a fundamental aspect of a NoR where the new road cuts across an existing street network, requires removal of existing buildings or bypasses a settlement. On the other hand, discussion of alternative details that are not fundamental (eg alternative bridge designs) might best be addressed in the 'Design and Mitigation Measures' section.

### The 'Alternatives' section of the UDA should:

- Summarise the major alternatives considered;
- Compare and contrast the relative urban design effects for the alternatives; and
- Provide reasons for the preferred option in urban design terms. The preferred option may not be the best in urban design terms given that selection of the preferred option entails several other factors. In such cases briefly summarise the reasons the preferred option was selected.

Route selection analysis



## 8.0 DESIGN AND MITIGATION MEASURES INTEGRATED IN THE DESIGN

This section of the UDA should describe those measures proposed to avoid, remedy or mitigate potential adverse effects. It should discuss those measures incorporated into the design of a project to avoid or minimise effects, as well as subsequent measures added to the design to mitigate effects. Positive design measures incorporated into projects (or measures incorporated to avoid potential adverse effects) are often overlooked because of the tendency to focus solely on 'mitigation' measures. It is important that such measures taken to avoid potential adverse effects or promote positive effects are explained and taken into consideration. It should be remembered that the purpose and principle of the RMA includes 'avoiding, remedying and mitigating' any adverse effects and that the definition of 'effects' in the RMA includes both 'positive and adverse' effects. (emphasis added)

This section of the UDA should explain the overall design and the design process. It can take more of a 'whole of project' approach in explaining the design and the design principles compared with the more reductive approach taken when discussing mitigation of individual effects (discussed further in following section of these guidelines).

### 'Best Practice'

A 'best practice' example of the 'Design and Mitigation Measures' section might include the following:

- a. An outline of the extent to which urban design matters were considered throughout the design process for example from route selection through to design details;
- b. A summary of the urban design input to the design process including:
  - (a) Reference to an urban design 'context analysis' as part of the design process. (Such context analyses identify urban design values and issues, and design opportunities to avoid potential adverse effects and should be contained within the Project's ULDF);
    - › The design decisions taken or measures adopted to avoid potential adverse effects where practicable;
    - › Opportunities taken to incorporate positive urban design principles and concepts into the design;
    - › Urban design measures taken to remedy and mitigate residual adverse effects ; and
    - › Alternative design methods that might have been considered eg the alternative designs considered for a bridge.
  - (b) A description of the design including:
    - › Reference to the 'Urban and Landscape Design Framework' (ULDF).as the guiding document for the urban design;
    - › The urban design principles and overall concept;
    - › How the design is resolved at different scales, such as how it responds to broad urban patterns and functions, as well as detailed elements of the project;
    - › The extent to which design attention has been applied to all elements of the project (as far as practicable) to collectively reduce potential adverse effects;
    - › The integration of urban design with other disciplines (such as landscape, ecology, civil and structural engineering) including any cross-over benefits; and
    - › A summary of the proposed implementation methods to the extent necessary to provide confidence the works are practicable.

The design and mitigation section of the UDA can typically use bullet points to summarise matters that may have already discussed. It should normally be in the order of 3-5 pages, and should reference other documents such as the 'Urban and Landscape Design Framework' where relevant.

## 9.0 ASSESSMENT OF (RESIDUAL) URBAN DESIGN EFFECTS

### Identifying Urban Design Issues

The main urban design issues should be listed at the start of the 'Effects' section and used as the sub-headings for this section of the UDA. An 'issue' is an effect in the context of a statutory provision. For example:

RMA PROVISION	EXAMPLES OF URBAN DESIGN ISSUES
s7(b) efficient use and development	<p>Effects on surrounding area</p> <ul style="list-style-type: none"> <li>• Existing, zoned or planned land use activities no longer viable as a result of the Project</li> <li>• Severance of areas with complementary activities (eg severance of town centre, industrial area, parts of a farm)</li> <li>• Severance of local street network</li> <li>• Disruption of access to individual properties</li> <li>• Positive connectivity enhancements along the highway</li> </ul>
s7(c) amenity values	<p>Effects on surrounding area</p> <ul style="list-style-type: none"> <li>• Visual effects of road and structures (especially flyovers, bridges, noise walls, retaining walls)</li> <li>• Detraction from 'sense of place'</li> <li>• Positive effects of reduction of traffic on local streets</li> <li>• Effects from the road</li> <li>• Amenity of road corridor itself (eg visual quality of structures)</li> <li>• Views to and experience of adjacent landscape or urban area</li> <li>• Effects on way-finding legibility</li> </ul>
S7(f) quality of the environment	<ul style="list-style-type: none"> <li>• CPTED effects (eg effects of pedestrian underpasses)</li> <li>• Reduced or improved connectivity for pedestrians, cyclists and local vehicular traffic along or across the highway</li> <li>• Severance of recreational pedestrian and cycle paths</li> <li>• Positive effects of new paths parallel with new highway</li> </ul>



### Typical Sub-headings

The subheadings of the effects section should reflect the urban design issues rather than the RMA provisions (It is the planner’s role to analyse the RMA provisions taking into account other disciplines). Typical ways of organising the discussion on effects may be:

- effects on land use activities
- effects on circulation
- effects on urban or rural form
- effects on amenity from surrounding areas
- effects on amenity for future road users

However, the topics may vary depending on circumstance. A critical task of the urban design expert is to identify those relevant to the particular context and project. The author of the UDA should take an intelligent approach to organising the material in a way that best explains the effects.

- Effects include potential as well as actual effects. A potential effect might be avoided (or reduced) by measures taken in the design, which the UDA should explain;
- Effects include positive as well as adverse effects. While assessments typically focus on adverse effects, positive effects are also a relevant consideration and should be discussed. (It is also worth noting that RMA sections 7(c) and 7(f) require that particular regard should be had to the maintenance and enhancement of amenity values and the quality of the environment respectively);
- Effects include temporary as well as permanent effects (for example amenity effects are typically amplified during construction); and
- Effects also include cumulative effects which will arise over time or in combination with other effects.



### Analysing Actual Effects

$$\text{NATURE OF EFFECT} + \text{MAGNITUDE} - \text{MITIGATION} = \text{ACTUAL EFFECT (ADVERSE OR POSITIVE)}$$

Describe the precise nature of the effect. For instance change is not an effect per se. Rather the relevant matter is the actual effect on an aspect of the environment, such as an effect on circulation (severance or connectivity) or amenity.

Evaluate the magnitude of the effect. For example, the magnitude of effect of severing a street pattern would take into account the proportion of the network affected, whether the severance is on the centre or fringe of the network, and the effectiveness of alternative connections. The magnitude of amenity effects of a structure would take into account the design quality of the structure, its visibility, and significance of the location. Use a relative scale to rate magnitude. The following 5 point scale is suggested: It is symmetrical around a ‘moderate’ middle score, and uses neutral (‘objective’) descriptors that can be applied to a range of effects. However, always provide the reasons to justify the assessment, and whether the effect is adverse or positive.



The same scale should be applied to both adverse and positive effects.

Discuss measures taken to mitigate each adverse effect: While such an approach is reductionist (ie it reduces what should be a comprehensive design into separate mitigation measures), it helps decision-makers to consider effects in terms of each RMA issue as part of their step-by-step deliberations. (Such discussion of mitigation measures is in addition to the more over-arching principles and concepts described in Section 8 of the UDA above).

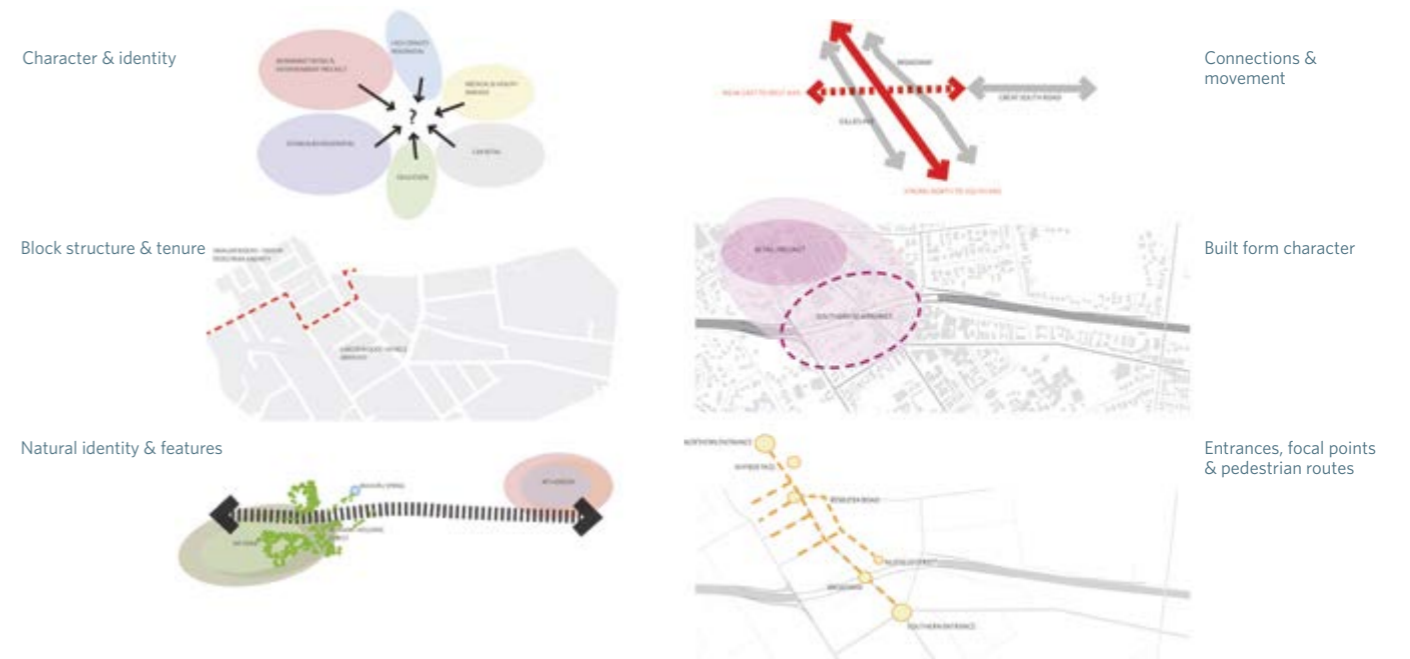
### Conclusions on each Urban Design Issue

Finally, provide an overall appraisal on the effects in relation to each urban design issue including:

- A summary of the nature and magnitude of urban design effects;
- An appraisal of the likely effectiveness of the mitigation measures (whether the potential adverse effects will be ‘adequately mitigated’); and
- A professional opinion on whether the effects will be ‘acceptable’ or ‘not acceptable’ in urban design terms. The reasons for the opinion should be stated: For example taking into account the context, the nature and magnitude of adverse and positive effects, and the mitigation. It is useful to qualify such an opinion with an acknowledgement that urban design is only one aspect to be taken into account. The purpose of the professional opinion is to assist the decision-makers in their overall weighing of issues.

The ‘Urban Design Effects’ section is the main part of an UDA. Its length will vary depending on the complexity of the project and urban design issues. It might typically be between 5-25 pages, although it may be longer for the most complex projects.

Newmarket Viaduct - urban design issues



## 10.0 RECOMMENDED CONDITIONS

Conditions are normally recommended as part of the 'Planning' workstream and attached to the Planner's evidence. The urban design measures should be sufficiently resolved that they can be effectively translated into recommended conditions. The UDA can also refer to the need for a condition to cover a particular aspect of the design. If a design feature is relied on for the UDA's conclusions, such a feature must be covered by a condition in order for the assessment to carry weight.

Urban design conditions (perhaps in combination with landscape matters) might cover such matters as:

- A general outline of the proposed urban design works (eg by reference to Urban Design Plans);
- A process for further design development during subsequent stages of the project. For example the conditions might require an 'Urban Design Management Plan' that is to be consistent with the principles and guidelines contained in the ULDF; and
- The content of any devices, such as Urban Design Management Plans, that are proposed to manage implementation.

Conditions may also require consultation with nominated stakeholders in the development of the ULDMP or specific aspects of it (eg noise walls, gateway treatment, cycle path).

Generic urban design conditions are illustrated in the side bar below. These should provide a foundation for conditions specific to each project.

### Urban Design Management Plans

The conditions may refer to an 'Urban and Landscape Design Management Plan' or 'Master Plan' (ULDMP) to be prepared to control implementation of certain aspects of the project. The conditions should outline the contents of such a plan and include sufficient information on the design principles, standards and techniques to be incorporated to provide sufficient certainty of eventual outcome for the decision makers.

## GENERIC URBAN DESIGN CONDITIONS FOR RMA PROCESS

### General

Except as modified by the conditions below and subject to final design, the works shall be undertaken in general accordance with the information provided at the hearing by the Requiring Authority (NZTA), the Notice of Requirement and supporting documents as follows:

- (a) <<insert list of supporting documents and plans>>
- (b) Urban and Landscape Design Framework (ULDF) dated <<insert date>>

### Outline Plan

An Outline Plan for the construction of any part of the Project shall include an Urban and Landscape Design Master Plan (ULDMP) for the relevant part of the Project. The purpose of the ULDMP is to integrate the Project's permanent works into the surrounding landscape and urban context and to illustrate the urban and landscape design elements of the project.

The ULDMP shall be prepared in consultation with:

- <<insert name of relevant stakeholders eg local authority, regional council, iwi, etc>>

This consultation shall commence at least 30 working days prior to submission of the Outline Plan. Any comments and inputs received from the parties listed above shall be clearly documented within the management plan, along with clear explanation of where any comments have not been incorporated and the reasons why.

The ULDMP shall be prepared by suitably qualified persons who shall include an urban designer and a landscape architect, and shall implement:

- a. the landscape plans submitted with the applications numbered <<XX>>;
- b. the Project's Urban and Landscape Design Framework (ULDF) (dated <<XX>>).
- c. and shall be prepared in accordance with:
- d. NZTA's Urban Design Guidelines: Bridging the Gap (2013) or any subsequent updated version;
- e. NZTA's Landscape Guidelines (2013) or any subsequent updated version; and
- f. AUSTRROADS standards where these are relevant to pedestrian and cycle paths.

The ULDMP shall include but not be limited to the following:

- a. Demonstration of how the design principles in the ULDF have been adhered to in the development of the design concepts, including (but not limited to) principles for noise walls, walking and cycling facilities and structures (including bridges, underpasses and associated retaining walls) which are identified in the ULDF as being in highly sensitive locations.
- b. A concept plan - this shall depict the overall landscape and urban design concept, and explain the rationale for the landscape and urban design proposals if different from the ULDF concepts;
- c. Landscape and urban design details - these shall cover the following:
  - i. Road design - elements such as earthworks contouring including cut and fill batters, benching, and spoil disposal sites; median width and treatment; roadside width and treatment.
  - ii. Roadside elements - elements such as lighting, sign gantries and signage, guard rails, fences, wire rope barriers, median barriers, etc.
  - iii. Architectural and landscape treatment of all major structures, including bridges, underpasses and retaining wall.
  - iv. Architectural and landscape treatment of tunnels, portals and ancillary buildings.
  - v. Architectural and landscape treatment of noise barriers.
  - vi. Land use re-instatement.
  - vii. Landscaping.
  - viii. Landscape treatment of permanent stormwater control ponds and swales.
  - ix. Integration of passenger transport.
  - x. Pedestrian and cycle facilities including paths, road crossings and dedicated pedestrian/ cycle bridges or underpasses;
  - xi. Consideration of:
    - › Crime Prevention Through Environmental Design (CPTED) principles in urban areas.
    - › Maintenance requirements and graffiti resistance measures.
    - › Protected viewshafts, character areas and protected heritage items, as identified in the District Plan.
- d. Planting Details - these shall include the following details:
  - i. Identification of vegetation to be retained, protection measures, and planting to be established along cleared edges;
  - ii. Proposed planting including plant species, plant/grass mixes, spacing/densities, sizes (at the time of planting) and layout and planting methods including trials;
  - iii. Planting programme - the staging of planting in relation to the construction programme which shall, as far as practicable, include provision for planting within each planting season following completion of works in each stage of the Project.
  - iv. Detailed specifications relating to (but not limited to) the following:
    - › Weed control and clearance;
    - › Pest animal management;
    - › Ground preparation (topsoiling and decompaction);
    - › Mulching; and
    - › Plant sourcing and planting, including hydroseeding and grassing.
  - v. A maintenance regime including monitoring and reporting requirements, which is to apply for the <<insert years>> following that planting being undertaken.
  - vi. Performance standards

APPENDIX 4:  
GENERIC  
URBAN DESIGN  
SPECIFICATION



Following are model specification to be used on NZTA Capital Projects eg Design and Construct, Alliance. It will be necessary to adapt the specifications to suit each individual project as required. The NZTA National Officer Urban Design Advisor can provide assistance with development of the specifications.

### 1. General

As a signatory to the New Zealand Urban Design Protocol the NZTA plans and designs state highways in a way that supports good urban design and value for money. In particular, NZTA aims to:

- i. ensure state highways contribute to vibrant, attractive and safe urban and rural areas; and
- ii. achieve integration between state highways, local roads, public transport, cycling and walking networks and the land uses they serve.

The contractor shall ensure that the [insert name] project gives effect to these values.

### 2. Designation [and/or Resource Consent] Conditions

The contractor shall ensure that all landscape and urban design works adhere to the relevant:

- i. Designation [and/or resource consent] conditions; and
- ii. Outline Plan of Works; and
- iii. Property Agreements

relating to the [insert name] project.

[List references to all relevant conditions, Urban Design and Landscape Plans and any relevant property agreement]

### 3. Urban and Landscape Design Framework

The NZTA has developed an Urban and Landscape Design Framework (ULDF) for the project. This provides an overall urban design and landscape concept for the project and is a source document which has informed the RMA application and the scheme design.

The Contractor shall ensure that all landscape and urban design works adhere to the Urban and Landscape Design Framework. A briefing memo shall be prepared and submitted to the NZTA as part of the tender submission to identify any differences between the project design and ULDF.

There remains opportunities to identify and include additional landscape and urban design initiatives and treatments that can add value to the project. Some such opportunities may include [list any opportunities eg art works]. In conjunction with NZTA, liaison with the local authority and/or key stakeholders shall be undertaken to establish whether such additional initiatives can be funded and incorporated in the design.

*If an Urban and Landscape Design Framework has not been developed, the National Office Urban Design Advisor will work with the team preparing the Principal Requirements to outline the NZTA's Urban Design and Landscape expectations.*

### 4. Urban and Landscape Design Master Plan

The Contractor shall prepare an Urban and Landscape Design Master Plan (ULDMP) for the project and submit it to the NZTA, including the National Office Urban Design Advisor for approval prior to construction.

The ULDMP must illustrate the urban and landscape design elements of the project and reflect any post-consent engagement with stakeholders. The ULDMP will contain the plans on which the construction drawings are based. The level of detail of the ULDMP should remove any ambiguity from the design and must be in general accordance with the ULDF and conditions of designation/resource consent unless different concepts have been approved by the NZTA.

Appendix 2 of the NZTA Bridging the Gap outlines the information and urban design requirements to be included in the Master Plan.

### 5. Best Practice

The Contractor shall ensure that all landscape and urban design works adhere to the guidance contained in the NZTA Bridging the Gap and Landscape Guidelines.

### 6. Quality Control

It is recognised that aspects of the concept design may need to change as the project's development progresses. Such changes may occur for a number of reasons, including unforeseen site conditions, revised community and/or NZTA requirements, potential cost and/or time savings which the NZTA approves, changes resulting from unavailability of materials and/or components and design innovations which emerges as the project progresses. Sometimes changes to the project improve the final built outcome, but there is also the risk that design quality may be compromised. Therefore, the Principal's Urban Design Advisor must remain fully involved in the project through to the completion of construction and the defects liability period to ensure design quality.

The Contractor must ensure:

- i. full participation of the Principal's Urban Design Advisor in all aspects of the project design development, detail design and documentation which are relevant to urban and landscape design.
- ii. that the highway designers are supported and closely aligned with the Urban and Landscape Design Team led by a nominated team leader, so that integration between all components of the project is achieved in line with NZTA's Urban Design requirements.
- iii. that an Urban and Landscape Design team leader is appointed whose role is to lead a team comprised of urban designers, landscape architects, structures architects [list others as required eg artist, ecologist etc] and other relevant personnel. The purpose of this team is to integrate the landscape and urban design aspects throughout the design and construction process. The Contractor must nominate the Urban and Landscape Design team leader in their tender and highlight his/her skills and experience.
- iv. that the Urban and Landscape Design team leader oversees the liaison with and inputs from key stakeholders during the design phase, to ensure these parties are aware and involved in the design as it affects their environment. Regular reporting must show how the co-ordination is being achieved and the beneficial outcomes that are resulting. Any changes to the ULDF or Plans resulting from such liaison must only be implemented following NZTA approval.
- v. that the urban design and landscape design consultants have access to the construction site on a sufficiently frequent and as required basis to ensure that, for all urban and landscape design components, design changes which arise during construction, construction standards generally, the quality of materials, finishes, plants and landscaping are all in accordance with the construction documents and to a high level of quality.
- vi. The urban design and landscape consultants record and document all yard, plant and nursery as well as site visits to be available to the Client's representative and NZTA personnel to ensure quality control through the construction period. No substandard products must be accepted on site. This must include any concrete form work, plant stock etc. Any defects or quality concerns should immediately be brought to the Client's representative and NZTA's attention and must be immediately remediated and managed by the principal contractor.

### 7. Whole of Life

All urban and landscape design works shall be designed to have a design life of 50 years and, as appropriate the requirements of the Building Act.

All urban and landscape design works shall be designed so that they require minimal maintenance for the first 20 years beyond the defects period after the opening of the project. This requirement shall include provision of appropriate measures to:

- i. Avoid the risk of graffiti and vandalism;
- ii. Protect the visual integrity of the project;
- iii. Ensure there is adequate access for maintenance;
- iv. Coatings shall have a minimum design life of 20 years;
- v. Coatings shall be applied to avoid a patchy appearance;
- vi. Coloured finishes including paint coatings shall retain their aesthetic appeal with a minimal fade, for a minimum design life of 10 years;
- vii. Establish and maintain self-sustaining landscape planting.

### 8. Post-Construction review

The Contractor in conjunction with the Urban and Landscape Design Team will undertake a post-construction review of the project in order to confirm that all landscape and urban design works have been constructed as specified and documented. This shall be undertaken between six and twelve months of the project opening and again at the completion of the defects period. This will include inspections by necessary specialists including the designers.

The reviews shall be documented and photographed and submitted to the NZTA's National Office Urban Design Advisor.

Any defects shall be immediately remediated and managed by the principal contractor to the NZTA's satisfaction.

Appendix 6 of the NZTA Bridging the Gap includes a template to assist with and guide the reviewer.

### 9. NZTA Standard Specification for Highway Landscape Treatments

The NZTA seek quality landscape outcomes. To achieve this requires rigorous consideration of all aspects of the works; including site preparation, topsoil quality, plant material, standard of planting and associated processes, timing of planting and maintenance. The detailed landscape plans shall be reviewed and approved by the NZTA, including the National Office Urban Design Advisor.

The landscape treatments shall be undertaken in accordance with the NZTA P39 Standard Specification for Highway Landscape Treatments.



**APPENDIX 5:  
URBAN DESIGN  
CONSIDERATIONS  
IN BRIDGE DESIGN**

**AUCKLAND HARBOUR BRIDGE**

Table 1 : Urban design bridge assessment matrix

URBAN DESIGN BRIDGE ASSESSMENT MATRIX

COMMENT IN EACH COLUMN FOR EACH BRIDGE LOCATION (THERE MAY BE MORE THAN 2 LOCATIONS ON ANY SECTION OF ROADING PROJECT - ADD FURTHER COLUMNS AS REQUIRED) AS TO THE LEVEL OF IMPORTANCE AND A BRIEF EXPLANATORY COMMENT

Assessment matter	Explanation as to importance for urban design attention	Measure types that may be used to gain an understanding of importance	Location A	Location B
<b>Underlying natural environment</b>	Does the context have underlying characteristics that will be affected by a bridge or suggest a certain form of bridge response? For example consider topography, natural features such as vegetation, ecology or landscape	Planning documents (district or regional plans) Landscape assessments Urban design contextual analysis Preliminary assessment undertaken as part of project		
<b>Circulation</b>	Is there an existing or likely future (eg from planned urban development) circulation pattern or network that will be affected by bridge or suggest a certain form of bridge response? For example consider what level of use occurs (or may be planned to occur) in the bridge location? Demographic profile also of interest as older people/children more vulnerable to level changes/safety and less likely to have access to a vehicle.	LAMS (Local Area Movement Surveys) Counts including school travel plans Network monitoring Demographic profile for area Urban growth plans		
<b>Activities</b>	Are the existing or likely future (eg from planned development) activities in the vicinity affected by bridge or suggest a certain form of bridge response? For example consider access to existing properties, accessibility to activities of local importance such as schools.	District Plan Urban growth plans, transport strategies Urban design contextual analysis Preliminary assessment undertaken as part of project		
<b>Built form</b>	Is the existing or likely future (eg from planned development) urban form affected by bridge or suggest a certain form of bridge response? For example consider whether the bridge at a key nodal point in the network (eg at an interchange, town centre, key turn off)? What is the fit with the scale of the built form in the area?	Network analysis (transportation plans) Urban growth plans Urban design contextual analysis		
<b>Amenity</b>	Is the location amenity affected by bridge or suggest a certain form of bridge response? For example consider how many people will view the bridge- ie live near the location or pass by frequently? What is the visibility of the bridge from the point of view of the highway user? What is affect on shading or tranquillity of the location?	Inter visibility assessment Landscape assessments Urban design contextual analysis Preliminary assessment undertaken as part of project		

**DETAILED GUIDANCE: URBAN DESIGN CONSIDERATIONS IN BRIDGE DESIGN**

The matrix (table 1) is a framework to guide urban design decisions in relation to bridges. It should be used early on in the project to identify urban design factors which must inform the bridge design.

The outcomes of the use of the matrix must be reported in the Bridges' Preliminary Design Statement and updated in the consequent design statements through to the final document. On large or complex projects, the urban design considerations which have influenced the bridge design and any design principles proposed to guide the detailed design at an ulterior stage must also be documented in the project's Urban and Landscape Design Framework.

It is expected that the urban design response for a specific bridge is appropriately calibrated to the outcome of the assessment.

The level of detail provided on how a bridge is designed to respond to the outcome of the assessment will vary depending on the stage of the project. Early in the process, a statement on whether any urban design criteria rated highly and general design principles to address the relevant criteria will suffice. Later in the process, a full bridge design including architectural drawings should demonstrate how the criteria identified have been addressed.





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**APPENDIX 6:  
URBAN DESIGN  
AND  
LANDSCAPING  
REVIEW  
TEMPLATE**

## URBAN DESIGN AND LANDSCAPING REVIEW TEMPLATE:

Project Name:

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Review Timing:

---

Date of Review:

---

Review of:

To what extent has this project sector or project component of the design achieved the Principles related to Urban & Landscape Design. For each project sector or project component, agree which of the principles is relevant. You may also choose to weight some principles ahead of others for each project sector or project component.

## PROJECT URBAN & LANDSCAPE DESIGN FRAMEWORK:

### UD / LD PRINCIPLE

(specific to each project)

### DESCRIPTION

Designing for the context	
Designing with nature	
Integrating transport and land uses	
Contributing to good urban form	
Integrating all modes of movement	
Supporting community cohesion	
Maintaining local connectivity	
Respecting cultural heritage values	
Creating a positive road user's experience	
Achieving a low maintenance design	

Note to designer:

- › The LD/UD principles and descriptions shown are for illustrative purposes only.
- › Each project shall have LD/UD principles, which may be more or less than the items shown.

## REVIEW AREA (EXAMPLES):

(1) Off-ramp 1; (2) Main Viaduct Structure; (3) Road Noise Wall; (4) Road On-ramp 1; (5) Footbridge; (6) Terrace and slopes along local road

LD/ UD Principle (Project specific)	Description (example only, tailor to project)	1 - strongly disagree 2 - disagree 3 - neutral 4 - agree 5 - strongly agree	Weighting (sum of all columns to be 20 in total)	Weighted Score (Total score out of 100)
Designing for the context	The unique natural landscape characteristics of the area and evolving urban form shall be acknowledged and respected in the design of the project. The design shall facilitate opportunities to view/maximise the landscape setting.			
Designing with nature	Sustainable (low impact) design and environmentally responsive design initiatives and opportunities are to be recognised and incorporated in the project.			
Integrating transport and land uses	Maintain and where possible enhance the development potential for land outside of the works footprint, but within the designation.			
Contributing to good urban form	The project will be responsive to the identity of the town and the characteristics that inform its 'sense of place', including...			
Integrating all modes of movement	Cyclist, pedestrians, equestrian and mobility access is provided for within the over bridge.			
Supporting community cohesion	Opportunities for public open spaces should be recognised throughout the project, including the street network, the pedestrian environment as well as under and around the highway structures (CPTED principles shall apply).			
Maintaining local connectivity	Design shall recognise that quality of connection and movement of all modes as important, and shall facilitate opportunities for creating improved linkages across this part of the city.			
Respecting cultural heritage values	Natural, cultural and ancient heritage should be recognised in the design, construction and delivery of the project in such a manner that it inspires continued understanding and transfer of local stories and tradition.			
Creating a positive road user's experience	The visual simplicity and slenderness of the existing structure should be replicated in the new structures. Visual cohesions and the under-croft and local views beneath the structures are important. Design of the structure is to include the integration of the service conduits and pipes, and recognise the need for inspections.			
Achieving a low maintenance design	To achieve whole of life value for money across all LD and UD assets; access has been provided for operations and maintenance, in consultation with the O&M organisation			
			Total Weighted Score	/100

### ISSUES/ DEFECTS (IF ANY):

Project Stage	Item	Description
Design (list issues)		
Construction (list issues)		

### DESIGNER/ VERIFIER'S COMMENTS / SUMMARY

Comment No	Description

Designer/ Verifier Signed: .....	Date: / 20XX
Main Contractor Signed: .....	Date: / 20XX
I/We agree that the above is a true and accurate record. (NZTA Environmental and Urban Design Team representative to sign and return if agreed)	
Signed: .....	Date: / 20XX

### SITE PHOTOGRAPHY/ DRAWINGS:

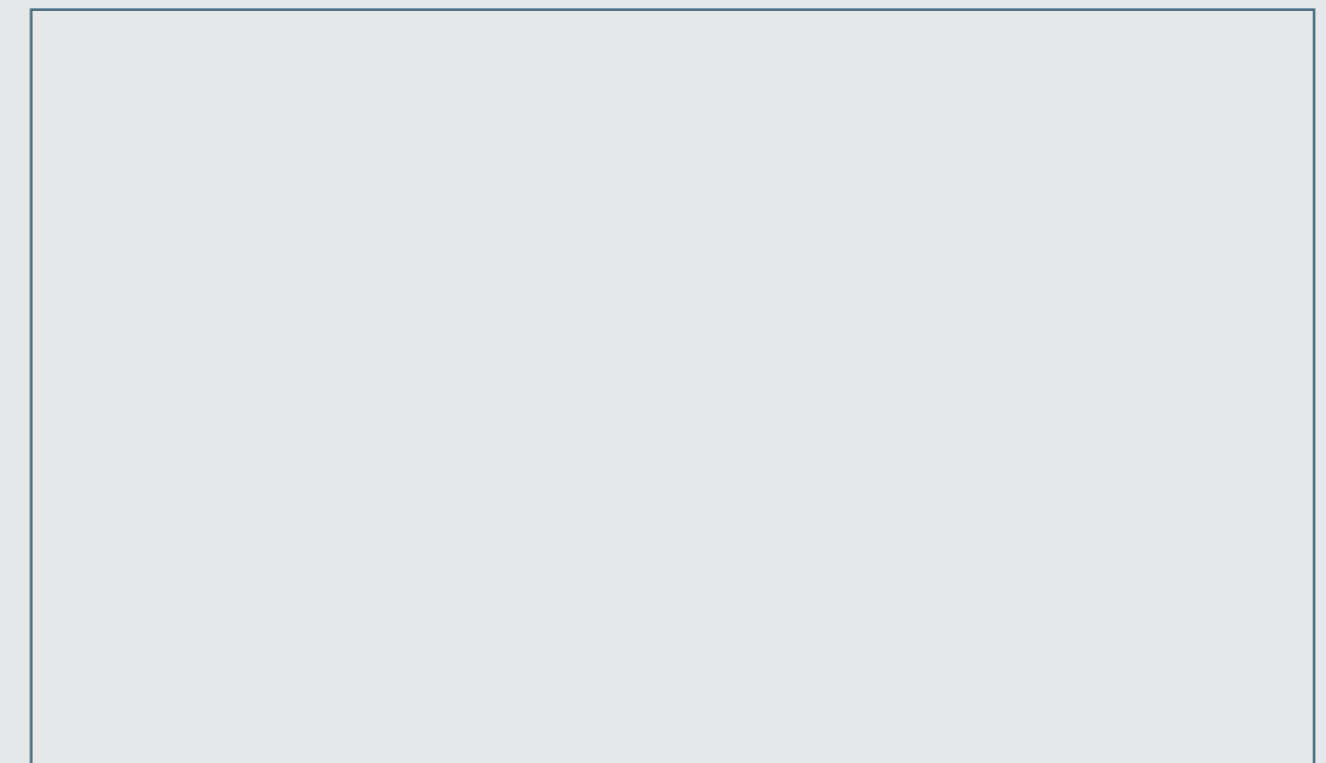
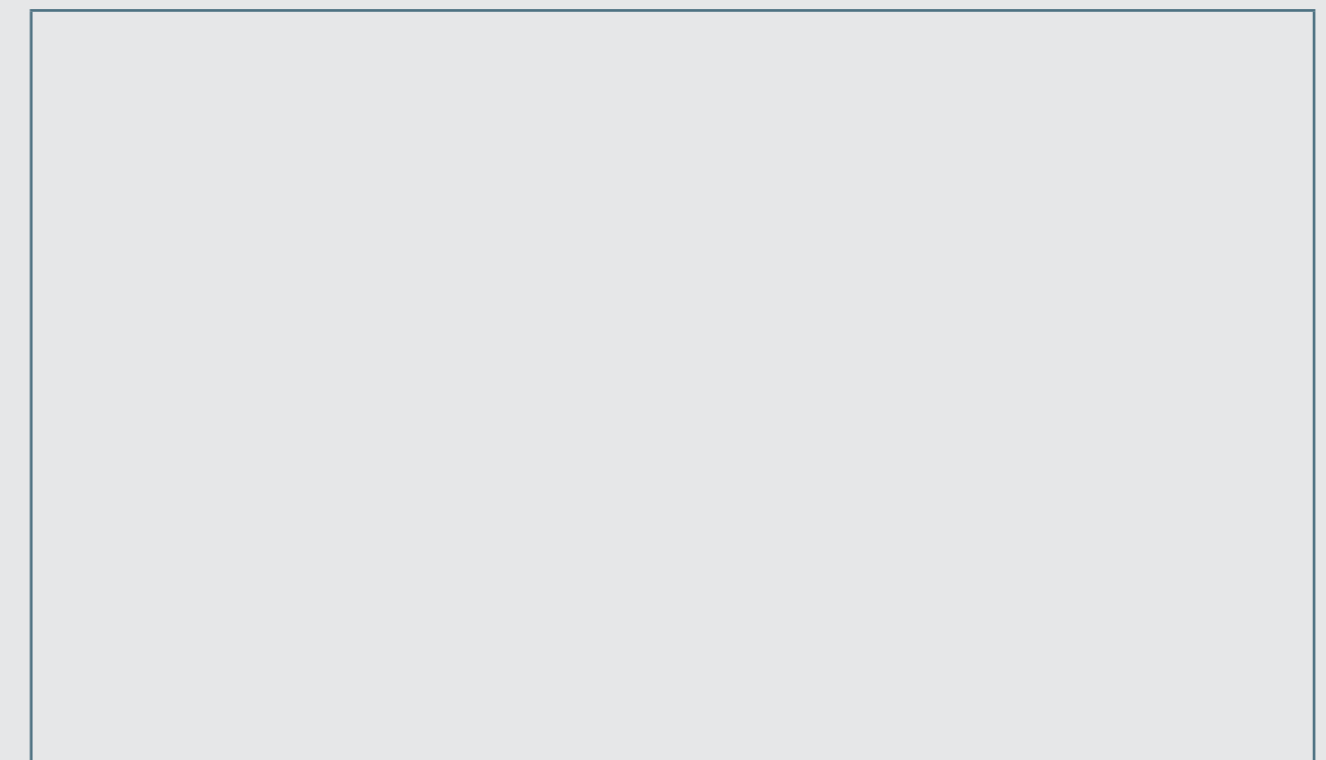


Image 1: Description



Plan 1: Description



If you have further queries, call our contact centre on 0800 699 000 or write to us:

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This publication is also available on NZ Transport Agency's website at [www.nzta.govt.nz](http://www.nzta.govt.nz)



NZ TRANSPORT AGENCY  
WAKA KOTAHI

New Zealand Government

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