ACT Government

SOFT LANDSCAPE DESIGN

MUNICIPAL INFRASTRUCTURE STANDARDS 24

Transport Canberra and City Services

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Endorsed By:	Karl Cloos	Director, Infrastructure Planning
Approved By:	Ken Marshall	Executive Branch Manager, Roads ACT

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1.1 General

1.1.1 Responsibilities

1.1.1.1 Objectives

Objective: Provide high quality designs to create robust soft landscapes suited to the local conditions, for urban public unleased land in the ACT managed by TCCS.

Provide details of suitable plant species for designs associated with open spaces and municipal streets in the ACT in order to:

- Ensure trees have adequate soil volume suitable to support healthy root growth and healthy trees;
- Ensure plants have adequate space and do not interfere with or overgrow paths, roads and other services;
- Minimise adverse impacts on adjacent buildings, urban infrastructure and utilities above and below ground;
- Ensure soft landscape does not impede maintenance, service and emergency access;
- Minimise maintenance needs and costs; and
- Minimise future management problems.

Territory Plan: This Design Standard provides technical support to the *Territory Plan* including the Estate Development Code to provide more detailed design requirements for the design of open spaces and verges in the ACT.

Scope: This document covers planting and soft landscape design within the open space network and on public land including road verges. Consider the growth characteristics of trees and shrubs (including the root zone) in the overall design of the open space or street. Select appropriate species for the site conditions and context (street, urban, suburban, parkland, environmental etc) that ensure the resultant spaces are appropriate and plants have sufficient room to grow uninterfered (avoiding conflict with awnings, services and other plants). All factors that influence the design shall be considered including:

- Existing vegetation and protection requirements
- Environmental conditions and requirements
- Site conditions and functional requirements
- Requirements of affected Authorities
- Relevant design standards

1.1.1.2 Designer's qualifications

Requirement: The design of all soft landscape shall be by a Registered Landscape Architect (AILA).The proponent shall submit evidence of designer's AILA Registration to TCCS.

1.1.1.3 Precedence

Where any document issued, except legislation or the *Territory Plan*, referenced in this Municipal Infrastructure Standard (MIS) includes technical requirements that conflict with this MIS, consult with the service authority and TCCS for clarification.

1.1.2 Cross references

1.1.2.1 Commonwealth Legislation

The following Commonwealth Legislation is relevant to this Standard:

Aboriginal and Torres Strait Islander Heritage Protection Act

Australian Capital Territory (Planning and Land Management) Act

Disability Discrimination Act

Environment Protection and Biodiversity Conservation Act

Work Health and Safety Act

1.1.2.2 ACT Legislation

The following ACT Legislation is relevant to this Standard:

Discrimination Act

Emergencies Act

Environment Protection Act

Heritage Act

Legislation Act

Lakes Act

National Capital Plan

Nature Conservation Act

Parks and Recreation Zone Development Code

Planning and Development Act

Planning and Development Regulation

Pest Plants and Animals Act

Pest Plants and Animals (Pest Plants) Declaration (No. 1)

Public Roads Act

Public Unleased Land Act

Territory Plan and related Codes

Parking and Vehicular Access General Code

Crime Prevention through Environmental Design General Code

Waterways: Water Sensitive Urban Design General Code

Tree Protection Act and related instrument

Tree Protection (Guidelines for Tree Management Plans) Determination

ACT Tree Register

Utilities Act

Utility Networks (Public Safety) Regulation

Water and Sewerage Act

Water and Sewerage Regulations

Water Resources Act

Work Health and Safety Act

1.1.2.3 ACT Government Strategic Documents

The following ACT Government Strategic Documents are relevant to this Standard:

ACT Pest Animals Management Strategy 2012-2022

ACT Weeds Strategy 2009-2019

ACT Climate Change Adaption Strategy

The ACT Planning Strategy – Planning for a sustainable city

Active 2020: A Strategic Plan for Sport and Active Recreation in the ACT & Region 2011-2020

Canberra Plan; Towards Our Second Century

The City Plan

The ACT Strategic Bushfire Management Plan 2014-2019

Nature Conservation Strategy 2013-2023

Strategic Bushfire Management Plan for the ACT, ACT Emergency Services Authority

Threatened Species Action Plans

Transport for Canberra. Transport for a sustainable city 2012-2031

1.1.2.4 Design Standards

This Design Standard references the following component Standards:

MIS 01	Street Planning and Design
MIS 04	Subsurface Drainage
MIS 05	Active travel facilities design
MIS 06	Verges
MIS 07	Driveways
MIS 08	Stormwater
MIS 11	Off street Parking
MIS 15	Urban Edges Management Zone
MIS 16	Urban open space
MIS 18	Irrigation
MIS 20	Street and park furniture
MIS 25	Plant species for urban landscape projects
Attachment B	Design Review requirements

1.1.2.5 Specifications

The following Specifications are related to this Standard:

MITS 09 Landscape

1.1.2.6 TCCS Reference Documents

Reference Document 4	Landscape Management and Protection Plans (LMPP) - Requirements for the Protection of Public Landscape Assets Adjacent to Development Works
Reference Document 6	Design Review Submissions
Reference Document 7	Operational Acceptance Submissions
Reference Document 8	WAE Quality Records
Reference Document 9	Final Acceptance Submissions
Reference Document 10	Landscape Consolidation and Handover

1.1.2.7 Design Guides

The following design guides are related to this Standard:

Canberra Central Design Manual

Environment Protection Guidelines for Construction and Land Development in the ACT (EPA)

ACT Crime Prevention and Urban Design Resource Manual, ACT Department of Urban Services, Planning and Land Management

Development Control Code for Best Practice Waste Management in the ACT (ACT No Waste)

Network Architecture and Technology (NBN)

Underground Services in a Shared Trench Agreement, (Telstra, TransACT, ActewAGL)

Water Supply and Sewerage Standards (Icon Water)

1.1.2.8 Further Reading

Managing the Urban Edge – Discussion paper December 2013, ACT Conservation Council

1.1.3 Referenced documents

1.1.3.1 Standards

AS 4373 Pruning of amenity trees

AS 4970 Protection of trees on development sites. (Incorporating Amendment No. 1 (2010)

AS 2303 Tree stock for landscape use

1.1.3.2 Other publications

Austroads

AGRD Austroads Guide to Road Design

AGRD03 Part 03: Geometric Design

AGRD04B Part 4B: Roundabouts

AGRD06A Part 6A: Pedestrian and Cyclist Paths

AGRD06B Part 6B: Roadside Environment

ACTMAPi (for the location of Registered Trees and significant plants and animals)

ACT Crime Prevention and Urban Design Resource Manual, Planning and Land Management, ACT Department of Urban Services, Canberra

ACT Crime Prevention Through Environmental Design General Code (CPTED)

Belconnen's Urban Parks, Sportsgrounds and Lake Ginninderra, Canberra Urban Parks and Places, Department of Urban Services, Canberra.

EPA - Environment Protection Policies – eg. General, Waste Water Reuse, Air, Contaminated sites, Outdoor concert noise, Water quality

EPSD - Nature Conservation web site includes information and strategy plans regarding ecological issues in the ACT, for example - Action Plan 27 (Woodlands for Wildlife), Grassland Conservation and Aquatic/Riparian Conservation

Heart Foundation - Active Living Impact Check list – A tool for developments in the Australian Capital Territory

Inner Canberra's Urban Parks and Sportsgrounds, Canberra Urban Parks and Places, Department of Urban Services, Canberra.

Tuggeranong's Urban Parks and Sportsgrounds, Canberra Urban Parks and Places, Department of Urban Services, Canberra.

Woden and Weston Creek's Urban Parks and Sportsgrounds, Canberra Urban Parks and Places, Department of Urban Services, Canberra.

Clark, R 1996, Specifying Trees: A Guide to Assessing Tree Quality, NATSPEC 2 Guide, Construction Information Systems Australia, Milsons Point, NSW. http://www.natspec.com.au/products/books-and-publications/specifying-trees

Draper DB and Richards PA 2009, Dictionary for Managing Trees in Urban Environments, CSIRO Publishing, Victoria.

Proprietary products: To *TCCS Products previously considered for use list*

1.1.4 Interpretations

1.1.4.1 Abbreviations

General: For the purposes of this standard the following abbreviations apply:

AILA: Australian Institute of Landscape Architects

ATIPT: Active Travel Infrastructure Practitioner Tool

ATN: Active Travel Network

ATRA: Active Travel Route Alignment

AUSTROADS: The National Association of Road and Traffic Authorities in Australia.

CPTED: Crime Prevention through Environmental Design

DA: Development Application

EPA: Environment and Protection Authority, ACT Government and its successors

IPCC: Intergovernmental Panel on Climate Change

LMPP: Landscape Management and Protection Plan

TCCS: Transport Canberra and City Services Directorate, ACT Government and its successors

TMP: Tree Management Plan

UHI: Urban Heat Island

WSUD: Water Sensitive Urban Design

1.1.4.2 Definitions

General: For the purposes of this Design Standard the definition given below applies:

Active living: A way of life that integrates physical activity into daily routines.

Active Travel Route Alignments (ATRA): The spatial alignments of the five ATN route types as detailed in this Design Standard. Routes include both planned future routes where the alignment remains unfixed and existing routes where the alignment is defined.

Active Travel Infrastructure Practitioner Tool (ATIPT): A web-based user interface that provides access to spatial mapping of the route alignments for walking, cycling and equestrian routes (ATRA) as well as access to planning and design policies, guides and other information relevant to the planning and design of active travel infrastructure in the ACT.

Biodiversity: The variety of life on earth, comprising countless species living in different but inter-dependent ecosystems. Variability among living organisms in terrestrial, marine and other aquatic environments (and the ecological systems of which they are part) includes:

- Diversity within species and between species; and
- Diversity of ecosystems.

Climate change: The *Intergovernmental Panel on Climate Change* defines climate change as “a change in the state of the climate that can be identified (e.g. using statistical tests) by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer. It refers to any change in climate over time, whether due to natural variability or as a result of human activity.”

Climate Change Adaptation: Actions by individuals or systems to avoid, withstand or benefit from current and projected climate changes and their impacts. Adaptation reduces a system's vulnerability or increases its resilience to the effects of climate change. Various types of adaptation can be distinguished, including anticipatory (proactive), autonomous (spontaneous) and planned (deliberate) adaptation (*IPCC*).

Crime Prevention through Environmental Design (CPTED): Aims to prevent crime by designing spaces and buildings that foster human activity and interaction using four key principles: natural surveillance to limit the opportunity for crime; natural access to encourage the movement of people into spaces that are open and inviting; territorial reinforcement to maintain a sense of ownership by the local community; and target hardening to make it difficult to steal or vandalise property.

Landscape Management and Protection Plan: A drawing with detailed notes that describe the planned method of protection of all hard and soft landscape assets on unleased land adjacent to / near the Works Area.

Path: A paved off-road facility of varying width and surfacing for shared use by pedestrians and cyclists. All paths, including paths adjacent to streets, are shared by pedestrians and cyclists in the ACT, differing from NSW and Victoria where cyclists over 12 years of age are not permitted to ride on paths unless appropriately designated.

Playground or Play Space: An area designed for children's play, including the site, natural features, built landscape, and any manufactured equipment and surfacing.

Street and park furniture: A term used to describe all of the peripheral objects that help create functional and appealing outdoor spaces for public use.

Urban Open Space: Unleased Territory Land within the urban area set aside for public use. (Defined in the *Territory Plan*, zoned as PRZ1)

Urban heat island (UHI) effect: Localised warming in urban areas due to energy created by people, transport, buildings and activities, and by the storage and emission of heat from large amounts of paved and darker coloured surfaces.

Water Sensitive Urban Design: An approach to urban planning and design that aims to integrate the management of the urban water cycle into the urban development process.

1.2 General design considerations

1.2.1 General

General: Properly designed and constructed soft landscape treatments such as planting beds, tree planting and grassing create interesting and dynamic public spaces within the urban environment. As soft landscape elements take time to grow and generally require ongoing maintenance costs throughout the entire life of the landscape, their design and construction should be carefully considered to ensure they meet the intended purpose and minimise maintenance.

Examples of functions and purposes of soft landscape design include:

- Providing aesthetic quality, visual interest and soft greenery to a landscape;
- Providing distinctive landscape character;
- Providing shade and microclimate amelioration;
- Improving air and/or water quality;
- Directing the flow of pedestrian and vehicular traffic along paths and roadways;
- Providing habitat for wildlife;
- Providing screening around buildings and screening of undesirable objects/assets in the landscape;
- Providing privacy for properties;
- Defining boundaries and creating spaces;
- Reducing stormwater run-off and erosion; and
- Reducing the heat island effect.

1.2.2 Consultation

1.2.2.1 TCCS and other authorities

Requirement: Consult with TCCS and other relevant Authorities during the preparation of design.

Comply with *Reference Document 6 Design Review Submissions* (if applicable)

1.2.2.2 Public consultation

General: If required by the DA, undertake public consultation on designs in conformance with EPSD policy.

1.2.2.3 Utilities services plans

Requirement: Obtain existing service plans from all relevant public utility Authorities and other organisations whose services exist within the area of proposed landscaping. Contact 'Dial before you dig' to identify location of underground utility services pipes and cables.

Collaborate with other design consultants to ensure the soft landscape design is not adversely impacted by installation of other proposed infrastructure.

1.2.2.4 Safety in Design

Requirement: Implement safety in design processes in accordance with the *Work Health and Safety Act.*

1.2.2.5 Heritage considerations

Requirement: If required by the DA, provide a plan for the management of heritage assets in accordance with the DA.

1.2.2.6 Protection of existing trees and other vegetation

General: The requirements for vegetation protection and the authority which grants approvals for works that may affect existing trees and other vegetation are different for leased land and unleased land in the ACT.

Requirement: Designs shall comply with the following:

- Leased Territory Land - protection for trees on leased Territory Land is to be provided in accordance with the *Tree Protection Act*;
- Unleased Territory Land - existing trees and other vegetation on verges and areas of unleased Territory Land managed by TCCS are community assets to be protected. Any proposed works within unleased Territory Land which may affect trees or other vegetation requires approval from the relevant asset management section within TCCS (eg Urban Treescapes for trees);
- The protection of Registered Trees on either Unleased Territory Land or Leased Territory Land is to be provided in accordance with the *Tree Protection Act*;
- The protection of flora identified as Matters of National Environmental Significance is to be provided in accordance with the *Environment Protection and Biodiversity Conservation Act*; and
- Impact on native species must not be in contravention of the *Nature Conservation Act*.

1.2.2.7 Contaminated site considerations

Requirement: Where the site may include contaminated material enquire with TCCS / EPA, if a contaminated site investigation has been carried out, and if not, is an investigation required.

1.2.2.8 Bushfire Prone Areas

Requirement: Comply with The *ACT Strategic Bushfire Management Plan* and any site specific fire management plans. Consider bushfire risk management in determining the location, species, density, extent and ongoing maintenance of landscape plantings.

1.3 Design criteria

1.3.1 Selection of species

Requirement: Tree, shrub, groundcover, ornamental grass and water plant species for use in public open spaces shall be chosen from the approved plant list (*MIS 25 Plant species for urban landscape projects*). Other species may be proposed along with evidence of suitability; their use will be subject to approval being granted by the authority responsible for managing and maintaining asset prior to Design Review. Refer to *TCCS Reference Document 6 Design Review Submissions.*

Consider: Selection of species shall consider the following:

- Designers must consider the site conditions (e.g. surrounding land uses and existing infrastructure, soil type, and required clearances), maintenance requirements (e.g. water, pruning), mature size of the selected plant species and design intent when selecting species; and
- Where soft landscaping is adjacent to ecologically sensitive areas, species selection must consider potential impacts on existing ecological communities. Potentially invasive species must be avoided.

1.3.2 Public safety and safety for maintenance

Requirement: When designing soft landscape treatments for public spaces the following principles help improve public safety and safety for maintenance:

- Locate trees, shrubs and groundcover so that minimum clearance requirements from paths / roads, sight lines and sight distance and lighting are maintained;
- Locate trees and shrubs so that they do not conflict with existing or proposed buildings, public lighting or other infrastructure;
- Avoid using shrubs with sharp or spiky foliage in areas where they may cause injuries, such as close to pathways and playgrounds;
- Ensure that the design of planting does not restrict or interfere with access including for people with a disability;
- Design planting beds in shopping centres and public pathway areas so that they do not form a complete screen or enclosure where pedestrians may feel vulnerable; and
- Consider how the planting will be maintained safely, including during all stages of growth from planting to maturity and also its removal. Design out risks to safety.

See the *ACT Crime Prevention and Urban Design Resource Manual* for more information about designing for public safety.

1.3.3 Design to reduce maintenance

General: Effective planning and design can keep maintenance to a minimum in public spaces.

Consider: The following guidelines to minimise maintenance requirements:

- Plant shrubs in masses and group plants of similar maintenance needs in the same location;
- Provide higher plant densities (not including trees) to minimise potential for weed growth; and
- Design paths and paving to accommodate desire lines.

Requirement: Soft Landscape Designs shall comply with the following:

- Grass areas are to be large enough to manoeuvre ride-on equipment and designed for mower access between separate areas of grass. (Also see **Grassing**.);
- Ensure trees in grassed areas are placed so that mowing around them is not impeded (see **Tree Planting, Design considerations**);
- Provide a mowing edge against walls and planting beds and other obstacles (including but not limited to - bollards, fences, signs, rip-rap, stone pitching and headwalls) to avoid hand clipping. Finish edges flush with adjacent grass;
- Grassed areas are to have adequate drainage;
- Avoid unwanted pooling of surface water in all landscape areas;
- Planting beds are to have adequate surface drainage or be specifically designed to tolerate water inundation without becoming anaerobic, such as the use of sub soil drainage, drainage sand and species selection to suit the conditions. Refer to *MIS 08 Stormwater* for more information;
- Choose plants that are long lived, reliable in Canberra's climate, hardy and require minimal maintenance;
- Locate groundcover and shrub planting so at maturity they do not grow over paths and roads;
- Locate trees and shrubs to achieve at least the minimum clearance requirements for services, luminaires, garbage bin collection pads, car parking overhang, car door opening, awnings and other infrastructure;
- For trees provide appropriately sized tree pits to allow for requisite soil volumes (refer *MIS 25 Plant species for urban landscape projects*);
- Provide adequate preparation of soil for planting and grassing (refer to Specification *MITS 09 Landscape*);
- Planting beds to have between 75–100mm settled depth of mulch (refer to Specification *MITS 09 Landscape*); and
- Provide access into parkland / open space areas for maintenance vehicles and emergency services, and prevent access by unauthorised vehicles. Refer *MIS 16 Urban open space*

1.4 Soils

1.4.1 Soil selection

General: Soil selection for plants is an important when designing soft landscape. The selection of soil can mean the difference between a poorly performing landscape and a thriving one. In many urban areas the existing soil cannot provide trees and shrubs with sufficient nutrients and water penetration for their survival.

Requirement: The location and requirements of the plant needs to be addressed when selecting imported topsoil and soil improvement:

- For environmentally sensitive sites and large scale landscape it may be important to retain the existing site topsoil and select plant species that are suited to the soil and site conditions;
- In areas where plants with greater nutrient requirements are desirable, or where the topsoil is removed or poor, the existing soil needs to be improved or soil imported to supplement the existing site soil. Where importing soil is not an option, specialist soil tests may indicate the most effective way to improve the soil; and
- For imported soil selections refer to the Municipal Infrastructure Technical Specification which provides a guide for the types of topsoil for different applications.

Requirement: The location and requirements of the plants needs to be addressed when considering reuse of site topsoil:

- Undertake appropriate soil testing by a certified member of Soil Science Australia to determine qualities of the site topsoil before stockpiling to determine if it is appropriate for reuse and what additives and soil improvements may be required.; and
- For reuse of site soil refer to the Municipal Infrastructure Technical Specification which provides a guide for reuse of site soil for different uses.

1.4.2 Structural soils and cells

General: When trees are planted in paved areas such as pedestrian plazas, car parks, or fully paved verges, tree growth can be restricted due to limited access to soil, water, nutrients and oxygen.

The following treatments provide support to pavements whilst providing less compaction of soil particles suitable for plant root growth:

- Structural Soil: Structural soil material is a gap-graded crushed rock used as a stone skeleton for strength combined with a clay loam soil and a stabiliser. A large volume of structural soil is required to provide adequate nutrient and water holding capacity due to the low percentage of clay loam in the mix; and
- Structural Soil Cells: Structural soil cells are high-strength modular structures (usually plastic) that can be assembled to form a skeletal matrix that supports pavement loads whilst providing large volumes of uncompacted soil (clay loam) within the structure for root growth.

Requirement: Where utilised structural soils and cells shall:

- Include drainage;
- Have water and aeration system installed;
- The volume of soil available for root growth must be appropriate for the selected tree species; and
- Structural soils and cells are not to be retrofitted around existing trees unless the installation is outside the current root system.

Consider: Consider using structural soils and cells for the following conditions:

- To replace existing soil in areas to be paved or where renewal of paving is proposed, for new tree planting or where existing trees have performed poorly and are to be replaced;
- Where existing soil conditions have limited capacity to support healthy tree growth;
- To extend the available soil between tree planting sites with linked tree pits;
- Where providing suitable soil volume within the medium will limit root incursion into adjacent service trenches;
- To take advantage of passive water capture from the paved surface into the tree root zone; and
- Where vehicles travel over paving.

1.5 Permeable paving

General: Permeable paving is useful where installation of a hard surface is required near trees. Permeable paving, allows water infiltration, and nutrients and oxygen exchange while still providing a hard wearing, trafficable surface.

Permeable paving may be specially designed paving units or pebbles stabilised with a bonding agent.

Requirement: Include the following measures in the design:

- Assess the potential adverse impact on existing tree/s (e.g. disturbance to root system) before proposing a change to surface treatment;
- Provide a flexible opening for the growth of the tree trunk, and allow for growth of woody roots close to the trunk to disrupt the surface;
- The soil and base below the permeable paving must allow water infiltration. Review drainage patterns to determine if installation of permeable paving needs to include modification to above or below ground drainage; and
- Permeable paving around trees must have a non-slip finish in pedestrian use areas.

1.6 Root barriers

General: Careful consideration is required before determining that use of a root barrier is appropriate in the situation. Ensure that the tree root system will have suitable area to grow, for both its stability and health.

Root barrier can provide protection to adjacent infrastructure against disruption from tree roots whilst having minimal impact on the tree. A properly installed root barrier can protect pavement, footings or kerb from cracking or lifting.

Care must be taken to avoid directing roots into service trenches and towards pipes; the trench backfill is often a suitable environment for root growth.

Requirement: Provide root barriers to tree as required by species, refer *MIS 25 Plant species for urban landscape projects.*

Consider: It may be appropriate to use a root director type barrier with new tree planting in paved areas; however there must be a zone of suitable soil outside the barrier that the tree roots will be able to grow into, to ensure a healthy and stable tree. The use of a root barrier surrounding a new tree must not create a “pot in the ground” effect; it must not prevent roots from growing laterally, or try to restrict the root system to grow in soils in which they will not thrive.

1.7 Mulching materials

General: The type of mulching material to be used for planting areas should be selected on the basis of its general purpose and location of the bed within the environment.

Requirements: Mulching material and areas must meet the following criteria:

- All planting beds and trees are to be mulched, except trees in irrigated grass;
- Documentation specifies any specific requirements for the material including source of material and chip size; and
- All mulch types listed shall conform to the Municipal Infrastructure Technical Specification.

1.7.1 Chipper waste

General: Chipper waste is gained from chipping branches of tree pruning. The mulch product varies according to the original source of plant material and chipping methods. It is an excellent reuse of material and is commonly used mulch.

1.7.2 Pine chip and pine flake

General: Pine chip and flake can be used to cover both non-irrigated and irrigated planting areas and can be used in most locations, including shopping centres and open space areas. It is especially useful on sloping sites as the mulch binds to itself and in urban areas and near buildings because it will not cause damage when thrown.

1.7.3 Pine bark

General: Pine bark comes in a variety of sizes. Its attractive appearance suits prestige areas.

Pine bark is the preferred mulch for most situations.

1.7.4 Restricted use mulches

1.7.4.1 River stones /pebbles

General: River stones and pebbles provide a suitable and attractive alternative to traditional mulch along watercourse plantings such as floodways.

Requirement: This type of mulch should not be used in urban areas and close to buildings or pedestrian accessible bridges, where there is a possibility of rocks being thrown through windows, at cars or spread by mowers.

Provide wide edging and design to avoid migration of material especially if stone based mulches are used adjacent mown grass.

1.7.4.2 Shale and crushed rock mulch

General: Shale mulch and crushed rock mulch provides a suitable and attractive alternative to traditional mulch.

Requirement: This type of mulch should not be used in urban areas and close to buildings or pedestrian accessible bridges, where there is a possibility of rocks being thrown through windows at cars or spread by mowers.

Provide wide edging and design to avoid migration of material especially if stone based mulches are used adjacent mown grass.

1.7.4.3 Eucalyptus chip

General: Derived from eucalyptus trees, eucalyptus chip is generally long lasting; however, its use may encourage removal of native eucalypt woodland or forests. If high in tannin it may stain pavements.

Requirement: Eucalyptus chip is only to be used on broad acre areas. It is only to be used if the source is known and is environmentally sustainable.

1.7.5 Mulches not to be used

Forest litter: The mulch product varies according to the original source of plant material, chipping and mixing methods. The product is inconsistent and may contain materials that breaks down too quickly or seeds which become weeds. Forest litter mulch is not to be used.

1.8 Protecting existing trees

General: Effective tree protection requires adequate protection of above and below ground parts of the tree.

In Canberra's clay soils the majority of tree roots grow in the top 300mm of the soil, with fewer sinker roots that grow down to greater depths. The root system can extend well beyond the edge of a tree's canopy.

Requirements:

- Refer to Consultation for tree protection requirements and approval authorities for undertaking works near existing trees;
- Where a Landscape Management and Protection Plan (LMPP) is required it is to be prepared and submitted in accordance with *TCCS Reference Document 4*;
- Where a Tree Management Plan (TMP) is required it is to be prepared and submitted in accordance with the *Tree Protection Act* and the Tree Protection (Guidelines for Tree Management Plans) Determination; and
- Comply with the *Tree Protection Act.*

Australian Standards:

- *AS4970 'Protection of trees on development sites'*

1.8.1 Causes of damage to trees

General: Typical causes of damage to trees include:

- Level changes – excavation severs roots and filling causes suffocation of the feeder roots;
- Trenching for underground services, kerbs, gutters and footings, which severs roots, can affect both the stability and health of the tree;
- Drainage changes – can cause drought or water logging of the root zone;
- Compaction – causes physical damage to roots and prevents air and water reaching the roots;
- Chemicals – including engine oil leaks, hydraulic fluid, concrete slurry and a wide range of chemicals can be toxic to tree roots and soil micro-organisms; and
- Construction equipment use close to tree canopies and trunks can cause physical injury – wounding affects tree health and can facilitate the entry of disease and decay.

Requirement: Design to avoid damage to trees. Refer to *AS4970* and requirements for TMP and LMPP, and *TCCS Reference document 4*

1.8.2 General design considerations

Requirement: The following shall be undertaken/ met where works are located near existing trees:

- Collaborate with other design/project consultants to ensure that trees are not adversely impacted by installation of other proposed infrastructure;
- Obtain professional arboricultural assessment and advice about the specific tree/s and the viability of retaining individual trees and groups of trees. All established trees need to be assessed and information recorded showing: species type, size (height, canopy spread and trunk circumference), location, quality, health and habitat value, along with a statement of the potential impact of proposals on trees;
- Determine the category of tree/s involved in the project e.g. Street Tree, Registered, Regulated, in a Heritage Precinct; and
- Ensure all trees in the vicinity of the project are considered in relation to potential impact from proposed works.

Consider: Consider the following:

- A decision to retain, prune or remove trees should be made at the early design stage with full recognition of their value, potential costs, advantages and disadvantages and alternative design strategies available to retain the trees;
- The public safety and maintenance implications where large trees will be retained; design these to be lower use areas; and
- Access for future maintenance equipment needs to be provided.

1.8.3 Protection from soil compaction and physical damage

General: The simplest and most effective protection for trees is fencing out construction activity from a tree protection zone, which must be specified for each tree / group of trees to successfully protect the root systems. Refer to the *ACT Tree Protection legislation*, for the identification of the tree protection zone.

For trees on Unleased Territory Land that are not Registered Trees the root zone to be considered for protection extends to 2m beyond the tree canopy, the overall shape and size of the tree canopy needs to be considered to determine the root zone (e.g. a tree with tall narrow canopy is likely to require a zone beyond 2m from canopy edge).

Requirement: To protect trees from soil compaction and physical damage:

- A tree protection zone must be defined for each tree / group of trees (Refer to requirements for a *TMP* or *TCCS Reference document 4*). The protection zone must be fenced off in accordance with the *Tree Protection Act*;
- No site compounds, building materials or vehicles are to be placed within the protection zone of existing trees. No heavy machinery shall be allowed in this area; and
- When tree protection fencing requires temporary removal (subject to approval) other tree protection measures are to be used to provide protection for the trunk and canopy, and to protect the ground (and root system below).

1.8.4 Level changes

General: Any excavation or level build-up around trees should be avoided or minimised. The impact of fill or excavation shall be assessed, as it will affect the tree to varying degrees depending on a number of factors such as:

- Species and age of the tree;
- Size and stability of the tree;
- Extent, location and depth of impact; and
- Timing of works.

Requirement: The design of level changes shall comply with the following:

- *The Tree Protection Act*;
- *TCCS Reference document 4*;
- Arboricultural assessment that includes advice on the ability of the tree/s to cope with this impact and measures to minimise or mitigate the effect on the tree/s of the proposed level change;
- Where level build-up is proposed:
  - The fill soil should be coarser or more porous than the existing underlying soil;
  - If the ground is heavily compacted some aeration should be provided before the fill soil is added;
  - Consider existing surfaces near the tree and consequential drainage changes of the design; and
  - Drainage and aeration should be provided when either of the following situations occurs:
    - fill depth ≥150mm within the canopy zone on one side of the tree; and
    - fill depth ≥100mm within the canopy zone on all sides of the tree.
- Where excavation is proposed:
  - Make the design documentation adaptable and take into account root locations identified during construction;
  - Consider terracing or other design interventions to protect the largest possible area around the tree is left at the original level;
  - Utilise hydro-excavation can minimise damage to woody roots; and
  - Consider advance preparation of roots to reduce the impact. A lead-time of at least one year is necessary to make this effective. The method should be prepared by a qualified Arborist.

1.8.5 Excavations for services

General: Trenching within the tree protection zone will damage tree health and can lead to death or significantly affect the stability of the tree.

Requirement: When planning for excavation for services comply with the following:

- If services are proposed to be inside the TPZ, installation must be with trenchless technology. The depth of boring must be a minimum of 650mm where it is below a tree canopy. Alignment of the service shall be as far from the trunk as possible; and
- Excavation for bore pit/s is to be outside the TPZ. Limited localised excavation may be allowed within a tree protection zone, subject to approval. Refer *TCCS Reference document 4.*

1.8.6 Disturbance to the existing drainage patterns

General: Changing the ground level or construction works near the tree commonly disturbs surface drainage. This may divert water away from or toward the root system, or the development may increase runoff and lead to water-logging or collar rot.

Sub-soil drainage is affected when substantial areas of hard paving or buildings are placed near trees, where areas surrounding trees are heavily compacted, or where major changes to ground level occurs.

Requirements:

- Review proposed earthworks, building and construction plans to determine if works are likely to impact on surface water flow and ground water, and the predicted changes to soil moisture levels for trees;
- Determine if remedial action for drainage, aeration, irrigation, passive watering or runoff diversion is needed; and
- Where excess water is likely to be a problem divert surface flow.

Consider: Retaining a group of trees in a larger area of land, rather than a single tree in a small area of land.

1.8.7 Paving around existing trees

General: Installing paving around existing trees should be avoided except where it is replacing an existing paved surface. Paving installation can be very detrimental to tree health when existing soil is removed as this would typically involve a loss of roots; and the hard paved surfaces create an impermeable layer preventing air and water from reaching tree roots.

Requirement: Obtain an arboricultural assessment and advice on the ability of the tree/s to cope with the impact, and advice about measures that can be utilised to minimise or mitigate the effect on the tree/s of the proposed work.

Consider: Where hard surfaces are proposed within a tree protection zone they should cover as small an area as possible and be built without soil compaction. The principles below may be relevant for the project design, but do not replace the need for professional arboricultural advice specific to the project:

- Raise finished levels so that cut into the existing root system is not required;
- No-dig, bridging or pier and beam techniques may suit some installations;
- Maximise permeable surface area;
- The zone beneath the paved surface needs to be permeable, such as a gravel diffusion layer;
- Vents in the paving can add to the permeability of the surface treatment;
- A minimum of 2.4 x 2.4 metres around the trunk needs to have a flexible and permeable treatment; and
- Refer to **Level Changes**

1.8.8 Tree surgery, pruning and remedial works

General: The need for remedial pruning or maintenance, and provision of adequate irrigation, nutrients and beneficial soil organisms to compensate for loss of roots or improve general tree health, should be assessed at the design stage and incorporated into the project.

Requirement: Tree pruning is to be carried out in accordance with *AS4373* Pruning of amenity trees. The project Arborist shall determine if the pruning is to occur prior to, during or on completion of construction. The minimum qualification of the person that will undertake tree pruning is to be specified (Certificate III in Arboriculture).

Consider: The principles below do not replace the need for professional arboricultural advice specific to the project:

- Pruning is to be done in accordance with *AS4373*;
- Comply with *TCCS Reference document 4*;
- Retain the lower branches of a tree unless removal is required to provide for traffic or pedestrian use, in which case a 2000mm clearance height can be provided; or for other specific clearance requirements. The height of lower branches of a tree should not be greater than 30 per cent of the tree height;
- Any branches that are damaged, for example by wind storms or vandalism, or have fallen off should be removed;
- Assess tree structure and prune to reduce public safety risk. Consider location of tree/s;
- Remnant Eucalypt trees may need removal of dead branches of 50 to 200mm diameter; however selective retention of larger diameter dead or hollow branch sections may be suitable to provide wildlife habitat; and
- Urban Treescapes shall be consulted regarding appropriate pruning for the situation.

1.9 Tree planting

General: Trees can play many roles in urban areas including:

- Aesthetic quality and visual interest;
- Visual screening;
- Shade and microclimate amelioration;
- Habitat for wildlife;
- Corridors for wildlife movement;
- Street trees;
- Identity e.g. define character for local area, street etc;
- Screening and wind breaks;
- Add scale to an open space or vertical scale against urban elements; create human scale;
- Shelter belts and amenity in recreational and open space areas;
- Improve green infrastructure and bushland in urban environments;
- Divide open spaces into a series of defined spaces; and
- Soften scale and bulk of infrastructure.

Requirement: The following criteria apply in the selection and location of new trees:

- Tree location within the urban environment is to be designed thoughtfully and appropriately for the trees to contribute positively to urban areas throughout their life; and
- Species must be chosen carefully to suit the intended purpose and site conditions. Pay attention to the mature size of the tree and situations for which it is not suited (refer to *MIS 25 Plant species for urban landscape projects*).

1.9.1 Street trees

General: Street tree planting is the most common type of tree planting in urban areas. Street trees provide identity to streets, and define the hierarchy of streets. They add colour and interest to the street and urban area. Mature street trees can provide a suburb with a definable character.

Species choice is important when selecting street trees, in terms of:

- The size of the tree in relation to the size of the verge and building set backs; consider the above ground space and the available soil volume for healthy growth to maturity;
- Size and shape of the tree and requirements for clear access, sight lines, and sight distance for pedestrian, cycle and vehicular traffic;
- Positive and negative shading impacts;
- Clearances from services and other hard infrastructure (refer *MIS 25 Plant species for urban landscape projects*); and
- The character it will provide to the street and suburb.

Requirement: Give preference to providing a consistent character and hierarchy for each street by selecting a single species, or a distinct pattern of two species per street.

Consider: Generally street trees are planted as one tree per standard residential block frontage, however sometimes one tree per two narrow block frontages is necessary. The number of street trees per block frontage will be dependent on the mature size of the tree, driveway location, services and other infrastructure (e.g. streetlights, waste collection). With narrow block frontages pairing of neighbouring driveways may be considered appropriate to provide space for tree planting. Refer *MIS 05 Active travel facilities design*.

1.9.2 Design considerations

General: Trees in urban areas can provide great benefits to the community and environment, and thoughtful design contributes to maximising these benefits.

Requirement: The following factors are to be considered when designing for trees in urban areas:

- Selection of an appropriate species for its intended purpose (refer to *MIS 25 Plant species for urban landscape projects* for a list of species);
- The mature height and canopy spread of the tree, and the tree shape;
- The appropriate tree spacing in different types of tree planting, such as street tree planting and open space planting, will differ from wind breaks and screen plantings;
- Placement and density of planting in relation to CPTED;
- Clearances from above and below ground services, as well as existing and proposed buildings and awnings (refer to *MIS 06 Verges* and *MIS 25 Plant species for urban landscape projects*);
- Clear access, sight lines and sight distances for pedestrian, cycle and vehicular traffic;
- Clearances to street and pedestrian lighting so the tree canopy does not significantly block out the light to roads or pedestrian areas;
- Provide summer shade while allowing solar access in the cooler months (April to September);
- Do not over plant with the expectation that the tree planting will be thinned in the future;
- Designs must allow access for mowing and other maintenance vehicles throughout the life of the tree;
- To ensure the successful growth of healthy trees to reach maturity the below ground growing conditions must be taken into consideration, in addition to the required soil volume for each species (*MIS 25 Plant species for urban landscape projects*);
- Consideration of the space required, both above and below ground, for each tree to reach its mature size is necessary. The typical mature tree canopy sizes for Canberra are given in *MIS 25 Plant species for urban landscape projects*;
- Reduce maintenance / management problems:

    - Avoid planting trees in pedestrian lanes with unsuitable access for tree surgery equipment;
    - Avoid planting trees where their placement imposes significantly on the adjacent leaseholder (that is, trees are too close to the property boundary); and
    - Avoid obstructing northern and eastern solar access to blocks (leased land) by choosing plant species carefully (consider deciduous versus evergreen, foliage density, height, width and distance).

- Matching existing street tree species.

1.9.3 Trees and infrastructure

General: There is potential for conflict between trees and infrastructure such as power lines, underground pipes, street lights, paving, kerbs and signs. The design and location of services and trees must be coordinated in the early stage of the design process to minimise conflict. In developing a landscape design, an awareness of the location of existing and proposed infrastructure is essential.

Conflicts may result in:

- increased maintenance costs;
- reduced longevity of the trees and loss of aesthetic value;
- reduced public safety;
- traffic hazard; and
- removal of the tree/s.

Requirements: When locating new trees the following criteria apply:

- Collaborate with infrastructure design consultants to achieve required clearances between trees and other infrastructure, to provide suitable space for tree growth to maturity and long-term quality treed landscapes;
- Beneath power lines: plant only trees that will not encroach the acceptable safe distance from the power lines when mature (refer to *Utility Networks (Public Safety) Regulation*). In open space areas a corridor of 10 metres either side of the power lines should be left clear of tree planting;
- Along roadways: design tree and other infrastructure locations to provide a clear line of sight from vehicles to traffic control devices, road signs, pedestrian crossings and driveways. Low branching or weeping species should not be selected for use near these items;
- Trees are to be planted at least the required minimum distances away from street lights, kerbs, driveways and footpaths, both to reduce root interference and to allow development of the tree canopy to mature size without the need for pruning that will distort natural tree shape. (Clearances are specified in *MIS 07 Driveways* and *MIS 25 Plant species for urban landscape projects* for a list of species);
- Careful species selection is very important to reduce the impact of tree roots on bitumen cycle paths as tree roots can create distortion and cracking of the path. The minimum clearance to allow for tree growth both overhead and underground is also required. (Refer to *MIS 05 Active travel facilities design*, and *MIS 25 Plant species for urban landscape projects* for a list of species);
- Clear sight lines and sight distances for pedestrian, cycle and vehicular traffic must be provided; and
- Species selection for use near buildings is important; consider the mature size of the tree. If adjacent green space is available then planting trees close to buildings should be avoided.

1.9.4 Specifying trees

General: In selecting trees suitable for a project the proponent will need to determine if the proposed species will be available, and that they will be of the desired size and quality. Ideally the landscape architect will work collaboratively with the project owner to ensure suitable tree stock is ordered in advance to ensure its availability.

Requirements: Plant Schedules that include trees are to include the following attributes:

- Species;
- Container or rootball size;
- Tree height; and
- Trunk calliper.

Trees are to meet *AS 2303:2015* Tree stock for landscape use. Refer *Specifying Trees, a guide to assessment of tree quality.*

1.9.5 Tree guards and tree grates

General: Consider whether the tree/s will require any protection, particularly during their early years.

Requirement: Design documentation must show what type of protection is appropriate to the situation. (Refer to *MITS 09 Landscape* for specification details).

Consider: The following types of guards may be appropriate for the tree planting situation:

- Plastic tree guards
    - Plastic tree guards may be used around newly planted trees in open space areas. They are often used to protect trees from vermin, make small trees visible and create a microclimate within the guard.
    - There are various sizes and shapes of plastic guards available. Plastic guards with a water-holding capacity that slowly release water are also available.
- Mesh tree guards
    - In open space areas substantial metal mesh tree guards may be used to protect trees from animal grazing, vehicles and repeated vandalism. They may be required in some street tree situations, particularly for protection against vandalism. A wide smooth section of guard may be required above the mesh section if possums are to be excluded.
- Metal tree guards and grates
    - The use of advanced tree stock is typically preferable to the use of metal tree guards in high use public urban areas, unless the guards are designed to be an important component of the street furniture.

Refer to *MIS 20 Street and park furniture* for more information on tree guards and grates.

1.9.6 Planting trees in paving

General: The following issues are relevant to planting trees in paved areas:

- Trees often perform poorly when planted in areas with impermeable surfaces and compacted soils, suffering stress from lack of water and oxygen in the root zone;
- The potential for roots to disrupt hard surfaces is variable, dependant on species of tree and planting situation; and
- Some tree species drop fruit, nuts and leaves that can be potential slip hazards or stain surfaces.

Requirements: The design of tree plantings in pavement shall comply with the following:

- Design for improved below-ground growing conditions; provide a non-compacted soil profile where water and oxygen can get into the root zone. The use of structural soil cells with a suitable growing medium, and permeable paving can be used to help achieve this (refer to **Structural soils and cells**);
- In pedestrian areas do not select trees with fruit or nuts that could cause slip hazards;
- Design for appropriate root barrier installation where trees will be planted close to pavement (see root barrier requirements for individual species in *MIS 25 Plant species for urban landscape projects*). Provision of structural soil cells can also help to encourage tree roots downward away from the surface material; and
- Avoid the use of hard surfaces (including hard permeable surfaces) too close to the tree trunk, as these can cause girdling as the tree grows.

1.10 Landscaping car parks

Car park design objectives and criteria are identified in *MIS 11 Off street parking* and the *"Parking and Vehicular Access General Code"*. Also refer to **Planting Trees in Paving**.

General: Car owners show a clear preference to park in the shade but the benefits of tree and shrub planting in car parks are not restricted to shade alone. Well-designed car parks, shaded by trees and incorporating planting beds or grassed mounds are a relief from stark expanses of paving.

Requirement: The design of soft landscape within/near car parks shall comply with the following:

- The integration of the landscape development with the design and construction of the car park is essential for both aesthetic and functional reasons. A minimum of 1 tree per 5 parking bays (eg every 5 bay widths / 5 pairs of bays);
- Design car parks to prevent vehicles from damaging trees. No tree or shrub planting should occur in areas where car overhang and door openings will occur. The normal car overhang allowance is 1 metre; and
- Paths and other hard surfacing in car parks shall be located to minimise the need for mowing edges.

Consider: The following are design principles for incorporating trees and shrubs into car parks to balance plant and human requirements:

- Planting areas shall typically have a minimum width of 2.5 metres;
- Consider CPTED principles;
- Consider any landscape character policies for the area and the existing landscape character of the site;
- Aim to achieve the functional requirements for the plants of: vigorous growth, longevity, minimal maintenance and ample shade; and

> Appropriate species for under pruning to allow adequate clearances for vehicles.

For plant selection refer to *MIS 25 Plant species for urban landscape projects*. The following issues are relevant to species selection for planting in car parks:

> Avoid plant species with nuisance sap drop as this may damage vehicle paintwork;
> Avoid tree species that generate nuisance litter drop (eg fruit, nuts, bark, branches) if it will fall on cars;
> Avoid plants with thorns; and
> Plant species and their placement should be designed to require minimal or no pruning at maturity – design for appropriate clearances between plants (at mature size) to lights, paths etc.

Also refer to **Design to Reduce Maintenance.**

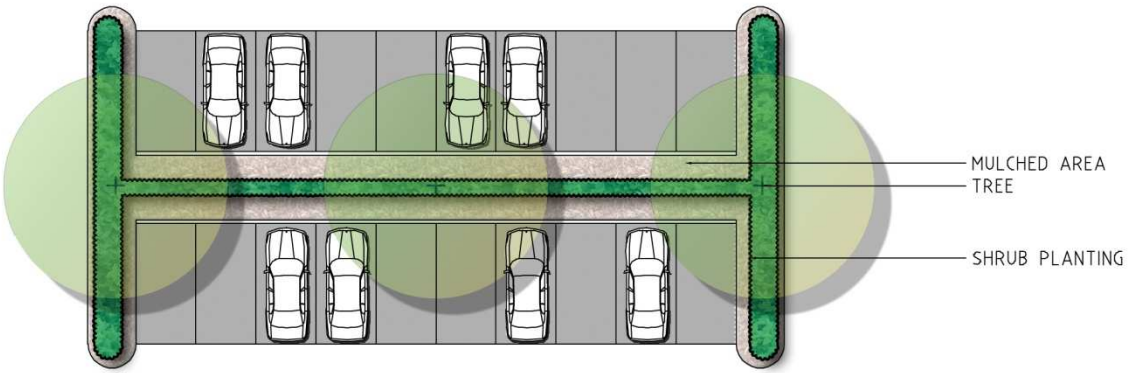

Figure 24-1 Indicative Tree Spacing (5 car bay spacing)

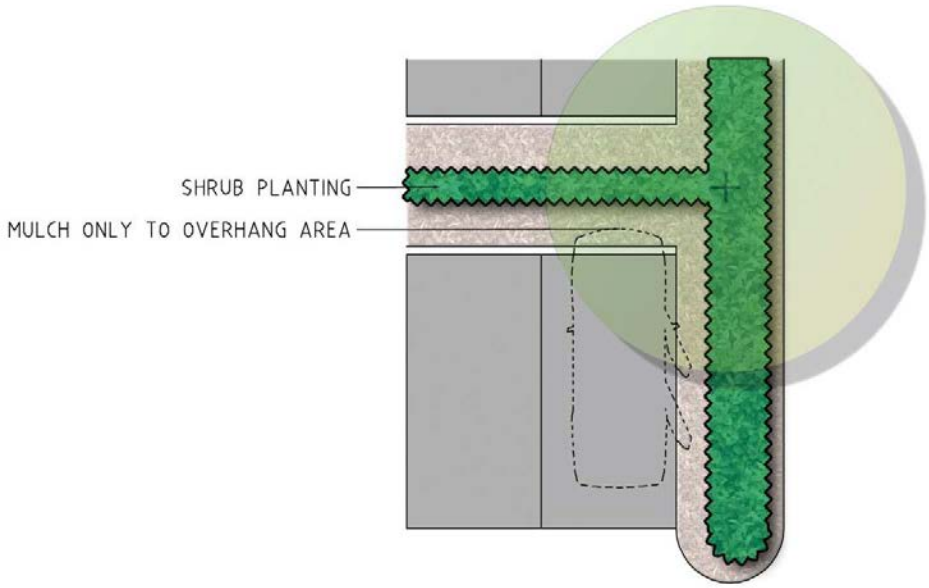

Figure 24-2 Planting Clearance for Vehicle Overhangs

1.11 Planting beds

General: Planting beds can serve numerous functions, such as provide habitat for fauna as well as amenity, character, identity, environmental performance and quality to spaces. They are useful to address areas of gradient too steep to mow safely, create spaces and screen unsightly elements.

Planting beds are often included in new public landscapes and in the revitalisation of existing public open areas. Planting beds are relatively high maintenance compared to mown grass.

Single species mass plantings sometimes results in large areas of plant failure.

1.11.1 Design considerations

Requirements: The design of planting beds shall comply with the following:

- Design the beds to serve their main functions, for example this maybe to provide spatial definition, visual interest, treatment of slopes, cohesion in the space or a setting for buildings;
- Design planting beds to be low maintenance;
- Select reliable species, suited to the conditions they are planted;
- Use planting beds on slopes greater than 1:4 that are unsuitable to mow;
- Maximum slope should be 1:3. Planting beds on slopes steeper than 1:3 are likely to erode or the topsoil may slump and mulch fall down slope. Slopes steeper than 1:3 are to be limited to restricted areas and they require stabilisation treatment;
- Avoid creating areas that may encourage undesirable activities such as hiding and loitering;
- Layout shrub beds to allow future vehicular access for mowing, litter removal, tree surgery, pest control and other maintenance;
- Consider the size of planting beds required to meet design or functional requirements such as screening or border planting). An average width of 3m allows for easy maintenance access (such as weed spraying) from either side of the planting bed;
- Avoid the use of spiky shrubs near pedestrian areas, playgrounds and high litter areas;
- Space shrubs at around three-quarters of their mature width unless forming a screen, where they should be planted closer;
- Use planting beds (or mulched areas with no shrub planting) in heavily shaded areas or areas that are difficult to mow;
- Design planting beds with adequate surface fall to drain excess water and select plant species suited to these areas; and
- Do not obstruct access to manholes, valves etc.

Consider: The following shall be considered in the design of planting beds:

- Using a mix of plant species to increase biodiversity and increase survival outcomes (minimise large areas of plant failure);
- Fencing shrub beds for the first few years after planting in high use areas to restrict traffic and aid establishment;
- Stating in the design intent where formal or naturally evolved beds are desired; formal shrub beds should be restricted to prestigious locations where the high maintenance requirements can be justified while informal, natural shrub beds are suited to broad-scale areas;
- Designing shrub plantings next to paths, buildings, lawns and fences to have a minimum clearance equal to their mature drip-line radius. On main network pathways a path shoulder of 0.5m should be kept clear (refer *MIS 05 Active travel facilities design*);
- Providing shrub planting to attract wildlife and consider the location of the site and reduce fragmentation of habitats;

- Providing windbreaks where winds are likely to make the space unpleasant;
- Shrub bed planting reduced to area that is necessary for design intent, typically 3m wide.

1.11.2 Maintenance considerations

General: Although planting beds are an important landscape element in open space areas, they can also create maintenance problems if not designed and constructed correctly. These include:

- Litter accumulation;
- Weed competition with subsequent difficulties of control;
- Damage caused by pedestrian tracks;
- Plant losses caused by water logging in winter or drying out in summer;
- Mulch decay and need for replacement;
- The need for pest and disease control;
- The need to replace dead plants;
- Excessive height growth if planted too densely (especially native grasses), or weed growth, if planted too thinly; and
- Fire maintenance (slashing, mulch, leaf drop, adequate breaks between mature tree canopy etc) where in Asset Protection Zones (APZ).

Planting beds can be a high maintenance alternative to other landscape options such as dryland grass.

Requirements: Design to minimise maintenance of the planting beds. The following should be carefully considered:

- Do not plant shrubs along pedestrian laneways except for specific purposes such as providing cover to un-mowable grades;
- Ensure that the established size of the shrubs will not obstruct sight lines and sight distance along paths and roadways;
- Allow sufficient space for vehicular access. Locate planting beds to enable future safe maintenance;
- Consider the location of existing and proposed services such as water, sewer, gas, electricity and telecommunications when designing planting beds (refer *MIS 6 Verges*); and
- Shrub plantings between pathways and buildings should not obstruct building maintenance. Provide a clearance equal to their drip line radius.

1.11.3 Non-irrigated planting beds

General: Non-irrigated planting beds are the most commonly used method of open space shrub planting.

Requirements: The design of non-irrigated planting beds shall comply with the following

- Planting beds must serve a useful purpose such as either covering the soil on steep un-mowable batters or floodways, providing wind, noise and privacy screening, adding definition to area boundaries, or restricting access;
- Planting in floodways is to be designed to not cause blockages or undesirable temporary damming that elevates flood levels; and
- Beds should be graded to facilitate drainage with a steeper gradient at the edge. Edging in open space and less formal areas is usually by spade edge. In areas of higher maintenance or places of importance or distinction, concrete or brick edging can be used.

1.11.4 Irrigated planting beds

General: The cost to construct and maintain irrigated planting beds is relatively high. If irrigated planting beds are proposed TCCS is to be consulted at the outset of design.

Requirement: The design of irrigated planting beds shall comply with the following:

- Irrigated planting beds should only be used in formal areas or around community facilities where their maintenance can be justified. Generally, irrigated planting beds should be smaller than non-irrigated planting beds and located close to water mains and drainage lines;
- In many cases planting bed irrigation is only required for the first few years after construction to provide rapid establishment of plants that are able to obtain sufficient moisture without irrigation when mature;
- Good drainage is essential in irrigated planting beds to prevent water logging and decay of mulch. In many cases deep ripping of the subgrade will be sufficient to provide for drainage. If this is not possible, a sub-soil drainage system must be included (refer to MIS 04 Subsurface drainage); and
- A depth of topsoil sufficient to support vigorous plant growth should be provided and the surface shaped to allow drainage and mulched.

Consider: The suitability of plant species to survive if irrigation is turned off after 3-5 years or for extended maintenance periods.

Refer to *MIS 18 Irrigation* for further information and design requirements.

1.11.5 Raised planting beds

General: If not designed and constructed correctly, raised planting beds can be high maintenance.

Requirement: Raised planting bed design shall comply with the following:

- Use confined to Town or Group Centres, prestige areas or those with high traffic where beds at ground level would be trampled. Areas along lake foreshores or other sites with high water tables may require raised planting beds;
- The dimensions of raised beds shall balance cost, drainage and maintenance requirements; and
- All raised planting beds require irrigation and a drainage system.

See also information about planter boxes in *MIS 20 Street and park furniture*.

1.11.6 Planting of roundabouts

General: Planting in roundabouts can contribute to the landscape by softening hard road infrastructure elements and provide environmental and visual benefits. As they are surrounded by roads this can create occupational safety issues during maintenance access.

Requirement: Planting in roundabouts shall comply with the following:

> The minimum size of a roundabout where planting can occur is 15 metres diameter, with the exception of tree/s which may be positioned in roundabouts less than 15 metres in diameter where all of the criteria stated below are met:

- Meet requirements of *Austroads*;
- Ensure that the roundabout is clearly visible and the line-of-sight is maintained;
- Allow clearances from and access to infrastructure eg light poles, mobile phone towers;
- Consider the mature growth habit of plants (height and width) – refer to *MIS 25 Plant species for urban landscape projects* for appropriate plants;
- Minimise weeds, the need for hand weeding should be avoided;
- Mulch shall be between 25mm-50mm in diameter and shall be contained to prevent spreading;
- Limit the area of mulched planting beds;
- Roundabouts planted with trees, shrubs, groundcovers or grasses are to provide access for maintenance vehicles and an area to park a maintenance vehicle without impacting sight lines; and
- Ensure there is 3 metres plant-free area from road edge to allow safe maintenance access and a parking location that does not obstruct sightlines.

1.11.7 Planting of medians

General: Planting in medians can contribute to the landscape by softening hard road infrastructure elements and provide environmental and visual benefits. As they are surrounded by roads this can create occupational safety issues during maintenance access.

Requirement: Planting in medians shall comply with the following:

> Provide maintenance access and parking of a minimum 2.5m width by 6m length area at min 30m intervals;
> Provide maintenance access grass or mulch only either side (or centrally) of any planting beds; and
> Maintenance vehicle access and parking is not a requirement if the approaching roads are 2 lanes and one lane can be closed during maintenance. In this instance the proponent shall prepare a typical maintenance TTM.

Consider: Planting of medians should consider:

> Width of planting within median to achieve designed outcomes (aesthetic, controlling access etc);
> Species selection and density to minimise weeds;
> Incorporation of WSUD and passive watering;
> Species that respond to width of the median; and
> Use of structural soils or structural cells to maximise tree performance.

1.12 Grassing

Grassing may be in the form of irrigated grass (in limited areas), dryland grass (most common) or native grass.

1.12.1 Irrigated grass

General: Irrigated grass areas have high maintenance costs. Grass does not grow well in heavily shaded areas.

Requirement: The design and use of irrigated grass shall comply with the following:

- Irrigated grass areas shall be limited to areas subject to high usage such as District and Town Parks or to areas with specific visual and design significance such as important approach roads or landscaped surrounds to major buildings;
- Areas should have grades of no less than 1:70 and no greater than 1:6, and be able to drain without ponding;
- Areas should be mowable with efficient machinery such as a tractor mounted cylinder mower with an extended width of approximately 5 metres and a retracted width of 2.6 metres;
- Areas should provide sufficient clearance for machinery such as a tractor mounted cylinder mower with an extended width of approximately 5 metres and a retracted width of 2.6 metres. Mowing obstructions should be sited to allow the easy manoeuvring of ride-on equipment (a minimum width clearance of 2.7 metres should be allowed in most areas with a 2 metre clearance allowed in tight developments where smaller machinery is acceptable);
- Irrigated grass should not be provided in strips less than 2.8 metres wide or have tight corners; and
- Where shrub and tree planting (including low branches) does not allow clearance for mowing equipment, it is preferable to incorporate planting into a mulched bed (self-seeding trees may be a problem in these locations). Paths or barriers to partition off narrow sections of grass are not desirable but paths can be positioned to define the edge of irrigated grass.

See also *MIS 18 Irrigation.*

1.12.2 Dryland grass

General: Dryland grass is commonly used in public areas such as road verges, traffic medians and neighbourhood parks.

Requirements:

- Grass should not be sown on slopes greater than 1:4, or in areas with less than a 3 metre clearance between obstacles (3.5 metre clearance between trees), in acute corners, under road signs, or in other difficult to mow areas; and
- Trees in dryland grass must be spaced far enough from obstacles for mowing by 2 metre wide equipment. A 3.5 metre minimum (4 metre desirable) clearance allows for watering basins and most mature girths (but not for low branches or excessive manoeuvring). Where this is not possible incorporate the planting into a mulched shrub bed. Individual shrubs should not be planted in dryland grass.

1.12.3 Native grass

General: The establishment or retention of native grass and herb species is encouraged and may be used where traditional mown grass is not practical or desirable.

Requirement: Location and species selection is to consider:

- Height and sight lines and the need for occasional trimming;
- Density sufficient to negate ongoing top-up of mulch and deter weeds – however if too dense this may increase height which may affect sight lines;
- Fire prevention and asset protection management requirements such as for inner and outer asset protection zone areas. Certain low growing and low flammable species may be suitable;
- Avoid planting in locations that are inaccessible or where the grade (greater than 1:4) will make it difficult to trim or weed; and
- Native grass plantings that are mulched must be mulched and finished level with or below the level of adjacent footpaths, roads and kerbs.

1.13 Edging

General: Edging delineates shrub beds and grass areas and provides for easier maintenance.

The type of edging required or desired will depend on the location, type of open space and maintenance regimes.

Requirement: Edging location, method and materials shall:

- Be to mown grass and planting beds, and to walls and all obstacles in grass;
- Be stable and able to withstand traffic by maintenance vehicles and mowers;
- Concrete edging – concrete edging is a robust edging that can be used in most circumstances;
- Brick edging – either side ways or length ways, and mortared in place. Brick edging can be used in formal spaces or in prestige areas to add character and visual distinction to the landscape;
- Sleeper edging –Sleeper edging can be used in areas where the space requires character or visual distinction;
- Treated pine logs or timber – Timber should only be used with the approval as it is prone to warping and lifting from the ground, creating a maintenance hazard;
- 'V' spade edging – generally used for less formal areas such as shrub beds in broad open space and in areas where a low cost, minimal type of edging is needed to provide visual distinct between shrub bed and grassed areas. A spade edge allows for easier maintenance, particularly in open space areas;
- Metal edging - may be acceptable in some situations; and
- Concrete and brick edging - can also be used against vertical landscape elements such as walls to provide for easier maintenance.

1.14 Documentation

Requirement: Comply with Requirements for Design Acceptance Submissions (*refer TCCS Reference Document 6 Requirements for Design Acceptance Submissions* and *TCCS Reference Document 6A Requirements for Design Acceptance submissions for infill developments*).

ACT Government

Transport Canberra and City Services

APRIL 2019