



City of Busselton

Geographe Bay

Engineering and Works Services Standards and Specifications

Section 9(a)

Landscape - General Guidelines

These Standards and Specifications are required to be practiced in the City of Busselton for landscaping works carried out by Consultants, Contractors, Developers and City Staff. These Standards and Specifications will be maintained by the Director, Engineering and Works Services.

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1 INTRODUCTION

These standards and specifications apply to all subdivision development and development applications for Public Open Space and road reserves within the City of Busselton and where it is a condition of development for land within private developments.

It is acknowledged that accepted industry standards will change over time. In order to accommodate such changes, the contents of this document will be reviewed on a regular basis as determined by the Director of Engineering and Works Services.

2 GENERAL CONSIDERATIONS AND REQUIREMENTS

Landscaping is the term used to describe any revegetation, rehabilitation, built form or created vegetation including planting, turf, irrigation, associated hard structures or features such as rockeries, ponds/lakes, bunds, steps, decks, structures, land contours and walls including entry statements.

The City requires, unless specific reasons are given, for indigenous (local endemic native plant species) species to be used as first choice in public open spaces or where required within private land if part of a planning condition. Such species shall be low maintenance, range in variety and suited to the location in size and type.

South West plant species are preferred in any development proposal to provide a more sustainable environment and support local biodiversity values and a sense of place.

Any plant species selected that are outside the City requirements as set out above will need to demonstrate the use and appropriateness of those plant species and subject to a maximum planted area of less than 10% of the landscape area and only in a nodal context. Minimum criteria shall include:

1. Low water use;
2. Low maintenance;
3. Appropriateness to the location; and
4. Provide a sense of place natural to the area.

It is necessary to provide nurseries with a 12 month period typically from November germination to grow / source plants that will support City requirements within all developments, especially Public Open Spaces (POS) including foreshore reserves, drainage reserves, recreational reserves, conservation reserves, landscape buffers and road reserves. The City will not accept last minute sourcing of inappropriate plant species.

Native cultivars that are based from local plant species may be approved in formalised landscape zones. No plant species that are considered environmental weed species will be approved by the City (See *Section 9(f) - Landscape Environmental Weeds* - Dept of Environment and Conservation - invasive/potential weeds in SW bush land).

In private developments, plant species should be localised South West species. Exceptions will be considered where the developer puts forward requirements for feature planting ie deciduous trees for winter sun in feature areas only, specific species to address modified surroundings or to retain and enhance existing landscaping on or associated with the site.

The City promotes water conservation by limited or non irrigated lawn areas as far as practicable given the limitations in water resources and as explained in the Dept of Water document 'Better Urban Water Management 2008", whilst aiming for an attractive, economic and properly planned landscape environment within subdivisions and developments, road reserves and public open spaces.

Vegetation retention, revegetation and landscaping conditions will be applied to any site requiring a condition in the development application and planning approval for a Landscape Plan. A landscape plan to the appropriate conformance level ie Landscape Strategy (LS), Landscape Plan (DAP) or Landscape Implementation Plan (LIP) dependent on type and stage of application is required by the Lifestyle Development Directorate and the Engineering and Works Services Directorate. The submitted plans will then be assessed by the appropriate City Officers in relation to the conditions of each development. These guidelines and specifications will assist Developers and Landscape Designers in meeting the City's requirements for ecologically sustainable developments.

The City will generally require for private development that common areas (such as those adjacent to joint use driveways), private open space and road verge areas, be landscaped to the satisfaction of the City. The Developer/Applicant is to submit a vegetation retention and landscaping plan to the required level dependent on the proposal.

Where Public Open Space (POS) landscaping is to be maintained after implementation, the developer must maintain all landscaping for a determined period set out as a condition of development approval. All POS areas shall be bonded by the City prior to issue of building licences or subdivision clearance. City planning conditions may require a maintenance period of up to five (5) years with a minimum of two (2) years - (2 summers until following break of rains) dependent on the size and scope of the development.

Developments that have allocated Public Open Space (POS) are required to enter into a legally bound Maintenance Agreement with the City, if the Condition of Approval sets out a 5 year maintenance period as part of the development requirements.

Entry Statements, decks, structures and walls require structural engineering certification, specific approval and an extended maintenance agreement For information on Entry Statements, refer to Section 9d Landscape POS, Foreshore Reserves and Entry Statements.

Landscape plans must include any remnant vegetation and identify significant trees to be retained (and or removed) and include areas to be planted with a range of native trees, shrubs and ground-covers. Lawn is to be shown where or if required with no potable water to be used outside a building unless all other opportunities for water resources has been expended. Bores showing ongoing viability should always be the first choice for irrigation. Any proposal to use potable water will require detailed cost analysis for economic sustainability based on portions on rateable

income within the development and will include all annual maintenance costs associated with the landscape. Irrigation should be kept to only intensive use areas where a higher landscape standard applies. Where possible, irrigation by trickle or micro-spray of shrub and tree areas is preferred. For information on the City's preferred irrigation methodology and materials, refer to *Section 9(b) - Landscape Irrigation System Specifications*

Selection of plants and planning the layout of landscaping is very important. There are several basic rules which should be taken into account in designing the landscape plan. (Refer *Section 9(e) - Landscape Species* for plant species selection lists.)

- Divide the areas being planned into sections, such as lawn, garden, trees, shrubs and ground-covers;
- Select and locate the biggest plants first, ie. large trees then small trees to tall shrubs, small shrubs, ground-covers, gardens and lawn;
- Trees have the most impact on the property and are a valuable asset but must be carefully selected and placed to avoid damage and nuisance from limbs, leaves and root systems to the property being developed and neighbouring properties including fence lines;
- Trees and tall shrubs should be planted at least 2/3 of their maximum expected height from a house or major building, ie. a 10 metre tree should not be less than 6.5 metres from a house. Proximity to plumbing, gas and electrical cables, pipes and fence lines also need to be taken into account;
- In planting beds, spreading mulch to a minimum 80mm in thickness will help inhibit weeds, keep roots cool and help water retention. In dry sandy areas the addition of a soil wetting agent will help with water penetration;

Further consideration in the design phase should be:

- Local species, and most native plants when established, do not need regular fertiliser unless in very poor soil or water except in extreme heat conditions. Over watering will produce high growth rates, restrict flowering and will require pruning to be carried out.
- Deciduous trees may have value where access to sunlight in winter is important or specific feature is sought.
- The City does not accept responsibility for intensively developed open space, entry statements, road verges or traffic islands.

3 DEVELOPMENT - VEGETATION RETENTION

Existing vegetation is a very important characteristic of an area, to the streetscape and the landscape and environmental values overall within the City. Removal of mature plants and in particular trees leaves a bare area devoid of the benefits that trees and shrubs provide which cannot be replaced by a new landscape.

WA Peppermint trees have a special status within the City. Prior to any removal of trees as part of any development proposal, the location of all WA Peppermint trees (*Agonis flexuosa*) with an individual trunk diameter of 10cm or greater (measured at 1.5 metres above ground level) shall be depicted on the site plan when the application is submitted for Planning Consent (this is to ensure habitat exists for the Western Ringtail Possum). For further information in regards to the specific requirements for all development clearing, the proponent must investigate and comply with all Local, State and Federal Laws and Acts in relation to any vegetation clearing. See Section 9d Landscape Public Open Space, Foreshore Reserves and Entry Statements for further information.

Significant trees can be defined as trees having particular character in isolation to other surrounding vegetation. The significance could be by the size, shape, type, heritage, locality, visual aspect and habitat. Where trees of significance (other than WA Peppermints) occur on the proposed development property, further assessment of the trees can be undertaken through the use of an assessment checklist to ensure they can be accommodated and retained where practicable within the proposed development. The major assessment retention considerations are:

1. Species type, characteristics and value in the streetscape/landscape;
2. Effect on development layout if retained (position of buildings, access and services);
3. Physical effect on buildings, civil infrastructure and safety if retained (size and proximity);
4. If pruning is required to support retention, care is required. Incorrect pruning will spoil the natural features of a tree and produce unsightly and undesirable sucker growths. Professional advice (arboriculture) may be required to be sought;
5. Effect on native wildlife which rely on trees for their natural habitat; and
6. Screening of proposed developments to minimise view impacts and potential to enhance the development.

4 GUIDELINES FOR PREPARATION OF LANDSCAPE PLANS

4.1 Landscape Plans

Landscape Plans are generally required for Development Guide Plans (DGP) or Subdivision Development Applications.

For DGP's, these can be provided in stages as:

- Landscape Strategy (LS).(DGP stage);
- Landscape Plan - Detailed Area Plan (DAP stage); and a
- Landscape Implementation Plan (LIP) - construction stage.

This process provides a link from strategic through to detailed information.

For Subdivision, Landscape Plan requirements will be determined subject to the complexity of the subdivision and the relevant conditions of approval.

Landscape Strategy Plan for Development Guide Plans

A Landscape Plan will require endorsement for the overarching DGP area which establishes the broad outline of rehabilitation, revegetation and landscaping of POS areas including road reserves to the satisfaction of the City. The Strategy identifies the concept of how the development will provide specific landscape values and associated costs to maintain. The Landscape Strategy shall be submitted at the same time as the DGP and formatted to a scale clearly showing all the detail as noted below with information provided as;

- Layout of proposed road network;
- Layout of all proposed lots;
- Layout of pedestrian or dual use paths;
- Layout of existing vegetation where applicable;
- Layout of areas with identified conservation values;
- Layout of all foreshore reserves and drainage corridors where applicable;
- Specify localities for all intended Public Open Space (POS) areas and the function to the current 'Liveable Neighbourhoods Version' requirements;
- Layout of landscape buffer zones within the development;
- Specify street tree species and the localities. (Ensure tree species are endemic to the area or listed in the City's tech specs(see Section 9e Landscape Plant Species);
- Specify all species of plants to be used within the development. Where exotic species are to be used identify areas and comply with the 10% nodal requirement. (see Section 9e Landscape Plant Species);
- Specify in square metres size of each POS area individually (+/- 20%);
- Specify percentage of lawn and garden for each individual POS (+/- 20%);
- Specify in percentage amount of irrigation required for turf in each POS including road reserves. (+/- 20%);
- Specify in percentage amount of irrigation required for gardens in each POS including road reserves (+/- 20%);

- Specify water source points, sustainability of water resource (type of resource ie superficial aquifer, Leederville or Yarragadee aquifer or other) and estimated water amounts required annually for each POS shown (+/- 20%); and
- Specify any open water storage and the intended function.

**Landscape Plan (Detailed Area Plan - DAP) -
Following endorsement of a Landscape Strategy for a Development Guide Plan (DGP)**

A Landscape Plan shown as a Detailed Area Plan (DAP) shall be provided for all proposed subdivision developments following acceptance in principle by the City of the Landscape Strategy as a result of a DGP. The DAP landscape plan is submitted at the same time as the Detailed Local Area Plan (DLAP) for endorsement of the concept.

The scale should be to a nominated size and clearly show all the detail as noted below with information provided as:

- Layout of proposed road network;
- Layout of all proposed lots;
- Layout of pedestrian or dual use paths including POS areas;
- Layout of existing vegetation including square metres (under storey) or number of trees (over storey) and any proposed remedial works including plant species;
- Layout of areas with identified conservation values and proposed enhancement works including plant species;
- Layout of all foreshore reserves and drainage corridors and proposed treatments including plant species to be used;
- Concept layout of intended design for each POS area including plant species to be used. Where exotic species are to be used identify areas;
- Concept layout of landscape buffer zones including plant species to be used;
- Concept layout of street trees including tree species to be used. Where exotic species are to be used identify areas;
- Concept layout of any open water storage and treatments to embankments and water quality management measures to be undertaken;
- Specify in square metres size of each POS area individually (+/- 10%);
- Specify percentage of lawn and garden for each individual POS (+/- 10%);
- Specify in square metres amount of irrigation required for turf in each POS including road reserves (+/- 10%);
- Specify in square metres amount of irrigation required for gardens in each POS including road reserves (+/- 10%);
- Specify water source points, sustainability of water resource (type of resource ie superficial aquifer, Leederville or Yarragadee aquifer or other) and estimated water amounts required annually for each POS shown (+/- 10%);
- Specify intended use of each POS to 'Liveable Neighbourhoods Version 3' requirements; and
- Specify type of paving to be used and the required areas for paving in square metres.

NOTE: The DAP Landscape Plan will require a Planning Policy Statement that at subdivision stage a condition is to be imposed which requires the Developer to provide detail designs to the satisfaction of the City on how the POS areas will be constructed and finished through a Landscape Implementation Plan for individual POS areas and adjoining road reserves.

Landscape Implementation Plan - Following endorsement of Landscape Plan (DAP) for DGP

As part of the DLAP Planning Policy Statement after the Landscape Plan (DAP) is approved, landscape construction drawings and a maintenance schedule is submitted as a Landscape Implementation Plan (LIP) for approval prior to clearance for construction. The plan should clearly show all POS areas and the detailed intentions of the design and construction. Approval by the City is required for the Landscape Implementation Plan. The scale should be a minimum of 1:200 in size and clearly show all the detail as noted below with information provided as:

- Layout of proposed road network;
- Layout of all proposed lots;
- Earthworks and soil profile modifications including nutrient and moisture retention measures;
- Details on all parking bays adjacent to or within POS (dependant on requirements of the POS);
- Detailed design of all proposed lawn areas including land contours;
- Itemise all planting species to be used (including street trees). Identify where or if exotic species are to be used;
- Layout of all proposed planting;
- Detailed design of all proposed irrigation, types of fixtures and connection points (an 'As Constructed' drawing will be required for the City after the installation of irrigation) and watering regimes;
- Details on all furniture and fixtures including lighting, seating, fences, structures and rubbish bins;
- Details on all paths to be constructed;
- Details on entry statements if applicable;
- Details on storm water flow paths through POS areas;
- Specify water source points, sustainability of water resource and estimated water requirements annually for each POS shown (+/- 5%);
- Layout of any open water storage areas, treatments to embankments and water quality management measures to be undertaken including Water Sensitive Urban Design (WSUD) and mosquito management if applicable; and
- Specify type of paving to be used and the required areas for paving in square metres.

NOTE: Prior to construction, the Landscape Implementation Plan and a Maintenance Agreement for any POS areas must be approved by the City. For further information on maintenance agreements see *Section 9d Landscape POS, Reserves and Entry Statements*

Landscape Implementation Plan (Suitable for smaller development planning application where minimal design requirements as set out below) -

A Landscape Plan shown as a Landscape Implementation Plan may be required for any proposed subdivision development application.

The standard conditions for development applications are:

The submission of a landscape plan to the satisfaction of the City of Busselton.

The Plan should:

- Indicate the location and species of all trees to be removed and / or retained;
- The location and type of fencing to be installed;
- The location and type of reticulation to be installed; and
- The location and type of paving to be installed.

The Plan should also include:

- A plant schedule nominating each species,
- The spacing of each species;
- The numbers of plants required; and
- The size of each plant to be used at the time of planting, together with the anticipated height of each plant at maturity.

The Plan should identify and include any adjoining road verges. The Plan must be submitted and approved prior to the issue of a building licence.

Landscaping and reticulation to be established in accordance with the approved plan(s) prior to occupation of the development and thereafter maintained to the satisfaction of the City of Busselton or Landscaping to be upgraded, in accordance with an approved plan(s), prior to occupation of the development and thereafter maintained to the satisfaction of the City of Busselton.

To ensure compliance to the requirements please read in conjunction with City specifications:

Section 9b Landscape Irrigation.

Section 9c Landscape Road Reserves/Nature Verge.

Section 9d Landscape POS, Reserves and Entry Statements.

Section 9e Landscape Plant Species.

Section 9f Landscape Environmental Weeds.

Section 9g Landscape Entry Statements

Integration of Additional Information into Landscape Plans

As part of the development of landscape plans it may be necessary to introduce additional information into a Landscape Plan that may be relevant within the context of the design to ensure compliance to WAPC or City conditions of approval. This may include but not limited to:

- Foreshore / Bush land Management Plan;
- Water Management Plan / Drainage and Nutrient Management Plan;
- Environmental Impact Assessment;
- Environmental Management Plan;
- Mosquito and Midge Management Plan;

- Noise Mitigation Plan;
- Acid Sulphate Soils Management Plan;
- Weed Management Plan; and
- Other Agency or Community Management Plans.

Nature Verge Landscape Plans

As part of 'Water wise' principles, the City accepts qualified design and maintenance of verges other than lawn by planting with indigenous species where it can be demonstrated that no liability for City maintenance and all safety issues are addressed.

Nature Verge Landscape Plans are a separate requirement to all of the above Landscape Plans and must be submitted for assessment prior to construction. To ensure compliance to the requirements of Nature Verge Planting please read *Section 9c Landscape Road Reserve / Nature Verge*, plan details must include:

- All surrounding infrastructure including road, crossovers, footpaths, power lines, boundaries and distance to nearest intersection;
- Plan layout of all planting and other materials to a nominated scale of no less than 1:100;
- Naming of all species to be used including their locality, height at maturity and spacing;
- Irrigation information ensuring no water is to spray outside of verge planting area;
- Type of materials to be used other than plants and mulch (The City will prefer plants and mulch only);
- If no existing footpath, show pedestrian access through verge to a minimum of 2 metres in width; and
- Maintenance requirements and maintenance regime.

To ensure that pedestrian safety and motorists sight lines are considered in the design of a Nature Verge some further consideration should be given to:

- Installation must be 'Water wise';
- Plants to be less than 75 cm at maturity and not contain sharp edges or poisonous properties;
- Pavers (max 33% of area) not to be used for pedestrian thoroughfare or car parking (pavers preference is red clay pavers, non slip and bedded flush to kerb and crossovers and other inspection lids with no trip points);
- Planting to not interfere with vehicle or pedestrian sight lines;
- No loose stone aggregates;
- Pedestrians to have easily managed access path through verge (parallel to road) by existing footpath or allowance for access footpath;
- All reticulation to be set at ground level height;
- Mulch to be contained within designated area;
- Allowance for bins on hardstand; and
- Flush ground levels with surrounding infrastructure are to be retained.

See *Section 9(c) - Landscape Road Reserve and Nature Verge* for a generic list of preferred plant species.

5 DESIGN ELEMENTS

VISUAL

- Native plants and other natural resources reintroduce a natural element into the landscape which has been degraded, previously cleared or is uninviting;
- Native plants provide a wide range of colours, forms and textures which can be used as features themselves to highlight architecture, screen unsightly areas and provide passive climatic control;
- Defines a greenbelt in parks, streetscapes and can create shade avenues;
- Complements the surrounding vegetation to reserves or enhances an existing group of trees; and
- Forms a major part of the original character of an area.

ENVIRONMENTAL

- Mimic as close as possible with the natural surrounding landscape;
- Improve water bodies through Water Sensitive Urban Design (WSUD) principles and minimise irrigation of areas;
- Ensure garden escapees or environmental weeds are not introduced to the site;
- Native plants reduce or remove the use of fertiliser;
- Minimal or no lawn areas reduce or remove the use of fertiliser; and
- Provides a habitat for the retention of local wildlife.

SUSTAINABILITY

- Provide a landscape that is minimal in maintenance;
- Where possible plant in winter and only water if plants are stressed;
- Use local species that can withstand local conditions; and
- Ensure species can attract native wildlife.

5.1 Factors Affecting Choice of Species

Wherever possible in the design and implementation of a landscape, the City of Busselton requires an ecologically sustainable development approach.

The easiest and most compatible type of sustainable development is by planting seedlings or younger plants endemic to the region of the South West over the winter months. This provides minimal energy, water and cost input and a long term sustainable outcome. To offset seedlings or younger plants then individual larger container tree and shrub species can provide a mix to offset heights initially. This will depend on the initial screening requirement of the site.

Where most issues occur in the requirement for native species is the supply of stock on short notice. With most developments there is sufficient lead time from the planning process to source or provide suitable species by ordering in advance to either grow from seed or source from contract or wholesale growers. The City will not support the use of substitute exotic plant species in the implementation stage of the Development if City approval of a Landscape Strategy or the Landscape Plan (dependent on the development) has taken place more than 12 months previously.

SELECTED NATIVE PLANTS

Particularly those indigenous to a region, will successfully grow in environmental conditions similar to where they naturally occur and have a low water requirement and biological advantage. If selected carefully they can provide an attractive, low maintenance landscape area and introduce birds and other wildlife into a living space.

EXOTIC PLANTS

Are sometimes preferred for their visual effect, flowers, leaf, shape or fruit which provides contrast to local species. They generally have a higher water requirement, may be drought intolerant and have a higher maintenance requirement for fertilisers, insect control, water and nutrient management. Exotic plants can only be accepted (subject to City approval) in a node and less than 10% of a planted area.

CLIMATIC FACTORS

Considerations in reference to a general acceptance of global warming or climate change do have a bearing on choice of plant species. Types of choice can also be from variances in the local topographic region and seasonal changes that occur. In all instances the more local species that are used the more adaptable they will be to slight variances in the climate and to changing conditions. Further local conditions may create micro climate sites and should be considered through:

- Rainfall and drought;
- Range of temperature;
- Proximity to the ocean (humidity and salt);
- Prevalence of wind; and
- Degree of frost.

SOIL FACTORS

Soils are either acid or alkaline (pH scale from 1 - 10). A pH of 7 is neutral, while a value below 7 is acidic and a value greater than 7 is alkaline. Most plants prefer a neutral to slightly acidic soil (ie. pH of 6 - 7). Other soil constraints include:

- Underlying geological formation (limestone, granite, etc.);
- Soil texture, chemical and mineral composition, acidity, salinity, organic content, etc.; and
- Soils must contain minerals, organic matter, water and air.

SANDY SOILS

Sandy soils consist of sand and air, are very porous and will not hold water or retain nutrients. Many plants thrive in sandy soils, particularly if mulched with organic matter. Plants can be planted deep in the soil.

CLAY SOILS

Clay soils have poor drainage and easily become waterlogged on flat sites and when dry, become hard and shrink. Planting on raised mounds is preferable. It is important that topsoil containing organic matter is maintained on clay sites. This can be achieved through introduction of mulch on the surface as a minimum preparation in building permeable topsoil.

LOAM AND GRAVEL

Loam and gravel are the best landscape soils, containing a proportion of clay, sand and organic matter; both hold water, drain water and retain fertilisers. Soils can vary from sandy to clayey loam or gravel.

TOPOGRAPHIC FACTORS

This will be dependent on the site. As a general rule passive use of planting will improve living spaces on private developments. Examples of this include:

- Planting trees and large shrubs to the western side of buildings for afternoon summer shade and cooling of building;
- Planting deciduous specimen trees to northern aspect to provide winter sun and warming of building;
- Provision of breezeway or corridor to south western aspect for cooling of building from summer sea breezes;
- Open aspect to north east for winter morning light and warmth to building;
- Lower planting to North West to provide winter afternoon sun and warming of building, this also lessens North West storms falling trees across the development; and
- Water intensive zones to south, south east, east and north east aspect dependent on sun requirements.

SITE FACTORS

On most developments sites, the ground surface has been disturbed, topsoil has been lost, surface artificially compacted, the natural water table has changed, flat areas poorly drained and soils are devoid of organic and mineral content.

To provide suitable preparation of the ground the soil may need modification so that surface water infiltrates the soil, by ripping the sub-surface and/or by introducing humus rich topsoil 80 - 100mm thick.

6 CLEARING AND TOPSOIL MANAGEMENT

6.1 Clearing Operations

Clearing of vegetation is the developer's responsibility. No clearing shall be permitted until all clearing conditions have been approved. As part of the City's environmental procedures and practices it is imperative that all issues in relation to any natural vegetation clearing is addressed and approved by relevant government agencies prior to any physical removal work - this may involve Federal, State and Local Government requirements. This will be dependant on the sensitivity of the site and conditions that may include at least provision of an Environmental Impact, Assessment and Management Plan as a minimum. Special site investigation at specific time/s of the year may be required for Declared Rare Flora or Conservation Priority Species by the Department of Environment and Conservation prior to any clearing being approved. Further consideration as to Federal laws may be required if vulnerable species are involved.

Clearing operations need special care to avoid unnecessary damage to the native flora and displacement of fauna. Planning approval conditions will require the Contractor and site Developer/Applicant to protect all vegetative material which does not have to be removed.

Limiting clearing area is important to conserve vegetation. Proper treatment and regeneration will enable a rapid recovery following construction. Road building and services plans must be submitted and approved prior to commencement of works. The site will then be required to be pegged for clearing and inspected by an authorised City representative prior to clearing once all statutory requirements have been met.

Vegetative material resulting from clearing work is too environmentally valuable to be pushed into heaps and burnt. Before clearing starts steps should be taken to ensure that all millable timber is first removed. Where good quality natural under storey vegetation is to be removed, use in brushing techniques or mulching to assist in regeneration and stabilisation. Where timber cannot be disposed of in any other way, it should be stacked and mulched using a wood chipper or large mulcher and reused within the development.

An alternative if not sustainable to mulch on site is to transport the material to the nearest regional waste disposal site and place it with other green-waste for mulching by the City. This requires payment of disposal fees. Burning is the least preferred option and not permitted in residential areas.

If burning has been permitted, care is to be taken to keep stacks clear of other vegetation and positioned to avoid nuisance by smoke impact or ash deposit to residences and industrial premises. Permits will be required during the restricted burning period (Contact the City's Fire Control Officer for dates of restricted and prohibited periods).

All clearing operations should be carried out using a root rake or a loader fitted with teeth on the bucket to ensure that clearing material to be stockpiled is free of soil.

This enables the valuable top layer of soil containing seed and humus, to be retained for respreading and regeneration.

6.2 Topsoil Management

Topsoil has many functions; the main one is the ability to provide a seed bank within nutrient and mineral rich soil for stabilisation of banks and the rehabilitation or regeneration of degraded areas.

Topsoil management is the management of soil considered capable of containing organic matter including minerals, seed and other nutrient material. Where topsoil exists within a development site then this should be used within the same development to ensure viability of growing plants in suitable soils without additional fertilisers and additional natural resources being required.

Once all vegetation clearing permits have been obtained by the developer, clearing then can be undertaken as described above. Once all vegetation has been removed by rake or grubbed out then areas to be reworked containing topsoil are to be excavated to a nominal depth and stockpiled away from where changes in fill heights, service trenches and roads are to be constructed. A nominal depth will be dependant on the site but generally between 80mm and 400mm.

Topsoil can generally be divided into 2 categories. One category is topsoil containing a high percentage of weeds and grass seed that can be used as a cover over final fill heights where stabilisation to embankments and building lots is acceptable. The second category is where minimal weed infested natural bush land has been cleared and the topsoil has a seed bank of viable native seed. This topsoil is considered a very valuable resource and should be kept clear of other contaminants. Where areas are identified for rehabilitation particularly within POS areas, drain embankments, nature reserves etc then this topsoil will provide a base source for regrowth opportunities.

Topsoil seed bank viability is considered only relevant if the topsoil is re-spread from stockpiles within a maximum period of 12 months to provide stabilisation and revegetation opportunities.

7 WORK PRACTICES

7.1 Timing

Plant trees, shrubs and groundcovers immediately after first rains (25mm+) (approximately June/July) if planting zones are to be non irrigated. Ensure this period is prioritised for non irrigated planting for winter establishment.

Grass and weeds should be treated with herbicide and / or removed from the area a minimum of 2 weeks prior to planting.

7.2 Planting

Planting stock should be healthy and undamaged. Trees should be straight, strong and of good shape, all plants should be free of disease and insect damage and not pot-bound.

Planting beds should contain a good top soil layer between 80 mm up to 300mm. Where good top soil is absent this should be imported. A minimum layer of 80mm mulch should also be used as a surface treatment.

For each tree or shrub, a hole two or three times the root volume (in the case of bare root trees assume the size), should be prepared and this should allow for 200mm between the base of the container and the bottom of the hole. In clay soils, this should be increased and the sides and bottom of the hole broken up.

The hole should then be back filled with loose topsoil or a suitably prepared soil mix (slow release fertiliser plant pills to be added if required), The plant should be planted to the level it was in the nursery, back-filled with prepared top soil, thoroughly watered in leaving a 500 - 900 mm diameter dish (dependent on the plant size) around the plant and set below the surrounding surface for watering (except in clay which should be slightly mounded to prevent collar rot). Slow release fertiliser may be incorporated into the top soil as a separate option to plant pills.

Remove any labels which may interfere with plant growth.

7.3 Mulching

The surrounds (root zone) of all trees and shrubs are to be mulched to a depth of 80mm minimum. Mulch may exceed surrounding ground heights. Organic mulch is preferable to reduce moisture loss and soil temperature. Avoid having a thick layer of mulch surrounding the stem as this may induce collar rot.

7.4 Staking and Tying

Small trees and shrubs should not require staking and tying. However, where necessary, the same method as described for large trees may be used. With advanced trees 1.5 metres or more, Jarrah or treated pine poles approximately 50 - 70mm square or in diameter and set to 1.1 metre height is recommended. Two or three stakes may be required depending on the tree. These should be placed in the firm ground surrounding the tree.

The tying materials should be an approved tree tie that is broad and has some flexibility. The tree should be tied in such a manner that the tree stands plumb but has a degree of movement so that it does not become solely dependant on the stakes and ties for support. Staking should always be used where mowing or slashing occurs in the vicinity of the plant, for protection.

Ties should be inspected regularly to ensure they have not broken or that no injury occurs to the tree.

Guying and anchoring may be used on very large trees that have been shifted (transplanted) or trees which have blown over. Each tree should have three guy lines which support the tree at the same point. The guy lines should be enclosed with a material such as rubber hose where they rub the tree. The lines should be connected to stakes or pegs in the ground about two - three metres from the tree. Guys should be clearly marked for pedestrians and cyclists safety.

7.5 Irrigation

Watering of areas can only be considered if there is a sustainable supply of water. This will either be from a groundwater aquifer or a mains water connection. Sustainability generally will be if there is a groundwater licence and a dedicated volume available or in the case of mains water if this is economically viable.

The watering and irrigation of trees and shrubs is required most when they have recently been planted (establishment period) or where they are under stress. Water should be deep to encourage downward root growth.

Amenity trees and shrubs are often associated with irrigated lawns. In this case the water supplied to maintain the grass is usually sufficient for the tree. Where not growing in an area similar this there are two methods available:

- (a) Low volume trickle.
(Requires the use of a low volume drip system or micro irrigation sprinklers. Several drippers may be required for large trees).
- (b) The use of soil basins around the tree for manual watering
(Requires the diameter of the basin to be between 500mm and 900 mm and approximately 50 - 100mm deep to allow for a good soaking of water to be applied either by hose or truck. The basin should not however, hold water for long periods or "collar rot" may occur).

Whilst trees are being established, they should be kept moist with occasional deep watering rather than light frequent watering. A minimum of one full summer watering is generally required, preferably two summers. The best planting time is often during the first rains of June/July).

Reticulated irrigation, if installed, in public open space development or entry statements should be co-ordinated with the City's systems. See Section 9b Landscape Irrigation System Specifications for further details.

A temporary water meter may be installed by the developer for the first 2 years to help establish a non irrigated area and prior to hand back of any POS to the City the water meter will require removal by the developer.

7.6 Fertilising

Most trees and shrubs will respond to an application of fertiliser while some such as Banksia, do not. Fertiliser applications should coincide with the trees growing season(s). The type of fertiliser may vary according to plant species, eg. native or exotic and the pH level of the soil. Soils should be tested for nutrient and pH levels before trees and shrubs are planted. Fertilisers may be applied in solid or liquid form and should always be slow release. Slow release tablets / granules or blood and bone powder are common forms of fertiliser. It will be important to ensure that nutrients such as Nitrogen and Phosphorous is limited from a 'run off' perspective and will need to tie into the Drainage and Nutrient Management plans for control of nutrients into adjacent water bodies. No direct runoff of nutrients from fertilisers into a natural water body can be approved.

7.7 Maintenance

Maintenance of the POS Landscape is required by the proponent for a minimum 2 summers or up to 5 years (dependant on development and conditions of development) and the developer should be fully aware of the responsibilities in maintaining the POS. For the period of the approved maintenance period the developer must ensure that any public open space including road reserves is to be maintained to a high horticultural standard and should include;

- Check for and treat disease and insect attack;
- Choose plants that are long lived and hardy (native plants);
- Keep roots moist. Do not water native plants too often if at all. See that they obtain generous water occasionally;
- Plant trees and shrubs in masses to keep out the light and therefore retard weed growth. Thin out later if necessary;
- Protect plants against rabbits and other animals using tree guards and plastic surrounds which also assist with wind protection);
- Protect trees and shrubs in grass areas from mowing damage;
- Untie plants from stakes as soon as possible;
- 500 - 900 mm diameter of mulch around each plant, 80mm thick, not at the stem; and
- Replace any losses in planting in autumn each year;
- Prune any deadwood and remove weeds prior to seeding;

- Maintain paths and roads free of sand build-up or debris;
- Maintain any irrigation systems in good working order; and
- Maintain infrastructure from graffiti, vandalism and damage in general.

Further information in relation to maintenance (Maintenance Agreements) can be found under *Section 9d Landscape POS, Foreshore Reserves and Entry Statements*.

8 REGENERATION OF NATIVE VEGETATION AFTER CONSTRUCTION

8.1 Direct Seeding

All topsoil should be stockpiled for reuse prior to any constructed earthworks. Where top soil is removed it must be stripped and windrowed to the edge of clearing or to stockpile. Care should be taken to ensure that all topsoil is saved to allow the reuse by even coverage of the area to be rehabilitated. Topsoil should be classified into weed free or weed infested for reuse purposes.

The topsoil can be 80 to 400mm thick dependant on quality within the horizontal layer and is usually recognisable by the colour and quantity of roots and other organic materials contained in it. It is rich in plant food, containing seed, organic material and minerals which will aid in the regeneration and future growth of native flora (weed free). The thinner the layer of top soil the more important it is to retain it.

On completion of earthworks formation, the top soil previously put aside can be used to top dress batter banks and other denuded areas where regeneration of plant growth is required. Stockpiles must be kept stabilised to prevent dust nuisance and wind/water erosion.

Where possible, it is preferable to carry out this phase of construction during summer months as seed will be set and incorporated in the top layer at this time. Similarly, the top layer should be returned to areas to be top dressed prior to the winter rains. Winter rains will then rapidly germinate seeds (initially mostly grass/weed species) left in the soil. Further native germination will follow over the course of spring, summer, autumn and continue to germinate and establish over the following one to two years.

As a general rule, topsoil does not carry enough seed to substantially regenerate areas without further assistance in the process. Where good weed free seed bank topsoil exists then an additional 2 kg of seed per hectare is required. Where topsoil is from more degraded native vegetation areas and is similarly weed free then 4 kg per hectare of seed is the minimum rate for direct seeding. A general fertiliser containing Nitrogen, Phosphorous and Potassium (NPK) and minerals should be used at a rate of 200 kg per hectare will aid in the initial germination and early growth of native germinates.

Where topsoil is weed infested then direct seeding may be difficult to cultivate through competition and difficult herbicide control. Where it is expected that weeds may be a concern within topsoil then seedlings should be planted and a plastic plant sleeve added to control weeds and ensure seedling can be identified from loss through herbicide control.

8.2 Re-Establishment of Native Vegetation on Degraded Land or Land under Pasture

Where areas have become denuded, and it is desirable to re-establish plant growth for conservation purposes and soil stabilisation, flora that is indigenous to the area shall be utilised for the following reasons:

- It has proved capable of surviving the conditions which exist in the area;
- It is representative of the area; and
- It provides long term sustainable solutions to maintenance requirements.

There are 2 types of re-establishment methods that can be undertaken following the re-spread of topsoil. The best methods are either by direct seeding into the topsoil or planting seedlings into the topsoil. Both of these methods will require preparation and maintenance management prior to and once implemented to provide an opportunity for success.

Direct seeding can be the most natural outcome based result although if the site is not prepared and maintained, little germination may occur. Seed can be collected within the site prior to clearing (summer). For the best results use an accredited seed collector/merchant that can collect seed through licensing arrangements with DEC to provide suitable provenance correct seed. The accredited seed collector/merchant can provide seed that can be pre - treated to increase viability, ensure suitable provenance and better germination results through scarification, hot water treatment and smoke immersion.

After spreading of reasonably clean (grass/weed seed free) topsoil over the site, the area should be left for 2 -3 weeks to settle and allow any grass germination to occur first. The area deep ripped to 500mm vertical depth approximately 500mm - 1000 mm (dependent on type of ground) apart along contour lines for best results (the harder the more rips). The topsoil should be loose and permeable prior to broadcast of seed. Once seed has been broadcast at 4kg per hectare with 200 kg per hectare fertiliser then a light rake or harrow should be carried out to help bed the seed. It is important to keep seed close to the top of ground for germination. Further work required is to protect the site from a pest perspective ie rabbits, kangaroos and people and also to control any grass that may compete with germination. Only selective herbicide (broad leaf / narrow leaf) or wick wipers can be used once seed has been broadcast.

Where topsoil is considered contaminated with grass seed then it may be considered the most effective way of maintaining plantings is by the planting of seedlings. Where ground requires ripping follow the directions above and plant seedlings along rip lines. In its natural state indigenous flora receives protection from the wind and sun in the early stages of its growth; this protection can be provided for seedlings by plastic plant sleeves, surrounding plants or landforms. When exposure to elements are extreme ie coastal or moving dunes it is advisable to cut brush of a bushy nature and cover seeded or seedling areas with this material to give some shade and wind protection. Contouring may be required on sloping ground to prevent erosion.

Contour ripping of steep banks and borrow areas will also assist regrowth by collecting seeds, nutrients , soils, etc., and at the same time increasing water penetration, but should not be considered a substitute for respreading the top layer of soil.

8.3 Identification

The aim is to recolonise areas of cleared land with indigenous flora to reproduce as near as possible the original landscape of that area. Careful inspection must be made of soil type and existing flora to enable correct selection of plants to be made. If no plants are present in the area then other nearby vegetation complexes should be inspected with similar topography, micro-climate and soil type where natural flora is present. Careful inspection will reveal that there is an association of plants, trees, shrubs and ground flora, and will require identification prior to either seed collection or a species list.

8.4 Typical Planting Densities for Revegetation

<i>Tree Type</i>	<i>Tree Name (Examples)</i>	<i>Plants per 100 m²</i>
Large Trees	Eucalypt, Corymbia	1-3
Small Trees	Peppermint, Banksia, Melaleuca	3-4
Tall Shrubs	Melaleuca, Acacia, Hakea	10-20
Medium Shrubs	Melaleuca, Acacia, Hakea, Kunzea	20-30
Small shrubs	Verticordia, Hypocalymma, Pimelea	30
Ground-covers and Herbs		30
	APPROXIMATE TOTAL	95-115

For the planting of seedlings use the above table, where seeds are used, increase numbers by 65% to the required weight (4kg per hectare) except for trees which should be planted or limit tree seed to a minimal amount within the seed mix. Note that Peppermints will generate easily from seed. It is considered initially far more important to provide a suitable lower storey for protection and stabilisation of the earthworks together with diversity in flora. Trees need to be limited to ensure lower storey vegetation is provided with sunlight, trees also are more easily germinated.

Woodland/parkland design - reduce tall shrubs and medium shrubs by 50% (by weight) and increase lower storey shrubs to provide a local eco system balance between the flora, fauna and insects.

Further remedial works may be needed in the following autumn to provide coverage to unsuccessful areas by reseeding or replanting seedlings.

9 NATIVE SEED COLLECTION

There are several ways to collect seed for re-establishment works. In all instances employment of a professional seed collector will ensure that seed picked will be viable and correct husking, storage and pre treatment is undertaken. The preference is for areas deemed to be cleared should be picked prior to the clearing. This should be done over the summer months. In conjunction with this, topsoil management will provide an additional resource to be used during the re-establishment phase of the project. Seed collected this way will provide suitable provenance correct seed and ensure the integrity of local vegetation is retained.

Where there is limited seed available within the clearing envelope, seed may be sourced from either an accredited seed merchant (ensure provenance seed is available) or alternatively under strict City conditions and prior City approval a limited amount of seed (20% of any one plant can be picked) within City Nature Reserves. Where the Community manages the Nature Reserve then permission will need to be sought from the Community Group and the City. Other potential seed collection would be under Department of Environment & Conservation (DEC) lands and will require a permit from DEC to collect any seed. On any City reserves written approval must be obtained from the Director, Engineering and Works Services as a minimum and is subject to the following conditions:

- That the pickings are limited to twig size and from areas approved by the Director;
- The shape or look of the tree or shrub is not to be altered appreciably, and picking is to be taken from mature plants only;
- That where such picking is on developed property verges, adjoining land owners are contacted, to enquire as to whether they object to the picking;
- The picking is monitored by the City's Parks and Gardens Manager. If picking is felt to be detrimental to the location, the quantity, locations and frequency may need to be adjusted;
- Seed collection must have the approval of DEC;
- The approval is reviewed on six (6) monthly basis; and
- The picker/collector shall provide copies of insurance policies observe Traffic Regulations in roadside collection/picking and demonstrate Safety precautions such as the wearing of high visibility jackets and protective clothing.

a. Vegetation Associations

Type	Height	Description	Percentage Cover			
			100 - 70	70 - 30	30 - 10	<10
Trees	>30 m	High Woodland				
		High Open Woodland				
Trees	10-30 m	Closed Forest				
		Open Forest				
		Woodland				
		Open Woodland				
Trees	<10 m	Low Closed forest				
		Low Open forest				
		Low Woodland				
		Low Open Woodland				
Shrubs	>2 m	Closed Scrub				
		Open Scrub				
		High Shrub land				
		High Open Shrub land				
Shrubs	<2m	Closed Heath				
		Open Heath				
		Low Shrub land				
		Low Open Shrub land				
Sedges		Closed Sedge land				
		Sedge land				
		Open Sedge land				

10 TREE PLANTING

10.1 Trees in Paved Areas

Trees in the urban environment may be subjected to the following stresses:

- Air pollution;
- Heat stress;
- Shade, shadowing and wind tunnelling;
- Intrusion by adjacent buildings (including basements) and verandahs;

- Limited or no water, nutrients and air to the soil;
- Inadequate soil for the development of anchor roots;
- Underground services which may interfere with roots and limit their growth;
- Vandalism and damage;
- Poor or excessive pruning; and
- Stunting from limited width root barrier to the size of tree.

Trees in paved areas generally apply to road verges, civic areas, CBD's and where the public gather such as playgrounds, adjacent to car parks, etc. Wherever trees are used within pavement areas, there is always a potential for roots to cause damage by lifting the surrounding pavement or pushing on nearby infrastructure such as kerbs.

Wherever possible where trees are planted, a permeable type of pavement is preferred for water infiltration. The main pavement types typically used near trees are brick paving, concrete or asphalt. The following is recommended;

Brick Paving (including slabs and other modular materials)

- Provide root barriers of the widest diameter possible;
- Do not use plastic membrane under paving; and
- Ensure top of root barrier is flush with top of paving.

Asphalt and Concrete (includes other sealed products)

- Provide root barriers of the widest diameter possible;
- Cut out asphalt to at least the width of root barrier;
- Provide metal grate or other permeable surface to width of root barrier or cut out; and
- Ensure top of root barrier is close to flush as possible (allowing for grate or similar for complete flush).

Protection of the exposed area is essential (use mulch or tree grates) to prevent soil compaction. Where possible, opportunities for natural infiltration of water and air should be retained. The expected tree canopy should not interfere with lights, roofs, traffic or pedestrians.

Where brick paving is used, regular monitoring of the site to ensure any pavers do not lift and cause a trip hazard.

Root shields are preferred where infrastructure could be damaged for intrusive types of trees to protect structures or piping.

10.2 Protection of Trees from Excavation Works

It is likely that new structures built in close proximity to existing trees, will damage or destroy tree root systems. This may be compensated by thinning or reducing the top of the tree by a corresponding amount during the coolest time of the year and by the use of substantial amount of watering.

Where structures are to be built close to trees, it may be possible to construct breaks in the foundations to save roots from being destroyed.

To prevent roots from damaging new work, it is essential to use appropriate pipes. Pipes laid near trees must have sealed joints and be flexible. Alternatively, pipes should be ductile or cast iron with a minimum of joints. The pipes should be strong enough to withstand the pressures of root growth. A further alternative is the use of root shields.

When excavations are made for water, sewerage lines and service facilities, the trenches should be directed away from the trees. If it is impossible to locate the trenches away from the drip-line area, the best alternative is to excavate a tunnel, usually with a high-powered soil auger, under the trees' root system rather than to the sides. Backfilling should be carried out as soon as practically possible

If the rising of the pavers/pavement is required (change in existing ground levels), a coarse porous wall of material such as stones or gravel topped with mulch should surround the tree so that water and air can penetrate to the original ground surface level.

If lowering of the pavers/pavement is required, the soil should be retained by either a battered slope or retaining wall with weep-holes left at the new surface to allow water to drain into the tree. If roots are cut, the tree should be pruned back to compensate

10.3 Site Drainage

Clay soils have high water-holding capacity and trees planted in soils of this type require much less water but will often suffer from water logging unless the soil is improved or a drainage system is installed.

When planting in heavy to medium clay subsoil's, backfill the hole with a porous soil mixture and provide for drainage to prevent a sump forming. The addition of gypsum to clay soils will improve soil structure and improve drainage, if several applications are made over a two - three year period.

Drainage may be provided, by running a sub soil drain (eg. slotted PVC) from the base of the hole to the underground drainage system or, if land is sloping, from the base of the hole to some lower point at the surface. Ripping and contouring, with planting on ridges or windrows is an alternative.

Drainage of planting holes which are subject to minor water logging may be achieved by using the 'flower pot' principle. Here, the bottom 200 - 500 mm of the hole (beneath the root ball) is filled with rock or coarse gravel which provides a pit into which water will drain.

Over-watering of heavy textured soils leads to water logging which reduces plant growth and can lead to tree losses. It should be noted that some trees can tolerate heavy soils and/or high water tables. Success will depend on the species selection.

10.4 Watering Systems in Paved Areas

An adequate watering programme can be provided manually, provided there is sufficient surface area to absorb a quickly delivered volume and provided a water source is available. A coil of flexible, slotted agricultural piping can be laid in a 'corkscrew' fashion around the root ball when planting, leaving a length (150 mm with cap) protruding above the soil level which can conveniently be filled manually.

Reliance on rain falling on paved surfaces and being directed into or past the exposed soil area round each tree is effective as a supplement. Where new paving is being constructed, gentle cambers and/or dish drains should be located appropriately. Use of porous paving such as bricks or concrete pavers laid on sand with a permeable membrane will also allow some water to filter through. Wetting agents may be required to ensure water penetration.

Drip irrigation, micro-irrigation and trickle irrigation systems provide another supplementary approach to applying specific volumes of water to trees. They are water-efficient, as moisture is distributed by pipe to each tree and released through one or more drippers, trickle heads or micro jets.

- Water should be delivered up to twice per week in the warmest weather, at a rate of 10 to 20 litres each application. In winter, natural rainfall should be adequate.
- When adjusting the amount of watering in different seasons and weather, alter the frequency rather than the volume.
- Young trees can be adequately watered by a single or double trickle outlet positioned about 500 mm from the trunk.

10.5 Pruning in Urban Areas

Lower branches may need to be pruned so that the mature height of the tree allows a minimum 2.1 metre clearance at ground level for pedestrians, and a minimum of 4.5 metres clearance above local roadways. Arterial roads will require 5.5 metres above the carriageway.

Trees that may grow into overhead power lines or roof lines should be selected so that the fully grown height is below the power lines or gutters. Where a tree cannot be placed on the road reserve where over head power lines exist, the preference is to place the tree within the property line or alternatively supply a tree described as a large shrub or small tree but must be under pruned to 2.1 metres to allow sight distance for vehicles, (City approval required for alternative tree).

Other reasons for pruning may include:

Trees may become too large, block views, obstruct the sun's rays and grow too close to buildings.

Selected pruning may be necessary to improve the tree's vigour and shape, control vertical growth and influence flowering.

Pruning is necessary to remove dead, diseased, damaged, broken, rubbing and crowded limbs.

10.6 Common Pruning Practices

Dead-wooding - Involves the removal of broken, diseased, dying and dead limbs, crossed limbs, those which are weakly attached, and those of low vigour. Limbs must be removed according to the correct branch removal technique. Climbing plants should also be removed.

Raising the canopy - Involves the removal of low growing branches which block pedestrian and vehicular movements, obstruct views or grow too close to buildings.

Crown thinning - Involves pruning to thin out the tops of trees to increase light penetration. It is carried out on trees which have developed dense upright limbs with laterals and reduces the resistance and weight at the top of the tree. It reduces the need for the tree to grow long branches. Another form is vee pruning under power lines.

Thinning out - reduces the height and spread of trees while retaining their natural shape, giving the impression that the tree has barely been pruned. It involves pruning branches back to lower laterals and trunks which are at least one third the size of the removed branch, and takes time and requires skill. Observations have indicated that trees which have been thinned out take longer to grow back than trees that have been lopped as the tree does not need to grow vertically to gain sunlight. A minimum of branch cuts is the objective to minimise suckering and reduce resultant "cancers".

Heading - Also known as pollarding. It involves pruning main branches back to stubs or to cut all growth down to a level, and is used almost exclusively to maintain a reduced tree size, especially under power lines. Regrowth from below the cuts is vigorous and upright, with the branches attached weakly to the older branches. It also destroys the nature of the type and increases future maintenance. A better alternative is either to thin and/or prune to vee shape under power lines or remove the tree and plant a more appropriately sized species.

10.7 Improving the Health of Existing Trees

Most mature trees in paved areas do not receive adequate water or air to the roots. A weekly soak during dry periods may be necessary depending on groundwater interface and also exposing soil in the root zone to air is important.

It is preferable to feed deciduous and evergreen species with a slow-release fertiliser at the correct time of the year and at the specified rate, wet the soil after the application. For evergreen native species, use blood and bone at the specified rate or a slow release fertiliser tablet when trees are young. It is important to always consider nutrient loading to the natural water systems and minimise use of fertilisers at all times. Native trees are preferred at all times to reduce fertiliser use.

Increase oxygen availability in compacted topsoils by scarifying, taking care not to damage or disturb the feeder roots. Add mulch, and protect the area from further compaction. Mulching provides the benefits of less frequent watering, keeping the roots cool and checking weed growth.

Professionally treat for disease and insect attack (if apparent) promptly.

Altering drainage patterns may cause soils to become poorly drained and subsequently waterlogged. In these circumstances, additional drainage (eg. impervious wall, underground or redirected run-off) will be necessary.

Consult an arboriculturist or horticulturist for advice on specialist tree maintenance.

10.8 Retention of Vegetation to Foreshore Reserves

Retaining natural vegetation within a foreshore reserve is a priority in the first instance where there is an opportunity to provide the public with a linear connection along natural watercourses or the coast. Watercourse and ocean front areas may already have some established trees or understory vegetation and generally provide contoured and interesting landforms for passive use where appropriate. Development of passive areas along or near water courses should always be balanced with high conservation measures through rehabilitation and revegetation.

- Clearing can be regulative in process and is similar to any clearing approval as set out under Item 3 Vegetation Retention within a Development.
- Written approval for clearing of fire breaks, maintenance or safety may be obtained from the Director, Engineering and Works Services.
- No Peppermint trees larger than 100mm in trunk diameter measured at 1.5m above the ground shall be removed. Pruning is limited to clearance of power

lines, property overhang and/or creating headroom or height clearance. Tree removal is limited to the requirement for fire breaks or pedestrian (public) access paths or maintenance access.

- The width and height of clearing of the undergrowth and trees be restricted to three (3) metres for pedestrians and five (5) metres for fire breaks. Dependent on the position of trees under pruning may suffice to give mower or maintenance vehicle access;
- Rehabilitation of disturbed or cleared areas further planting of WA Peppermints or other approved local native species only, is permitted in coastal and riparian areas of creeks, rivers, wetlands and lakes;
- Apart from firebreaks, reserves shall be retained as far as practicable as natural vegetation and in the natural contour form;
- The cleared area be maintained free of debris and rubbish; and
- The approval for clearing applies generally for the length of the property adjoining the reserve only.

11 FENCING

Where so specified, fences may consist of one or more of the following types for subdivision lots, adjoining POS or other reserves, roads, footpaths, protection of vegetation, habitat, access control, etc. The fence must be uniform in design and construction and shall comply with the specific requirements of the site and at all times provide a combination of aesthetic function and purpose.

To determine a fence suitable for inclusion within the subdivision the following provides some typical design parameters;

Bollards (vehicle access)

- Nominal bollard post diameter is not less than 150mm;
- Post spacing is to be not greater than 1.5m between centres;
- Post tops to be chamfered;
- Where placed near car parks or road edges bollards shall be 1100mm above ground and 900mm below;
- At park edges, bollards shall be 750 to 900mm above ground and 450 to 600mm below ground;
- Concrete footings where required for each post to be 450mm x 450mm and between 450mm and 600mm in height dependent on length of bollard;

Post and rail with chain wire mesh (dog / rabbit proof)

- The rails both top and bottom (where used in conjunction with mesh) diameter is 100mm. The top rail shall be nominally 50 - 150mm below the post top and 50 - 100mm above natural ground height;
- Nominal post diameter is not less than 125mm;
- Nominal rail diameter is not less than 100mm;
- 7mm diameter galvanised fixing round head bolts being used. Nuts and protruding bolts thread shall be countersunk and recessed;
- Post spacing is to be 2.4m maximum

- Chain wire mesh to be 1350mm high with nominal 50mm mesh, wire shall be 2.5mm diameter, galvanised and knuckle selvedge
- Tension wire for chain wire support shall be provided at centre and bottom of fence and be 3.15mm diameter and galvanised. Ties to be provided along tension wire at 450mm intervals and galvanised stapled to top rail;
- Concrete footings where required for each post to be 425mm x 425mm x 600mm;
- Stays/bracing to be provided at terminal points;
- Gates to be galvanised and self closing;
- Rabbit proof mesh to be installed at horizontal along ground for 400mm and bent vertically (right angles) and fastened to wire mesh for 400mm to prevent rabbits digging under bottom rail.

Post and wire (vegetation protection)

- Strainer Posts: Treated CCA pine, 175 - 225 mm diameter, at least 900mm in ground.
- Intermediate Posts: Treated CCA pine, 125mm - 150mm diameter, at least 600mm in ground.
- Struts: Treated CCA pine, 100 - 125mm diameter.
- Strainer assemblies - maximum distance apart 100m.
- Intermediate posts 4 - 6 metre centres, with one (1) 1.2 m steel dropper in between. Wire strapped to dropper through drilled holes. Wire to pass through intermediate posts.
- Wire: Four (4) line plain wire PVC coated 2.0mm diameter galvanised wire.

Shade cloth 750mm wide may be fixed to the bottom of the fence to assist in controlling sand drift or to shelter vegetation from wind or salt spray.

11.1 Fencing Subdivision

URBAN AREAS

Uniform fencing shall be a maximum height of 1800mm (unless specifically approved otherwise by the City) and may be constructed of timber, super 6 (painted and capped), brick or masonry, or other materials as deemed appropriate for the situation and approved by the City.

Brick or other masonry piers where required shall be a maximum of 300mm above the fence line and provided at an interval of not more than 7.5 metres for brick or masonry fences and 6 metres for all other fences.

In considering applications for uniform fencing, the City may impose a condition requiring the treatment of such fencing as may be affected with a non-sacrificial anti-graffiti coating upon or prior to its erection, to the satisfaction of the City.

RURAL

Where special rural lots abut a POS or PAW uniform fencing is to consist of:

- 3 strand wire (2mm high tensile);
- Jarrah or CCA treated pine timber posts (100-125Ø) @ 5 m centres;
- fence height to be 1200 mm; and
- box strainer assemblies at not greater than 200 m or change of alignment greater than 5° deflection.

To reduce the extent of uniform fencing along major roads, the City will:

- (a) Encourage the provision of service roads and the extension of cul-de-sac heads to abut the major road, to break the continuity of the fence and provide view lines.
- (b) Where the integrity of the structure plan is not jeopardised, promote the provision of other non-residential land uses adjacent to major roads.

Where cul-de-sac heads and service roads are located immediately adjacent to regional roads or other roads of district importance, the City shall require the provision of barrier fencing along the common boundaries of these road reserves. Such fencing shall consist of bollards, posts and rails or other low, open design as approved.

12 TRACKS

12.1 SPECIFICATIONS FOR ACCESS TRACKS

Base and Surface:	(a)	On sand 150mm thickness or on gravel 100mm thickness compacted fine gravel or fine crushed limestone base;
	(b)	Light seal of fine aggregate and bitumen emulsion;
	(c)	2%-5% cement stabilisation can be used on some gravels to reduce base depth or to strengthen base in poor foundation soils;
	(d)	Heavy layer of medium coarse mulch - mixed bark chip and leaf may be used for informal, low use paths;
	(e)	Asphalt seal with moderately high bitumen content 25mm thickness in limestone a 20mm in gravel. Apply a touch coat;
	(f)	Boarded walk; and
	(g)	Rubber mats, chained slats or sleepers.
Cross Section:		Flat, one way 2% crossfall or with crown 2% crossfall.

13 STEPS

13.1 SPECIFICATIONS FOR STEPS

Slopes:	Greater than 20%. Rest platforms should be constructed at centres of not more than eight (8) metres (horizontal) of steps.
Steps Treads:	1 metre to 1.5m long, 250mm wide x 50mm thick hardwood or 650mm thick treated pine.
Vertical Height:	(The rise between treads) Maximum 175mm.
Stringers:	270mm x 50mm hardwood or treated pine.
Hand Rails:	100mm x 50mm, Stringers should be firmly bolted to at least 150mm diameter or 100mm x 100mm timber posts, etc., sunk at least 1.35 metres into permanent sand by jetting.
Maintenance:	Normal maintenance to keep in a safe condition, with extra work necessary where damaged by high seas.

14 SIGNS

Signs requesting the public to use tracks, and not to damage coastal vegetation, should be placed at each end of the access track.

15 FURTHER READING

Section 9a Landscape, Revegetation and Stabilisation - General Guidelines (*this document*)

Section 9b Landscape Irrigation System Specifications

Section 9c Landscape Road Reserve / Road Verge

Section 9d Landscape Public Open Space (POS)

Section 9e Landscape Plant Species

Section 9f Landscape Species Environmental Weeds

Section 9g Landscape Entry Statements