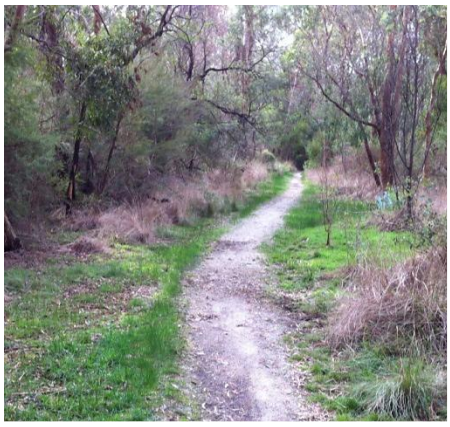

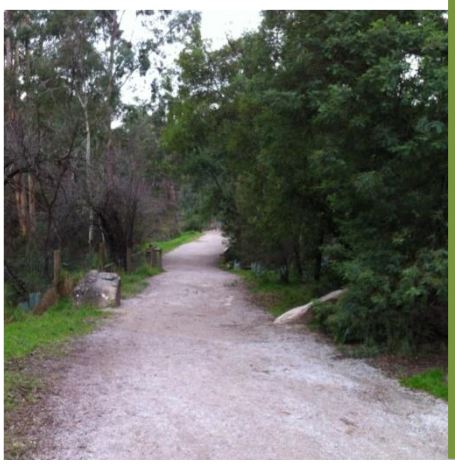

MANNINGHAM

MANNINGHAM GREEN WEDGE INFRASTRUCTURE

SITE RESPONSIVE DESIGN GUIDE

VERSION 1
OCTOBER 2013

Manningham Green Wedge Infrastructure
Site Responsive Design Guide

Report prepared by: Steve Wallbrink.

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Revision Register

Issue	Description
October 2013	Version 1

Foreword

The Manningham Green Wedge is an area highly valued by the community. This Design Guide has been provided to assist in the design of sensitive, site responsive and visually compatible civil infrastructure in the Manningham Green Wedge.

The Guide is 'landscape character focused'.

This means that the design strategies respond to and reinforce the important identified characteristics of the Green Wedge with the aim of minimising negative visual change of proposed civil infrastructure works.

The identified landscape character is:

...an undulating semi-rural landscape dominated by indigenous vegetation and scenic views of informal small townships, public parks, low density rural living and small scale agricultural enterprises

Responding to the semi-rural landscape values, the Overall Design Objective for the design of infrastructure is to:

Provide safe, sustainable, functional and site responsive infrastructure that protects, enhances & celebrates the local landscape, ensuring that the highly valued semi-rural landscape character of the Green Wedge is retained and enhanced.

Responding further to Green Wedge character, eight infrastructure design principles have been nominated:

i. Plan & Involve

ii. Value the Landscape

iii. Resolve

iv. Protect, Enhance & Regenerate

v. Design with Respect

vi. Embrace Responsive Design

vii. Design for People

viii. Design for the Future

To meet the overall design objective and in response to the design principles, site responsive design strategies and general arrangements have been proposed for three key areas of Manningham Green Wedge infrastructure:

Traffic & Drainage Infrastructure
Paths & Trails
Level Changes

Contents

1 INTRODUCTION

1.1 BACKGROUND & PURPOSE

The consultation process for the *Manningham Green Wedge Action Plan 2020* identified the need for infrastructure in the Green Wedge to be sustainable and sympathetic to the semi-rural character of the area.

The Manningham Green Wedge is defined by the Urban Growth Boundary and is predominantly zoned Rural Conservation (RCZ). The Green Wedge covers 4,322 hectares, including public land. It is located on the fringe of Metropolitan Melbourne, almost entirely east of Mullum Mullum Creek. (Figure 1).

It includes the suburbs of Warrandyte, Warrandyte South, Donvale, Templestowe, Park Orchards and Wonga Park.

This Design Guide has been provided to assist the design of sensitive, site responsive and visually compatible civil infrastructure. The guide is founded on the aim of responding to the Green Wedge character.

A character assessment forms the basis for the development of site responsive design strategies and site responsive design arrangements for four key areas of Green Wedge infrastructure.

The Design Guide fosters all participants to follow a process, adapt, hybridise and compose the design strategies into innovative outcomes that address civil requirements whilst responding to the site in a balanced and appropriate manner.

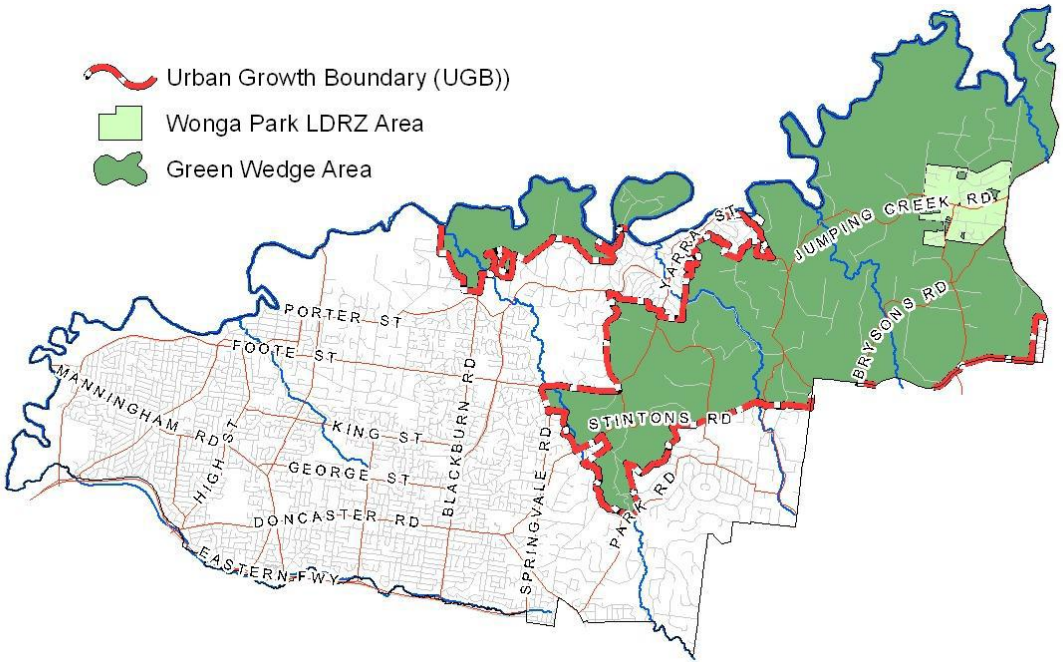
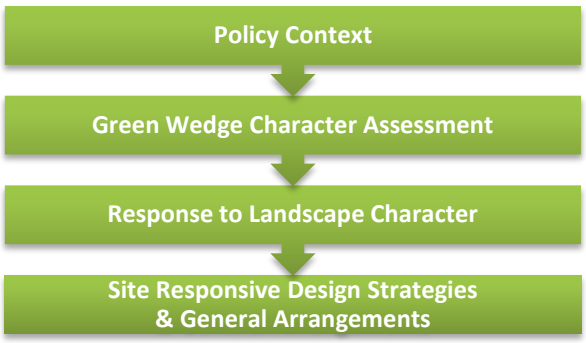


Figure 1: The City of Manningham Green Wedge Area

1.2 FORMAT

The 'landscape character focus' of this guide is facilitated by the following format:



2 USING THIS GUIDE

2.1 CONTEXT

This Design Guide is 'landscape character focused' and provides strategies to help facilitate the visual response to the landscape for new or upgraded civil infrastructure. The guide should be considered as a starting point for site responsive design of civil infrastructure within the Manningham Green Wedge.

The Design Guide is a design phase resource and is intended to be used within the context of Manningham's established overall project process of strategic framework > assessment > design > construction > maintenance > review.

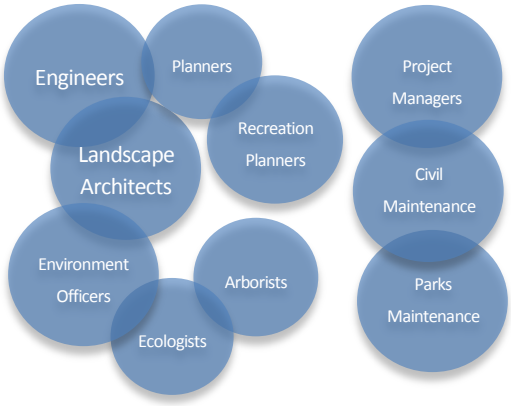
Each and every phase of the overall project process plays an important role in contributing to overall sensitive, site responsive outcomes.

This Design Guide is a design phase resource and should be used in the context of Manningham's overall project process

2.2 USE & COLLABORATION

The guide is intended to be used by any personnel involved in the design of civil infrastructure within the Green Wedge or areas of Manningham with similar landscape character.

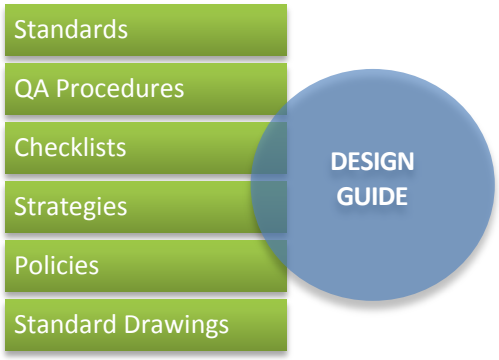
As with any process, good communication and collaboration is central to sensitively resolved outcomes and as such, the users of this guide effectively extend to all Manningham departments associated with infrastructure planning, design, construction and maintenance.



A collaborative approach by Manningham departments will foster innovative and best practice outcomes

2.3 COMPLEMENTARY PROCEDURES

The Design Guide should be used together with the relevant Manningham departmental procedures and standards to addresses all strategic, statutory, stakeholder, environmental, design theme and safe functional compliance requirements.



Use this Design Guide together with the relevant Manningham procedures

3 POLICY CONTEXT

This guide responds to key Manningham policy and statutory objectives.

The vision statement for the Green Wedge in the Manningham Green Wedge Action Plan 2020 is:

The Green wedge is a 'Living Place' to be valued, cared for and enjoyed by all.

One of the main objectives in the Manningham Green Wedge Action Plan 2020 states:

To ensure Sustainable built form and Infrastructure:

- *Design, develop and manage Green Wedge infrastructure in ways that maintain biodiversity and are consistent with regional ecological models;*
- *Ensure that the built form is designed & developed for the long term, with an understanding of and relationship to the natural landscape, local plant and animal communities, is resource friendly and climate wise;*
- *Facilitate a range of efficient, accessible and affordable transport options that readily connect neighbourhoods, work places, community facilities, services and enable people to participate in community life; and*
- *Create places that are safe, respect cultural identity and are inclusive and functional for all members of the community.*

Manningham Planning Scheme Clause 35.06 Rural Conservation Zone states:

Purpose

- *To conserve the values specified in the schedule to this zone.*
- *To protect and enhance the natural environment and natural processes for their historic, archaeological and scientific interest, landscape, faunal habitat and cultural values.*
- *To protect and enhance natural resources and the biodiversity of the area.*
- *To encourage development and use of land which is consistent with sustainable land management and land capability practices, and which takes into account the conservation values and environmental sensitivity of the locality.*
- *To provide for agricultural use consistent with the conservation of environmental and landscape values of the area.*
- *To conserve and enhance the cultural significance and character of open rural and scenic non urban landscapes.*

Manningham Planning Scheme Municipal Strategic Statement states:

Clause 21.07 Green Wedge and Yarra River:

Built form and landscape character

These areas have an attractive, undulating topography. The slopes and extensive vegetation cover contribute to the landscape and environmental qualities. Development should protect and enhance the natural environment, including the Yarra River and other waterways, topography, open space, habitat and fauna links within the green wedge and Yarra River corridor.

21.07-4 Built form and landscape character

Objectives

- *To encourage building form that responds appropriately to the landscape and minimises risk.*
- *To encourage retention of native vegetation.*
- *To minimise the extent of earthworks and to preserve and enhance natural drainage lines.*
- *To encourage the planting of indigenous vegetation.*
- *To protect and enhance landscape quality, view lines and vistas.*

4 GREEN WEDGE CHARACTER ASSESSMENT

4.1 EXISTING LANDSCAPE CHARACTER

Landscape character sets the visual context for site responsive design.

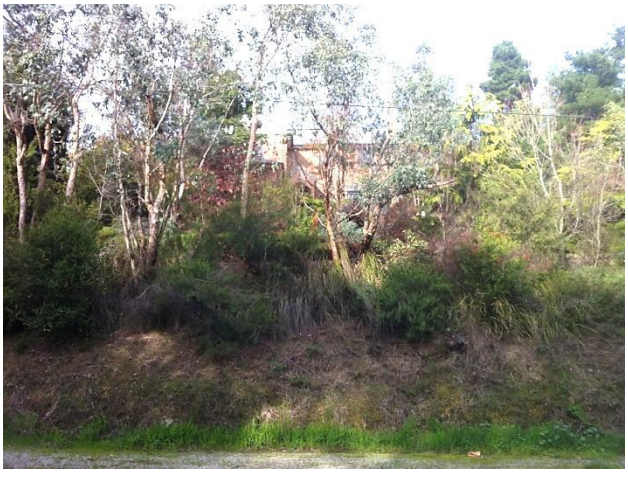
By identifying the salient character elements, the core visual values are identified. These values are responded to in Section 5 with the aim of minimising negative change and reducing overall visual impacts of proposed civil infrastructure works.

The identified landscape character is:

...an undulating semi-rural landscape dominated by indigenous vegetation and scenic views of informal small townships, public parks, low density rural living and small scale agricultural enterprises

An undulating landscape with scenic views and semi-rural land uses

Townships set within informal indigenous and native landscapes



Houses set within the natural landscape

Roads with vegetation close to the road, often with connected tree canopy

4.2 EXISTING NATURAL CHARACTER TO REINFORCE

Overview

The protection, reinforcement and celebration of natural qualities and natural processes in the Manningham Green Wedge are fundamental to a sensitive response to local character.

Signature Natural Character

Natural character dominates man-made character. Natural features are central to the informal rural - living character of the Green Wedge.

The main important natural character features to protect, enhance and celebrate in site responsive design are:

Significant vegetation areas

Connected tree canopy over local streets

Natural plant associations & vegetation close to the edge of the street pavement

Bushland spaces and natural walking & riding experiences

Indigenous replanting

Exposed geology

Natural waterways

4.3 EXISTING INFRASTRUCTURE CHARACTER TO REINFORCE

Overview

Existing civil infrastructure in the City of Manningham Green Wedge is also an important component of local character. Existing infrastructure has an overall informal character. It is often characterised by unformed edges, irregular geometries and is frequently dominated by natural landscape elements.

Signature Road & Street Character

Roads and streets provide the main viewing places, the main day-to-day experiences and means of access in the Green Wedge. The design and detail of road and street infrastructure provides the greatest overall visual influence of any infrastructure element in the Green Wedge.

Irregular street geometries

Roads within vegetation

Local streets with asphalt edge

Streets with asphalt edge

Light weight spray seal streets

Informal car parking areas

Kerb with detail in town areas

Informal looking crossovers

No car park line marking/kerb

Planted roundabouts

Wire rope barrier

Guard rail with planting

Signature Drainage Character

Together with informal road pavement edging and kerb-less streets, open informal street drainage is integral to the informal local character of the Green Wedge.

Roads with swale drainage systems

Lined table drains on steep streets

Culvert drive crossings

Open drainage networks

Informal & simple road WSUD using indigenous plants

Swales in carparks

Signature Path & Trail Character

Paths and trails provide informal connectivity for pedestrians, cyclists and equestrians.

Successfully integrated paths have informal alignments and surfaced with either asphalt (higher use or erosion control) or aggregate (lower use).

Asphalt footpaths associated with planting in townships

Asphalt footpaths in higher use areas

Custom-designed arrangements for footpaths

Aggregate footpaths in woodland street verge

Informal natural surfaced paths in woodland street verges

Informal natural surfaced equestrian paths

Asphalt shared use paths in higher use areas

Aggregate shared use paths in natural settings

Boardwalks with composite deck and timber rails

Signature Level Change Visual Elements

Level changes in the Green Wedge have been successfully achieved by leaving natural cut surfaces or exposed rock rather than retaining walls.

Visually successful retaining walls are rock-faced in higher profile areas and timber sleeper in lower profile or non-visible areas.

Stable natural roadside batters

Exposed natural rock

Simple timber sleeper walls

Rock-faced retaining walls in high visibility areas

Rock retaining

Natural surfaced steps

5 RESPONSE TO LANDSCAPE CHARACTER

5.1 RESPONSE & APPROACH

Response

Infrastructure provides the interface and conduit for experiencing the Green Wedge. Streets, roads, paths and trails provide the journey experiences and means of social, cultural and natural contact and connection. The scale, form, colour and texture (visual impact) of infrastructure also contributes to landscape character.

With this in mind, infrastructure design has enormous potential to influence the Green Wedge character in both negative and positive ways.

To reinforce positive change, this design guide focuses on strategies and processes that foster the design of infrastructure that responds to character.

Overall Design Objective

Responding to the identified landscape values, the Overall Design Objective for the design of infrastructure is to:

Provide safe, sustainable, functional and site responsive infrastructure that protects, enhances & celebrates the local landscape, ensuring that the highly valued semi-rural landscape character of the Green Wedge is retained and enhanced.

Recommended Design Approach

Follow a rigorous overall project process.

Work collaboratively with other Manningham Departments.

Follow the relevant Manningham departmental procedures and standards.

Use this Design Guide to help facilitate the visual response to new or upgraded infrastructure.

One solution may not necessarily fit all situations and the adopted overall design process should identify which design strategies are applied and where and how they are applied.

Consider each element as part of an overall 'composition' which is based on an identified character-based design theme. Get advice on how to identify design themes and plan for overall design continuity.

Think about the overall visual impact when choosing materials. For instance there may be situations where a 'natural' material such as a timber may not be appropriate due to the visual bulk of the material.

Hybridise and adapt techniques if necessary to achieve best outcomes.

Considering the above, the recommended general approach is:

HIGHER ENVIRONMENTAL SIGNIFICANCE:
Provide greater attention to minimising impacts and reducing the footprint.

HIGHER VISIBILITY:
Provide greater attention to scale, colour, texture and screening.

HIGHER USER INTENSITY:
Provide greater attention to design detail.

5.2 INFRASTRUCTURE DESIGN PRINCIPLES & AIMS

Responding further to Green Wedge Character, seven Infrastructure Design Principles have been nominated.

The principles have been adapted from the *Australian Institute of Landscape Architect's 'Australian Landscape Principles'.* Design aims have also been proposed in response to the principles.

i. PLAN & INVOLVE

Aim 1: Identify Statutory Policy

Identify Planning Scheme requirements and Overlays.

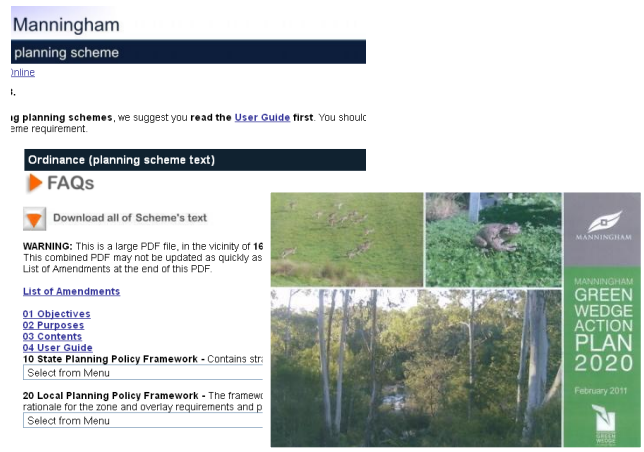
Aim 2: Identify strategic direction

Implement the infrastructure in a strategic context.

Look at the broader picture and provide an overall vision.

Confirm need and priority

Aim 3: Identify stakeholders & their requirements



ii. VALUE THE LANDSCAPE

Aim 4: Assess & understand the site

Document the physical features of the site.

Assess all natural, cultural, visual and functional opportunities, constraints and issues.

Read the landscape.

iii. RESOLVE

Aim 5: Make it safe & fit for purpose

Fully address safety and function in association with applying all of the aims below.

Aim 6: Sensitively cater for accessibility

Aim 7: It is sometimes OK to do nothing

Aim 8: Strive for minimal intervention

Aim 9: Minimise costs

Design for minimal capital, life cycle and recurrent costs.

iv. PROTECT, ENHANCE & REGENERATE

Aim 10: Protect natural systems & cultural heritage

Avoid high significance areas.

Foster minimal intervention.

Minimise the impact footprint.

Aim 11: Aim for positive change

Always minimise visual change whilst addressing the issue at hand.

Aim 12: Harness natural processes

Incorporate natural drainage patterns.

Encourage natural regeneration.

v. DESIGN WITH RESPECT

Aim 13: Compose for visual integration & sympathetic appearance

Every infrastructure element contributes to character.

Think about informal design options.

Aim14: Design for sensitive fit within the landform & landscape

Infrastructure should be submissive to the natural landscape.

Keep it Simple.

Aim 15: Involve stakeholders

vi. EMBRACE RESPONSIVE DESIGN

Aim 16: Interpret the character

Every infrastructure element should address local context and contribute to an overall character theme.

Create journey experiences.

Provide windows to the landscape.

Aim 17: Enrich the experience

Consider the role of infrastructure in place making, interpretation and experience and design accordingly.

Aim 18: Adapt & hybridise

Adapt and provide the best outcomes.

vii. DESIGN FOR PEOPLE

Aim 19: Address the way people use spaces, make it easy to use
Respond to use intensity.

Aim 20: Foster active lifestyles & connection with people & natural processes

viii. DESIGN FOR THE FUTURE

Aim 21: Use sustainable materials, products, energy sources & construction techniques

Aim 22: Incorporate integrated water management

Aim 23: Provide durable assets

6 SITE RESPONSIVE DESIGN STRATEGIES & GENERAL ARRANGEMENTS

6.1 OVERVIEW

Site responsive design strategies and site responsive design arrangements have been proposed for three key areas of Green Wedge infrastructure.

Traffic & Drainage Infrastructure
Paths & Trails
Level Changes

The strategies and arrangements have been developed considering the Overall Design Objective (page 9) and the Infrastructure Design Principles & Aims (page 10).

The design strategies provide a commentary on preferred approaches and techniques that are compatible with the recommended visual outcomes for the particular infrastructure category. Where appropriate, examples of inappropriate and preferred techniques and approaches are shown to demonstrate the strategy. The design strategies should be read carefully as they provide the basis upon which the general arrangements should be applied.

The site responsive design arrangements provide proven examples of construction techniques, materials and finishes that are visually sensitive to the identified character, strategies and aims for the infrastructure category. The arrangements are a starting point only for infrastructure design and it is intended that over time, the arrangements are updated as new materials and technologies are developed and ongoing project performance is reviewed.

6.2 DEFINITIONS

The site responsive design arrangements provide the following information:

Application – recommended situations where the treatment could be applied and preference for treatment. Also info on the anticipated users or use intensity where appropriate.

Appearance – notes on appearance and 'formality/ informality' of the treatment.

Standards – lists the relevant Manningham standard drawing numbers.

Visual Fit – a scale of the visual appropriateness of the element considering the Green Wedge character (poor to good sliding scale, good is better).

Initial Cost – a nominal scale of magnitude of comparative cost (low to high sliding scale, low is better).

Embodied Energy – a basic indicator of the energy required for the manufacture and transport of the constituent materials (low to high sliding scale, low is better).

Recyclability – a scale of ability to recycle (low to high, high is better).

Durability – a scale of expected useful life of the materials (low to high, high is better).

Maintenance Intensity – a nominal scale of expected degree of maintenance required (low to high, low is better).

Sustainable sources and recycled content materials are recommended wherever possible. Due to the varying quality, techniques and sources of materials, and varying site conditions a 'sustainable content' rating has not been provided. Recycled content path base, recycled content premix concrete and sustainably sourced timber is encouraged. In all cases, the material is only truly sustainable if the product is durable and requires minimal maintenance.

6.3 TRAFFIC & DRAINAGE INFRASTRUCTURE

General Considerations

The Green Wedge street character is significantly influenced by the informal character of the local streets and roads. In many cases roads and streets are 'submissive' to the surrounding vegetation, with visually dominant vegetation, trees close to the pavement edge, irregular road verges and frequent off-standard street widths, edge treatments, drainage and drive crossovers prevailing. The visual dominance of vegetation and the simplicity of an irregular kerb-less pavement draining to an open table drain is an important character feature to retain.

Sensitively incorporate the strategies and general arrangements below, together with the Manningham Civil Design QA procedures to deliver high quality street infrastructure which is sympathetic to local character.

Manningham Strategies

Arterial Roads Improvement Strategy (2008) | Road Safety Strategy (2010) | Roadside Environmental Management Strategy (2004) | Streetscape Character Study (2002) | Urban Design Framework for Warrandyte Township | The relevant Reserve Management Plans

Relevant Standards

VicRoads Standard Drawings | Manningham Civil and Drainage Design Standards.

Site Responsive Design Strategies

Strategy 1: Consider doing nothing

Many streets in the Green Wedge are valued for their quirky, eclectic and informal street arrangements. Evaluate how the infrastructure works will impact on this character. Is it OK to leave it as it is?

Strategy 2: Minimise the intervention & the construction footprint

If street works are required, minimise the extent of the work and the degree of visual change.

Strategy 3: Don't standardise the design

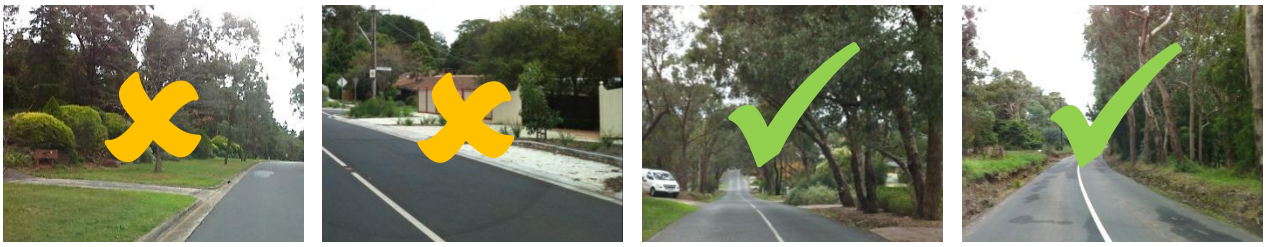
In natural landscape settings avoid 'standardising' the design. Straight geometries, concrete kerb and channel and concrete drive crossovers are not sympathetic to the Green Wedge Character. Adapt and hybridise techniques that retain informal features.

Strategy 4: Don't 'clean up' street verges & roadsides

Leave existing remnant vegetation untouched on roadsides and verges where safety, utility and fire management requirements are compatible with the retention of vegetation. This includes restricting the impact footprint and retaining the natural roadside topography. Reinforce the appearance of irregular, often 'haphazard' roadsides.

Strategy 5: Retain existing verge vegetation & tree canopy wherever possible

The informal character of Green Wedge streets is reinforced by the retention of safe indigenous vegetation in irregular locations on street verges. Connected canopy over the street is also an important local character.



Strategy 6: Resolve people access

Consider how people use a site to resolve convenient and safe public access routes such as permeable access required adjacent to a car park. Provide access where desire lines are identified rather than barricade and restrict.

Strategy 7: Consider excavation impacts on tree root zones

Seek advice on adjacent tree protection zones before excavating for traffic and drainage works.

Strategy 8: Use the opportunity to improve landscape values, but factor in maintenance

Factor in the horticultural requirements of plants and integrate indigenous planting in new street works where safety and sight lines permit. Indigenous plant species are preferred outside of townships. Factor in plant maintenance – remember that wet areas promote weed growth.

Strategy 9: Provide the appearance of an informal pavement edge

Asphalt with no visible edge restraint is the preferred street pavement edge, followed by dark grey coloured concrete edge strip. Where kerb and channel is required, preference should be given to dark grey coloured concrete.

Strategy 10: Use asphalt pavement for high use areas

Use asphalt rather than standard concrete pavement for streets, car parks and drive crossovers requiring extra protection.

Strategy 11: Use aggregate or sprayed seal pavements for lower use areas

Use aggregate pavements for lower use on-street car park spaces and drive crossovers on gentle grades. Consider sprayed seal as a more durable wearing course for lower use areas

Strategy 12: Minimise 'urban-character' traffic treatments

For infill pavement such as traffic islands or mountable pavement at roundabouts, use simple infill pavement finishes. Wherever possible (considering safe traffic requirements), minimise the use of linemarking. For carparks, if linemarking is required, use 'T" marks or pavement markers to delineate parking bays. Consider alternative speed control devices such as planted traffic slow points rather than speed humps, which require extensive linemarking.

Strategy 13: Consider end-of-pipe wet WSUD Systems as a first priority design option

Firstly consider 'nodal' end-of-pipe WSUD wetland systems that follow natural drainage lines, have capacity to hold water during summer, provide aquatic habitat benefits and improve landscape values.

Strategy 14: Consider simple WSUD systems as a mid-priority design option

Simple, low cost systems such as mown grass swales and grass buffer strips are easy to maintain, often address water treatment-train objectives and are sympathetic to many landscape character types. Mown grass is also often suitable for sites such as car parks where pedestrian access is required at multiple points.

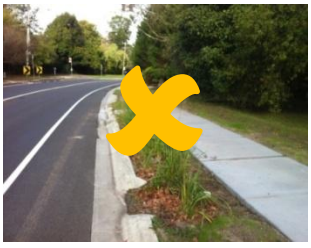
Strategy 15: Consider car park WSUD swales & infiltration areas as a mid-priority design option

Car park WSUD systems should be designed with the widths, areas and grading necessary for the proper function of the system. Don't design the car park first and then insert WSUD in the 'left over' spaces. WSUD requires grading for water to drain into the system with allowance for extended detention and silting.



Strategy 16: Consider in-street WSUD systems as the last priority design option

In-street WSUD systems in the Green Wedge are often heavily constrained by steep topography, narrow width nature strips, existing vegetation, underground utility services and pedestrian access requirements and may not necessarily offer the best cost benefit. Consider other techniques first. If in-street WSUD is required, consider locating the system in wider areas of the nature strip or localised nature strip widening such as traffic control outstands.




Strategy 17: Aim for 'infrastructure amongst landscape'

Ameliorate the visual impact of highly visible standard infrastructure such as guard rail or kerb and channel by planting vegetation appropriate to the function of the asset. The overall visual impression should be one of 'infrastructure amongst landscape' rather than 'infrastructure or landscape'.




Site Responsive Design Arrangements

GW-TD01: Street Swale Drainage

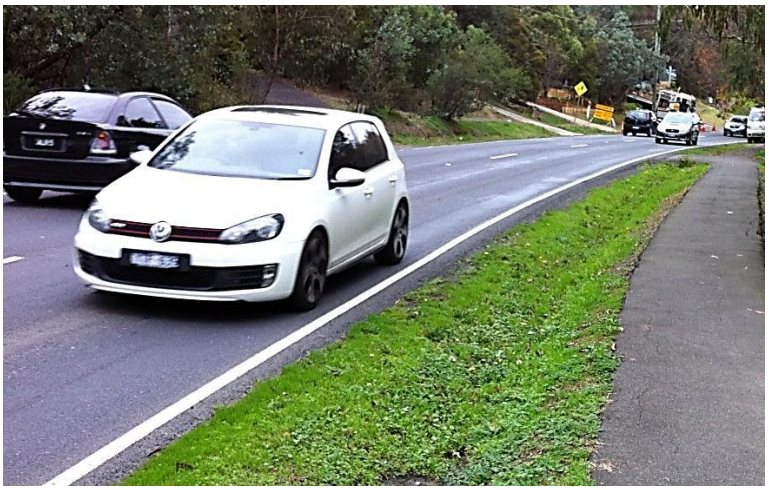
Application: Street swale (table) drains, with finish responding to erosion potential and traffic safety. Used in association with various traffic pavement edge treatments (GW-TD02 & TD03).

Grassed swale drain – used for swales not requiring lining for erosion control.

Asphalt lined swale drain – used for swales requiring high velocity water erosion control.

Appearance: Informal appearance open swale drains.

Standards: No Manningham Standard Drawing.



Grassed Swale Example

Grassed Swale

Visual Fit:
Initial Cost:
Embodied Energy:
Recyclability:
Durability:
Maintenance:

Grassed table drains provide a 'soft' informal appearance and are the preferred drainage treatment for streets in natural landscape settings where traffic management and road safety requirements permit its application.

Asphalt Lined Swale Example

Asphalt Lined Swale

Visual Fit:
Initial Cost:
Embodied Energy:
Recyclability:
Durability:
Maintenance:

Asphalt lined table drains provide the visual informality of a table drain while providing erosion protection and the next preferred treatment in natural landscape settings where traffic management and road safety requirements permit its application.

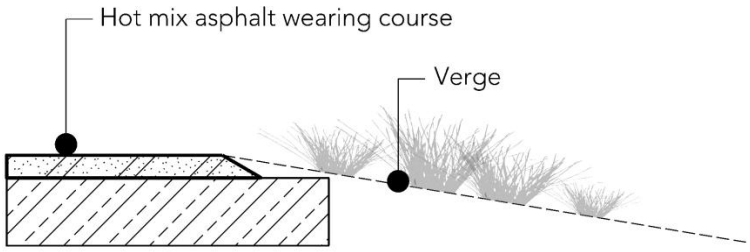
GW-TD02: Asphalt Pavement Edge (associated with street swale drainage)

Application: Roads and streets with swale drains or informal shoulders and where an informal edge is appropriate. The preferred visual treatment for streets in natural landscape settings where traffic management and road safety requirements permit its application.

Appearance: Informal appearance asphalt pavement edge.

Standards: No Manningham Standard Drawing.

Visual Fit:
Initial Cost:
Embodied Energy:
Recyclability:
Durability:
Maintenance Intensity:



Typical Cross Section

Asphalt Pavement Edge

- Hot mix asphalt wearing course
- Asphalt pavement edge shaped to 30% to reduce risk of car wheels being caught on any otherwise vertical pavement edge.
- Base course extends 150mm beyond edge of pavement to reinforce the edge.
- Shoulder built up to cover shaped asphalt edge.
- Verge protected from erosion to ensure edge remains safe.

GW-TD03: Concrete Edge Strip (associated with street swale drainage)

Application: Roads and streets with swale drainage or informal shoulders. A successful visual treatment when associated with adjacent planting. Suitable for streets in natural landscape settings where traffic management and road safety requirements permit its application.

Appearance: Concrete edge provides a more formal appearance than asphalt pavement edge.

Standards: Manningham Standard Drawing S214.

Visual Fit:

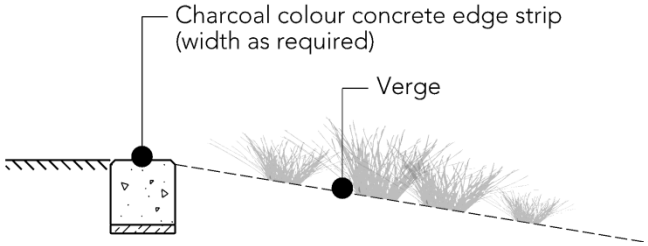
Initial Cost:

Embodied Energy:

Recyclability:

Durability:

Maintenance Intensity:



Typical Cross Section

Concrete Edge Strip

- Charcoal colour integral oxide concrete.
- Width of edge strip may vary according to specific road design requirements. Minimum widths are the preferred visual outcome.
- Verge protected from erosion to ensure edge remains safe.
- Edge strip may be concealed by covering the edge strip with the asphalt wearing course.

GW-TD04: Asphalt Kerb

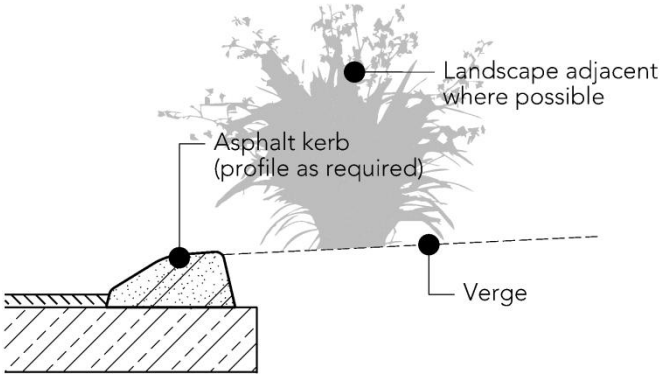
Application: Roads and streets that require underground drainage for traffic management and road safety requirements.

Appearance: Formal edge treatment and should only be used where specific road design, drainage design and traffic requirements prevail.

Standards: No Manningham Standard Drawing.

Visual Fit:
Initial Cost:
Embodied Energy:
Recyclability:
Durability:
Maintenance Intensity:

Asphalt Kerb



Typical Cross Section

- Asphalt extruded kerb.
- The actual kerb profile depends on the specific road design requirements.
- Provide landscape planting adjacent to kerb wherever possible.

GW-TD05: Charcoal Colour Concrete Kerb & Channel

Application: Roads and streets that require underground drainage and kerb treatment for traffic management and road safety requirements.

Appearance: Very formal edge treatment and should only be used where specific road design, drainage design and traffic requirements prevail.

Standards: Manningham Standard Drawing S200 series.

Visual Fit:

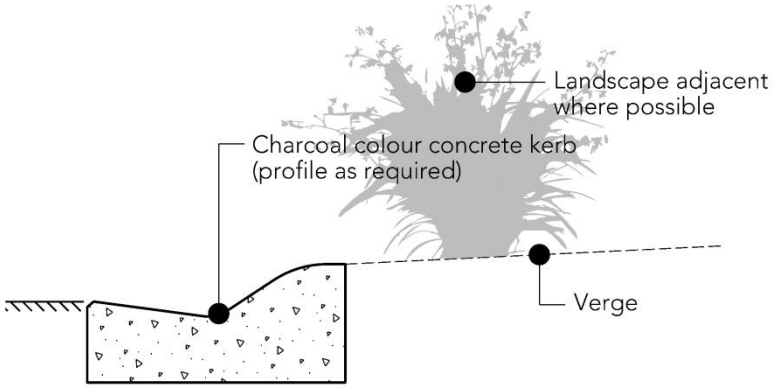
Initial Cost:

Embodied Energy:

Recyclability:

Durability:

Maintenance Intensity:



Typical Cross Section

Charcoal Concrete Kerb & Channel

- Charcoal colour integral oxide concrete.
- The actual kerb profile depends on the specific road design requirements.
- Standard grey concrete kerb may be required in some traffic situations to visually define raised pavements or traffic control devices.
- Provide landscape planting adjacent to kerb wherever possible.
- Kerb may be further concealed by applying a sprayed seal with aggregate over the entire pavement and kerb.

GW-TD06: Vehicle Crossing Preferred Surface Treatments

Application: Vehicle crossings with driveable culvert end walls as per Council's technical specification.

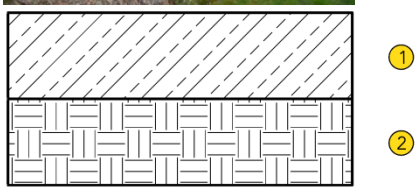
Aggregate used for gentle grades and lower-use areas where gravel is not likely to wash onto through-traffic lanes.

Asphalt used for steeper grades, higher erosion risk areas and higher-use areas.

Exposed aggregate concrete used for special high durability applications.

Appearance: Informal appearance (concrete least preferred).

Standards: Manningham Standard Drawings S240-246,



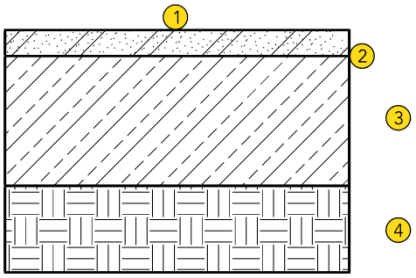
Aggregate Vehicle Crossing Typical Profile

Aggregate Vehicle Crossing

Visual Fit:
Initial Cost:
Embodied Energy:
Recyclability:
Durability:
Maintenance:

Aggregate has an informal appearance.

1. 100mm compacted depth of 20mm to dust Class 2 F.C.R.
2. Compacted subgrade.



Asphalt Vehicle Crossing Typical Profile

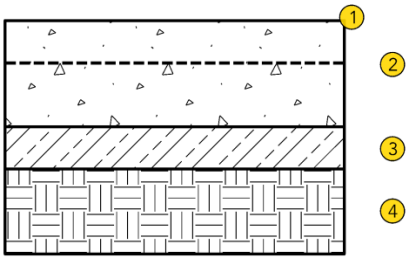
Asphalt Vehicle Crossing

Visual Fit:
Initial Cost:
Embodied Energy:
Recyclability:
Durability:
Maintenance:

Asphalt vehicle crossings are a visually suitable alternative for higher erosion risk locations.

1. Wearing course - 35mm compacted depth 7mm asphaltic concrete.
2. Prime.
3. Base course – 150mm compacted depth of 20mm size Class 2 F.C.R. or R.C.C. to Section 5 of Council Technical Spec.
4. Subgrade – stable and compacted.

Exposed Aggregate Concrete Crossing



Exposed Aggregate Concrete Vehicle Crossing Typical Profile

Visual Fit:

Initial Cost:

Embodied Energy:

Recyclability:

Durability:

Maintenance:

Exposed aggregate concrete vehicle crossings can be used for special high durability applications.

1. 125mm min thick concrete with exposed finish.
2. Reinforcement mesh as per Standard Drawing.
3. Base course – 50mm compacted depth of 20mm size Class 2 F.C.R. or R.C.C. to Section 5 of Council Technical Specification.
4. Subgrade – stable and compacted.

GW-TD07: Miscellaneous Traffic Infrastructure Finish Preferences

Application:

Low traffic volume streets - spray seal wearing course, suitable for lower traffic road pavements except on bends, intersections and turning areas. Not as durable as hot mix asphalt, but more durable than aggregate surface and visually blends with aggregate surfaces.

Carparks in open space areas – informal-edged asphalt pavement preferred.

Traffic management pavement – use visually informal infill pavement finishes for areas of <1.2m width between back of kerb to back of kerb, traffic management areas or mountable pavement. The finish is to be based on an overall infrastructure design theme.

Standards: Manningham Standard Drawing S220, S224, S225.

Spray Seal Example

Spray Seal Surface Finish

Visual Fit:
Initial Cost:
Embodied Energy:
Recyclability:
Durability:
Maintenance:

Spray seal with choice aggregate:

- Aggregate from the same source as adjacent aggregate surfaces can be rolled into the spray seal surface to provide a durable surface which is visually compatible with surrounding surfaces.
- In this example, the spray seal surface is in the foreground and the parking bay is a loose aggregate surface.

Asphalt Car Park Example

Asphalt Surface Finish

Visual Fit:
Initial Cost:
Embodied Energy:
Recyclability:
Durability:
Maintenance:

Informal asphalt car park pavement:

- Asphalt edge.
- Minimal linemarking.
- Lower maintenance than spray seal.
- Compatible with WSUD treatments.

Traffic Management Pavement Examples

Traffic Management Pavement

Visual Fit:

Initial Cost:

Embodied Energy:

Recyclability:

Durability:

Maintenance:

The surface finishes of traffic management islands and separators should have informal appearance infill pavement finishes such as exposed aggregate or stone rather than brick or 'faux' patterned concrete:

- Exposed aggregate concrete with 25mm dark aggregate types.
- Coldstream Quarry random stone pavement.

6.4 PATHS & TRAILS

General Considerations

The aim of paths and trails in the Green Wedge is to provide safe and convenient connectivity for pedestrians, cyclists and equestrians in ways that protect and reinforce the informal, semi-rural character.

Due to steep topography and existing vegetation, the sensitive routing of paths and trails in the Green Wedge presents many challenges. The Site Responsive Design Strategies below are a starting point for the design of paths in the Green Wedge. Where these principles can be met, the Site Responsive Design Arrangements provide a suite of surface finishes for various path user types and classifications.

Manningham Strategies

Roadside Environmental Management Strategy (2004) | Wildlife Movement and Habitat Needs in Manningham (2006) | Streetscape Character Study (2002) | Manningham Horse Riding Strategy (2002) | Manningham Horse Trail Network Strategy Parts 1 & 2 (2007) | Manningham Public Open Space Strategy (2004) | Manningham Bicycle Strategy (2006) | Manningham Outdoor Signage Guidelines | Manningham Public Lighting Procedures and Guidelines | Manningham Road Safety Strategy (2010) | Making Manningham Mobile (2010) | Access and Inclusion of People with Disabilities Policy and Action Plan (2008-2012) | Principal Path Network 2013.

Relevant Standards

Austroads Guide to Traffic Engineering Practice – Part 13 – Pedestrians | Austroads Guide to Traffic Engineering Practice – Part 14 – Bicycles | AS 2156.1 - 2001 Walking Tracks: Classification and Signage | AS 2156.2-2001 Walking tracks Part 2: Infrastructure design | AS 1428.1 - 2001 Design for access and mobility. Part 1: General requirements for access - New building work | AS 1428.2 - 1992 Design for access and mobility. Part 2: Enhanced and additional requirements - Buildings and Facilities | Shared Pathway Guidelines, Melbourne Water (2009)

Site Responsive Design Strategies

Strategy 1: Avoid sensitive & significant areas

Avoid areas of environmental significance (this includes the less obvious ground plants). Avoid identified cultural heritage areas. Avoid poorly drained areas

Strategy 2: Consider the minimal visual change option first

Minimise the intervention (extent of work) in response to the path classification. Consider minimal visual change options first such as natural surface finish.

Strategy 3: Minimise the impact footprint

If path works are required, minimise the impact footprint through design and construction techniques. Use retaining walls to reduce the construction width on sloping ground and to minimise below ground impacts on existing tree roots. Remove excess material and don't spread excess material beside the path. Reduce the path width at key points if necessary to reduce impacts.

Strategy 4: Build on top of natural surface when adjacent to tree root zones

Minimise disturbance into existing tree root zones by minimizing excavation in the TPZ and building on top of natural surface.

Strategy 5: Use sustainable path & trail grading principles

Follow the Sensitive Grading Principles on page 29. Use natural drainage except where significant issues exist. Let water flow across the path and not along the path.

Strategy 6: Where space permits, the path or trail should follow desire lines

Follow desire lines. This will ensure that users do not leave the trail and form new, easier routes.

Strategy 7: Consider grades when choosing path materials and treatments and use path surfaces appropriate to the path classification

Longitudinal grades influence the path surface type. Steeper path grades may require a hard wearing course such as asphalt. Aim generally for 'informal' looking path surfaces such as asphalt, aggregate or natural surfaces. Use ordinary grey concrete sparingly.




Strategy 8: Aim for a 'journey experience'

Respond to the landscape type to make the most of the journey experience. In bushland settings, reinforce indigenous plant types and very informal treatments. In parks, provide interesting links between destinations and incorporate views into the design. Where appropriate, coordinate with an arts program to integrate artful responses in higher use areas.



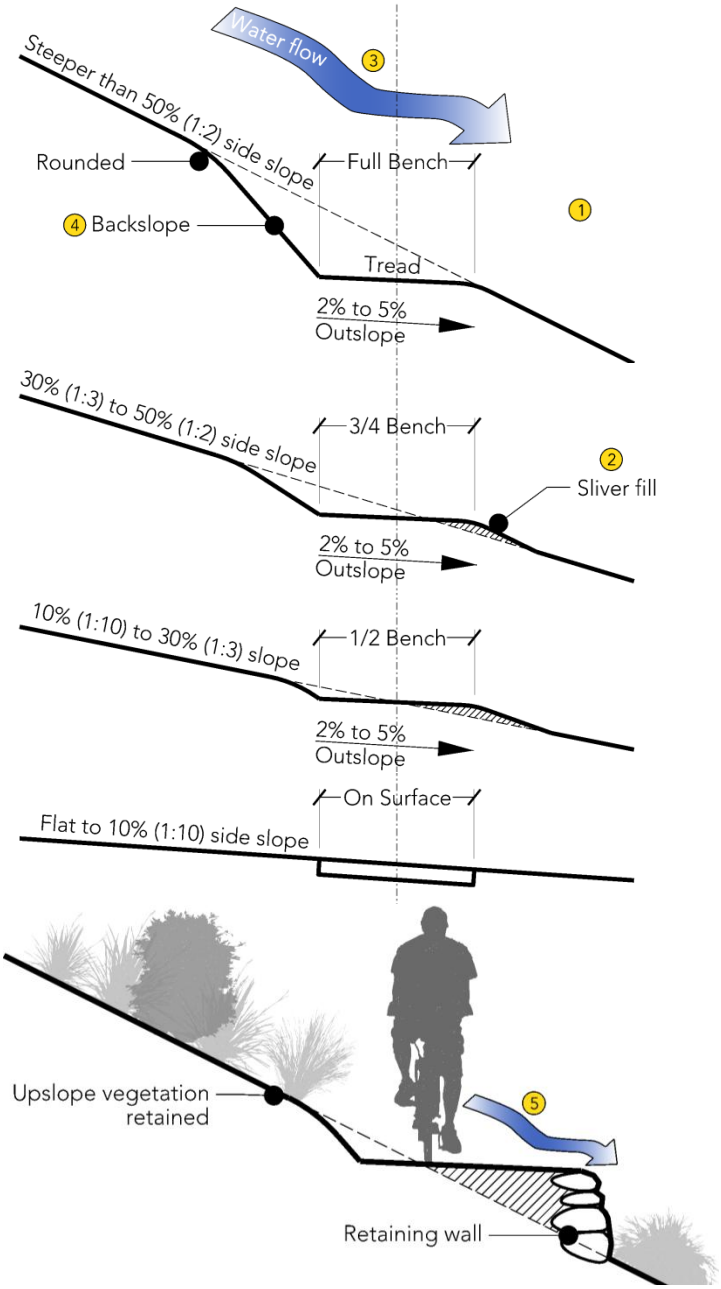

Site Responsive Design Arrangements

GW-P01: Sustainable Aggregate Path & Trail Grading Principles

Application: Sensitive grading is fundamental to the site responsive design of paths and trails surfaced with erodible materials such as aggregate or natural surface. Controlling water flow is central to good path design. The following path grading principles have been adapted from the International Mountain Bicycling Association publication *Trail Solutions- IMBA's Guide to Building Sweet Singletrack, 2004.*

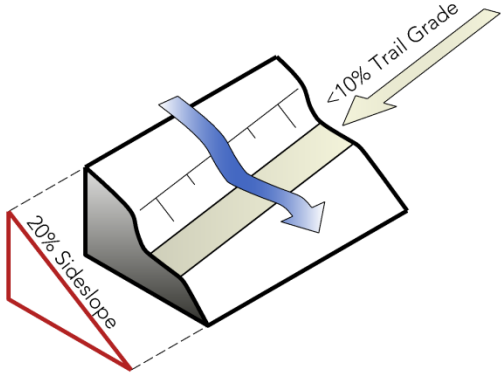
It is acknowledged that restricted right of way widths, make some of the grading principals below difficult to implement. Where this is the case, control water erosion in other ways, such as using surface reinforcement treatments described in GW-P02 starting on page 32.

Standards: No Manningham Standard Drawing.



Path Grading – Bench Varies with Grade of Side Slope

1. Paths constructed on sites with side slopes are more durable and less prone to slippage when they are constructed with a full bench tread.
2. Paths with 'sliver fill' tend to be less stable.
3. Surface water should flow down the slope and over the path – a 2% to 5% outslope on the path tread allows water to flow freely over the path.
4. The backslope should be gently graded back and rounded into existing surface where existing vegetation is not impacted.
5. When rock or adjacent significant areas restrict a full bench cut, a retaining wall can be used to retain fill. Ensure that surface water is able to shed off the path and over the retaining wall.

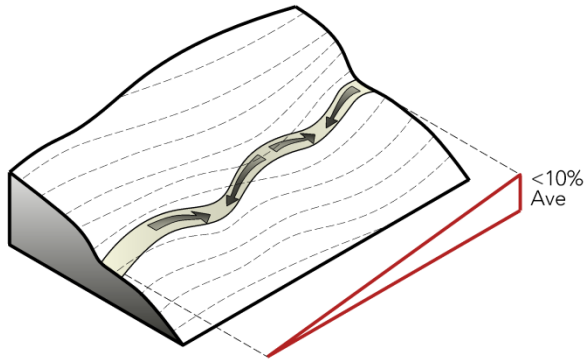


Path Grading Rule #1: The Half Rule

Rule #1: The Half Rule

The path grade should not exceed half the grade of the side slope. For example, for a path traversing a 20% grade sideslope, the trail longitudinal grade should be <10%.

Adopting this rule will maximise the amount of up-slope stormwater runoff that flows over the path rather than down the path (which causes path erosion).



Path Grading Rule #2 : Average 10% Grade

Rule #2 : Average 10% Grade

To help conceptualise a path route, the average overall longitudinal grade for a section of path should not exceed 10%.

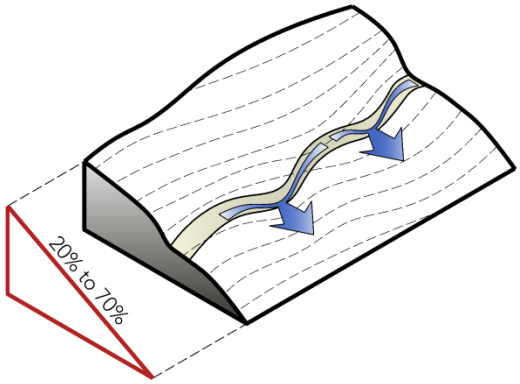
For most soil types, longitudinal grades may exceed 10% in parts, but the average overall grade for the section should ideally be <10%.

The 10% average grade rule may be exceeded based on an assessment of suitable stable ground and erosion risk.

Rule #3 – Determine the Maximum Sustainable Grade

Determine the maximum sustainable grade:

- Identify the soil type erosion potential.
- Identify the average annual rainfall to resolve any possible drainage or erosion issues.
- Determine the type and frequency of users – infrequent pedestrian path users may have a steeper sustainable maximum grade than frequent equestrian users.
- Determine the Classification of the path – an accepted higher level of difficulty may allow steeper grades.



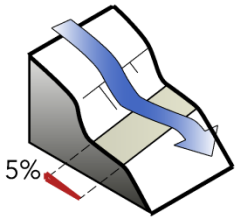
Path Grading Rule #4 : Use Grade Reversals (rolling contour path)

Rule #4 : Use Grade Reversals

Where roadside widths and other constraints allow and when traversing side slopes of 20% to 70%, provide rolling contour paths. Rolling contour paths use grade reversals which gently dip and rise to minimise concentration of water flows and reduce erosion.

The grade reversal allows water surface flows to exit the trail before it can gain volume and momentum and erosive power. This effectively divides the path into individual watersheds.

Depending on the soil type, grade reversals should be every 10 to 20m



Path Grading Rule #5 : Provide a Path Outslope

Rule #5 : Provide a Path Outslope

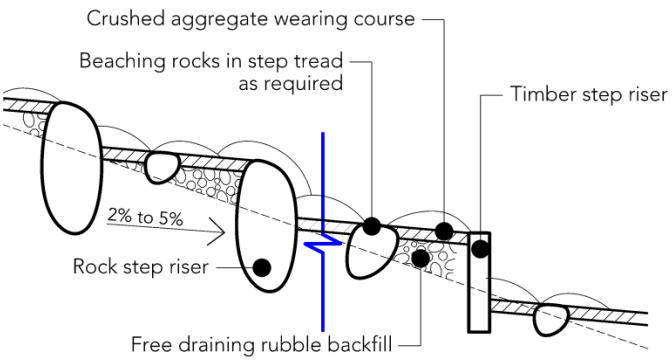
For a path contoured across a hillside, the downhill or outer edge of the path should slope slightly downhill. This is called the outslope.

The cross-slope of the path allows water to sheet across and over the path instead of channelling along the line of the path.

GW-P02: Sustainable Aggregate Path & Trail Steep Grade Treatments

Application: When aggregate paths are required, the sustainable path and trail grading principles on page 29 should be followed wherever possible. For steep sections of aggregate path of 20% to 45% longitudinal grade, switch-back routes are preferred over straight-line ascent. Steep sections of path require higher maintenance and erosion is difficult to control due to the difficulty of controlling surface water volume and intensity, but where site constraints force aggregate or natural surface paths onto steep longitudinal grades special surface treatments are recommended to protect the path surface.

Standards: No Manningham Standard Drawing.



Path Steep Grades – Rock or Timber Steps : Longitudinal Section

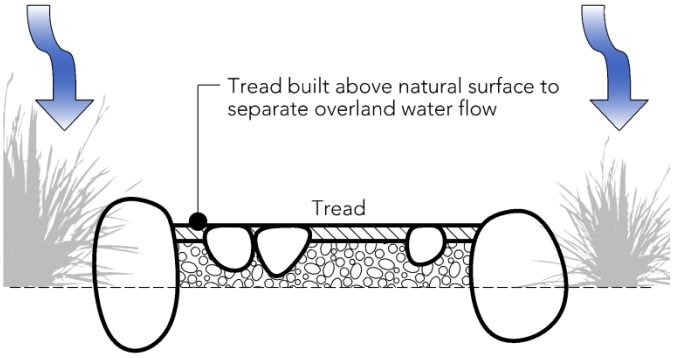
Rock or timber riser steps are recommended.

Rock risers are a durable construction technique for paths and trails with an aggregate surface. Rocks of suitable shape and safe flat tread should be used. Large anchor rocks should be used to tie-in the step risers.

Timber risers are less durable but easier to install.

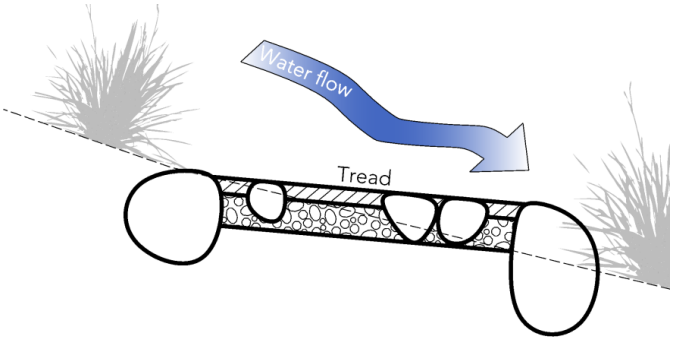
For pedestrian paths – riser height 150mm to 190mm, tread length minimum 300mm.

For equestrian trails – riser height 150mm to 300mm, tread length 1500 to 3000mm.



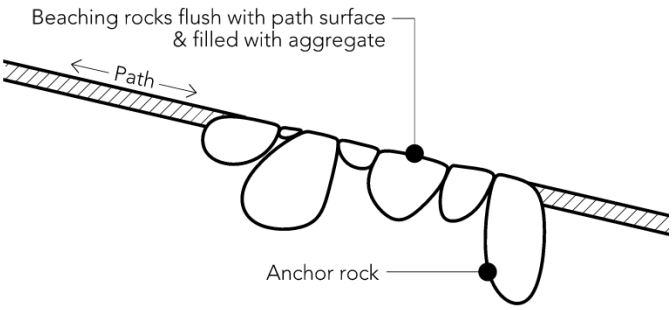
Path Steep Grades – Steps Parallel to Contours : Cross Section

For steps rising parallel with the contours, the path tread should be separated from the surrounding surface water flow by raising the tread.



Path Steep Grades – Steps Traversing a Sideslope : Cross Section

For steps traversing a sideslope, upslope surface flows should flow over the trail tread.

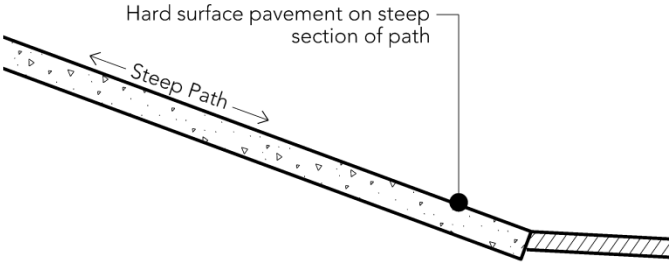


Path Steep Grades – Rock Path Beaching : Longitudinal Section

Rock beaching can be used to stabilise sections of steeper aggregate paths or trails of 20% to 45% longitudinal grade or to reinforce higher use areas.

The path tread should be graded in accordance with the sustainable path and trail grading principles starting on page 29.

For equestrian trails, the length of beaching should be 500mm, spaced 1500mm apart.



Path Steep Grades – Hard Surface Pavement : Longitudinal Section

For pedestrian paths and trails only (not suitable for equestrian paths), a hard surface pavement such as asphalt, exposed aggregate concrete or coloured concrete may be used to protect steep sections of path.

GW-P03: Path & Trail Surface Finish Options

Application:

The following surface finish options can be used for the appropriate path type, grade and user classifications detailed in GW-PO4 to GW PO9. Please refer to GW-PO4 to GW PO9 on how to use these surface finishes appropriately.

Aggregate Surface Finish – aggregate paths have an informal appearance and should be used for low use, low grade (<5%) pedestrian paths and trails and equestrian trails. They are not recommended for paths requiring regular vehicle access.

Asphalt Surface Finish – asphalt paths should be used for high use or higher grade pedestrian paths and trails (but not for equestrian trails) and where a durable and slip resistant wearing course is required.

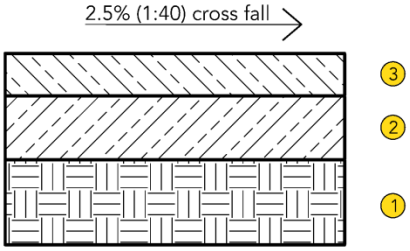
Coloured Concrete or Exposed Aggregate Concrete Surface Finish – concrete paths should be used for high use or higher grade pedestrian paths and trails (but not for equestrian trails) and where extra durability is required.

Open Graded Asphalt (Permeable Sealed) Surface Finish – open graded asphalt provides a permeable sealed pavement (water can freely drain through the wearing course) and should be used when required for arboricultural reasons to provide an appropriate permeable sealed surface within an identified existing tree Critical Root Zone.

Informal Natural Surface Finish trails also exist within the Green Wedge. These trails are worn desire lines and are generally not 'constructed' by Council. Emphasis is on maintenance of defects only. They have low use intensity and are situated in natural vegetation verges and roadsides where more challenging accessibility requirements are acceptable. A maintenance detail is included at the end of this section for information on how to address maintenance defects.

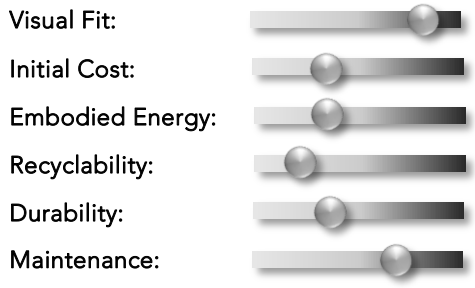
Standards:

Manningham Urban & Park Design Guidelines – Section 7 | Manningham Urban & Park Design Details – Section 11.



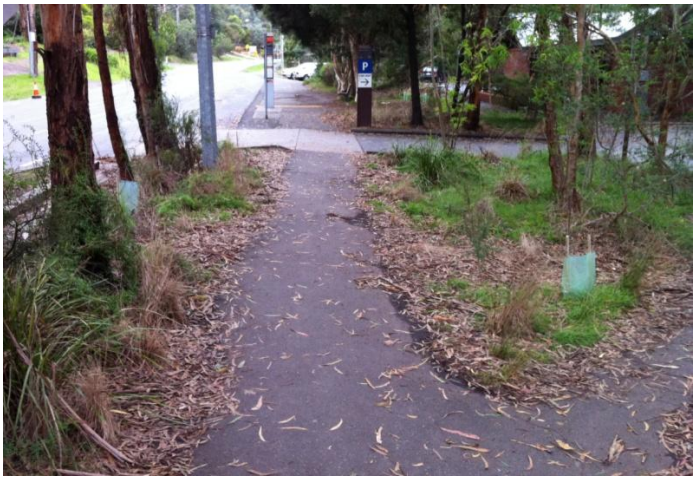
Aggregate Surface Finish Path - Typical Profile

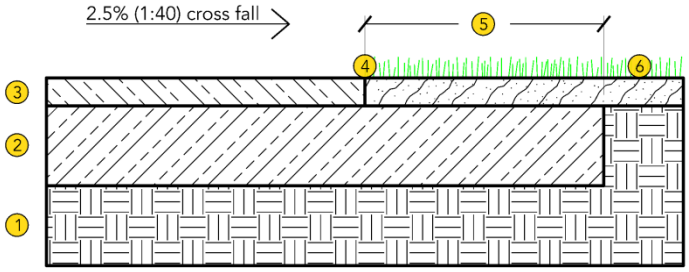
Aggregate Surface Finish



For light grey soils use Lilydale Toppings, for darker soils use crushed basalt aggregate, for brown soils use brown aggregate such as Castella Toppings.

1. Subgrade – stable and compacted.
2. 75 to 100mm compacted depth of 20mm size Class 2 F.C.R. or recycled crushed concrete to Section 5 of Council Technical Specification.
3. 50mm depth 5mm minus to dust aggregate (3% cement option).





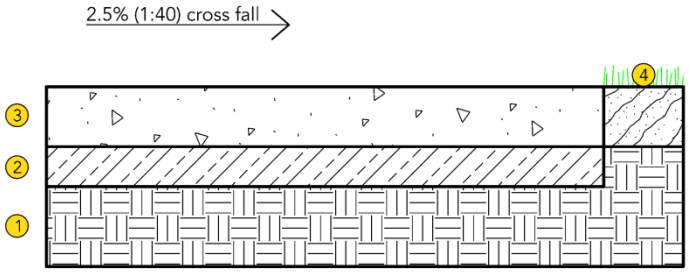
Asphalt Surface Finish Path - Typical Profile

Asphalt Surface Finish

Visual Fit:
Initial Cost:
Embodied Energy:
Recyclability:
Durability:
Maintenance:

Asphalt surface paths:

1. Subgrade – stable and compacted.
2. 100mm compacted depth base of 20mm size Class 2 F.C.R. or recycled crushed concrete to Section 5 of Council Technical Specification.
3. 35mm compacted depth of 7mm nom size asphalt wearing course.
4. No timber edge preferred.
5. Base course extends 150mm beyond edge of wearing course to reinforce the path edge.
6. Topsoil flush with path FSL.



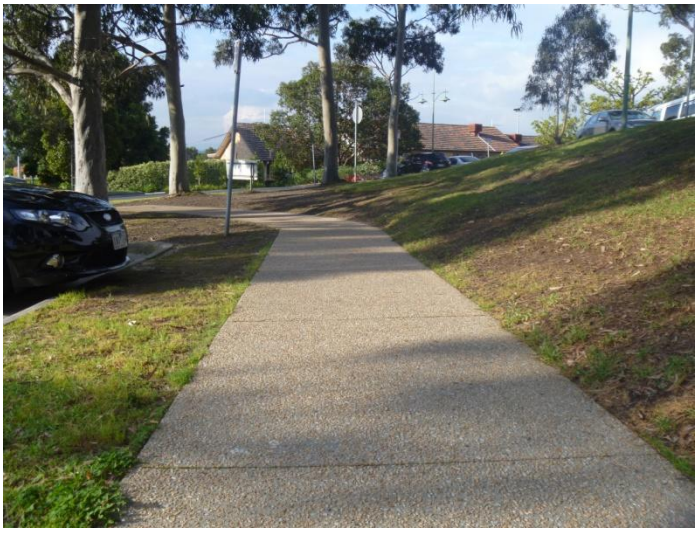
Coloured Concrete Surface Finish Path - Typical Profile

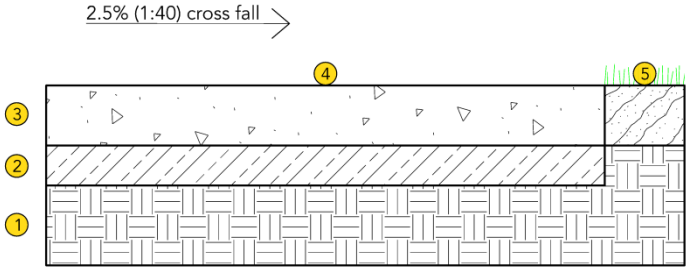
Coloured Concrete Surface Finish

Visual Fit:
Initial Cost:
Embodied Energy:
Recyclability:
Durability:
Maintenance:

Coloured concrete surface paths:

1. Subgrade – stable and compacted.
2. 50mm compacted depth base of 20mm size Class 3 F.C.R. or recycled crushed concrete to Section 5 of Council Technical Specification.
3. 75mm depth 25MPa concrete with integral oxide colour appropriate to the location. Contraction joints at 1.5m spacings and 12mm wide expansion joints at 12m spacings max as per S248.
4. Topsoil flush with path FSL.





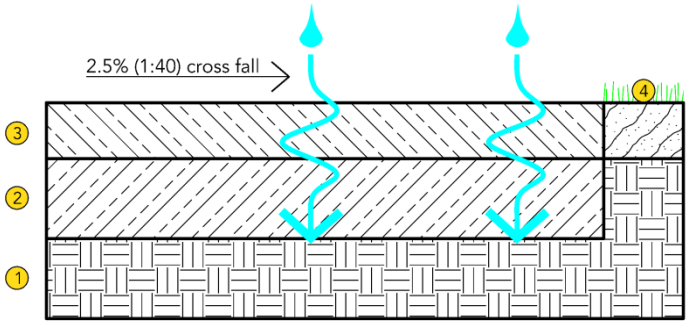
Exposed Aggregate Concrete Surface Finish Path - Typical Profile

Exposed Aggregate Concrete Finish

Visual Fit:
Initial Cost:
Embodied Energy:
Recyclability:
Durability:
Maintenance:

Exposed aggregate concrete surface paths:

1. Subgrade – stable and compacted.
2. 50mm compacted depth base of 20mm size Class 3 F.C.R. or recycled crushed concrete to Section 5 of Council Technical Specification.
3. 75mm depth 25MPa concrete. Contraction joints at 1.5m spacings and 12mm wide expansion joints at 12m spacings max as per S248.
4. Exposed Aggregate (washed) finish. Concrete batch mix design is to include aggregate colour, size and oxide colour appropriate to the location.
5. Topsoil flush with path FSL.



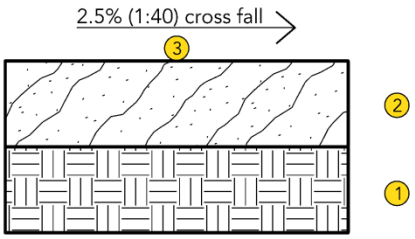
Open Graded Asphalt Surface Finish

Visual Fit:
Initial Cost:
Embodied Energy:
Recyclability:
Durability:
Maintenance:

Open graded asphalt surface paths:

1. Subgrade – stable and compacted.
2. 100mm compacted depth base of 20mm size Class 3 F.C.R. or recycled crushed concrete to Section 5 of Council Technical Specification.
3. 65 to 70mm compacted thickness of size 10mm open graded bituminous asphalt wearing course.
4. Topsoil flush with path FSL.

Open Graded Asphalt Surface Finish Path - Typical Profile



Informal Natural Surface Finish Trail – Typical Maintenance Profile

Informal Natural Surface Finish

Visual Fit:

Initial Cost:

Embodied Energy:

Recyclability:

Durability:

Maintenance:

Natural surface trails are worn desire lines and are not 'constructed' by Council. Emphasis is on maintenance of defects only.

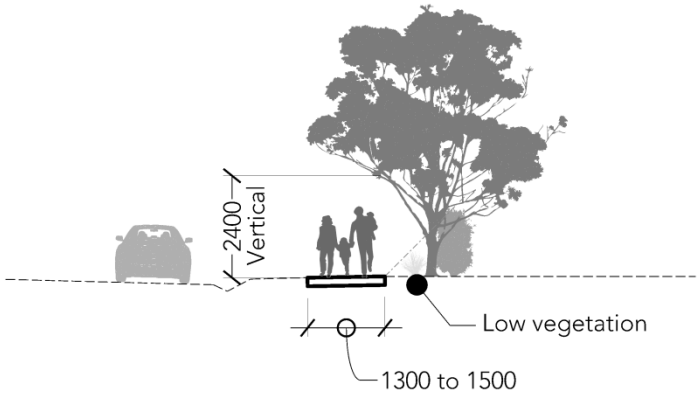
Trail surface maintenance defects such as trip hazards, worn tread, water surface erosion and slippery surfaces may be addressed by applying the following construction detail:

1. Firm base.
2. Mix and roll in 100mm depth 7-20mm F.C.R where natural soils are uneven and slippery.
3. Form an even surface that allows free drainage.

GW-P04: High Use Pedestrian Footpaths

Application: High Use Pedestrian Footpaths – high use paths on the Principal Path Network and high intensity pedestrian use paths such as at road intersections, bus stops and in townships. High use paths have a high level of accessible design and specific grade requirements and widths as detailed below.

Standards: Manningham Urban & Park Design Guidelines – Section 7 | Manningham Urban & Park Design Details – Section 11 | Manningham Standard Drawing S22.7.



High Use Pedestrian Footpath General Arrangement For Footpath Set Back From Road - Cross Section

High use pedestrian footpath:

- Width: 1300mm to 1500mm for footpaths set back from road; 1800mm for footpaths abutting road kerb.
- Vertical Clearance: 2400mm.
- Longitudinal Grades: Desirable grade 3% (1:33), preferred max grade 5% (1:20)
- Cross Fall: 2.5% (1:40).
- Tactile pavers to AS1428.4 on a concrete base.

Asphalt High Use Footpath Example

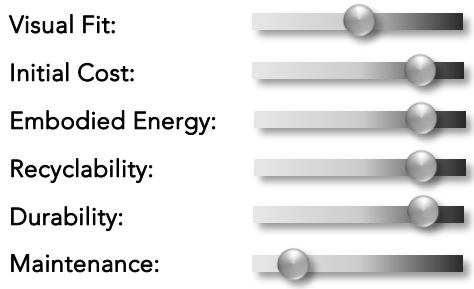
Asphalt High Use Footpath

Visual Fit:
Initial Cost:
Embodied Energy:
Recyclability:
Durability:
Maintenance:

Asphalt high use pedestrian footpath:

- Asphalt surface is the preferred visual treatment for high use footpaths.
- Asphalt surfaces are easy to patch, but are not as durable as concrete paths.
- Please refer to GW-P03 Surface Finishes Options starting on page 34 for asphalt construction profiles.
- Open graded asphalt may also be used as required to protect the critical root zone of exiting trees as per Surface Finishes Options starting on page 34.

Exposed Aggregate Concrete High Use Footpath

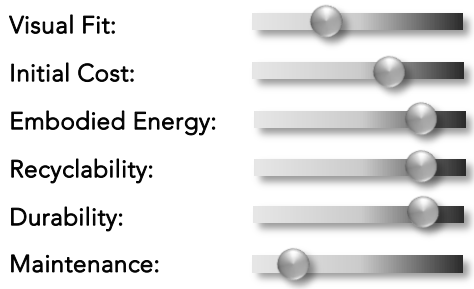


Exposed Aggregate Concrete High Use Footpath Example

Exposed Aggregate Concrete high use pedestrian footpath:

- Concrete paths have a more 'urban' appearance and should only be used in the Green Wedge where extra pavement durability is required.
- Exposed aggregate is more expensive than asphalt to patch repair and if coloured concrete is used, there may be batch colour matching issues.
- Please refer to GW-P03 Surface Finishes Options starting on page 34 for the construction profile. Open graded asphalt may also be used to protect the critical root zone of trees as per Surface Finishes Options starting on page 34.

Coloured Concrete High Use Footpath



Coloured Concrete High Use Footpath Example

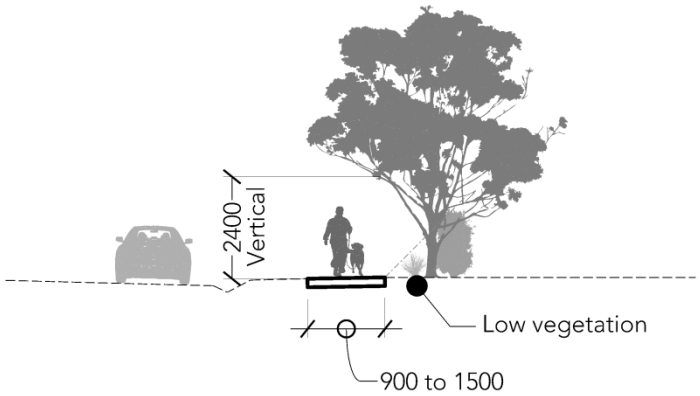
Coloured Concrete high use pedestrian footpath:

- Coloured concrete footpaths have a more 'urban' appearance and should only be used in the Green Wedge where extra pavement durability is required.
- Coloured concrete may have batch colour matching issues.
- Please refer to GW-P03 Surface Finishes Options starting on page 34 for the construction profile. Open graded asphalt may also be used adjacent to existing trees.

GW-P05: Low Use Pedestrian Footpaths

Application: Low Use Pedestrian Footpaths – low use paths may have possible variable widths and meandering alignments. Aggregate surface finishes are the preferred finish and are appropriate for grades gentler than 5%.

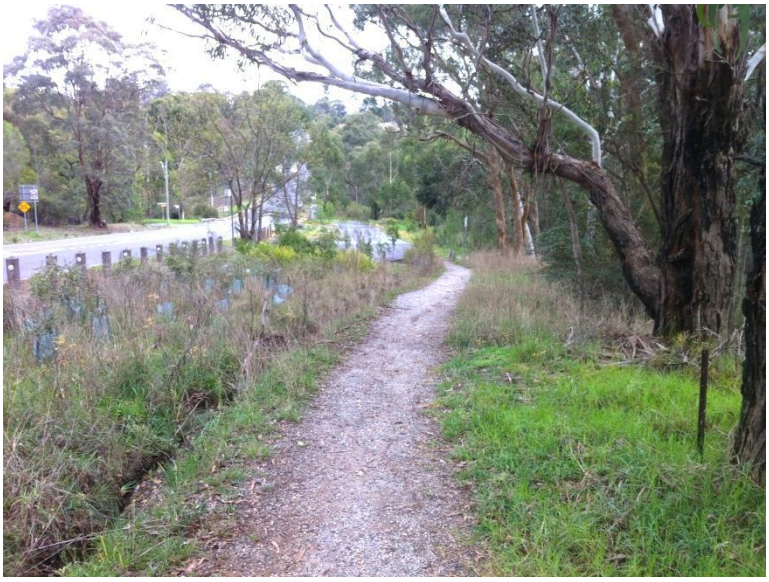
Standards: Manningham Urban & Park Design Guidelines – Section 7 | Manningham Urban & Park Design Details – Section 11.



Low Use Pedestrian Footpath General Arrangement For Footpath Set Back From Road - Cross Section

Low use pedestrian footpath:

- Width: 900mm to 1500mm.
- Vertical Clearance: 2400mm.
- Longitudinal Grades: Preferred 5% (1:20), short sections 10% (1:10).
- Cross Fall: 2.5% (1:40).
- Possibly meandering alignments.



Aggregate Low Use Pedestrian Footpath Example

Aggregate Low Use Footpath

Visual Fit:
Initial Cost:
Embodied Energy:
Recyclability:
Durability:
Maintenance:

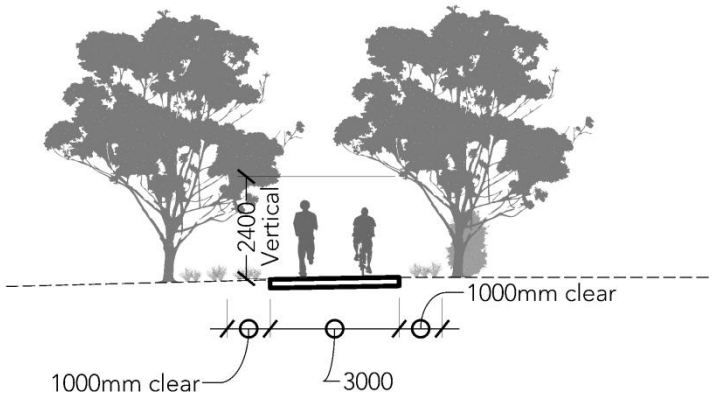
Aggregate low use pedestrian footpath:

- Aggregate is the preferred visual treatment for low use footpaths.
- Please refer to GW-P03 Surface Finishes Options starting on page 34 for typical construction profiles for aggregate path finish.
- Steep sections of path may need to be reinforced with hard surface treatment options described in GW-P02 starting on page 32.

GW-P06: High Use Shared Path - Commuter (pedestrian & cycling)

Application: High Use Shared Paths - shared use pedestrian and cyclist commuter path on the Principal Path Network.

Standards: Manningham Urban & Park Design Guidelines – Section 7 | Manningham Urban & Park Design Details – Section 11 | Melbourne Water Shared Path Guidelines.



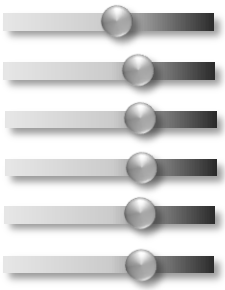
High Use Shared Path General Arrangement - Cross Section

High use shared path:

- Width: 3000mm preferred (2500mm min)
- Vertical Clearance: 2400mm.
- Longitudinal Grades: Desirable 3% (1:33), preferred max 5% (1:20), short sections 10% (1:10).
- Cross Fall: 2.5% (1:40).
- Alignment: To AustRoads standards.
- To Melbourne Water Standards for paths adjacent to waterways.
- Assumed 30km/hr cycling speed.
- Bicycle compliant intersections, signage, fencing, barriers and obstacles
- Minimal linemarking preferred.

Asphalt High Use Shared Path Example

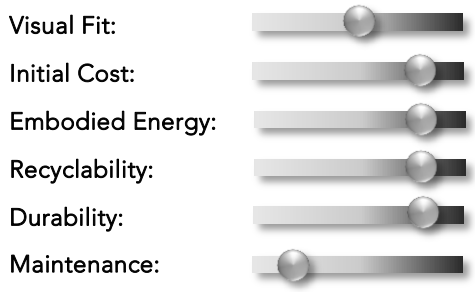
Asphalt High Use Shared Path



Asphalt high use shared path:

- Asphalt surface is the preferred visual treatment for high use shared paths.
- Please refer to GW-P03 Surface Finishes Options starting on page 34 for typical construction profiles for asphalt path finish.
- Open graded asphalt may also be used as required to protect the critical root zone of exiting trees as per Surface Finishes Options starting on page 34.

Exposed Aggregate Concrete High Use Shared Path

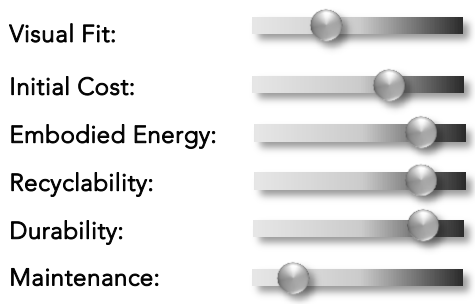


Exposed Aggregate Concrete High Use Shared Path Example

Exposed Aggregate Concrete shared path:

- Concrete paths have a more 'urban' appearance and should only be used in the Green Wedge where extra pavement durability is required.
- Exposed aggregate is more expensive than asphalt to patch repair and if coloured concrete is used, there may be batch colour matching issues.
- Please refer to GW-P03 Surface Finishes Options starting on page 34 for the construction profile. Open graded asphalt may also be used to protect the critical root zone of trees as per Surface Finishes Options starting on page 34.

Coloured Concrete High Use Shared Path



Coloured Concrete High Use Shared Path Example

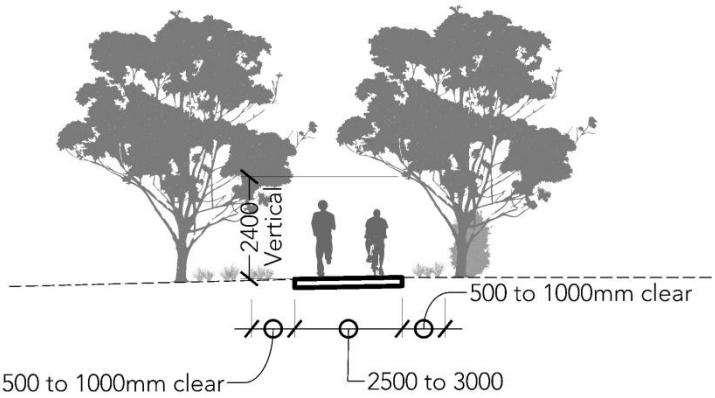
Coloured Concrete shared path:

- Coloured concrete paths have a more 'urban' appearance and should only be used in the Green Wedge where extra pavement durability is required.
- Coloured concrete may have batch colour matching issues.
- Please refer to GW-P03 Surface Finishes Options starting on page 34 for the construction profile. Open graded asphalt may also be used adjacent to existing trees.

GW-P07: Low Use Shared Path – in Reserves (pedestrian & cycling)

Application: Low Use Shared Path - more informal looking shared pedestrian and cyclist path suitable for bike path trail network within reserves.

Standards: Manningham Urban & Park Design Guidelines – Section 7 | Manningham Urban & Park Design Details – Section 11 | Melbourne Water Shared Path Guidelines.



Low Use Shared Path General Arrangement - Cross Section

Low use shared path:

- Width: 2500mm to 3000mm.
- Vertical Clearance: 2400mm.
- Longitudinal Grades: Desirable 3% (1:33), preferred max 5% (1:20), short sections 10% (1:10).
- Cross Fall: 2.5% (1:40).
- Alignment: To AustRoads standards. To Melbourne Water Standards for paths adjacent to waterways.
- Assumed 20km/hr cycling speed.
- Bicycle compliant intersections, signage, fencing, barriers and obstacles.

Aggregate Low Use Shared Path Example

Aggregate Low Use Shared Path

Visual Fit:
Initial Cost:
Embodied Energy:
Recyclability:
Durability:
Maintenance:

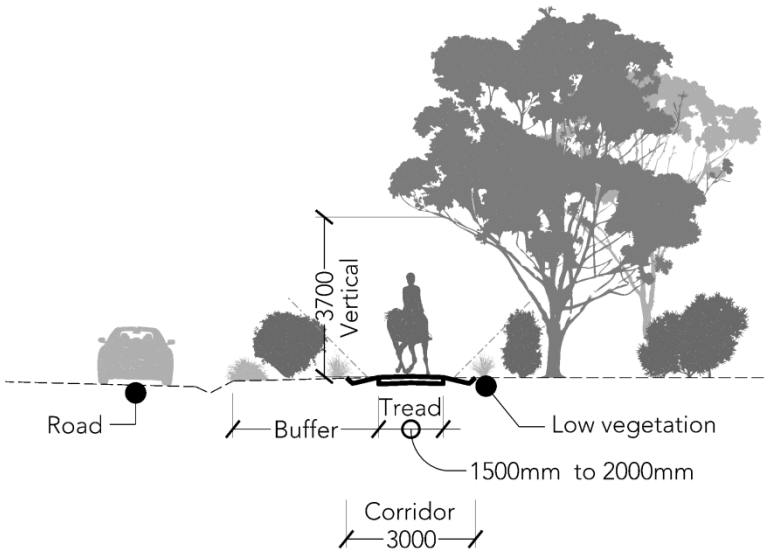
Aggregate low use shared path:

- Aggregate surface is the preferred visual treatment for low use shared paths, particularly adjacent to waterways.
- Please refer to GW-P03 Surface Finishes Options starting on page 34 for typical construction profiles for aggregate path finish.
- Steep sections of path may require hard surface treatment such as asphalt or hard surface treatment options described in GW-P02 starting on page 32.

GW-P08: High Use Equestrian Trails

Application: High Use Equestrian Trail – aggregate tread off-road Class 1 Trail with possible localised difficult sections (reduced widths, steep grades).

Standards: Manningham Urban & Park Design Guidelines – Section 8 | Manningham Horse Trail Network Strategy Parts 1 & 2 (2007).



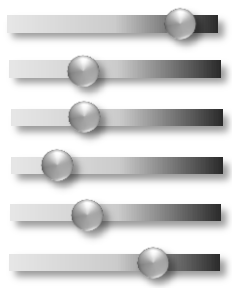
High Use Equestrian Trail General Arrangement - Cross Section

High use equestrian trail:

- Corridor width: 3000mm.
- Tread width: 1500mm minimum, 2000mm maximum. Width at short 'pinch points' can be reduced to 600mm tread with 1.5m clearance at height of rider's stirrups.
- Vertical Clearance: 3700mm.
- Longitudinal Grades: Preferred 0-10% (1:10), short sections 20% (1:5).
- Cross Fall: 2.5% (1:40).
- Hard surfaces such as asphalt or concrete are not suitable.
- Route the path and vary widths to minimise impacts.
- Refer to Manningham standards for full details on preferred widths, grades, obstacles, signage, crossing points, caviletti etc.

Aggregate High Use Equestrian Trail Example

Aggregate High Use Equestrian Trail



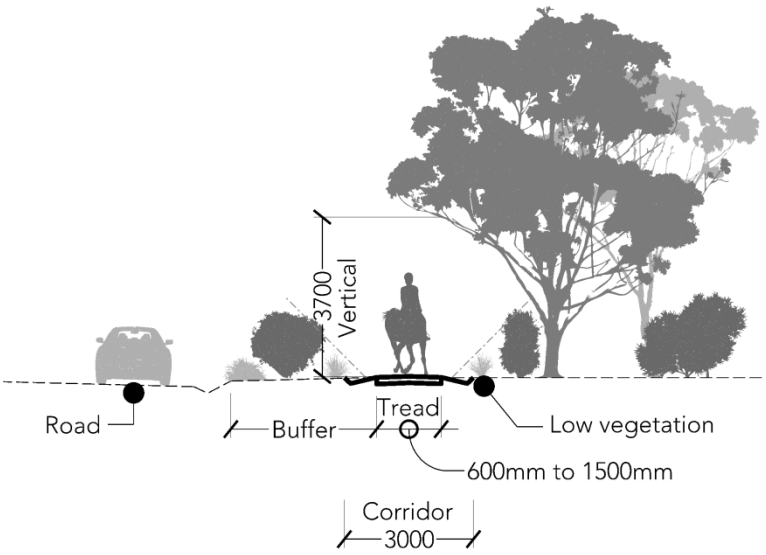
Aggregate high use equestrian trail:

- Please refer to GW-P03 Surface Finishes Options starting on page 34 for typical construction profiles for aggregate path.
- Steep sections of path may require surface treatments described in GW-P02 starting on page 32 (not asphalt or concrete surface).

GW-P09: Low Use Equestrian Trails

Application: Low Use Equestrian Trail – informal natural surface tread off-road Trail with possible localised difficult sections (reduced widths, steep grades).

Standards: Manningham Urban & Park Design Guidelines – Section 8 | Manningham Horse Trail Network Strategy Parts 1 & 2 (2007).



Low Use Equestrian Trail General Arrangement - Cross Section

Low use equestrian trail:

- Corridor width: 3000mm.
- Tread width: 600mm to 1500mm with 1.5m clearance at height of rider's stirrups.
- Vertical Clearance: 3700mm.
- Longitudinal Grades: Preferred 0-10% (1:10), short sections 20% (1:5).
- Cross Fall: 2.5% (1:40).
- Hard surfaces such as asphalt or concrete are not suitable.
- Route the path and vary widths to minimise impacts.
- Refer to Manningham standards for full details on preferred widths, grades, obstacles, signage, crossing points, caviletti etc.

Informal Natural Surface Low Use Equestrian Trail Example

Informal Natural Surface
Low Use Equestrian Trail

Visual Fit:
Initial Cost:
Embodied Energy:
Recyclability:
Durability:
Maintenance:

Informal natural surface low use equestrian trail:

- Natural surface trails are worn desire lines and are not 'constructed' by Council. Emphasis is on maintenance of defects only.
- Possible meandering alignments.
- Please refer to GW-P03 surface finishes options starting on page 34 for details on possible maintenance details for informal trails.

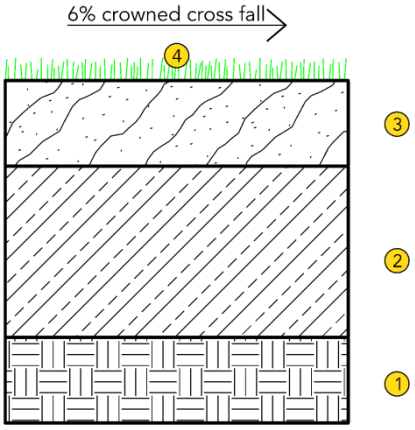
GW-P10: Structural Soil Vehicle Access Track

Application: Low use vehicle access track (maintenance track) where a grassed surface appearance is preferred.

Appearance: Appearance of a grassed track.

Standards: No Manningham Standard Drawing.

Visual Fit:
Initial Cost:
Embodied Energy:
Recyclability:
Durability:
Maintenance Intensity:



Structural Soil Access Track Typical Profile

The aim of the structural soil is to provide a load bearing solid base to the track while permitting root growth. This treatment may not be appropriate in areas where weed control is an issue.

1. Compacted subgrade free draining at lowest point.
2. Structural soil 200mm compacted depth base course.
3. Planting layer, 100mm depth of aggregate/soil planting mix.
4. Planted grass.

Structural soil specification - thoroughly combined mix of 5 parts 40mm angular clean aggregate to 1 part of clay loam filler soil by volume (providing a void space of at least 30%) mixed with 30g of dry powder Hydrogel per 100kg of stone and water at the rate of approximately 20% of the weight of dry soil. Install in 100mm compacted layers.

Planting layer mix specification – 1 part 12mm - 5mm aggregate to 1 part free draining sandy loam topsoil.

Grassing specification - area planted with grass – type dependent on environmental sensitivity. Danthonia racemosa is an adaptable native grass species which could be used.

Structural Soil Aggregate Particle Size Distribution

A.S Sieve (mm)	Percent Passing
53.0	100
37.5	90-100
26.5	0-75
19.0	<15
13.2	<2
9.5	<2
6.7	<2
4.75	<2

Structural Filler Soil Properties

% gravel	< 5
% sand	10- 30
% silt	15 - 25
% clay	50 - 70
Organic matter	<10% by weight
pH in water	5.5-6.5
Electrical cond (1:5 extract)	<1.5 dS/m
CEC (meq %)	> 20

6.5 LEVEL CHANGES

General Considerations

Cut or fill level changes are frequently required in civil infrastructure projects. The visual integration of retaining walls can be achieved through material selection and a level of detailing appropriate to the visibility of the wall and in response to local character. Or alternatively through screen planting of a lower class finish wall.

The Site Responsive Design Strategies presented below provide the key visual considerations, while the Site Responsive Design Arrangements provide a suite of sympathetic retaining systems for various applications.

Manningham Strategies

Streetscape Character Study (2002) | Roadside Environmental Management Strategy (2004) | Streetscape Character Study (2002)

Relevant Standards

Austroads Guide to Traffic Engineering Practice – Part 14 – Bicycles | Shared Pathway Guidelines, Melbourne Water (2009) | Council Standard Drawings

Site Responsive Design Strategies

Strategy 1: Use design systems and finishes that respond to the level of visibility

Determine whether the level change treatment will be visible to the general public. For low visibility level changes, use the most cost effective retaining device for the purpose (such as a sleeper retaining wall). For high visibility level changes, use retaining walls with higher levels of design detail and construction techniques that provide appropriate top-of-wall level changes. The finish type should respond to local character.

Strategy 2: Design the elevation

In high visibility areas, resolve the elevation of the retaining wall. Document the line of the top and toe of the wall, including any top of wall steps and end of wall terminations. Don't leave these details up to the contractor.

Strategy 3: Integrate any associated barriers or railing

Identify any requirements for safety barriers, guard rails or fencing required on top of the retaining wall. Visually integrate the barrier design into the retaining wall elevation. For pedestrian barriers, consider a 'light' structure such as dark painted tubular steel. Use planting wherever possible to reduce the visual impacts of barriers.

Strategy 4: Integrate planting

Visible retaining walls should appear as a part of the landscape. Where space permits, planting should 'feather' the line of the top and bottom of retaining walls and assist in visually integrating end terminations.

Strategy 5: Use a consistent suite of finishes

Aim for visual continuity at least on a precinct basis or for a particular route.

Strategy 6: Wherever possible, use natural cut batters and exposed rock level changes

For cut level changes in semi-rural situations, natural cut batters (with natural regeneration and planting) or exposed rock are the preferred treatment. Exposed rock should be assessed for risk of rock fall.

Strategy 7: Carefully step modular retaining walls

Maintain a horizontal line and a consistent step interval for modular retaining walls. Single steps are preferred. Don't cut down sleepers to address the step change – if the steps are a problem, then use a different system.



Strategy 8: Provide neat retaining wall terminations

Provide gradual steps down at end terminations of retaining walls or return the termination back into the slope.



Strategy 9: Avoid short sections of low retaining wall

Short sections of low retaining wall are usually unnecessary – alternatives include batters and grade line changes.

Strategy 10: Don't use sleeper retaining walls on steeply sloping high visibility sites

Sleeper retaining walls on steep sites (without opportunity for screen planting) with frequent steps are not visually appropriate for high visibility areas.


Strategy 11: Consider special opportunities for design expression

Special areas may warrant site specific design themes.



Site Responsive Design Arrangements

GW-R01: Retaining - Stacked Rock

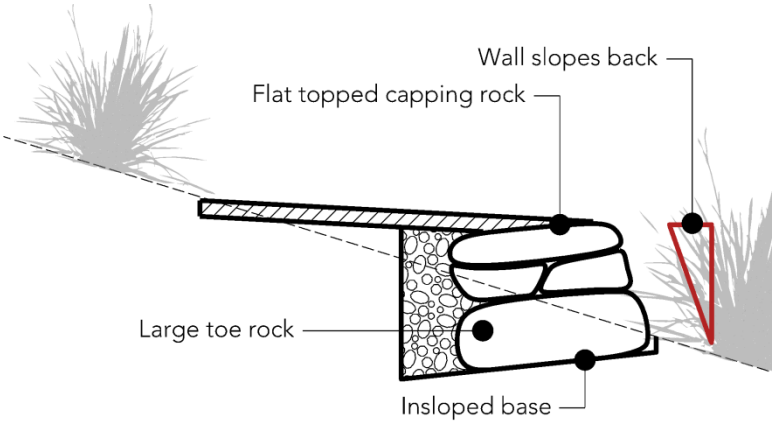
Application: Use for retaining low cut or fill level changes in informal areas.

Appearance: Stacked rock.

Standards: No Manningham Standard Drawing.

Visual Fit:
Initial Cost:
Embodied Energy:
Recyclability:
Durability:
Maintenance Intensity:

Retaining - Stacked Rock



Typical Cross Section

- Rock stacked in horizontal stretcher pattern.
- Height of wall <1000mm.
- Coldstream Quarry rock source.
- Large rocks preferred.
- Smaller rocks can be used in a more detailed stacked pattern.

GW-R02: Retaining - Rock Facing

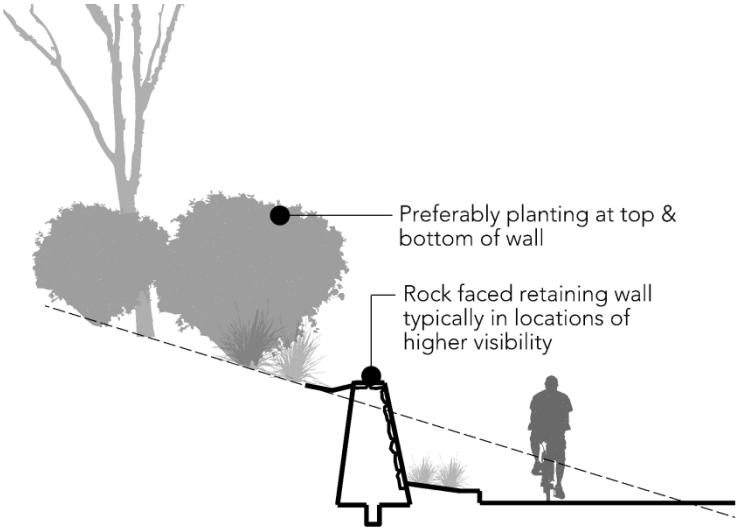
Application: Use for retaining cut or fill level changes in higher visibility areas and possibly higher use areas.

Appearance: Random rock facing.

Standards: Manningham Standard Drawing S300.

Visual Fit:
Initial Cost:
Embodied Energy:
Recyclability:
Durability:
Maintenance Intensity:

Retaining – Rock Facing



Typical Cross Section

- Rock faced engineered concrete retaining wall.
- Height 1000mm to 2000mm.
- Coldstream Quarry rock source.
- Mortared and raked joints.
- Random stone pattern.
- Useful for steep longitudinal grades as the top of wall can follow the line of grade rather than having to step down.
- The horizontal line of the wall can also be formed to irregular or organic curves.

GW-R03: Retaining – Rock Gabion

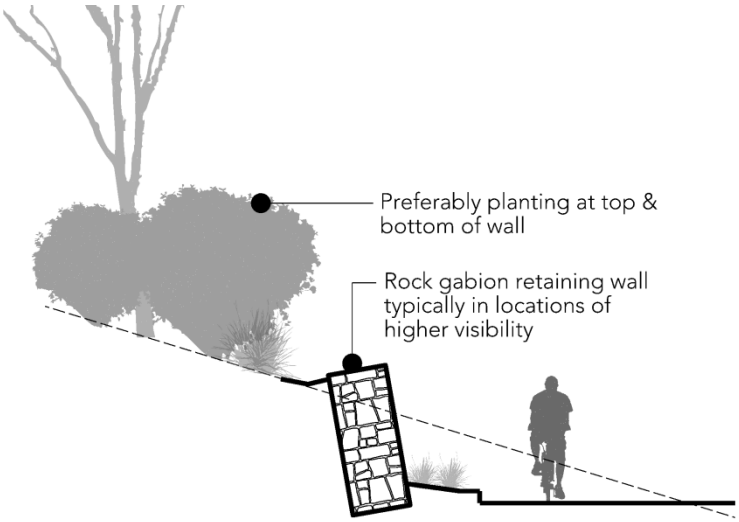
Application: Use for retaining cut or fill level changes in higher visibility areas and possibly higher use areas.

Appearance: Random rock within a wire 'cage'.

Standards: No Manningham Standard Drawing.

Visual Fit:
Initial Cost:
Embodied Energy:
Recyclability:
Durability:
Maintenance Intensity:

Retaining – Rock Gabion



Typical Cross Section

- Rock staked within an engineer-designed steel mesh cage.
- Coldstream Quarry rock source.
- Useful for steep longitudinal grades as the top of wall can follow the line of grade rather than having to step down.
- The horizontal line of the wall can also be formed to curves.

GW-R04: Retaining – Sleepers

Application: Low visibility cut or fill situations where simple finishes or simple construction detail is required. Can be used in association with screen planting to reduce overall construction costs. Also recommended for retaining fill near existing trees due to minimal impact from posts.

Appearance: Horizontal sleepers with vertical steel posts.

Standards: Manningham Standard Drawing S302.

Visual Fit:

Initial Cost:

Embodied Energy:

Recyclability:

Durability:

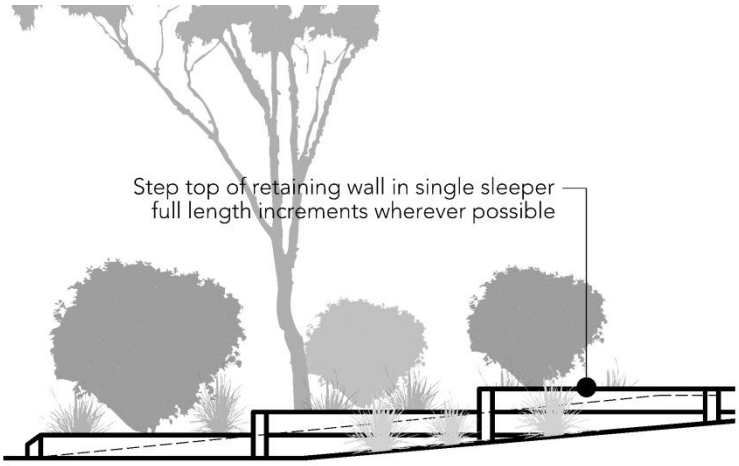
Maintenance Intensity:

Timber sleeper retaining wall

Concrete sleeper retaining wall

Concrete sleeper retaining wall

Retaining – Sleepers



Typical Elevation

- Treated pine to have a minimum H5 rating.
- Concrete sleepers (charcoal colour) are more durable and also appropriate in areas of low public visibility.
- Preferred minimum radius = 10m.
- The face of the wall is preferably screened by vegetation if required in visible areas.

GW-R05: Retaining – Form Textured Concrete

Application: Use for retaining cut or fill level changes in higher visibility areas and projects that require bespoke surface finishes and colours.

Appearance: Textured concrete surface, with optional colour.

Standards: No Manningham Standard Drawing .

Visual Fit:

Initial Cost:

Embodied Energy:

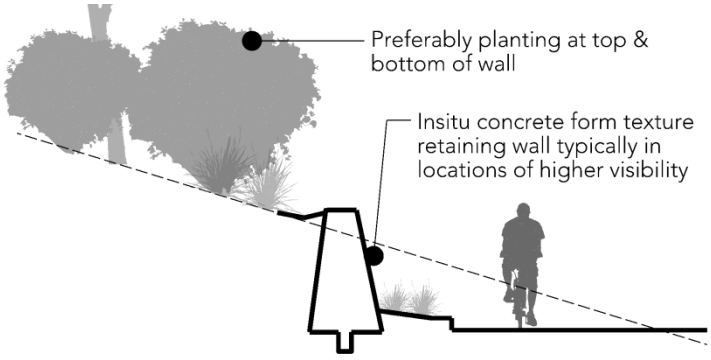
Recyclability:

Durability:

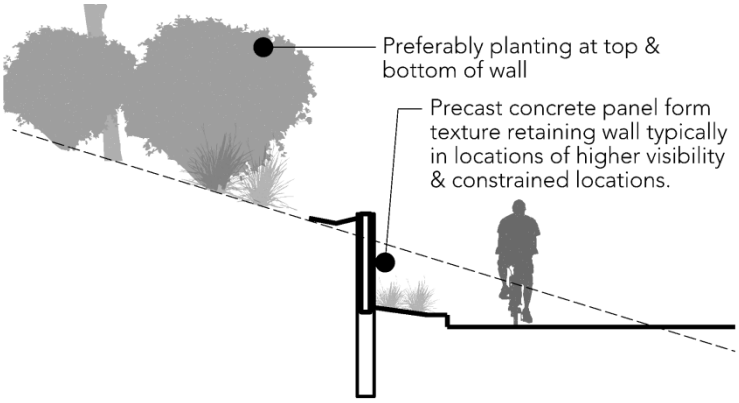
Maintenance Intensity:

Concrete form texture example

Concrete form texture example



Typical Cross Section – Insitu Concrete



Typical Cross Section – Precast Concrete Panels

Retaining – Form Textured Concrete

- Concrete form liners can be used to provide texture finish to both insitu-formed or precast concrete retaining wall systems.
- Integral colour can be used.
- Insitu-cast retaining walls offer the ultimate design flexibility in vertical and horizontal line.

GW-R06: Retaining – Shotcrete

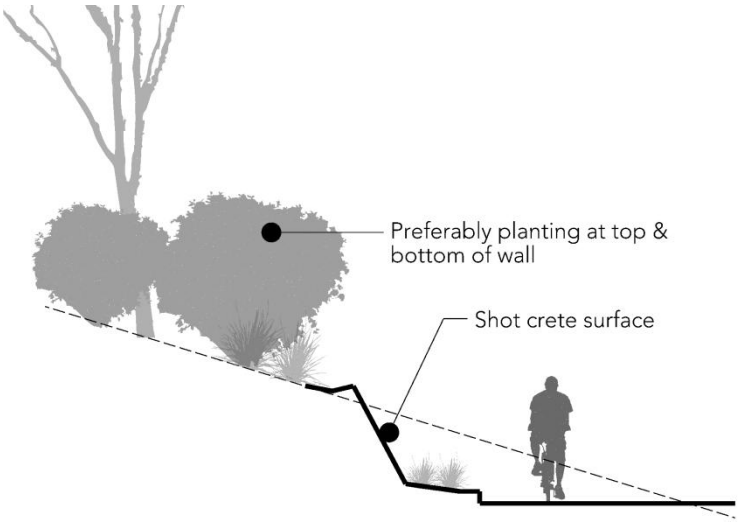
Application: An alternative slope stabilisation technique which may be appropriate for some lower visibility situations where low-detail slope stabilisation is required.

Appearance: Gun-finish concrete in various possible colours.

Standards: No Manningham Standard Drawing

Visual Fit:
Initial Cost:
Embodied Energy:
Recyclability:
Durability:
Maintenance Intensity:

Retaining – Shotcrete



Typical Cross Section

- Gun finish shotcrete (also referred to as 'off-the-gun' or 'undisturbed finish) is concrete mix applied by spray nozzle.
- Finish may also be troweled smooth or a detailed 'imitation rock' finish may be designed into the concrete.
- May be associated with reinforced earth or used to stabilise natural rock cut.

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