AUSTRALIAN NATURE CONSERVATION AGENCY

DESIGN GUIDELINES

FOR THE

AUSTRALIAN NATIONAL BOTANIC GARDENS

November 1993

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1 INTRODUCTION

1.1 Purpose and objectives of the guidelines

This design standards manual has been prepared to provide design guidelines to help ensure future development of the Australian National Botanic Gardens (ANBG) will create an environment worthy of a national institution. The objectives of these guidelines will be to:

- ensure a common design theme is applied throughout the Gardens, promoting strong images of the Australian landscape character.
- allow the consistent use of design techniques and site furniture to convey an overall image of organisation. This objective would not limit the variation of furniture or landscape materials where appropriate from one area to another.
- improve access to the gardens for ambulant disabled people.
- promote visitor safety and enjoyment in the gardens.
- ensure all new works are developed in accordance with accepted design and building standards and the requirements of relevant authorities.

The designs guidelines will provide a theme for all site furniture and detail design elements as well as address their typical distribution and placement in the landscape.

1.2 Background

The Australian National Botanic Gardens was formally opened in 1970. Since this time, the Gardens have evolved with a general emphasis on the use of native plants in informal planting arrangements. However, development of the Gardens has proceeded without a consistent master plan or specific design detailing theme. A number of different design styles and materials have been used. While many attractive zones have been established in the Gardens, there is increasing public demand for designs to be in accordance with minimum acceptable standards and a need for coherence in the planning and design of the various sections of the Gardens, right down to the detail design level.

The Australian National Botanic Gardens was declared under the National Parks and Wildlife Act in 1991. The subsequent Plan of Management for the Gardens identifies a need for coherent development of the Gardens to help promote to the public an overall image of the organisation. This manual has been prepared in response to the Plan of Management and describes design objectives and guidelines for the development of the landscape of the Gardens.

These guidelines aim to provide a practical guide to Garden's staff and consultants involved in the planning, design and construction of visitor facilities in the Gardens, at all levels. It is intended that these guidelines willhelop to achieve a minimum standard for landscape design and development. It aims to outline:

What existing building standards apply to the Gardens.
How to plan and design for new developments, be they of large or small scale.
The design techniques to apply to achieve a greater level of visitor safety, enjoyment, appreciation and understanding of the Gardens and to improve both visitor and staff access etc
Design detai guidelines, to use as appropriate to create a coherent image to the Gardens.
Ways in which the interpretive elements of the gardens can be improved visually.
Provide a database of existing site utilities and a guideline for the installation of new services.
Procedures for the implementation of new proposals for the Garden's landscape.

1.3 Site and activities covered by the manual

These design standards are intended for use on all new developments within the Gardens. This includes those designed and constructed by Gardens staff and those wholly or partly undertaken by external consultants or contractors.

The manual is intended to be used in the consideration of developments from very small scale, such as repair or alteration of minor landscape details, to large scale, such as new sections within the gardens.

Where appropriate, the manual refers to other standards or publications which should be used in the consideration of new developments.

1.4 Feedback from users

It is intended that this manual be used by both Gardens staff and external contractors and consultants. It will need to be updated from time to time. Users of the manual should advise the ANBG Development Officer, of any suggested alterations or additions to the manual to ensure it remains a practical tool in the development of new works.

2 FRAMEWORK FOR PLANNING AND DEVELOPMENT

2.1 Planning and the ANBG Development Guide

In 1991 the ANBG commissioned a Development Planning Guide for the Canberra site to rationalise existing site functions and facilities and integrate them with proposed developments in the context of the Gardens unique natural and cultural heritage.

Planning of future development in the Gardens shall be based on the Development Guide master plan, although precise master planning of particular sections and the siting of new facilities will be reviewed in the light of detailed design requirements and surveys.

2.2 Planning and Design

The following is a guide to the process that should precede the development of any new sections:

1 Any new development should generally be in line with the Plan of Management and the Development Guide of 1992. These documents were prepared in close consultation with both ANBG staff, the general public and interested user groups and provide a thorough framework for planning of the overall future development in the gardens.

2 Planning of any future sections or developments in the Gardens should commence with a design brief formulated in consultation with relevant ANBG staff. The design brief should be prepared regardless of whether the design and/or construction will be undertaken in house or by consultants or contractors. It will set out in detail the objectives, general parameters of the project and specific functional requirements.

3 Site survey as required

4 Concept plans should be developed to show functional relationships of new sections. (eg access, circulation, garden areas, paths and structures, views, linkage to existing surrounding areas of the gardens etc). The concept designs will be reviewed by relevant ANBG staff in consultation with the design Agent.

5 Following agreement on the concept plan, a master plan of each new section of the gardens should be developed. Where this involves large development and/or new buildings or parking areas, the designs should be sent to NCPA for works approval. Once a landscape master plan is agreed for a new section, small developments within each section can then proceed over time as funds become available, within the framework of the master plan.

6 During the development of detail design, ongoing review of design should occur. Designs should consider site constraints such as slope; drainage; soil conditions; exposure to wind and sun; minimising disturbance to existing site features particularly large trees; creating the landscape character intended; existing landscape character including drainage, soils, vegetation, slope, views, noise etc etc; water availability; functional considerations of access, servicing, maintenance etc

7 Once a design is finalised and specifications prepared, tenders for construction should be called from selected contractors approved by ANPWS. Contractors selected should have either successfully completed work for ANBG before or be able to show a good standard of workmanship on similar projects.

8 Successful contractors should be fully briefed by ANBG in environmental protection requirements at the commencement of site work. Construction should be scheduled to minimise disruption to visitors to the Gardens.

9 Regular (eg minimum fortnightly) meetings should be held on-site between ANPWS/ANBG and Contractors (and consultant if applicable) to ensure adequate progress etc.

3 DESIGN

3.1 Theme and Character

The Australian National Botanic Gardens has been developed using Australian native plants. Early plantings were based on family groupings but more recently sections such as the rainforest gully have been developed to depict plants in their natural ecological groupings. This theme of ecological plantings has the advantage that it allows the gardens to evoke the character of the Australian landscape, not only through the plant material used but also through the overall visual effect of various groupings. The educational role of the gardens can benefit from these ecological groupings of plants as it enables visitors to learn about and enjoy the individual plants and gain an insight into various landscape types of Australia.

The typical Australian landscape with which most people are familiar is the dry bushland and/or woodland complex. This usually consists of a canopy of Eucalyptus trees, under canopy mixed shrubbery varying in height, low perennial/herbaceous plants scattered informally with grass formations and dry litter. The usual and/or ornamental elements of this bush setting comprise :

* Mosaic/drift pattern plant spacings
* Organic shapes/forms
* Twisted/gnarled trunk formations
* Sharp colour and textural variation in foliage
* Sharp contrast in light and shade
* Sinuous/free form line patterns
* Informality in structural composition and pattern
* Dryness - plants developed in relation to climate, fire and drought

The aesthetic and ecological elements of native landscape systems need to be studied to provide standards for presentation of botanical displays. For example, a woodland complex can comprise dominant tree species of Eucalypts, Casuarinas, Melaleuca and Acacias.

It is recommended that ANBG recreate only the distinctive elements of each particular landscape system - those features which are the main characteristic features. This will conserve resources and the available development area.

A significant attribute of the ANBG is its informal lay out of plantings. This is beautifully reinforced by Black Mountain's dry woodland environment. This character should be continued as it strongly reflects conditions found in the Australian natural environment.

A grassy woodland landscape dominated by eucalypts. (North West slopes, NSW)

3.2 Access and Circulation

Access to the ANBG is provided for private cars, tourist buses, local buses, bicycles, pedestrians, ANBG staff vehicles, services vehicles etc.

An efficient and well designed circulation system is important to provide access for visitors through gardens. Paths should be designed to cater for all user groups which visit the gardens including disabled and non disabled people within the following age groups :

* Very young (custody of adults)	1-4 years
* Children (custody of adults)	5-10 years
* Children (unsupervised)	11-12 years
* Teenagers	13-20 years
* Young adults	21-39 years
* Middle age citizens	40-65 years
* Senior citizens	over 65 years

Circulation routes should also be delineated into:

- main access paths
- subsidiary routes around the gardens between particular garden zones.
- smaller walking paths that go through particular sections of the gardens and give visitors close hand experiences of the various planting zones.

Access into the gardens is currently cluttered and confusing to the visitor in the core precinct. The Development Guide has made a number of recommendations regarding ways in which these problems can be resolved.

One of the main problems with circulation on the Canberra ANBG site is the lack of delineation and separation between pedestrian and service vehicle paths throughout the gardens.

Circulation through the gardens has become an issue of concern given the size of the site and its steep terrain. It is recommended that circulation be developed to provide a number of different walks of varying lengths and degrees of difficulty. Where possible these should be designed to ensure the users return to their starting point at the end of their walk, with minimal chance of confusion.

It is recommended that the surface treatments for service roads and pedestrian circulation routes be different, so as to delineate their intended use. Sections 5.1 and 5.2.4 of this manual provides recommendation on surfaces for various types of path and road surfaces.

3.3 Composition and siting of developments

The siting and composition of new developments should be planned and sited so as to create a coherent visual image sympathetic with the site character.

Wherever possible display plantings should be on gentle slopes to maximise their visibility from footpaths. Consideration should be given to how plantings will look from are views from more distant parts of the ACT. Gradually transition from one planting zone to another, or having section boundaries along rather than horizontal to the contour will assist in achieving this. Rigid variations in planting should be minimised as this does not reflect the natural pattern in the landscape. Each new section in the gardens, such as the rainforest gully or the Tasmanian Section should provide a focus area, where people would meet if they were visiting that area (eg beginning of the rainforest gully, pool area in the rockery, eucalypt lawn)

Structures in the gardens should be sited to ensure they are not visually dominant unless specifically aimed to be a focal point. It is recommended that buildings be sited so they don't break the skyline and earthworks to accommodate the building are minimised. The land around the building should be reshaped if required to achieve natural looking slopes and minimise sharp changes. Gentle level changes around buildings will allow ease of service access and minimise the need for ramps etc for disabled access. Buildings should be sited to be viewed amongst trees or against a backdrop of trees and so that they don't interfere with views around the gardens. It is important that buildings blend into the landscape of the gardens so that the plantings are the focus of the visual image. Buildings should be grouped to assist in minimising their overall visual impact.

3.4 Functional and visual links to existing developments

In the establishment of new zones within the Gardens, consideration should be given to how the section will link to existing established garden sections. A visual buffer/transition zone should be provided between zones to allow a subtle change in character from one zone to another, so people are aware, without signage necessarily telling them, that they are entering a different ecological planting zone. Views between sections should be opened up selectively to add contract and visual interest to the overall experience of a visit to the gardens.

Functional links between developments may include:

- Path access
- Disabled access at appropriate gradients
- Service access links
- Continuity of plant families

3.5 Use of materials, textures and colours

All new developments within the gardens should generally be in line with ANPWS policies on maximising use of recycled materials. This may include use of recycled plastic logs in lieu of CCA pine, use of old telegraph poles for boardwalk posts or use of timber salvaged from demolition sites, sandstone from demolition sites, recycled tyre non slip surfacing etc.

Rock material for use in retaining walls or creekline works , should only be sourced from existing quarries or previously disturbed sites (eg rocks along the edge of a road may well have been salvaged from the road section during construction). Rock material from undisturbed landscapes or rural properties should not be used for work at ANBG.

It is recommended that ANBG only use non-endangered timbers for structures within the gardens. As a general guide, the following table, compiled by the Rainforest Information Centre, should be used as a guide to timber selection.

ALTERNATIVE TIMBERS

THE R.I.C. READY RECKONER

	ENVIRONMENTAL RATING	FRAMING & GENERAL CONSTRUCTION	FLOORING	INTERNAL JOINERY, MOULDINGS & LINING	EXTERNAL CLADDING	WINDOW & DOOR FRAMES EXTERNAL MOULDINGS	WINDOW SILLS	FURNITURE	OUTDOOR FURNITURE	EXPOSED SITUATIONS	DECKING	IN GROUND	
Alpine Ash (a Tas Oak)		★	★	★		★		★					E. delegatensis
Blue / Smooth-Barked Mountain(s) Ash		★		★		★							E. oredes
Mountain Ash (a Tas Oak)		★	★	★		★		★					E. regnans
Silvertop Ash, Coast Ash Ironbark, Black Ash		★		★		★							E. sieberi
White Ash, White Mountain Ash		★		★				★					E. fraxinoides
Blackbutt	RP2	★	★		★		★			★	★	★	E. pilularis
New England Blackbutt, New England Ash		★	★	★									E. campanulata
Swan River Blackbutt, Yarri (W.A.)		★	★	★						★			E. patens
Candlebark, Ribbon Gum, White Gum		★											E. rubida
Coast Grey Box, Gippsland Grey Box		★								★		★	E. bosistoana
White-Topped Box, Coastal White Box			★		★					★	★	★	E. quadrangulata
Brown Barrel, Cut-Tail		★	★		★								E. fastigata
Carabeen, Moreton Bay Ash		★											E. tessellaris
Tasmanian / Southern Blue Gum		★										★	E. globulus
Sydney Blue Gum, Blue Gum	RP2	★	★	★	★			★		★			E. saligna
Small-Fruited Grey Gum, Grey Gum		★								★		★	E. propinqua
Grey Gum		★								★		★	E. punctata
Mountain Grey Gum, Monkey Gum		★	★							★		★	E. cypellocarpa
Lemon-Scented Gum, L-S Spotted Gum		★	★		★								E. citriodora
Maiden's Gum		★								★		★	E. maidenii
Manna Gum, Ribbon Gum, White Gum		★	★	★				★					E. viminalis
Mountain Gum, Broad-Leaved Ribbon Gum		★	★	★									E. dalrympleana
Forest Red Gum, Blue Gum, Red Irongum		★								★		★	E. tereticornis
River Red Gum, Red Rum, River Gum			★	★		★				★		★	E. camaldulensis
Flooded Gum, Rose Gum	RP2	★		★									E. grandis
Round-Leaved Gum, Deane's/Mount Blue Gum		★	★										E. deanei

Shining Gum, Silvertop	★	★	★										E. nitens
Spotted Gum, Spotted Irongum	★★	★		★		★			★				E. maculata
Yellow Gum, Blue Gum, White Ironbark	★★	★							★			★	E. leucoxylon
Grey Ironbark	★★	★	★	★					★	★		★	E. siderophloia E. paniculata
Old Grey Ironbark, Grey Ironbark	★★	★	★						★	★		★	E. drepanophylla
Narrow-Leaved Red Ironbark	★★	★		★					★			★	E. crebra
Blue-Leaved Ironbark	★★	★		★					★			★	E. fibrosa
Mugga, Red Ironbark	★★	★							★			★	E. sideroxylon
Jarrah	★★	★	★	★				★	★	★	★	★	E. marginata
Western Red Cedar	★★ P2			★	★	★	★	★	★	★			Thuja Plicata
Oregon, Douglas Fir	★★★ P2	★		★		★		★	★				Pseudotsuga menziesii
Karri	★ L	★	★	★						★	★		E. diversicolor
Red Mahogany, Red Massmate	★★ RP2	★	★	★	★		★			★	★	★	E. resinifera
Southern Mahogany, Bangalay	★★ RP2	★	★							★	★		E. botryoides
White Mahogany, Yellow Stringybark	★★ RP2	★	★		★		★			★		★	E. acmenioides
Brown Mallet	★ L	★											E. astringens
Messmate Stringybark (a Tas. Oak)	★ R	★	★	★	★			★					E. obliqua
Gympie / Yellow Messmate	★ R	★											E. cloziana
Bunya Pine	★★★ P2			★				★					Araucaria bidwillii
Black Cypress Pine	★★	★	★	★	★					★		★	Callitris endlicheri
Northern Cypress Pine, Cypress Pine	★	★	★	★	★					★			Callitris intratropica
White Cypress Pine, Western Sand Cypress	★★	★	★	★	★					★		★	Callitris glauca
Hoop Pine	★★★ R P2			★		★		★					Araucaria cunninghamii
Forest Sheoak, Rose Sheoak	★★ R			★				★		★			Casuarina torulosa
West Australian Sheoak	★★			★				★		★			Casuarina fraserana
Blue-Leaved Stringybark	★★	★	★							★	★	★	E. agglomerata
Brown Stringybark	★★	★	★							★		★	E. baxteri E. capitellata
Blaxland's Stringybark	★★	★								★		★	E. blaxlandii
Darwin Stringybark, Messmate	★★	★								★			E. tetrodonta
Diehard Stringybark	★★	★								★			E. cameronii
Silvertop Stringybark	★★	★								★			E. leavopinea
White Stringybark	★★	★	★		★					★			E. eugenioides E. globoidea
Yellow Stringybark	★★	★	★		★		★			★	★	★	E. muelleriana
Tallowwood	★ E	★	★		★	★	★			★	★	★	E. microcorys
Turpentine, Luster, Red Terpentine	★★ R	★	★	★						★	★	★	Syncarpia glomulifera
Wandoo	★★	★	★							★	★	★	E. wandoo
Wattles	★★			★				★					Acacia spp.
Woollybutt	★ L	★	★							★		★	E. longifolia
Yellowjuk	★	★	★							★	★	★	E. considenana
Spruce / Pine / Fir	★★★ P2	★		★		★							various spp.
Redwood, Californian Redwood	★★ P2			★	★	★			★	★			Sequoia sempervirens
Poplar	★★★ P			★									Populus spp.
Slash Pine	★★★ P	★	★	★									Pinus elliottii
Radiata Pine, Monterey Pine	★★★ P	★	★	★	★	★		★					P. radiata
Maritime / Cluster Pine	★★★ P	★		★									P. pinaster
Loblolly Pine	★★★ P	★		★									P. taeda
Caribbean Pine	★★★ P	★	★	★									P. caribaea
Camphor Laurel			★					★					Cinnamomum camphora
European Larch	★			★				★					Larix decidua
Paulownia	★★ L			★				★					Paulownia tomentosa
Blackwood	★★ R			★				★					Acacia melanoxylon
Pink Bloodwood	★★	★	★	★				★					E. intermedia
Customwood	★★★			★		★		★					
Particleboard	★★★		★	★				★					
Craftwood	★★★			★				★					
Waferweld	★★★			★									
Hardboard	★★★			★									
Plywood (non rainforest veneers)	★★★		★	★	★					★			
Glulam	★★★	★		★									
L.V.L.	★★★	★											
Scrimber	★★★	★		★									

Composite Timber Products

ENVIRONMENTAL RATING

★ Alternatives should always be used where available

★★ Only recommended where ★★★ is unavailable or unsuitable

★★★ Highly recommended for use wherever possible.

L . . Of limited occurrence

R . . Associated with rainforest as well as more open habitat. Not recommended for use when from secondary rainforest and rainforest margins

P . . Grown in plantations

P2 Recommended if grown in plantations or sustainably managed forests. Not recommended if from old-growth forest

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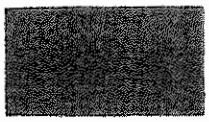
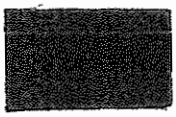
Colours for paths, furniture and site structures should be selected to blend with those found in the Australian landscape. The following colour schedule provides some examples of colours which could be used to achieve this:

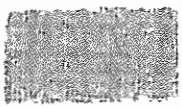
Colorbond 'mist green' roofing to blend with Eucalypts

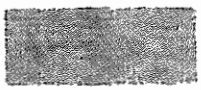


Mission brown used for bollards to blend with the colour of bush litter

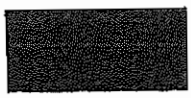


Timber furniture either painted in mute grey/greens or allowed to weather to natural timber colours.





Contrast colours for signs etc might reflect the brighter colours found in the Australian vegetation... eg grevilleas, acacias etc



The texture of the bush should be conveyed by placing some trees and shrubs sufficiently close to paths to allow visitors to touch tree trunks and plant foliage. In this way, visitors can gain an appreciation for the texture of native plants, and the variations from, for example, the very smooth to the rougher fibrous barked eucalypts.

3.6 Borrowed landscape

Future development of the gardens should give consideration to the use of views to immediately surrounding sites of interest and to more distant views of Canberra landmarks to enhance the visual appeal of the gardens.

Where appropriate and practical, views could be opened to features such as Parliament House, Lake Burley Griffin and parts of Black Mountain outside the gardens.

Consideration will also be given to the opening up of views between the various planting zones of the gardens to help in visitor orientation.

3.7 Planning and Design to Reduce Maintenance

The following points should be considered in the planning and design of the gardens to reduce maintenance:

- Use good quality materials and construction techniques.
- Keep garden edges and pavement surfaces flush with natural site levels. Planting beds should be raised to assist with keeping visitors off the planting zones.
- Avoid development of overly intricate or irregular shaped garden beds.
- Where possible, mass plant trees and shrubs. Use high density numbers and later thin out.
- Site paths where people are likely to want to walk. (ie not in a curved alignment when there is an obvious attraction which will draw people to walk along a more direct alignment towards it).
- Use appropriate level changes and surface drainage treatments.
- Select plants based on ecological groupings.
- Carry out appropriate weed eradiation, installation of irrigation and soil improvement prior to planting, to minimise the later need for maintenance.
- Utilise mulch surfaces and ensure there are adequate erosion control treatments installed to prevent loss of topsoil or washouts from paths etc.
- Plant species which will not outgrow their space and later obstruct access and facilities.

3.8 Water Conservation and Irrigation

- Select and cultivate plants in ecological groups.
- Plant dominant structural tree species that will provide microclimatic benefit to understorey species.
- Mass plant to prevent undue evaporation from soil surfaces.
- If small specialised garden beds are being developed, concentrate on one site to maximise the use of resources.
- Conserve natural vegetation and selectively thin it out over time while new plantings establish. This will allow new plants to be sheltered from prevailing winds and help reduce evaporation of water from soil surfaces.
- Use water harvesting techniques wherever possible Design surface drainage systems to disperse water over garden beds rather than allowing water to immediately run-off via storm water systems.
- Use low volume micro irrigation systems than conventional over head sprinklers in developed beds if possible.
- Use mulch surface treatments.
- Measure and specify water irrigation levels to the minimum requirement for healthy plant growth.
- Install automatic irrigation systems where funds allow, with appropriate automatic timers.

4 EXISTING STANDARDS

4.1 Standards Australia Publications

New developments within ANBG will be designed in accordance with the following Standards Australia publications, and any other relevant publications of the organisation:

AS 1428.1 & supplements	Design rules for access by the disabled
AS 2555	Adventure playgrounds
AS 2155	Playgrounds - siting an equipments installation and maintenance
AS 1158	Public Lighting code
AS 1725	Chainwire fences
AS 2890.2	Off-street parking
AS 1597	Smaller drainage culverts
AS 1742 & supplements	Traffic manual control devices
AS 2156	Signs for walking tracks

4.2 Building Codes

Future development in the ANBG will be in accordance with the requirements of the Building Code of Australia, 1990 including all supplements and updates and the Appendix on the A.C.T.

4.3 Requirements of relevant authorities

The National Capital Plan specifies Designate Areas which have the special characteristics of the National Capital. The Gardens occupies a site in a Designate Area and no works may be undertaken without the approval in writing of the National Capital Planning Authority (NCPA). In the absence of an agreed long term plan, the Authority has been approving works in the Gardens on a case by case basis. The adoption of the Plan of Management, the Development Guide and these design standards will streamline this process.

New developments within the gardens should be referred to the NCPA, the Australian Heritage Commission and the Environment Protection Section of the Office City Management.

4.4 Applicable ANPWS guidelines/design manuals

New developments within the gardens should be generally in line with ANPWS guidelines listed below:

- Walking tracks management manual
- Checklist for design for disabled access

5 DESIGN DETAILS

5.1 Access

Walking tracks shall be designed to:

- have a minimum width of 600 mm and a maximum width of 2400mm, depending on the type and location of the path.
- have a maximum gradient of 1:16 wherever possible but generally no greater than 1:8 over great distances.
- follow the natural site contours and curve to emphasis natural land form. This will assist in providing gentle gradients for users and reduce maintenance of gravel paths required due to excessive erosion.
- have curved horizontal alignments to maintain interest and minimise views of other people on the path.
- be well signposted. An appropriate number of signs should be provided but not so many that they create visual clutter.
- be constructed to shoe standard so they have a smooth and well formed surface, providing an even surface
- be obstacle free (ie not sited beneath overhanging branches or too close to existing plants likely to grow onto the path). Paths should be maintained in good condition and kept free of low hanging branches (ie below 2.3 metres) which could be hazardous for people.
- have seats and informal rest stop points incorporated in their design.
- have well defined edges for visual & safety reasons
- to minimise maintenance requirements
- minimise the likelihood of water/moisture remaining on the path and causing a slippery surface to form.

Access for the disabled will be provided throughout the gardens wherever possible. Where paths are to allow for disabled access they shall:

- have a maximum gradient of 1:16 and have appropriate handrailing if required.
- have minimum width of 1200 mm but preferably 1500 mm to allow two people in wheelchairs to pass each other.
- Where path gradients exceed 1:20, 1200mm wide level rest stops should be provided at a maximum of 9 metre spacings.
- Where path gradients are between 1:20 - 1:33, 1200 mm wide level rest stops should be provided at a maximum of 18 metre spacings..

Roads

Road surfaces in the gardens shall be designed to be surfaced with a prime and double seal, have concrete kerbs and gutters, be constructed according to accepted Australian Standards, include adequate drainage and standard linemarking etc, have a maximum gradient of .....

5.2 Surface treatments

5.2.1 Ground form and mounding

Ground forming and mounding should be designed to blend with existing site contours to provide an impression of natural landform.

Gradients for ground form on different surfaces should be as follows:

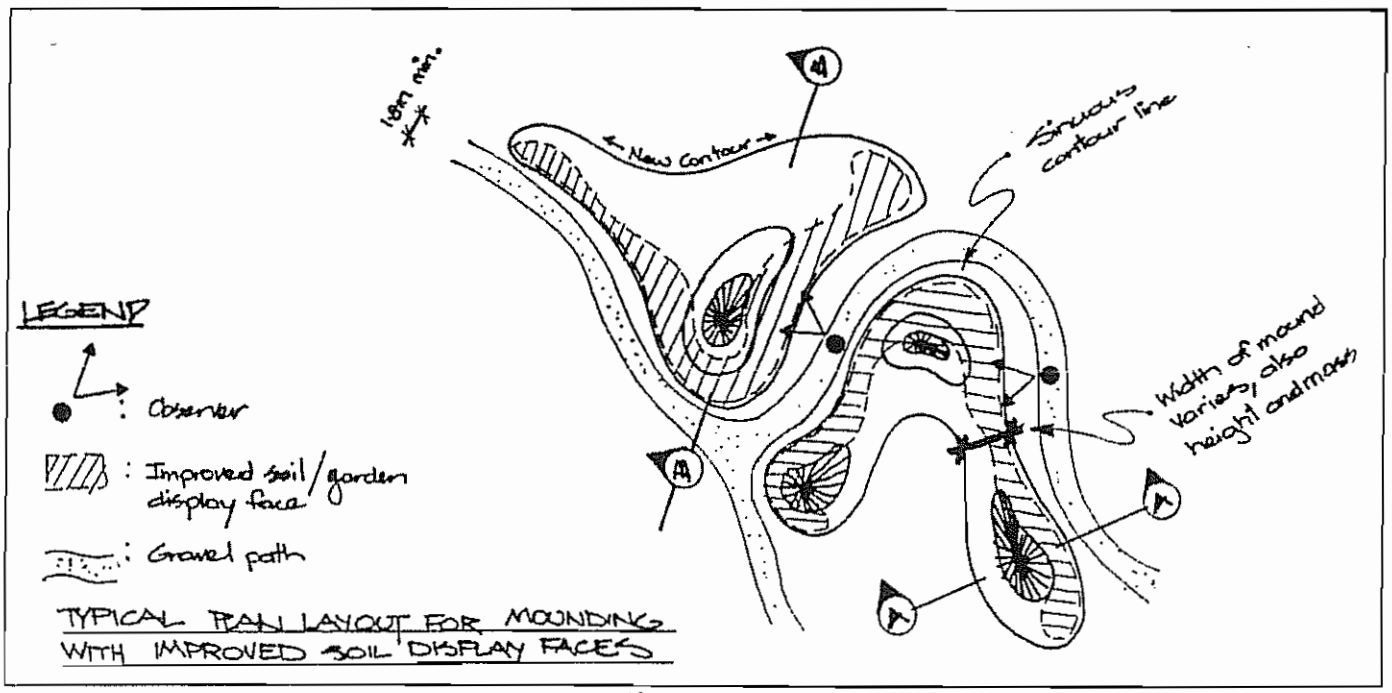
1) Up to a maximum of 1:4 for mown grass
2) Up to a maximum of 1:3 for general garden bed development
3) Up to a maximum of 1:2 for small display plantings that need to be elevated
4) Up to a maximum of 1:1 for terracing areas.
5) Between 1:16 and 1:50 for paving surfaces.

Mounds should be shaped to include some irregularities in the form and have variation in the gradient of the sloping sections. Avoid the use of sharp angles and straight lines. To edges of mounds, provide horizontal shoulders, minimum width 500mm, before any change of level. The surface between contours on mounds should be smooth to achieve and natural appearance.

Mounds should be considered for inclusion in new landscape areas where they may provide:

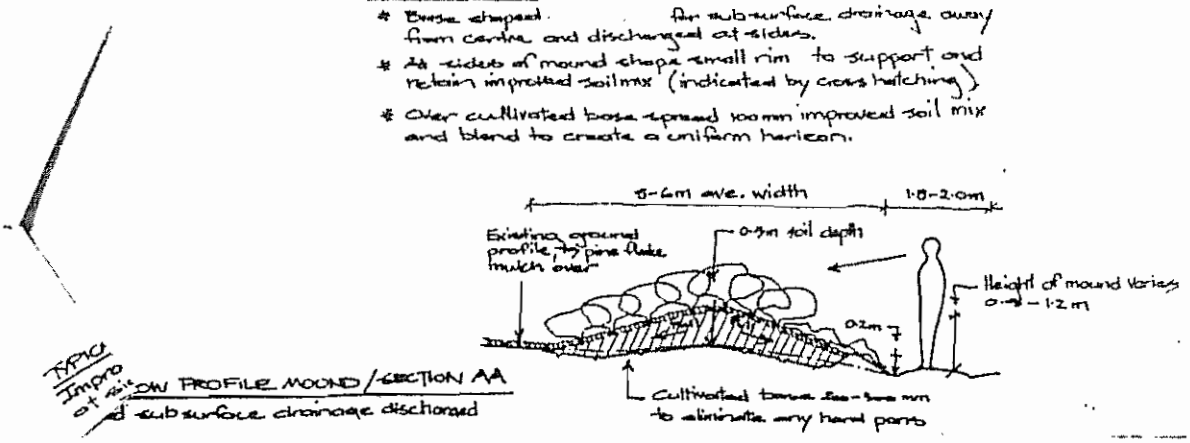
* Elevated levels for display of small plants
* Elevated levels for improved soil development to cultivate special plant communities
* Spatial definition
* Visual interest or screening
* A means of subtly directing pedestrian flow
* A barrier to prevent visitor access to certain sections of the gardens.
* Collection points for surface run-off.

The following treatments are recommended for use at the ANBG:

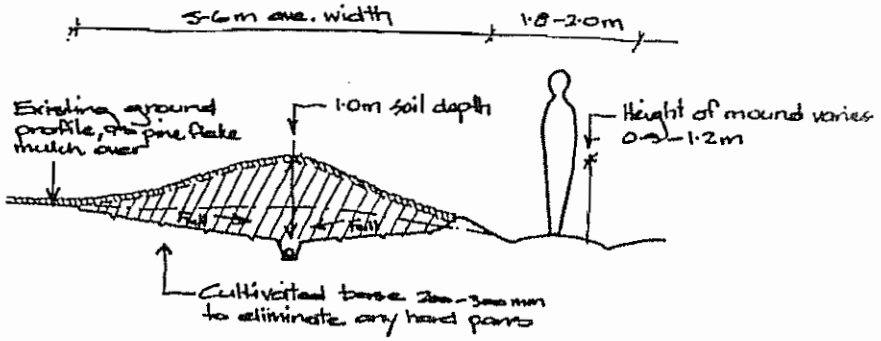


General Points

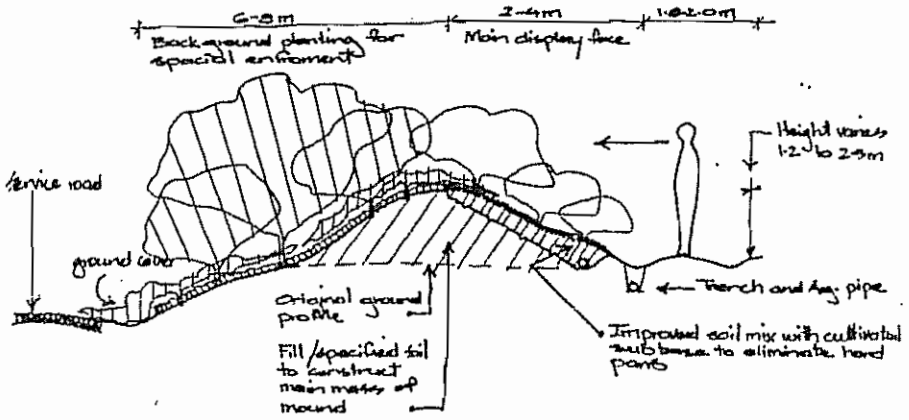
* Base shaped for sub-surface drainage away from centre and discharged at sides.
* Sides of mound shape small rim to support and retain improved soil mix (indicated by cross hatching).
* Over cultivated base spread 100 mm improved soil mix and blend to create a uniform horizon.



TYPICAL DETAIL: LOW PROFILE MOUND / SECTION AA
Improved soil bed, sub surface drainage discharged



TAIL: LOW PROFILE MOUND / SECTION AA
Soil bed, sub surface drainage towards centre to channel heavy flow



General Points

* Mound constructed to be an extension of original ground profile.
* Typically mound divided into two main sections, one side is for back ground planting and the alternate side developed for display planting. This encorporates improved soil development.
* Sub surface drainage is designed to discharge from the sides and be collected by drag trench drains.

TYPICAL DETAIL: MEDIUM TO LARGE PROFILE MOUND / SECTION BB

5.2.2 Rocks

The use of natural rock within the ANBG has helped to reinforce the natural bush appearance of many sections and can often provide a bold feature in contrast with plants, water, ground form and the landscape. It is recommended that use of natural rock be considered where they might provide:

* Raised levels to display small plants
* Visual interest
* Bank stabilisation and terracing
* Microclimate for cultivation of certain plants
* Barrier/borders
* Background texture
* Wildlife habitat
* Erosion/drainage control

General principles:

1) The design intent for placement of rocks should reflect the scenic character of the environmental area being portrayed. Replicate rock patterns found in nature: river edge, dry creek bed, exposed outcrop,alpine rock slope, glacial moraine.
2) Always position rocks in random patterns comprising odd numbers 3-5-7 and avoid use o' even numbers which may create a contrived visual image.
3) Spacings between rock centres should vary and repetitive and uniform patterns should be avoided.
4] Select rock material which has variation in height, mass, shape, colour and texture. The parent base material should be uniform (eg granite).
5) Use good quality rock material that is not adversely damaged by scratches, drill holes and excavation marks.
6) Rock material over one metre in diameter should be placed about one third below ground for stability and natural contouring.

Construction character:

The following treatments are recommended for use at the ANBG:

PLAN LAYOUT : ROCK OUTCROP

1. Preferred

2. Avoid

3. Acceptable

ELEVATION : ROCK OUTCROP

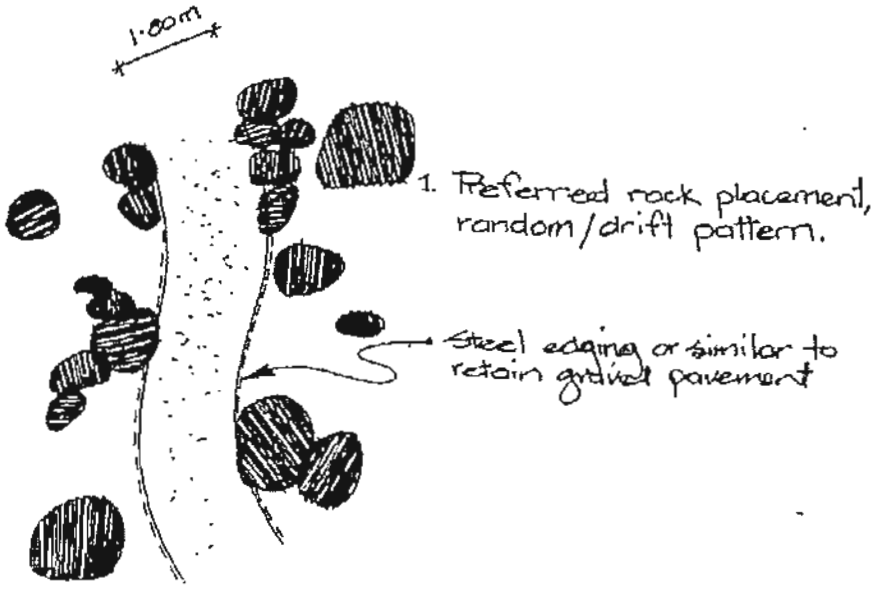
1.

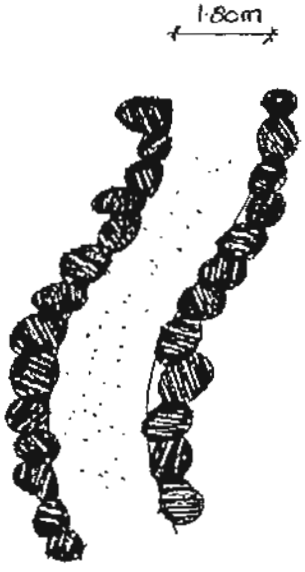
2.

3.

Refer point 6

PATH : ROCK EDGE





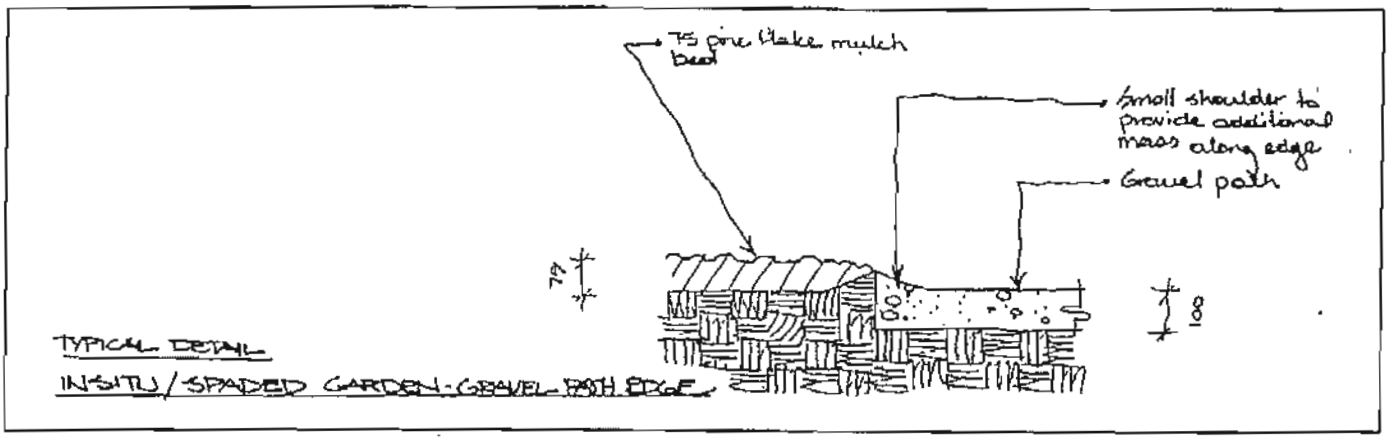
2. Avoid uniform and formal patterns.

5.2.3 Edging treatments

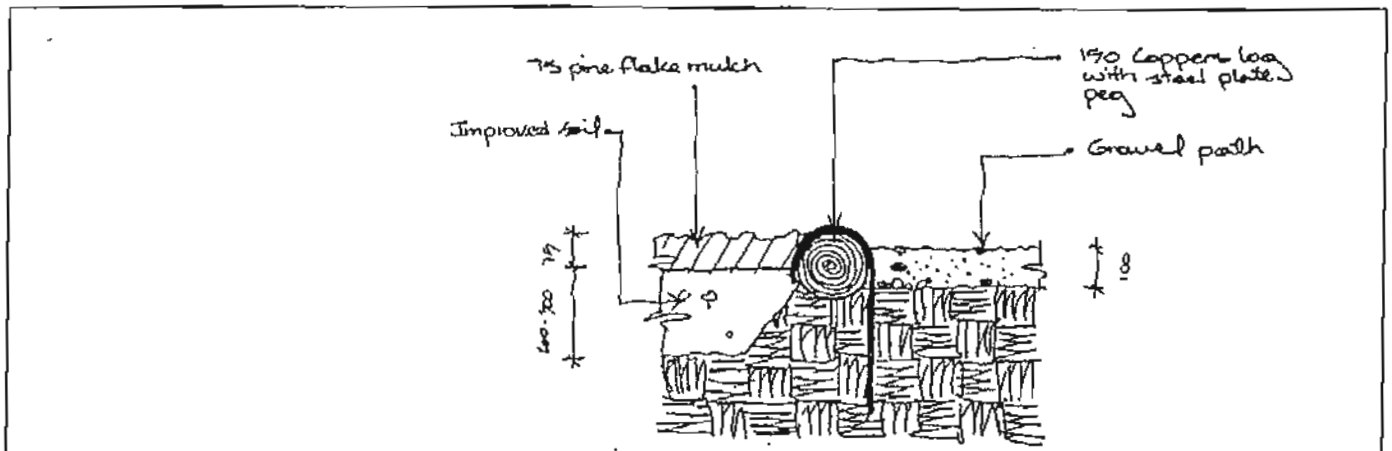
Surface edging to paths, garden beds and lawn areas is an important component within the landscape of the gardens that provides various functions:

- Defines, divides and contains hard/soft landscape areas
- Contains non rigid pavements
- Defines movement path ways
- Enhances the aesthetic character
- Slope stabilisation

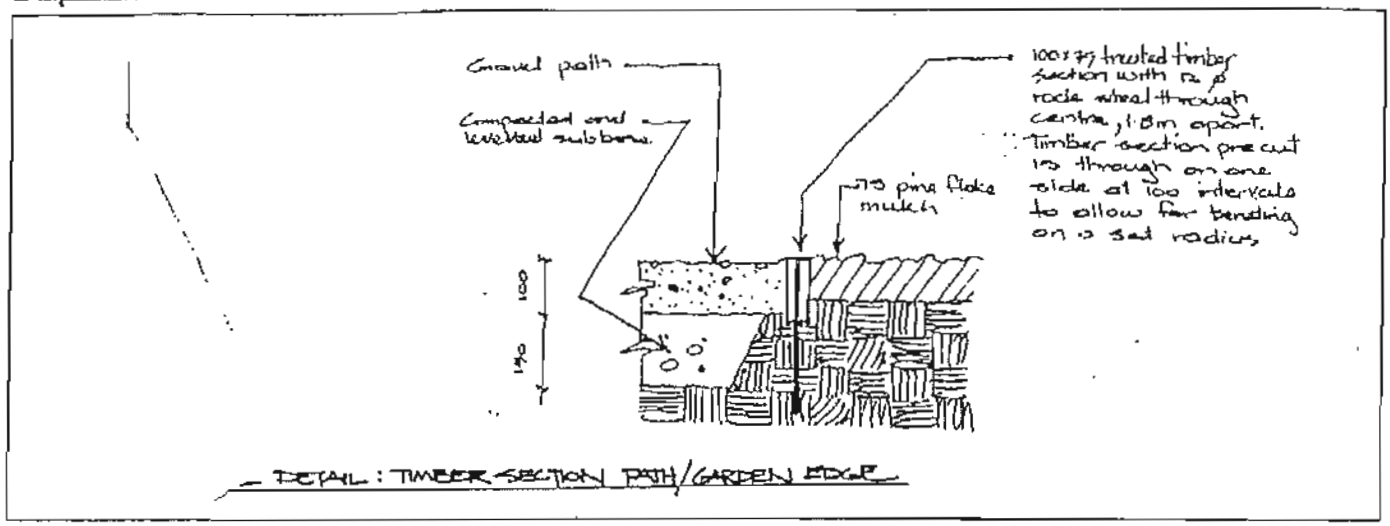
In high use zones, edging should finish flush with surrounding levels so that obstacles to machinery and trip points are minimised. The choice of edging materials will depend on its intended purpose, required appearance, cost and durability.
Construction character:
The following treatments are recommended for use at the ANBG:



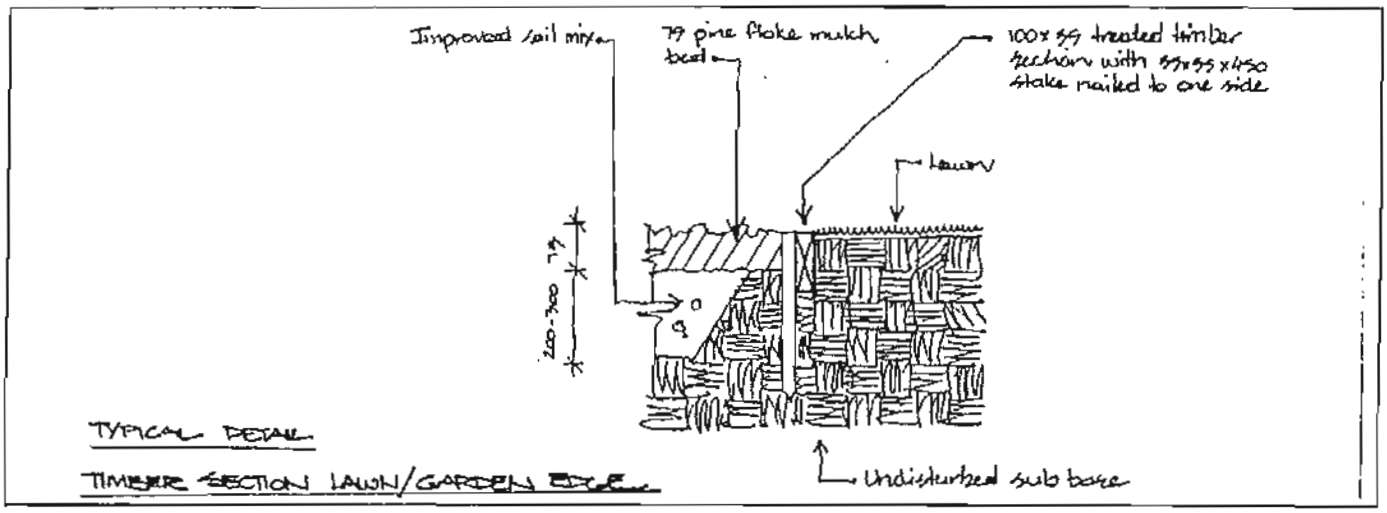
TYPICAL DETAIL
IN SITU / SPADED GARDEN - GRAVEL PATH EDGE



TYPICAL DETAIL : COPPER LOG PATH GARDEN EDGE

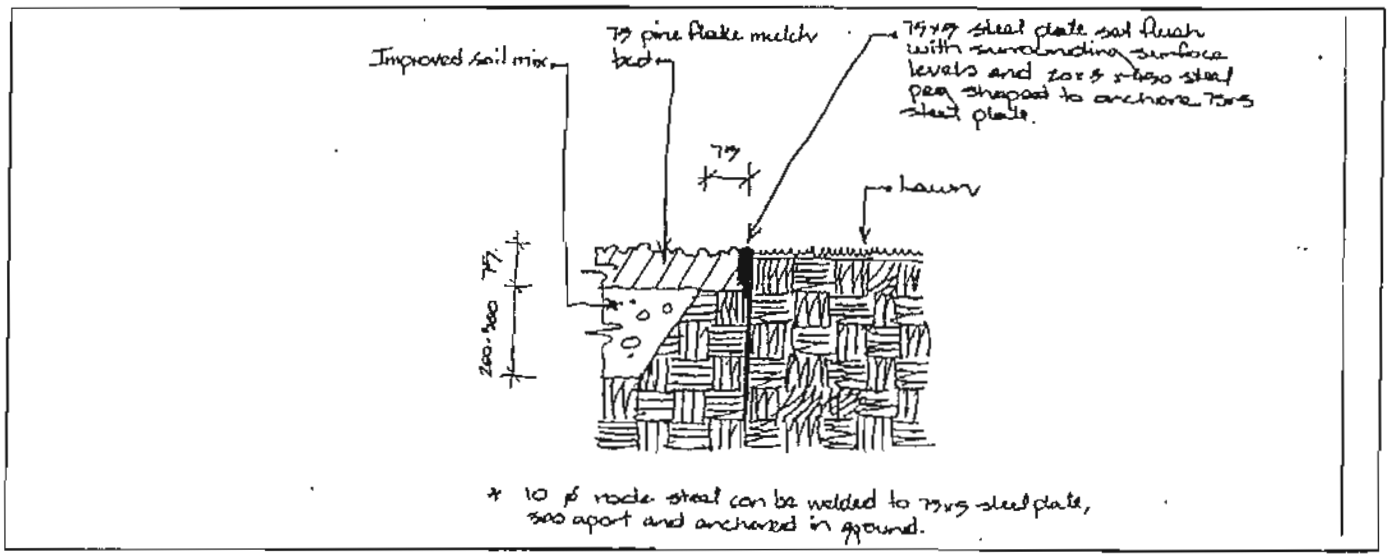


DETAIL : TIMBER SECTION PATH/GARDEN EDGE

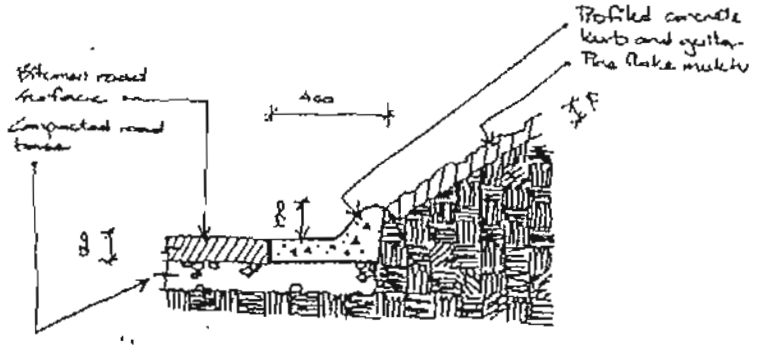


TYPICAL DETAIL

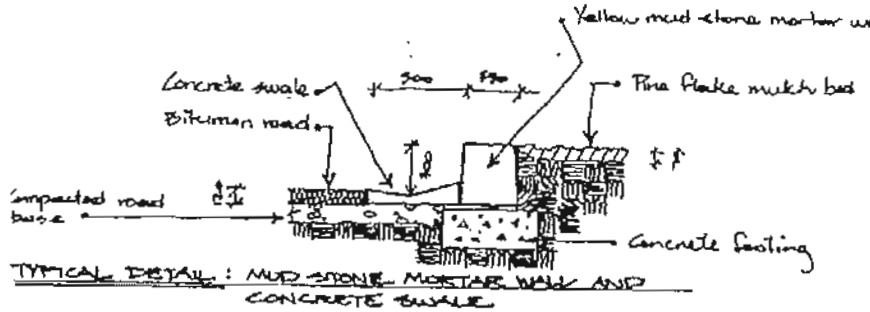
TIMBER SECTION LAWN/GARDEN EDGE



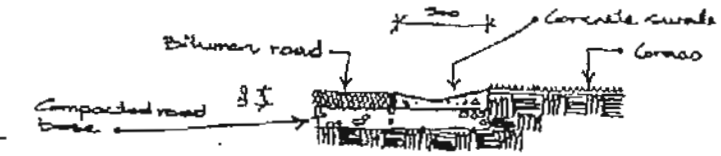
TYPICAL DETAIL : 75 mm STEEL PLATE LAWN/GARDEN EDGE



TYPICAL DETAIL : PROFILED CONCRETE KERB AND GUTTER - ROAD EDGE SLOPING BANK

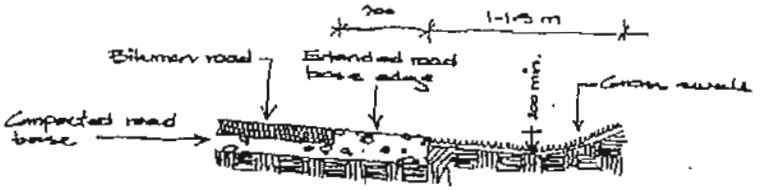


TYPICAL DETAIL : MUD STONE MORTAR WALL AND CONCRETE SWALE

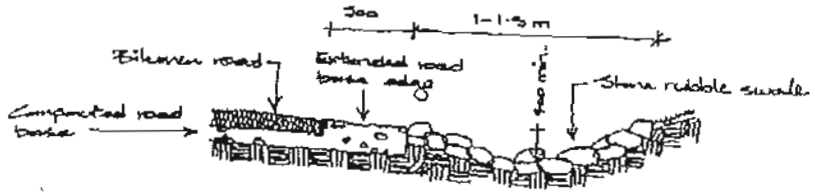


TYPICAL DETAIL

CONCRETE SWALE



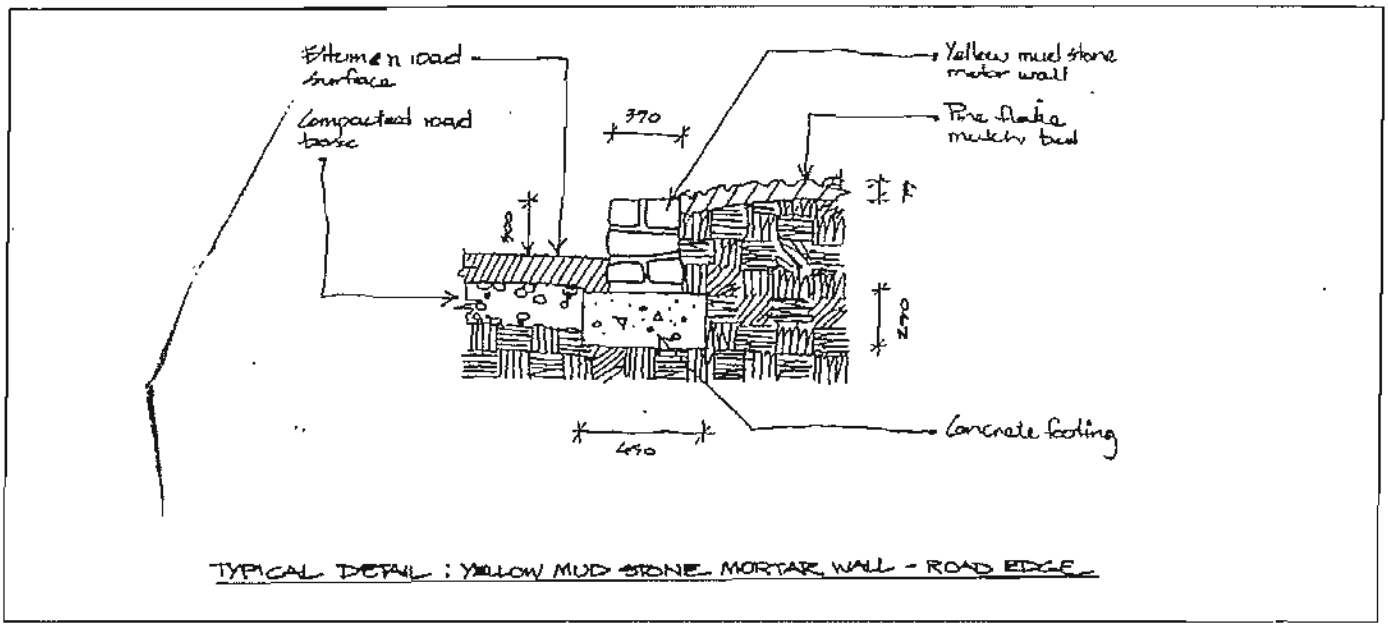
TYPICAL DETAIL : EXTENDED ROAD BASE EDGE / GRASS SWALE



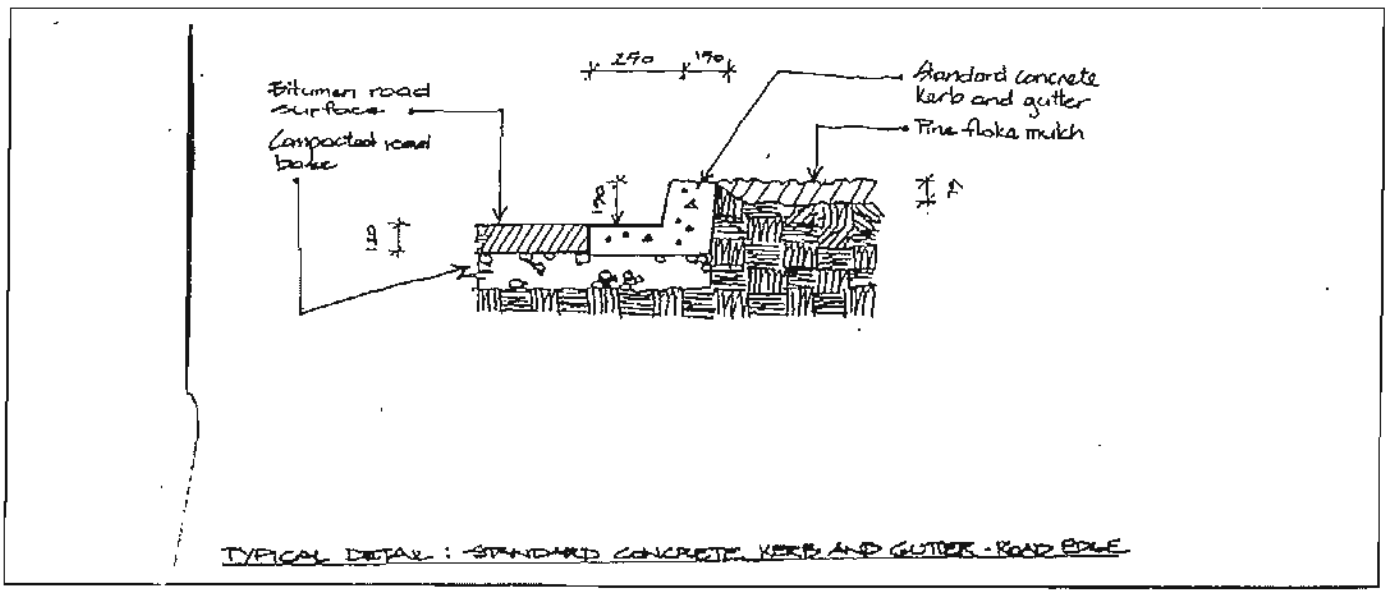
TYPICAL DETAIL : EXTENDED ROAD BASE EDGE / STONE COBBLE SWALE

Surface edging along roads within the ANBG forms an important hard landscape element for drainage control, transition from road to soft landscape, define direction of movement, road edge protection and bank stabilisation.
A dominant road edge treatment used extensively in the Gardens is a yellow mud stone mortar wall. Future hard landscape additions must compliment this style.
In high use zones road edging needs to be durable and constructed to require minimal and/or no maintenance in the long term.

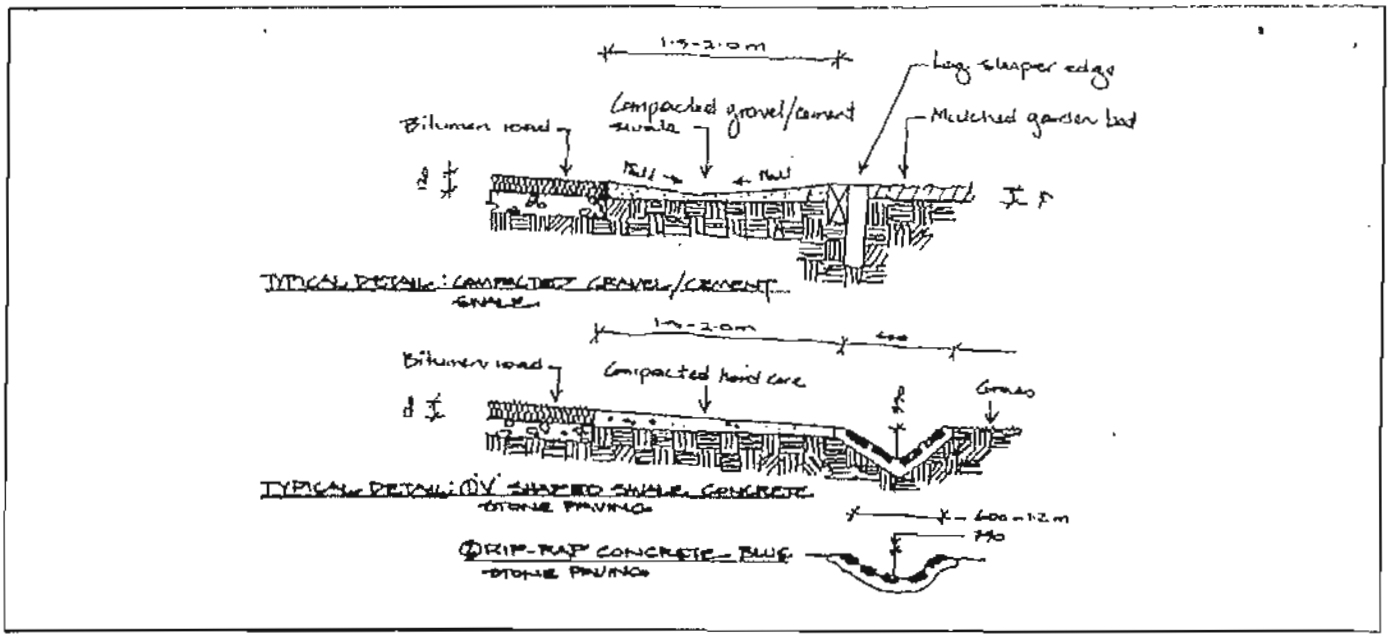
The following treatments are recommended for use at the ANBG:



TYPICAL DETAIL : YELLOW MUD STONE MORTAR WALL - ROAD EDGE



TYPICAL DETAIL : STANDARD CONCRETE KERB AND GUTTER - ROAD EDGE


1·5-2·0m
Log sleeper edge
Compacted gravel/cement
Bitumen road
Mulched garden bed
Compacted hard core
Grass
600-1200
750

5.2.5 Mulch treatments

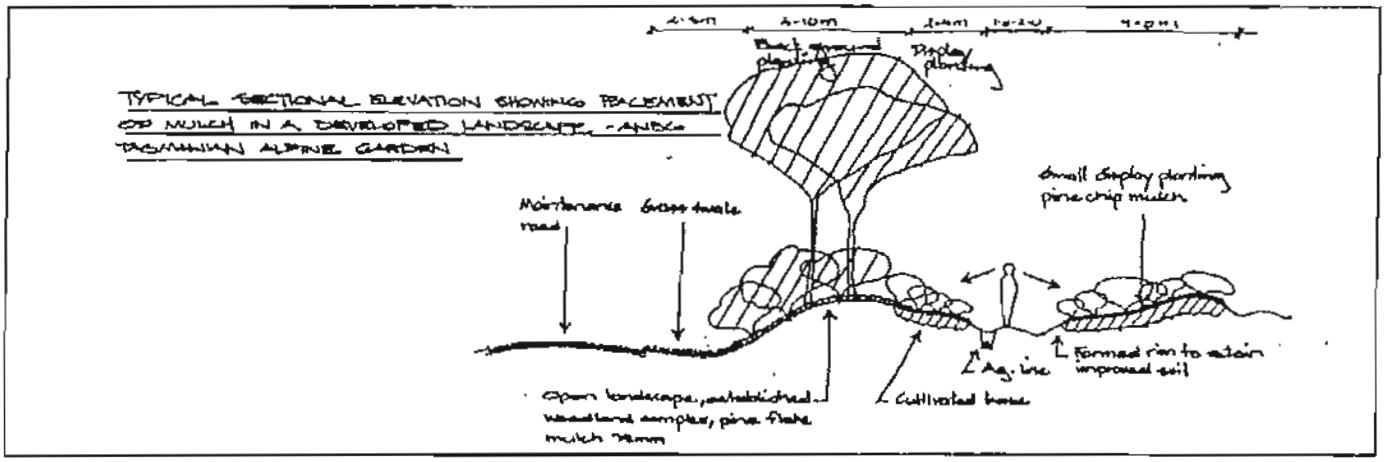
The main mulch type used at the ANBG is pine flake.

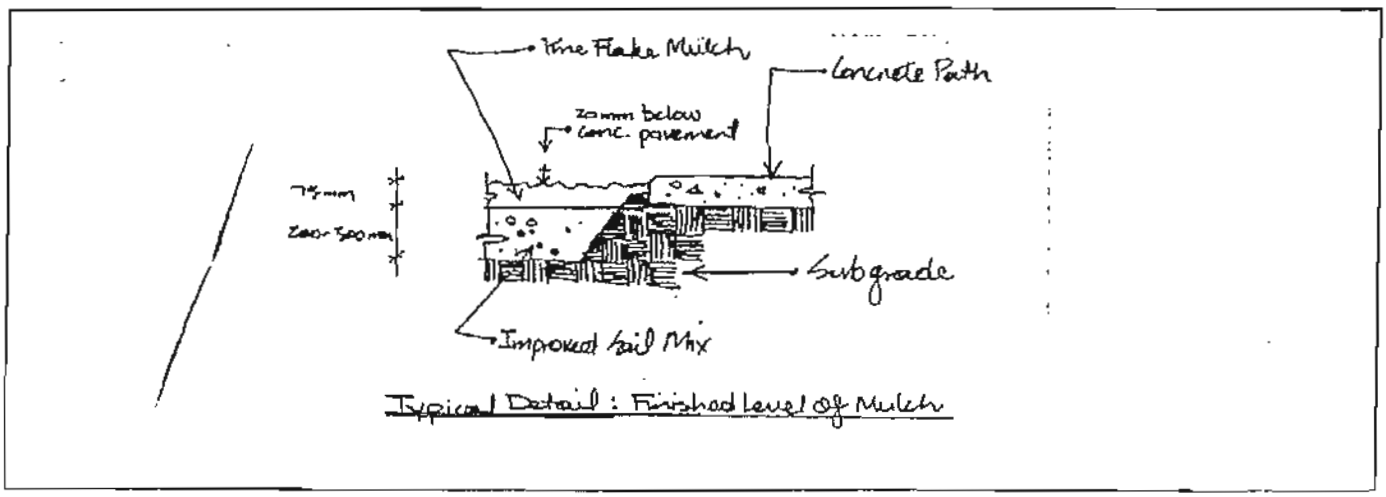
In open landscape areas and established planting zones, pine flake mulch is used because of its slow decomposition rate, low cost and good handling qualities for spreading over large areas.

In small display planting areas, 10cm pine flake mulch is used because it provides good visual contrast defining small planting areas, reduces the risk of damage to plants when it is being spread and allows for effective application of low volume micro irrigation.

Detail design

The following treatments are recommended for use at the ANBG:





5.3 Access and level change

- Steps should have well defined edges and solid risers. Open risers and protruding edges can catch the toes of shoes and be a hindrance for persons using supports.
- Steps should rise in even treads 4-6-8 and generally never exceed 10 risers in one group. If level changes are excessive , landings should be installed regular intervals.
- The following formula for design of step risers and treads should be used as a general guide.

  2 Risers lengths + 1 tread length = 600-676

- Handrails should be installed beside steps in high visitation areas. The top height of a handrail should be set at 900mm above the ground and have a 150mm central off-set from vertical walls.

- Handrails should be installed on all raised structures over 900mmm above ground level. The height of the handrail should be about 1 metre, to enable people in wheelchairs for look over the railing . The construction of the handrail should not provide opportunity for climbing and have vertical rails at close centres to discourage children from climbing through the railings. An edge should be constructed at the base of the handrail as a trip edge.

5.2.4 Pavements

Surface pavements are required to provide durable level areas for site access, car parking, site storage, entertainment areas, recreation, exhibition space, walking and movement. A wide selection of treatments are currently used :

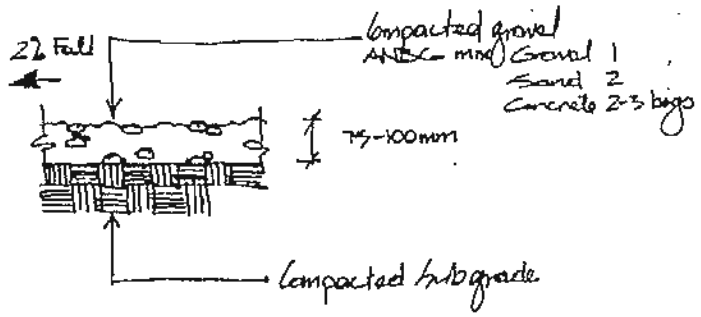
- Stabilised granite
- Brick/cobble pavers/natural stone
- Slate
- Concrete block
- Concrete insitu
- Concrete exposed aggregate
- Bitumen
- Compacted hard core
- Log sleepers

The pavement materials used in the gardens should complement the materials of buildings, site structures and other hard landscape elements. High cost materials can be used in the form of edge definition and a cheaper infill material used to provide the main paved area (brick edging/concrete infill).

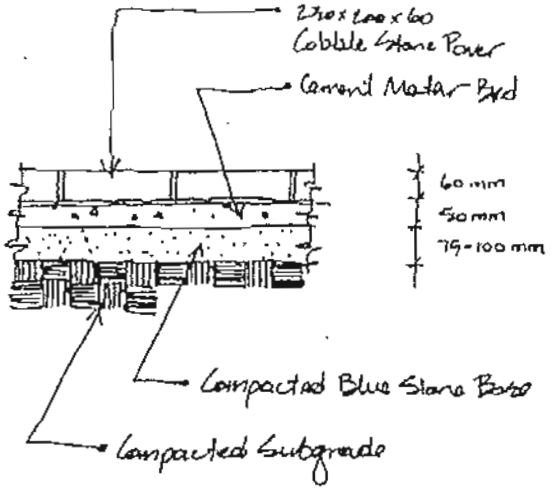
All paving is to be laid with a a minimum of a 2% fall across its surface to direct drainage and have adequate collection points.

Detail design

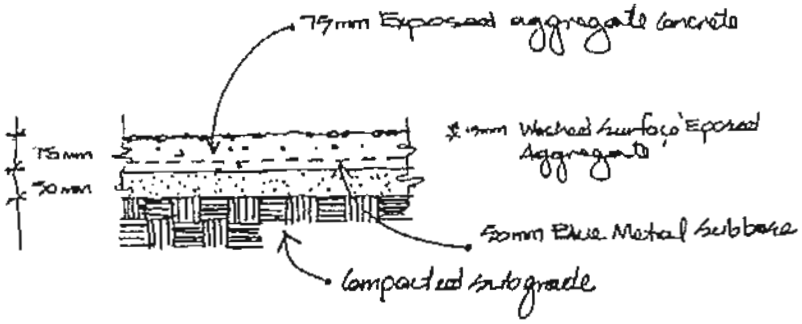
The following treatments are recommended for use at the ANBG :



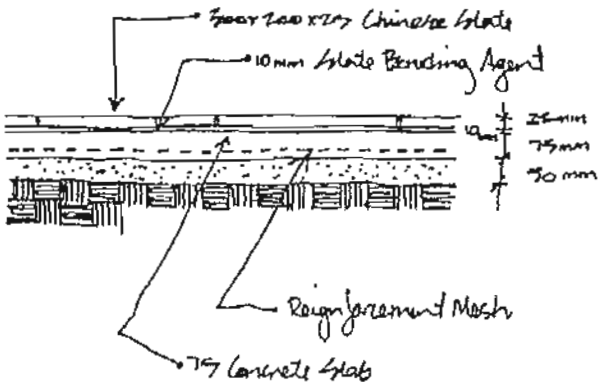
Typical Detail : Compacted Gravel Pavement



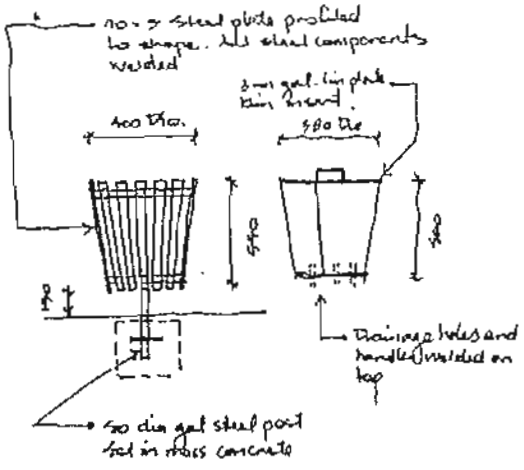
Typical Detail : Cobble Stone Pavement



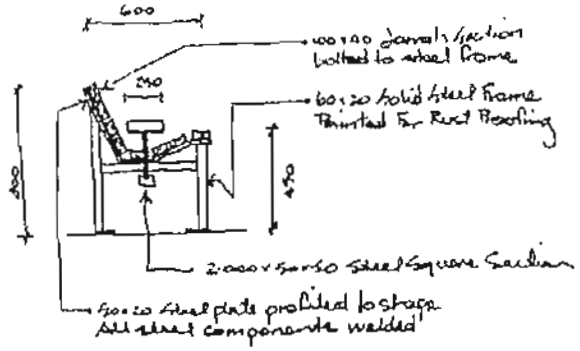
Typical Detail : Exposed Aggregate Pavement



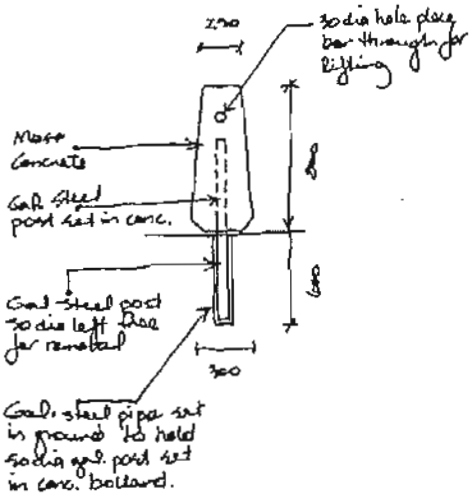
Typical Detail : Slate Pavement



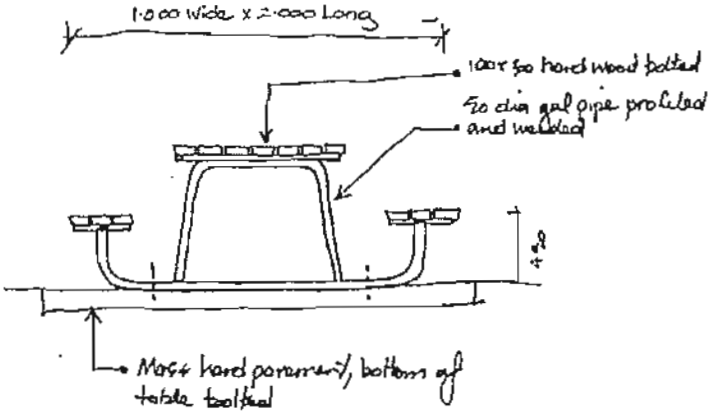
Typical Detail : Galvanized Steel Bin



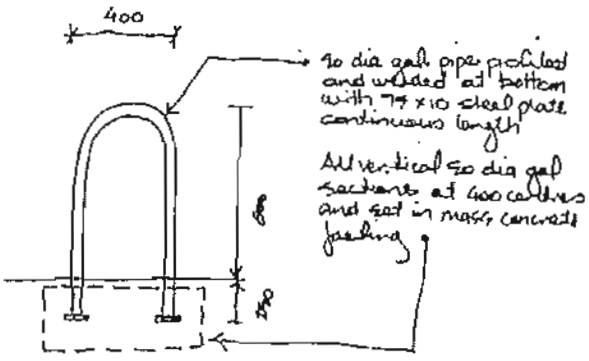
Typical Detail : Steel Frame Jarrah Seat



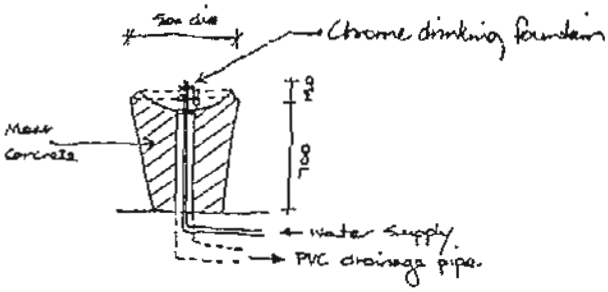
Typical Detail : Concrete Bollard



Typical Detail : Standard Picnic Table



Typical Detail : Galvanized Steel Bicycle Stand



Typical Detail : Concrete Drinking Fountain

5.4 Site furniture

A range of site furniture elements are required at the gardens to meet visitor needs, particularly along main access paths. Site furniture requirements include :

- seats/benches
- tables
- bins
- lights
- bollards
- planting containers
- bicycle stands
- sculpture/art works
- signs/notice boards

In the past, the gardens has not had a defined theme for site furniture. A strong design theme for site furniture could assist in creating a coherent visual image for the gardens. Site furniture can vary in design character and for particular section of the gardens to reflect themes relevant to each landscape type being depicted.

Furniture should be sited:

- to provide maximum convenience and ease of access.
- so as not to be a barrier on paths
- to provide some protection from the elements
- to be adjacent to but set back from main paths.

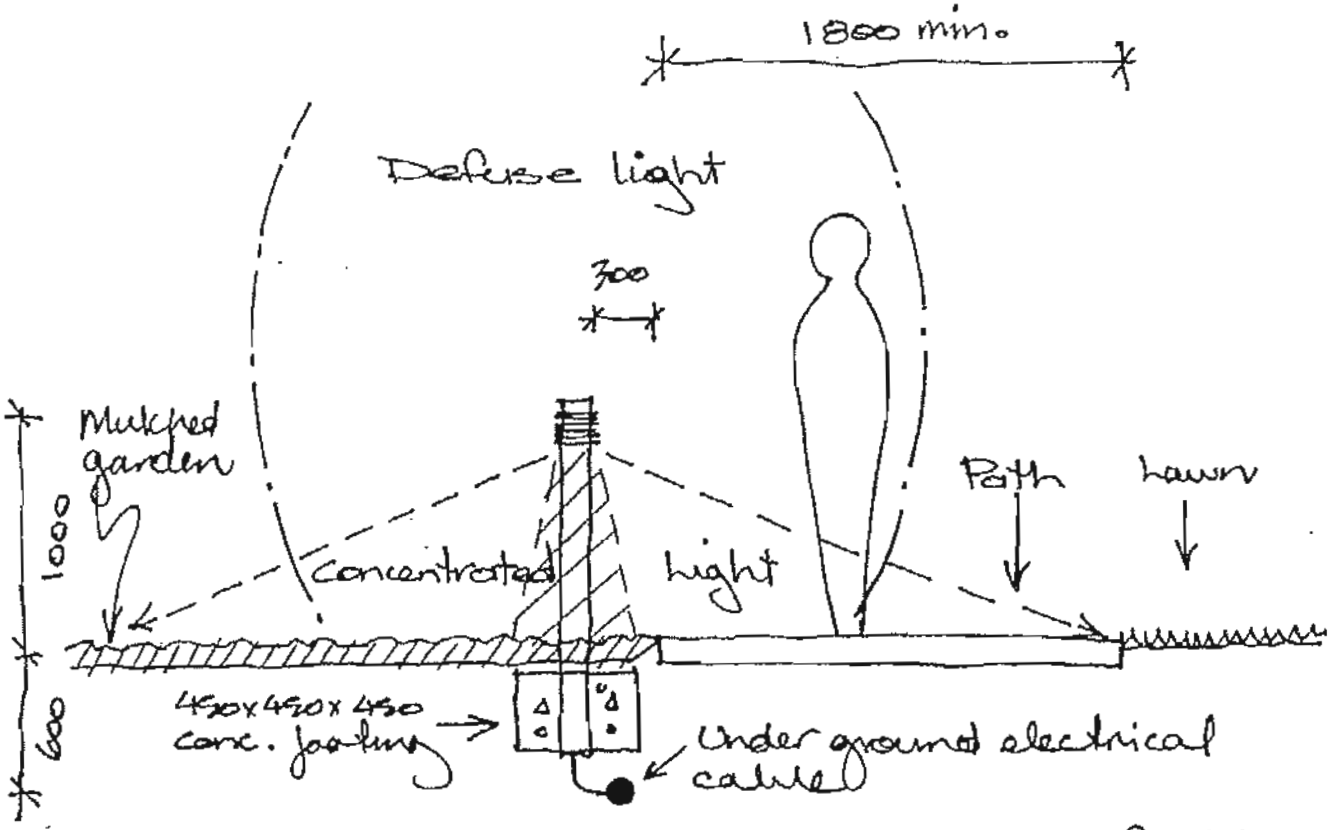
Materials used in construction should be cost effective, durable, low maintenance and consist of components easily replaceable.

Detail design

The following examples of site furniture currently in use at ANBG should be used as a general guide only. *(A schedule of existing and proposed site furniture will be compiled for the ANBG before the finalisation of the design manual).*

TYPICAL EXAMPLE PLACEMENT OF SITE FURNITURE IN THE LANDSCAPE

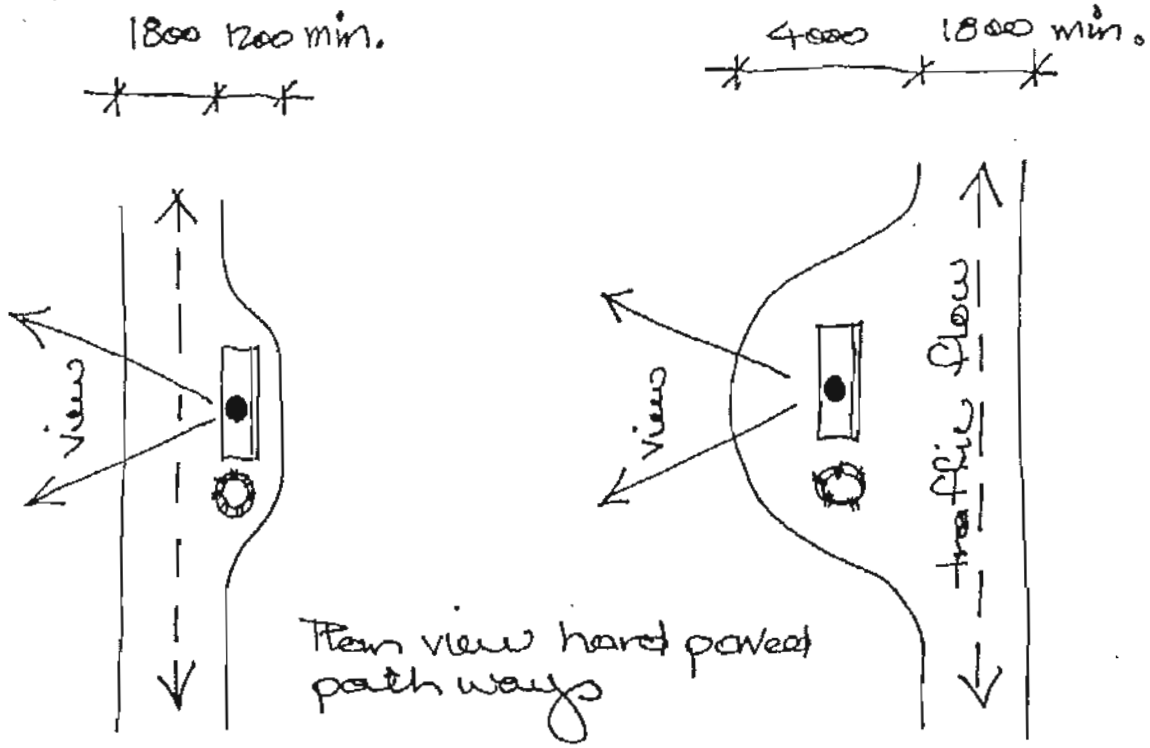
LIGHT BOLLARDS AND FLOOD LIGHTS



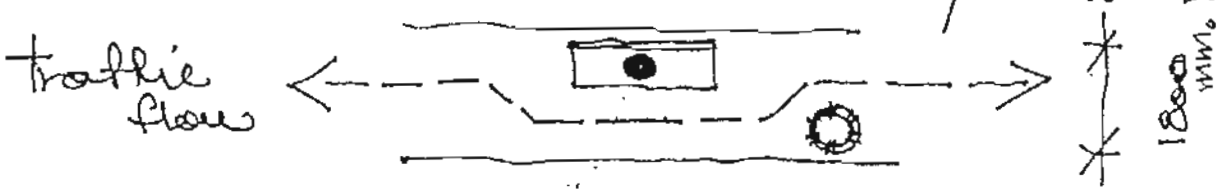
* Set bollards out at centres specified by manufacturers manual.
* Seek and utilize adevise from relevant specialists
* Trench for underground cables preferably within existing garden beds and align close to hard pavement edge lines
* Underground electrical cable lines should be min 600 deep or covered 75 concrete.
* Control switches should be solar powered.
* Fittings should be non-corrosive and durable
* Concentrated light source should totally cover traffic flow area.
* Avoid placement of bollards in lawn.

TYPICAL EXAMPLE PLACEMENT OF SITE FURNITURE IN THE LANDSCAPE

BENCH/BIN COMBINATION



* Site seating benches in locations to take advantage of views or quiet spaces with a pleasant microclimate.
* Create spaces to site furniture off main pathways and do not position furniture to restrict pedestrian flow.
* Combine uniform furniture elements and do not separate apart that may create a barrier



Treatment not recommended

5.5 Planting design

An important function of a botanical garden is the presentation and display of living plants collected from the wild. Plant material can be presented in landscape lay outs based on spatial form and height. For simplicity, plant material can be classified :

1)	Moss/lichen	< .1 m
2)	Herbaceous/perennial ground form	< .5 m
3)	Grass/tussock/sedge/aquatic form	< .5 m
4)	Climber - horizontal and vertical form	> .1 m
5)	Shrub horizontal ground form	< .5 m
6)	Shrub	> 1.0 m
7)	Shrub to small tree	> 3.0 m
8)	Tree	> 6.0 m

The visual character of the above plant forms singly and/or in combination provides a diverse selection of patterns for use in the gardens. The design use of plants in the developed landscape provide the following functions :

- Background/middle/foreground landscape
- Transitional landscape
- Sequential landscape
- Spatial definition - enclosure, containment, framing, screening, barrier
- Microclimate - variation, protection, enhancement
- Visual stimulation - colour, texture, shape, scale, height

Design Considerations

1) For presentation of botanical planting, landscape design should generally reflect patterns found in nature (composition, structure, spacings, microclimate, soil, drainage, topography). A theme could be based on an ecological system (dry woodland) and/or a botanical aspect (plant evolution).

2) Plant material should be selected to have some variation in height, shape, colour, and texture but some unifying features which will assist in creating a coherent visual image. The selection of plants could show variation in family and species composition.

3) Within the landscape plant material should be positioned in random patterns comprising odd numbers 1-3-5-7 and avoid use of even numbers. Design layouts can be implemented via a finalised landscape planting plan and/or out on site by an experienced horticulturalist.

4) Spacings between plant centres should vary and avoid formal patterns.

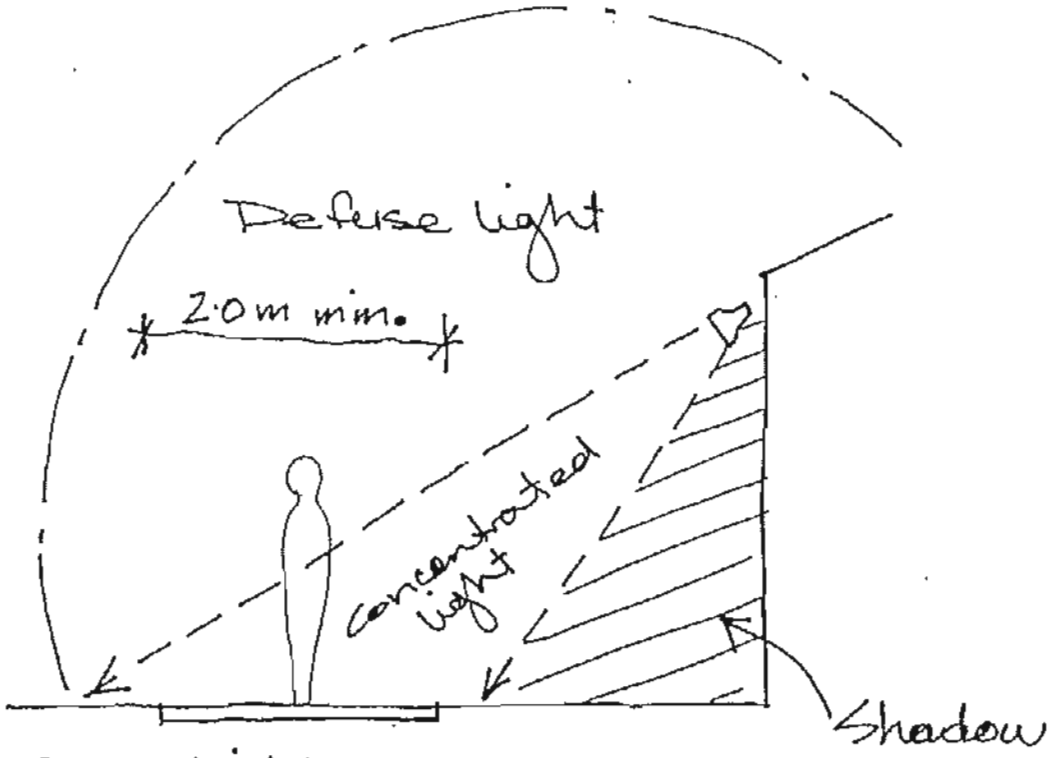
5) A spacing of one metre should be left between single and massed plant groupings. This will allow access for routine maintenance and monitoring.

6) Planting themes and selection of species may have to compliment established landscape. A new landscape display may be situated in a public space and so spectacular foliage may be the deciding factor in contrast to a scientific theme.

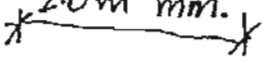
7) In siting small plant material for display along a path edge consideration needs to be given for path alignment, display area, bed shaping and contouring. For example a straight path alignment can provide reduced display area on either side than for a curving path within a given area.

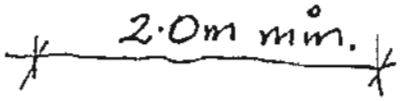
Detail design:

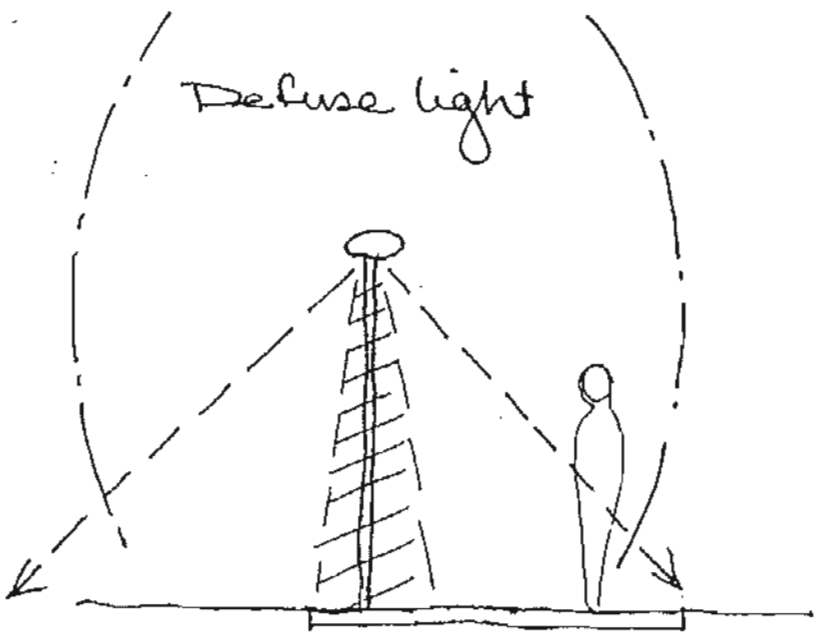
The following treatments are recommended for use at the ANBG:



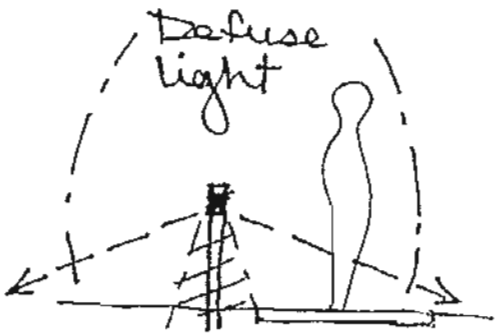
① Flood light mounted on building





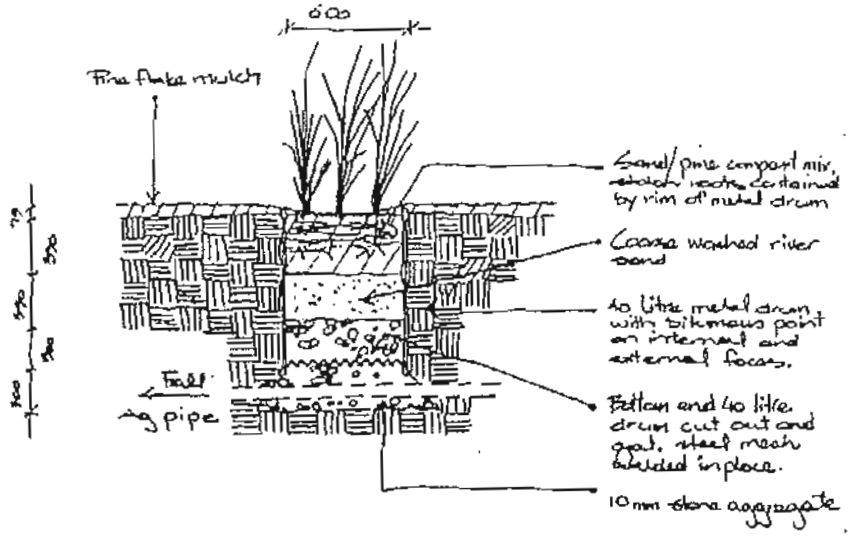


② light pole

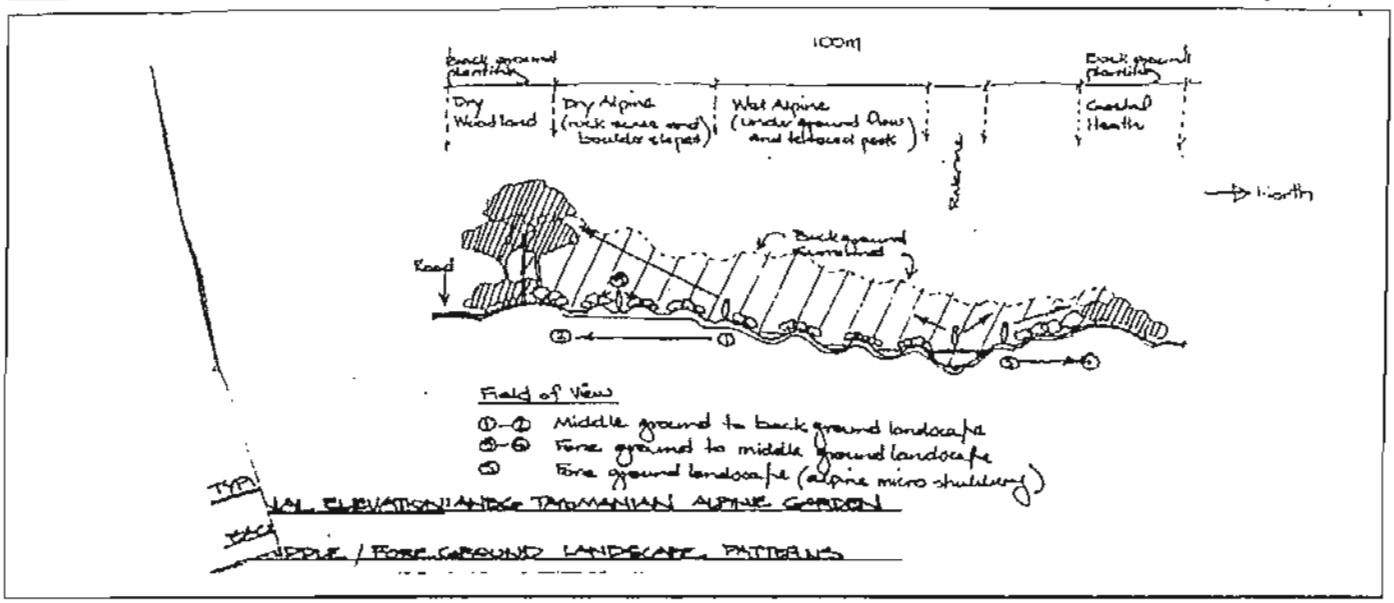


③ Bollard light

* Concentrated light source should totally cover traffic flow area.

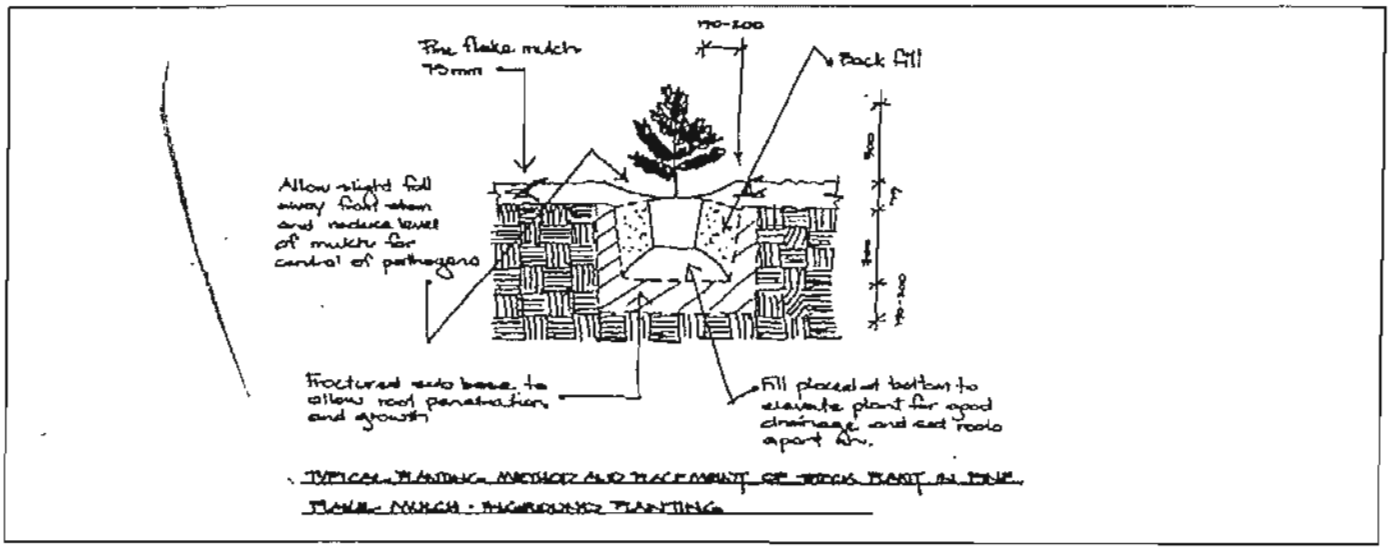


TYPICAL DETAIL METHOD FOR PLANTING NATIVE GRASSES WITH INVASIVE STOLON ROOTS

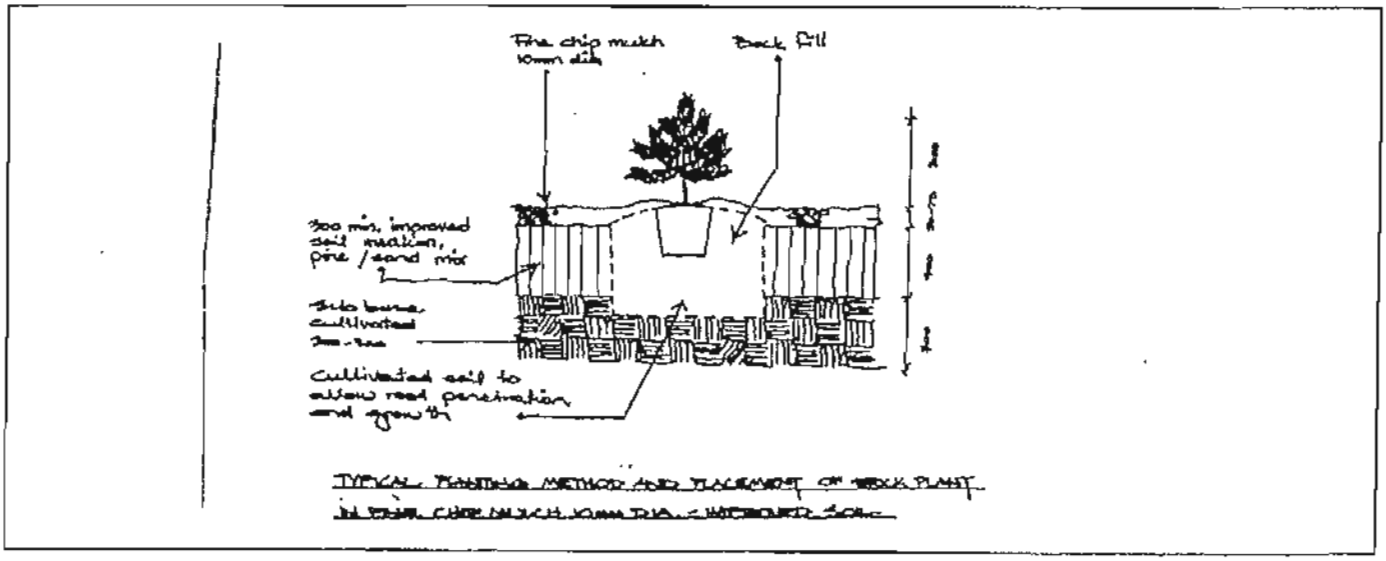


TYPICAL ELEVATION ACROSS TASMANIAN ALPINE GARDEN

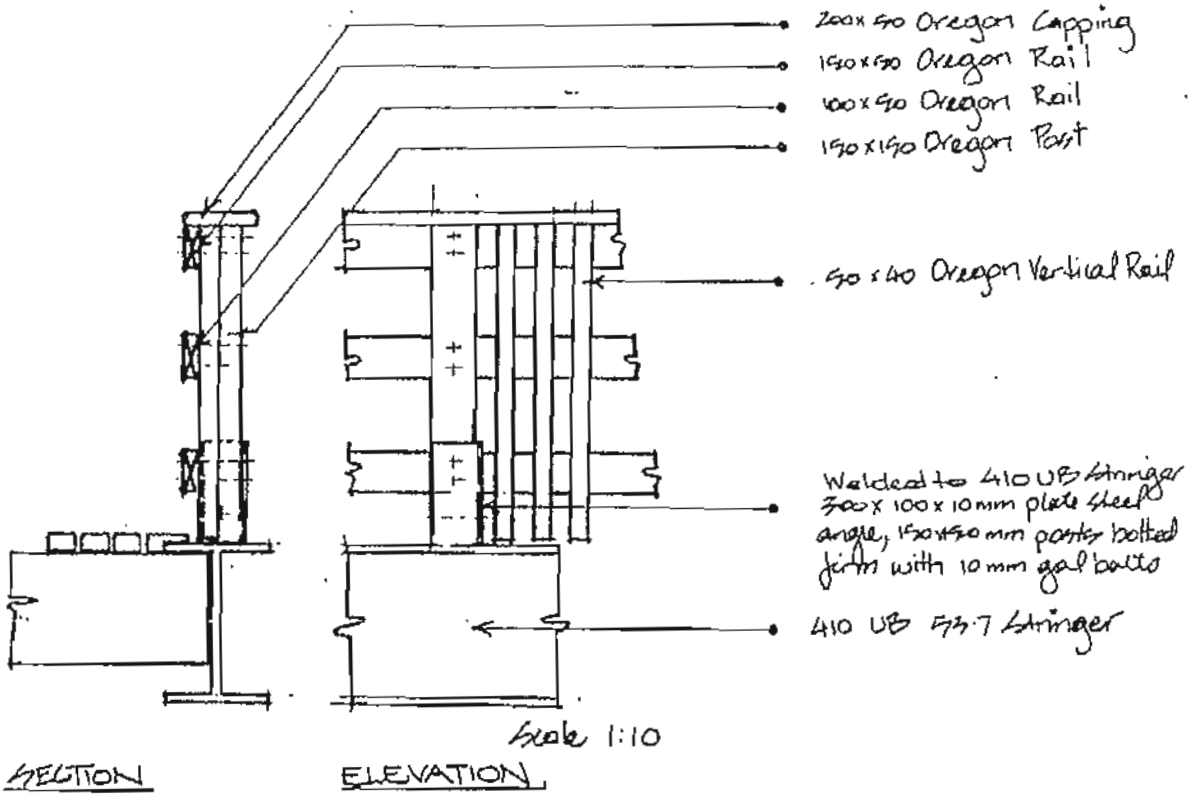
MIDDLE / FORE GROUND LANDSCAPE PATTERNS



TYPICAL PLANTING METHOD AND PLACEMENT OF ROCK PLANT IN FINE FLAKE MULCH - BACKGROUND PLANTINGS



TYPICAL PLANTING METHOD AND PLACEMENT OF ROCK PLANT IN FINE CHIP MULCH 10MM DIA. - MIDGROUND SCENE



TYPICAL DETAIL : BLUE ARROW WALK BRIDGE

5.6 Structures

Structures used at the gardens include:

- Bus shelters
- Information/rest stations
- Toilet/service blocks
- Platforms/decks/board walks
- Picnic/entertainment pavilions
- Special exhibits/attractions
- Amphitheatres
- Pergolas
- Lookouts

It is recommended that the number of structures in the gardens be carefully limited to those essential for visitor use. The gardens should not be cluttered by haphazard placement or overuse of structures. A balance will be made to locate a limited number of site structures to meet visitor/staff requirements.

An important requirement will be for site structures to meet a high architectural design and construction standard. Design character should be simple and bold and blend with elements found in the natural environment.

Throughout the gardens, structures may vary in design character as required so that they will reflect themes relevant to each particular landscape type. Within particular landscape settings, the use of structures and furniture details should be combined in a coordinated style (colour, shape, materials, scale).

Materials used in construction should be cost effective, durable, low maintenance and be easily repairable.

Site structures :

- only on primary pedestrian lines.
- at appropriate locations, where they might provide a means of visitor orientation. Include "You are here" maps on structures.
- at locations where positive site attributes such as good views, shade, microclimate characteristics can be taken advantage of.
- in clutters rather than spread over the entire gardens. Ensure structures are sited so as not to impede pedestrian movement along paths.
- to blend with landscape character and only be visible from immediate surrounds
- to take advantage of local conditions eg.
  raised boardwalk above creekline
  bridge over gully
  deck to take advantage of views
  decks over water areas

Detail design

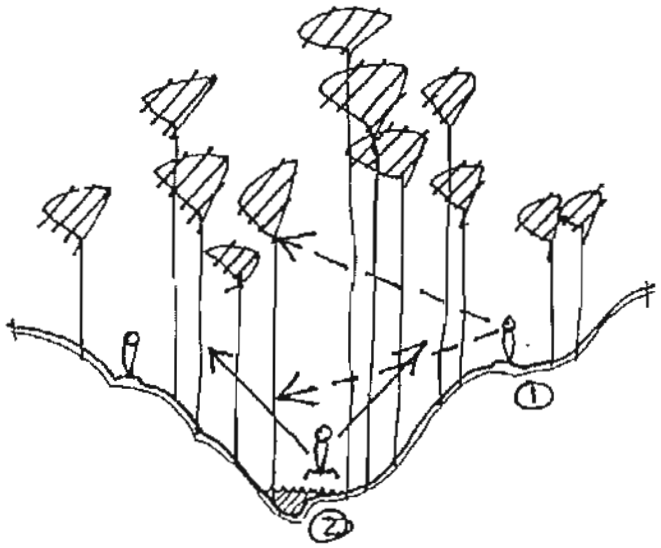
The following examples of structures in the ACT and JB botanic gardens are to be used as a general guide only.

(A schedule of existing and proposed site structures will be compiled for the ANBG before the finalisation of the design manual).

TYPICAL EXAMPLE SITING OF A RAISED STRUCTURE : ANBG RAINFOREST BOARDWALK

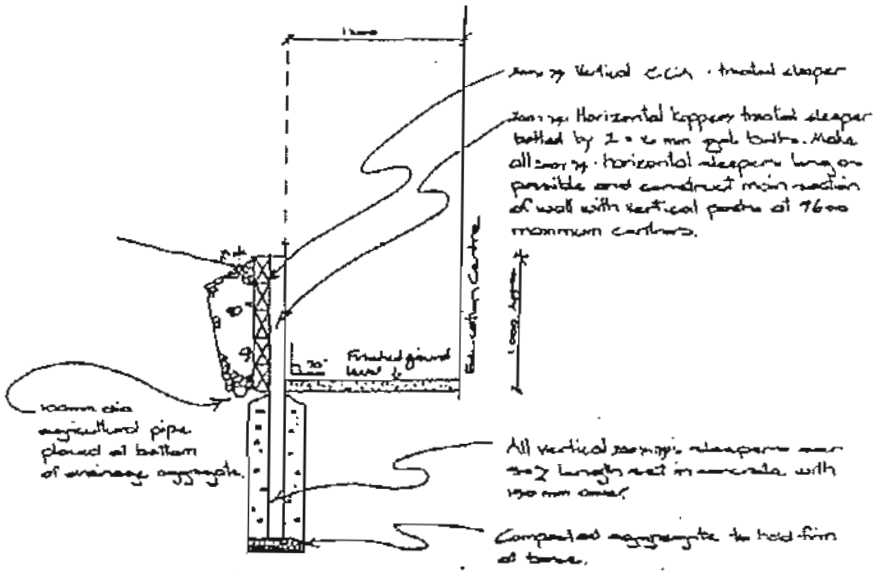
Previous observation of rainforest vegetation via paths along sides of gully over looking middle canopy. Bottom of gully was to restrictive for construction of a hard paved path system.

The solution was a raised treated pine boardwalk above floor to limit impact of construction and footing. A raised walk way provides view of rain forest understorey and total perception of forest enclosure realized.

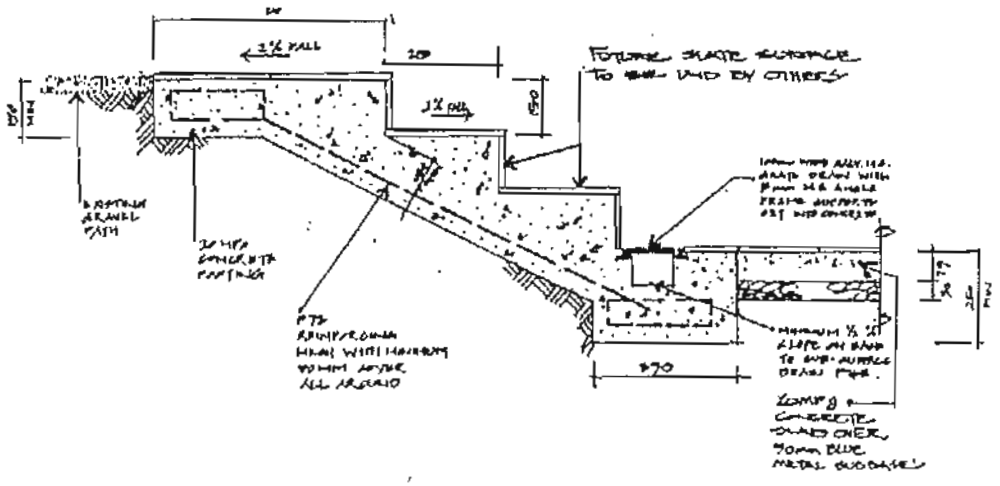


① Hard paved path - scale and size of forest host

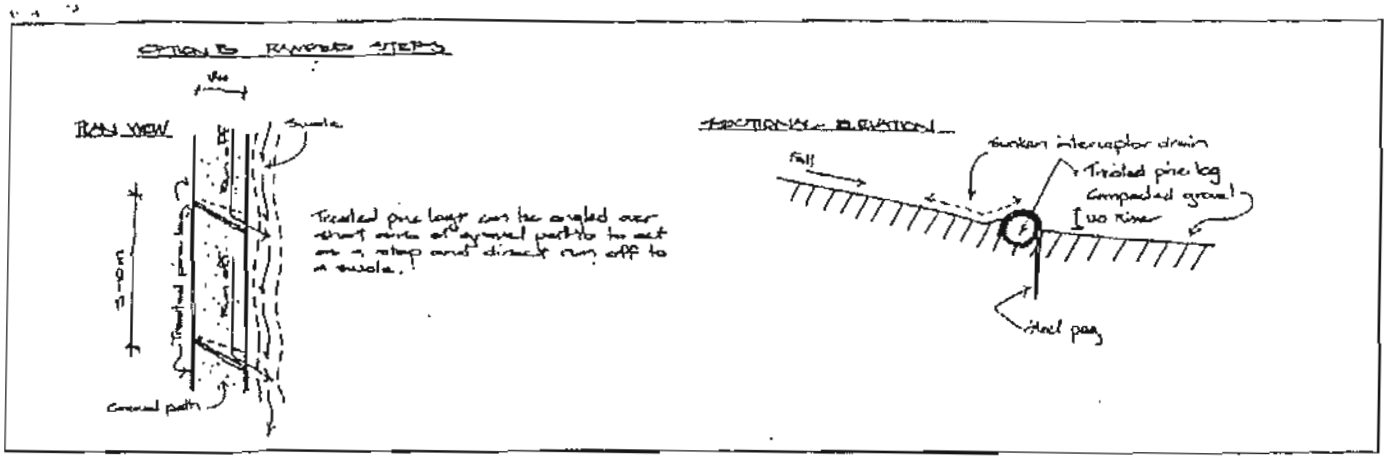
② Raised boardwalk - total impact upon stream



TYPICAL DETAIL : LOG SLEEPER RETAINING WALL



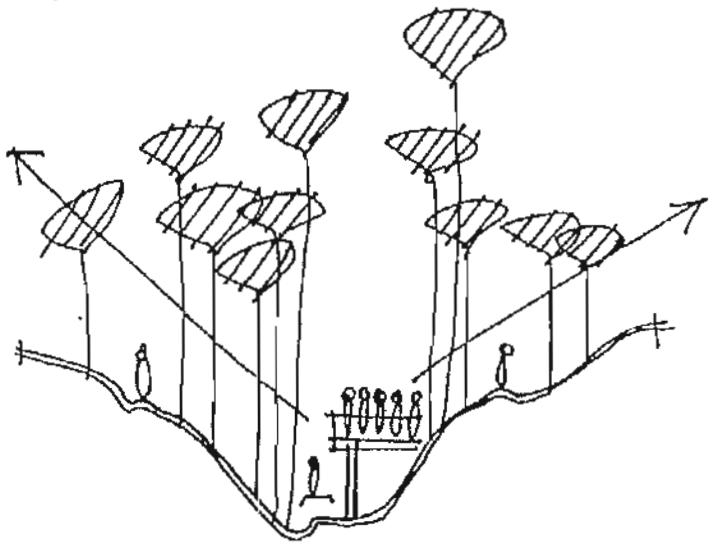
TYPICAL DETAIL : CONCRETE/SLATE STEPS


OPTION B: RANDOM STEPS
PLAN VIEW
Swale
Treated pine logs
Run off
3-10m
Gravel path
Treated pine logs can be angled over short runs of gravel path to act as a step and direct run off to a swale.
SECTIONAL ELEVATION
Fall
Sunken interceptor drain
Treated pine log
Compacted gravel
Top Rail
Steel peg

TYPICAL EXAMPLE SITING OF A SINGLE STRUCTURAL ELEMENT : ANBG RAINFOREST VIEWING PLATFORM

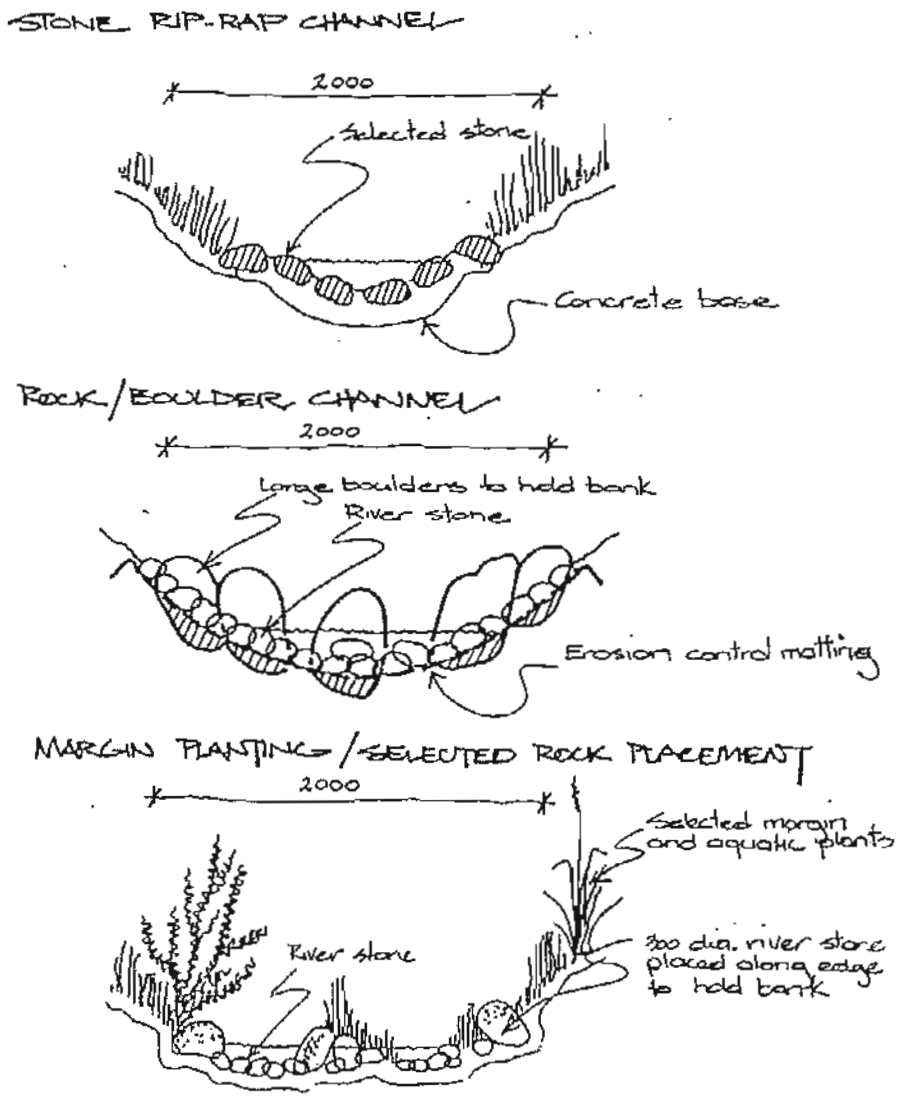
The board walk provides access along the gully floor and has limited standing areas for a group.

The viewing platform provides a transition down to the board walk and a point for a teacher to inform a group about the significance of the vegetation.



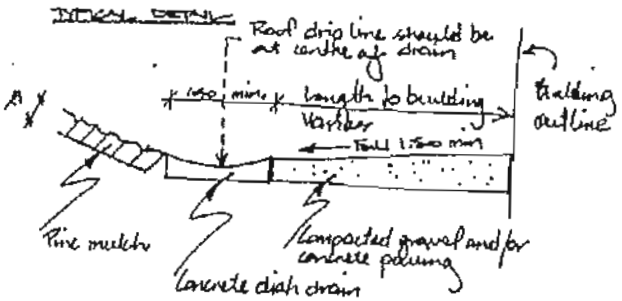
Natural drainage lines

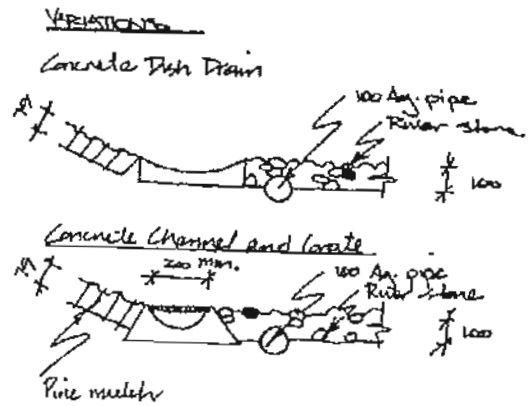
For stabilising small natural drainage and creeklines the following treatments are recommended:

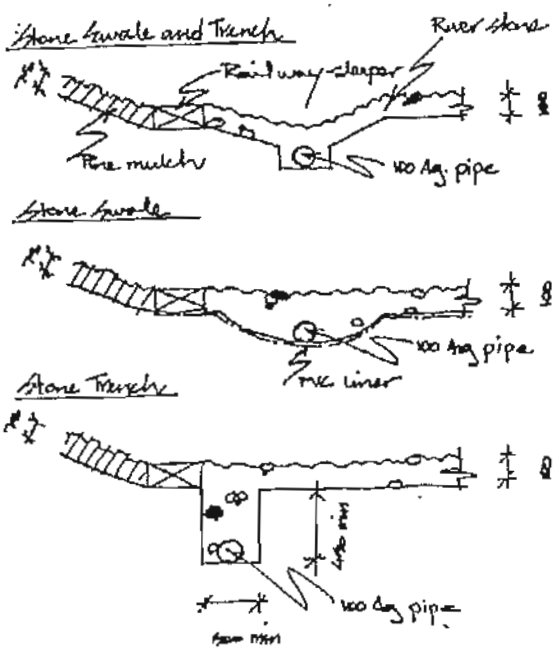


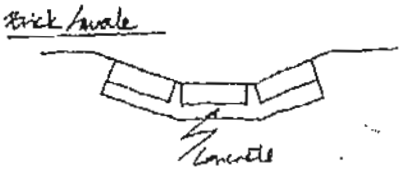
Building surrounds

The following treatments are suitable for directing run-off from building surround and are not intended for use in pedestrian areas.









7 SITE UTILITIES

7.1 Survey of existing services

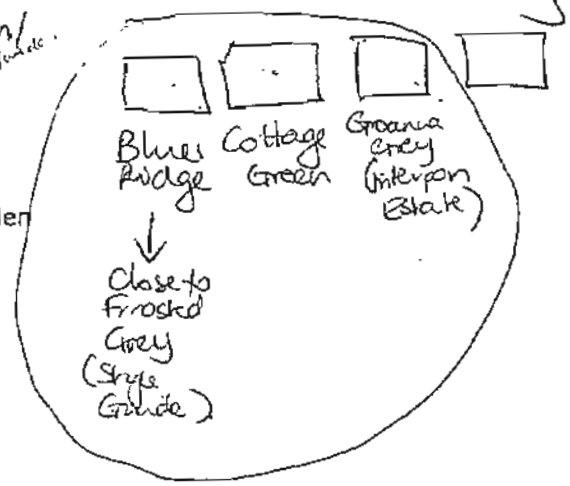
A survey of existing services should be undertaken to record and map the location and type of electrical, water, telephone, sewerage, irrigation and other service lines.

7.2 Protection of services

To be advised.

Reproduce colours proposed for relevant part of the gardens – reproduce areas of gardens & recommend colour for each. Colours to appear in doc.

DULUX & INTERPON – Powder coating



Colour choice for powder-coating of directional signage

The chosen colour needs to:

- Be easily seen in a range of Garden environments – eg, rainforest gully low light through to glary sun in Rock Garden
- Easily seen from a distance
- Harmonise with existing bright green (similar to Dulux Classic Hawthorn Green) and white thematic signs
- Blending with other 'furniture' in some areas – eg, rainforest gully railing, café vicinity
- Aesthetically pleasing

2 providers – Dulux and Interpon

Existing colours

Light pole near café – very close to Dulux Pale Eucalypt
Rainforest railing – close to Dulux Weathered Copper (darker), Dulux Jasper (lighter), Interpon Estate (almost spot on) Goanna Grey.

Recommended colours for directional signage

Dulux

Shade name	Code and finish	UV Rating (low, moderate, good, very good)	Colour of lettering	Blend with rainforest railings	Blend with thematic signs	In the environment	Comments
Admiralty	51017 Satin	Good	black	Bit too light	Okay	Looks okay but quite pale	• very similar to Black Mtn signage and other furniture • close to style guide colour Pantone 557 C
Horizon Blue	33344 Gloss	Good	black	Okay	Okay	Rather pale, maybe too blending with silvery foliage	
Wizard	50283 Gloss	Good	white	Okay	Quite good	Distinctive	• Very similar to Blue Ridge below
Blue Ridge	88480 Satin 5005 Matt	Good	white	Quite good	Quite good	Distinctive	• close to style guide colour Pantone 5487 C • similar to shade used by Sydney Botanic Gardens - see photo below • distinctive from foliage colours
Pale Eucalypt	84221 Satin 36648 Matt	Very good	white	Fine	Fine	Potentially blends too much with the environment	• a bit muddy/yellow • darker shade of style guide colour Pantone 578 C

Interpon

Shade name	Code and finish	UV Rating (low, moderate, good, very good)	Comments
Admiralty Grey	Gloss MJ040A	Rated for high ultraviolet exposure	Same as Dulux Admiralty
Wizard	Gloss MJ054A PCS23	Rated for high ultraviolet exposure	Same as Dulux Wizard
Pale Eucalypt	Matt MK236A Satin MS136A	Rated for high ultraviolet exposure	Same as Dulux Pale Eucalypt

Sydney Botanic Gardens

Management decision

Materials taken to Management Team Meeting on Tuesday 21 April 2009 and raised as an agenda item. The meeting agreed on Blue Ridge (88480 Satin, 5005 Matt) for the powder coating of all directional signs. Agreement on white vinyl lettering.,Second choice was Pale Eucalypt.