



Waitakere Ranges Heritage Area

Purpose

This document provides Auckland Transport designers and project managers with guidance on principles and practices of road corridor design and management that help to meet the requirements of the Waitakere Ranges Heritage Area Act, 2008 (the Act).

Terms of reference

The Waitakere Ranges Heritage Area Design Guidelines cover all works, including routine and emergency maintenance and repairs and upgrades, that have the potential to adversely affect the Act's objectives or could help to implement them, for example by restoring or enhancing landscape character. This includes footpaths, kerb and channel and other stormwater management structures, retaining walls/structures, signage, safety/crash barriers and traffic calming measures. This guide covers the use of vegetation as it impacts on the landscape of the area, but it does not cover operating procedures relating to the management of vegetation and weeds.

Contents

| | | |
|-----------|---|----|
| 01 | Introduction | 4 |
| 02 | The Waitakere Ranges Heritage Area | 5 |
| | Waitakere Ranges Heritage Area Act 2008, section 8 heritage area objectives | 6 |
| | Local area plans (LAPs) | 7 |
| 03 | Auckland Transport's principles | 8 |
| 04 | Design guidelines | 10 |
| | Are 'improvements' required? | 10 |
| | Multidisciplinary teams | 10 |
| | Consultation | 11 |
| | Landscape | 12 |
| | Vegetation management | 13 |
| | Road design | 14 |
| | Sealed and unsealed surfacing | 15 |
| | Footpaths | 16 |
| | Safety and speed management | 17 |
| | Signs and road markings | 18 |
| | Lighting | 19 |
| | Street furniture | 20 |
| | Safety barriers | 21 |
| | Structures (bridges and retaining walls) | 22 |
| | Stormwater | 23 |



01 Introduction

Auckland Transport recognises the national significance of the Waitakere Ranges Heritage Area (WRHA) and is committed to ensuring that Auckland Transport projects within the area show respect for the heritage features of the area.

- This guide has been produced to help Auckland Transport staff when they design and deliver projects within the Waitakere Ranges Heritage Area (WRHA).
- This guide establishes a set of principles that recognises the specific character of the WRHA.
- This guide shows how road safety can be improved within the WRHA without detrimental impact upon the local character.
- This guide supports the existing Auckland Transport Urban Design Principles and Auckland Transport Code of Practice to promote outcomes that are appropriate to this exceptional location.

By taking note of the principles established in this guide, Auckland Transport will be able to promote schemes that recognise and respect the heritage features of the area, yet still deliver routes and connections that are safe and convenient for all users.

Background

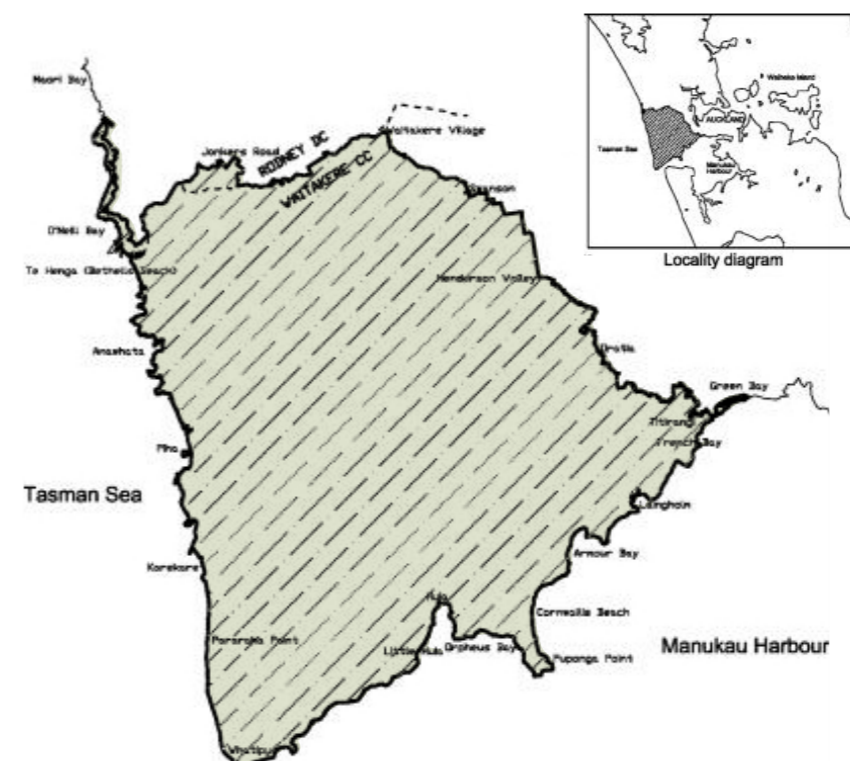
The Waitakere Ranges Heritage Area 2008 Act recognises that an important feature of the heritage area is the subservience of the built environment to the area's natural and rural landscape. However, The Waitakere Ranges Heritage Area Monitoring Report (2013) (the monitoring report) highlighted the impact that urban-style road corridor design was having on the landscape of the WRHA and recommended that the design specifications for infrastructure in the road corridor in the WRHA be reconsidered.

This design guide provides a set of principles and associated guidance to Auckland Transport designers and project managers to help them ensure that:

- All outcomes are appropriate to this significant location.
- The built environment remains subservient to the natural and rural landscape.

02 The Waitakere Ranges Heritage Area

The national, regional and local significance of the Waitakere Ranges Heritage Area (WHRA) has been recognised by the Waitakere Ranges Heritage Area Act 2008, which seeks to promote the protection and enhancement of the heritage features of the area for present and future generations.



- The heritage features include:
- The terrestrial and aquatic ecosystems of prominent indigenous character
 - The different classes of natural landforms and landscapes
 - The coastal areas
 - The natural functioning streams of the eastern foothills
 - The quietness and darkness of the Waitakere Ranges and coastal parts of the area
 - The visual backdrop to the Auckland Metropolitan Area
 - The WRHA's wilderness experience and recreational opportunities
 - The eastern foothills.



Further details are available at: <http://www.aucklandcouncil.govt.nz/EN/newsevents/culture/heritage/Documents/guideheritagefeatures.pdf>

The Act requires that effect must be given to its purpose and the relevant objectives when preparing or reviewing a district plan, regional policy statement or regional plan that affects the heritage area, or when considering an application for resource consent for a discretionary or non-complying activity in the heritage area.

While not explicit in the legislation, Auckland Transport considers that it is also appropriate to ensure that, within the heritage area, the Codes of Practice are interpreted in a way that promotes outcomes in keeping with the character of the area.

Waitakere Ranges Heritage Area act 2008, section 8 heritage area objectives

The objectives of establishing and maintaining the heritage area are:

- to protect, restore, and enhance the area and its heritage features;
- to ensure that impacts on the area as a whole are considered when decisions are made that affect any part of it;
- to adopt the following approach when considering decisions that threaten serious or irreversible damage to a heritage feature;
 - carefully consider the risks and uncertainties associated with any particular course of action;
 - take into account the best information available; and
 - endeavour to protect the heritage feature;
- to recognise and avoid potentially or cumulatively adverse, effects of activities on the area's environment (including its amenity) or its heritage features;
- to recognise that, in protecting the heritage features, the area has little capacity to absorb further subdivision;
- to ensure that any subdivision or development in the area, of itself or in respect of its cumulative effect
 - is of an appropriate character, scale, and intensity;
 - does not adversely affect the heritage features; and
 - does not contribute to urban sprawl;
- to maintain the quality and diversity of landscapes in the area by
 - protecting landscapes of local, regional, or national significance;
 - restoring and enhancing degraded landscapes; and
 - managing change within a landscape in an integrated way, including managing change in a rural landscape to retain a rural character;

- to manage aquatic and terrestrial ecosystems in the area to protect and enhance indigenous habitat, landscape and amenity values;
- to recognise that people live and work in the area in distinct communities, and to enable those people to provide for their social, economic, environmental, and cultural wellbeing;
- to provide for future uses of rural land in order to retain a rural character in the area;
- to protect those features of the area that relate to its water catchment and supply functions;
- to protect the natural and historic resources of the Waitakere Ranges Regional Park in perpetuity for their intrinsic worth and for the benefit, use, and enjoyment of the people and communities of the Auckland region and New Zealand.

Local area plans (LAPs)

The Act provides for the preparation and adoption of Local Area Plans (LAPs) by Auckland Council. LAPs under the Act describe the character and amenity of the area they cover. Developed by Auckland Council and by working with the community, they identify what the community values.

There are currently five LAPs, covering the areas of:

- Oratia, Waiaatarua,
- Henderson Valley/Opanuku,
- Muddy Creeks (Laingholm, Parau, Woodlands Park and Waima),
- Te Henga (Bethells Beach) and
- the Waitakere River Valley.

The LAPs should be consulted when making transport decisions that may impact on the character and amenity of these areas.

Project teams should consult the Waitakere Ranges Foothills Design Guide in the development of schemes.





03 Auckland Transport's principles for the Waitakere Ranges Heritage Area





In line with the findings of the monitoring report, Auckland Transport recognises that incremental minor alterations to roads, footpaths, signage and other features within Auckland Transport's control can cumulatively lead to changes to the character of the area. Careful consideration of these matters can result in positive change that benefits the overall character of the Waitakere Ranges Heritage Area (WRHA).


In order to ensure that future changes are sympathetic to the area, Auckland Transport have developed a set of principles that together will ensure that the scenic, sightseeing and landscape character of the heritage area, the rural character of the bush, individual identity and character of the villages and low-key and understated appearance of the low-density residential development will remain dominant.


 PRINCIPLE 1 To carefully consider whether 'improvements' are required for all projects.


 PRINCIPLE 2 Encourage and test innovative approaches and make full use of the flexibility in national regulations, standards and codes of practice to promote outcomes that are appropriate to the WRHA.


 PRINCIPLE 3 Do not restrict a scheme to the use of standard urban infrastructure and consider the use of more appropriate alternatives, including bespoke ones, even if these bring additional capital or operational cost.


 PRINCIPLE 4 For significant projects, form a multidisciplinary project team who can ensure understanding and demonstration of all of the design guide principles.


 PRINCIPLE 5 Ensure that traffic speeds are slowed to be appropriate to the WRHA.

 PRINCIPLE 6 Maintain the existing overall informal character of the road corridors both within villages and the wider WRHA. The retention and restoration of vegetation as green infrastructure is a significant tool and adds both to the informal character and the environmental capacity of the design.

 PRINCIPLE 7 Where possible, use local materials that sit comfortably within the WRHA.

 PRINCIPLE 8 Signs, lines and street furniture should be kept to the minimum needed for safety. Intrusive roadside clutter should be removed.

 PRINCIPLE 9 Where signs and markings are needed, adapt standard designs or develop new signs to be the best possible fit with local surroundings.

 PRINCIPLE 10 Ensure that projects consider the character and ecology of the landscape next to the road.



04 Design guidelines



Are 'improvements' required?

Auckland Transport recognises that incremental minor alterations within the Waitakere Ranges Heritage Area (WRHA) can cumulatively lead to changes to the character of the area. At the project inception stage, very careful consideration should be given as to why the potential improvement works are required. This should include consideration of questions such as:

- Are the improvement works necessary for road safety?
- Will the improvement works have a positive, neutral or negative impact upon the WRHA?
- Would the project contribute to multiple outcomes if it is carried out in a different way?



Multidisciplinary teams

Teams for many Auckland Transport projects should include project managers and design engineers. For projects within the WRHA, there will often be a benefit in extending the range of skills within the project team. In particular, it may be appropriate to include carefully selected heritage specialists, landscape architects and urban designers who have developed specific skills in character analysis and who also have a good understanding of the technical constraints of transport projects. Including these additional skills within the team will help achieve schemes that contribute to the overall character of the area.



Consultation

Local boards are a key part of the governance of Auckland Council and were set up to enable local, democratic decision making that promotes the social, economic, environmental and cultural wellbeing of current and future communities within the local board area. Local boards are responsible and accountable for communicating the interests and preferences of their local communities and for local, non-regulatory decision making.

The relationship between local boards and Auckland Transport sits within the overall statutory framework of Auckland Council. Auckland Council and Auckland Transport have agreed a statement of intent that sets out the mechanisms by which Auckland Transport will work with Auckland Council.

Auckland Transport should engage with local boards on matters that impact on their area of jurisdiction, seeking to involve local boards at an early stage of any project. In summary, Auckland Transport should:

- Develop and implement local board engagement plans
- Appoint an elected member relationship manager
- Report to local boards.

Engagement plans are crucial for projects being designed and implemented in the WRHA. Auckland Transport currently has engagement plans for transport projects, for example projects involving:

- Road maintenance
- Vegetation management
- Infrastructure
- Street lighting.

Early community engagement with business associations, directly affected individuals, the wider public and consultation with the local board at workshops and progress meetings is highly recommended, using these engagement plans as the foundation for great project management.

For any vegetation removal in the WRHA, the project team must produce a report and submit this in good time, before attending a workshop with the local board. In addition, business and community organisations and directly affected individuals should be consulted. However, it is worth noting that for small-scale and routine type works there is no engagement recommendation.

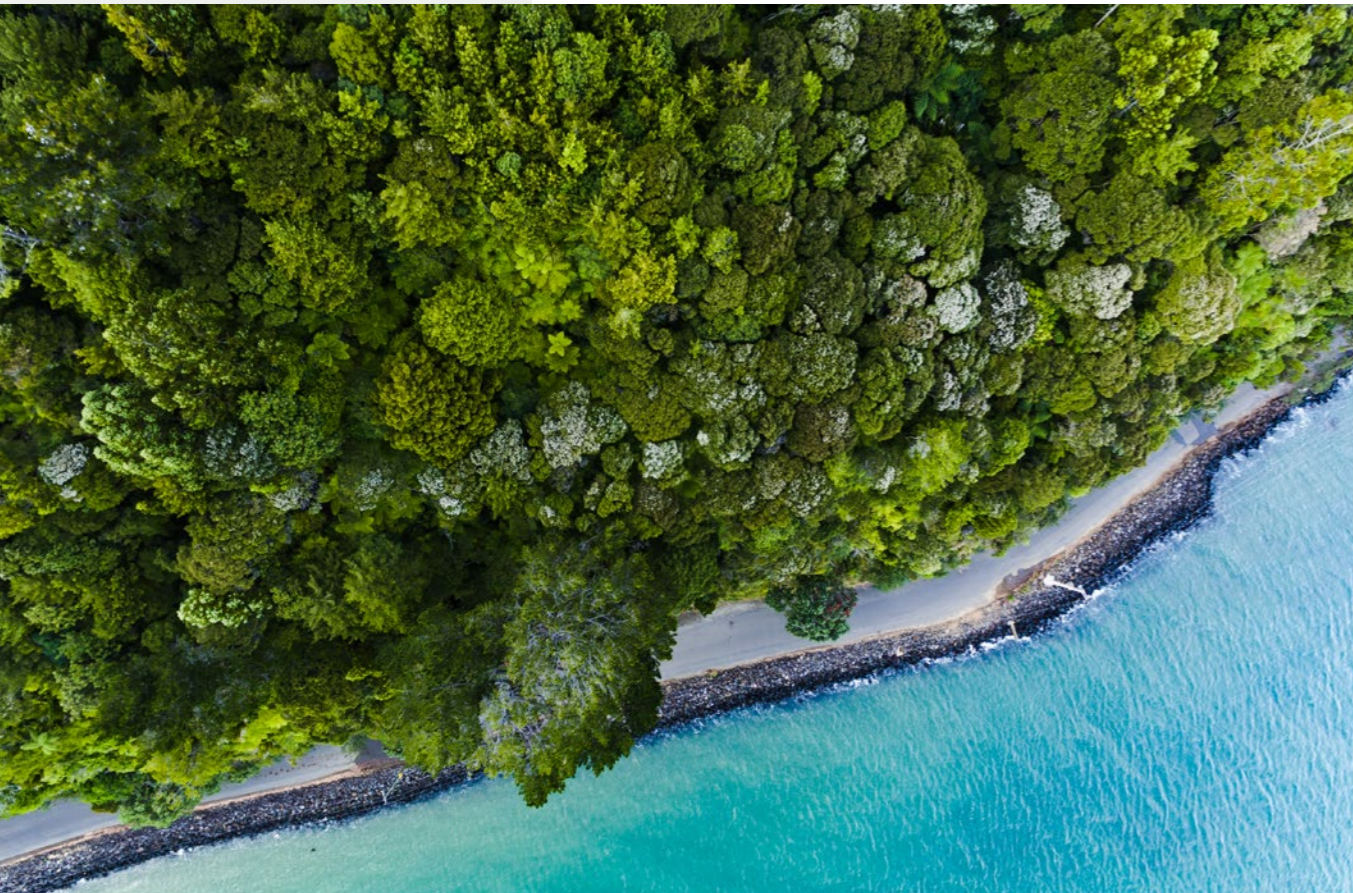


Landscape

The design and upgrade of roads and footpaths should not be considered in isolation. It is important that they sit unselfconsciously within their surroundings and respect the character and heritage of the landscape adjoining the road.

It is also important that the works do not have a negative environmental impact upon their surroundings and consideration should therefore be given to their ecological impact.

- All development should, where practicable, use local natural materials or materials to reflect the materials of the locality of the development.
- Where possible, existing swales should be retained and not replaced with kerb and channel.
- The use of vegetation (green infrastructure) as part of the road design/stormwater management and maintenance should be encouraged.
- Weed hygiene should be employed for all construction and maintenance works.
- Batters should be masked and stabilised through the retention or restoration of natural vegetation.
- Project teams should consult with Auckland Council's Biodiversity team on native plantings.



Vegetation management

Auckland Transport recognises that the road network is an intrinsic and valuable element of any area's character and that the way in which the roads and roadside environment are managed can have a significant effect on local distinctiveness, character, heritage and biodiversity. It is very important to Auckland Transport that weeds and pest plants within the road reserve are actively managed to ensure that there is no negative impact upon the local ecology. In the WRHA particularly, Auckland Transport expects the highest standards of vegetation management.

Auckland Transport seeks to protect and, where practicable, restore and enhance native vegetation and habitat for native species within road corridors in the WHRA.

Specific guidance on vegetation management within the road reserve is currently shown in Auckland Transport's Code of Practice, Section 14. However, this edition has been in draft since 2014 and requires updating which is beyond the scope of this document.

- Auckland Transport is responsible for the vegetation control in the road corridor of rural roads and the maintenance of grass berms in road corridors in urban areas of the Auckland region.
- Auckland Council has responsibility for the maintenance of urban street trees, gardens, bush, natural areas, wetland and landscaped areas in the road corridor, as per Auckland Transport requirements.
- Auckland Council Parks Department and Auckland Transport's Road Corridor Maintenance (RCM) Department should work cooperatively together and should be in constant contact about vegetation in the road corridor.

The road reserve within the WRHA includes significant natural assets, and the Design Guidelines have the potential to have a significant positive effect on the health of these, and the rainforest, streams and other habitats that back onto them.

The road reserve habitat is important because:

- There are multiple threatened species in the road reserve. In many cases, the ridgeline habitat is their preferred habitat and most roads within the WRHA are located on ridgelines.
- The bush edge that fronts the roads is an important structural component to rainforest. When intact and dense, it plays an important role to buffer wind and retain humidity that benefits the health of the rainforest beyond.
- Roadside batters provide important seral habitat for a range of species that otherwise struggle to find such habitat. Good practice maintenance provides the disturbance that maintains this habitat.

Design elements that retain natural assets can reduce the cost of maintenance of the carriageway and road reserve. At other times there may be increased cost, but also improvements to other values that benefit the wider community.

The asset design plays an important role in retaining or restoring the quality of these habitats and structures. For instance, benefits can be achieved from visually narrowing the carriageway with additional eco-sourced native planting within berm areas or potentially allowing extra growth of existing vegetation, subject to site-specific considerations.

Design elements within the road reserve should seek to:

- Reduce invasive weed distribution and growth
- Enhance the tourist, and local, driving experience and sense of place
- Reduce slips and erosion
- Reduce siltation and pollution to local streams
- Increase road safety.

Project teams should consult Auckland Council's Weed Management Policy.



Road design

It is important that the roads retain their informal, rural appearance. However, there is often a difficult balance between providing for the needs of all of the main users—pedestrians, cyclists and cars—with the need to retain a low-key and ‘low-engineered’ appearance.

- Roads should generally be designed to the least possible width to cater for the needs of their users. In addition, where space permits, footpaths should generally be separated from the main carriageway.
- The needs of cyclists should be considered on a case-by-case basis. The different opportunities, constraints and circumstances in each area mean that a bespoke response may be needed, rather than relying on usual standards.
- Where possible, incorporate appropriate vegetation as part of the design. Such green infrastructure contributes to both the character and environmental capacity of the design, and should be maintained as valued infrastructure.
- The retention of an unformed edge to the road with swales is more in character with the informal character of the villages and rural sections of the WRHA and could also encourage slower speeds than a more formalised kerb and channel arrangement.
- A kerb and channel may be required in some cases to ensure that water does not damage any retaining wall associated with a barrier. If this is the case, their overall length should be kept to a minimum.
- The design of roadside parking and layby areas should follow the general advice of this guide to be very informal in appearance and, where possible, have an unsealed surface rather than a sealed surface. (See further advice and guidance in Piha Area Design Guidelines.)
- Entrances to roadside parking areas that are separated from the road should be kept narrow to ensure that they do not become over-dominant.
- Natural calming and other passive calming measures should be used near parking areas to reduce vehicle speeds and improve overall safety.



Sealed and unsealed surfacing

- While it generates greater noise, the use of coarse chip seal should be the norm within the WRHA. It has a less urban appearance than other options and is more in keeping with the overall character of the area.
- The greater noise generated by coarse seal is also likely to passively calm the traffic.
- The use of high-friction surfacing is acceptable, although care should be taken to ensure that the aggregates selected are of appropriate colours for their specific location.
- Consideration should be given to the use of alternative surfaces where surrounding users are sensitive to the noise generated, subject to funding and site-specific requirements that meet the long-term maintenance objectives.
- Existing unsealed roads should remain in an unsealed state, unless there are overriding health or road safety reasons to change.
- Where there are good reasons to seal a previously unsealed road (which may include addressing environmental impacts, reducing maintenance or addressing accessibility issues) careful attention should be given to the design of the altered road to ensure that it remains as informal as possible.



In many parts of the WRHA, there are no dedicated footpaths alongside the road. This places pedestrians in the vulnerable position of having to walk along the carriageway. There are two possible alternatives: to provide a dedicated footpath, or to reduce vehicle speeds sufficiently that it is safe for pedestrians to walk on the road.

Footpaths

- Vehicle speeds on open roads within the WRHA can be high. Where it is not possible to reduce these speeds to a safe level, it is desirable to separate pedestrian footpaths from the main carriageway. However, the undesirability of kerbs and channels or other physical barriers that have an urban appearance may mean that there needs to be greater physical distance between users than would be the norm. Where new footpaths are proposed, the road reserve may have to be wider to accommodate the footpath behind a swale and/or berm.
- Alternatively, consideration can be given to providing even greater separation by taking a footpath through an adjacent reserve or open space.
- Within villages, pedestrians are often forced to walk on the road. Consideration should be given to new footpaths, walkable berms or cycling routes that local communities have identified that they would like to see developed as a priority. The available road reserve and ability to form a separate footpath within these areas is often limited. Where this is the case, Auckland Transport should look at ways to reduce overall vehicle speeds to improve pedestrian safety.
- Designers and project teams could consider narrow footpaths in specific locations and in conjunction with the local community. (Less than 1.80m standard as per Auckland Transport's Code of Practice.)
- Consideration should be given to using gravel for footpaths where circumstances permit. However, the decision whether to use gravel should take into account the level of service expected and the expected maintenance required. Project teams could consider specifying the installation of geotextile products.
- Where concrete is used for footpaths, it should be tinted with black oxide. While this will fade over time, it will provide the opportunity for the surface to weather naturally.
- Where areas of concrete tinted with black oxide are repaired, the repair should be similarly tinted to provide the best possible colour match. However, it is recognised that it is not practical to expect to fully colour match repairs and they may remain visible for many years.



Ensuring that traffic travels at an appropriate, slower speed within the WRHA, both within the rural area and within villages, has a very significant impact upon people's enjoyment of the area.



Safety and speed management

- Slower speeds will enable residents and visitors to appreciate the characteristics of the nationally important landscapes from the road and also allow different users (including walkers, cyclists and pedestrians) to share the road.
- Within the WRHA, natural calming measures should be considered as a means to passively slow down traffic speeds rather than urban, built interventions.
- This can include visually narrowing the carriageway using eco-sourced native planting with additional planting within berm areas, or potentially allowing extra growth of existing vegetation, subject to site specific considerations.
- Project teams must involve road safety and other teams in regard to proposals that consider altering speed limits in the WRHA.

Marking the entrance or gateway into villages and settlements alerts motorists that they are entering a different environment and should alter their driving pattern.

- This can be marked by built elements such as timber fences.
- Signs can be incorporated into these features.
- Changes in road surface can also mark these thresholds and can be used in other locations to passively slow down traffic.
- Changes to surfaces to mark the entrance or gateway into villages and settlements may include the use of cobble stones or small unit setts that create noise and vibration for drivers, as well as visually marking entrances. The impact of these upon the amenity enjoyed by adjacent land uses must be considered as part of the decision. An effective alternative to the use of cobbles or setts is the use of a section of concrete with appropriate aggregate rolled into the surface, or another textured surface.
- The retention of an unformed edge to the road with swales is more in character with the informal character of the villages and rural sections of the WRHA and could also encourage slower speeds than a more formalised kerb and channel arrangement.





Experience shows that reducing road signs and markings to the minimum can passively calm traffic by encouraging drivers to better interact with their environment and to drive more appropriately. Too many signs also create clutter and can impact on views within the area. Together, these detract from the overall amenity of the WRHA.

Signs and road markings

- Using standard designs for road signs or excessive use of painted road markings are likely to undermine the natural values of the WRHA.
- Where new signs are required, Auckland Transport will therefore prefer signs of a design that recognise the informal and rural character of the area.
- Auckland Transport will consider the overall existing provision of road signage within the WRHA and look towards reducing the number of posts and signs where feasible. This may include using a post for more than one sign, thereby reducing the number of posts
- Auckland Transport will work with the local board to create a new design of road sign for use solely within the WRHA. This should use materials for the post which are sensitive to the rural character of the area and will carefully consider the appropriate reflectiveness and colour of the signage.
- Within individual communities, Auckland Transport will consider the incorporation of community-led art elements into some of the infrastructure, including signage, to ensure that the new infrastructure contributes to the character and identity of the area. Existing examples include the 'Free Range Kids' surf board at Bethells Beach.
- Changes in road surface will be considered as an alternative to markings painted on roads, as they can also indicate to drivers that they are approaching hazards or other features.



By its very character, the WRHA is generally not an area where high levels of lighting are expected and the Act specifically identifies the heritage significance of the darkness of the area.

Lighting

Auckland Transport recognise that it is therefore necessary to balance the lighting levels against the overall character of the area and that lighting is a specific focus of the area.

- Careful consideration should be given to the appropriate level of lighting within a particular area. This will require a careful and controlled balance between the environmental and safety requirements.
- Auckland Transport will consider the removal of existing lighting if this represents an enhancement of the heritage character of the area, providing that there would be no adverse safety effect.
- All road lighting should be designed to spill no light. Where this cannot be achieved, spill light must be limited to the absolute minimum.
- Lights should be further adjusted by use of the telemanagement system to reduce light levels at times of low road use.





The use of standard designs and styles of street furniture and structures could lead to the urbanisation of the character of the WRHA. Auckland Transport will therefore aim to use street furniture that has been designed specifically for use within the WRHA, for instance timber bollards instead of metal bollards.

Street furniture

Auckland Transport would also like to incorporate community-led art elements. Existing examples include the Ark in the Park bus shelter on Te Henga Road.

- Street furniture should reflect the overall low-key appearance of the area. They should incorporate local and natural materials. Wherever possible, consideration should be given to working with local designers to help ensure that new street furniture contribute to the character and identity of the area.



The use of standard designs of structures could lead to the urbanisation of the character of the WRHA.

Safety barriers

- Auckland Transport recognises that crash barriers have an urban appearance. However, the topography of the WRHA and the design of roads in the area mean that they are sometimes necessary. To ensure that they function as required, it is likely that they will have to be of a standard design.
- Where possible, the crash barrier should be set behind or within existing roadside vegetation to minimise its visual impact.
- Wire rope barriers, with posts retained in a galvanised finish that will dull over time and not stand out excessively against surrounding vegetation is the preferred option, as this will be visually less obtrusive. However, these are only suitable where there is an appropriate deflection zone. Where this zone is not available, W-shape barriers may be used.
- Where a W-shape barrier is required, existing plant should be retained in front and behind if possible.
- Project teams should consult with Auckland Council's Biodiversity team on native plantings to hide safety barriers, using species in keeping with surrounding vegetation.
- Where practicable, the installation of a safety barrier should not be accompanied by the installation of kerb and channel, as this would further urbanise the area.
- Timber facing safety barriers have to be approved by Auckland Transport's Network Operations and Safety Manager before installation.





The use of standard designs of structures could lead to the urbanisation of the character of the WRHA.

Structures (bridges and retaining walls)

- Structures should reflect the overall low-key appearance of the area. They should incorporate local and natural materials. Wherever possible, consideration should be given to working with local designers to help ensure that new structures contribute to the character and identity of the area.
- Bridges and other structures should be low-key in appearance and not appear overly engineered, for instance simple rural style fencing with chain link between could be an alternative to more formal balustrading.
- Project teams should consult with Auckland Council's Biodiversity team on native plantings to hide structures, using species in keeping with surrounding vegetation.
- Where retaining walls are required, they should be faced in natural materials that are in sympathy with the surrounding area.
- Steps, terraces and associated landscape planting should be used to reduce the overall height and dominance of the retaining walls.
- Encourage the use of vegetation (green infrastructure) as part of the road design/stormwater management and maintenance.



Runoff from roads can have a detrimental impact upon surrounding habitats. However the creation of kerbs and channels to manage stormwater runoff can also have an impact upon the overall character of the WRHA, as they are of an overall urban appearance.

Stormwater

Road edges should be informal in character, with swales preferred to kerbs and channels in villages as well as in rural areas, as this is more in keeping with the overall character of the WRHA. Possible exceptions to this may include the villages within the WRHA and instances where the topography, volume and speed of runoff or the needs of pedestrians mean that swales are impractical or will not function effectively.

Where practical, swales should be used to provide some retention and cleaning of the stormwater from roads, footpaths and cycle ways before it is discharged onto surrounding land or entering a reticulated system where appropriate.

New swales should be formed in preference to kerb and channel, and existing water table drains should be vegetated on the sides and base, or formed into swales.

Auckland Transport encourages the use of vegetation (green infrastructure) as part of the road design to achieve stormwater management and maintenance.

Following significant storms, the water runoff may have created 'underslips and overslips', i.e. slip faces, thereby causing realignment of the adjacent road reserve. In these circumstances, care should be taken when constructing earthworks with excessive benching-out features and unsightly lateral groundwater drainage pipes.



