Engineering and Works Services Standards and Specifications

Section 8

Requirements and Guidelines for Reserve & Foreshore Works, and Tree Management

These Standards and Specifications have been adopted by Council, and are required to be applied in the City of Busselton for all reserve developments and foreshore works approved by Council and carried out by Consultants, Contractors, Developers and Council Staff. These Standards and Specifications will be maintained by the Director, Engineering and Works Services.

MARCH 2001 (STANDARD 8)

Index

1 General

1.1 Council Policies

1.1.1 Council Policy 134/3 - Foreshore Reserves – Works and Development

Policy On Works And Development. It is council policy to preserve the land form and natural vegetation of coastal and foreshore reserves while providing public and adjoining occupiers reasonable access.

Council Policy 132/3 - Park and Reserves

Organisations or persons requiring the use of any park or reserve, (other than playing fields) may be granted approval for that usage by submitting a written application at least 4 weeks in advance, to the Chief Executive Officer. The application will be referred to the Parks & Gardens Co-ordinator for appropriate action and any approval given may be subject to certain conditions involving the siting of vehicles and structures, the use of power, prohibiting unauthorised alterations to the electrical system, information on underground reticulation points, the digging of holes in the ground surface and any other relevant information.

Council Policy 215/2 – Processing of Green Waste from Development Sites

It is the policy of Council that where green waste is generated from the clearing of a major development or subdivision site, that, where practical, not be burnt but processed and reused on-site.

Council Policy – 082 – Rehabilitation Policy

It is the policy of Council that where green waste is generated from the clearing of a major development or subdivision site, that, where practical, not be burnt but processed and reused on-site.

Council Policy – 185/3 – Subdivision Contribution

It is Council Policy to require a verge improvement contribution as a requirement for urban subdivision clearance charged on a per lot basis. Contributions so obtained are to be kept in an asset account with the funds to be used at the appropriate time in the general locality of the contributing subdivision. The contributions are for the purpose of improving verges by tree planting, stabilisation of soil, minor earthworks and enhancement or protection of existing vegetation.

1.1.1.1 These standards and specifications have been developed for all subdivision, development and Council reserve development and foreshore works associated with subdivision and property development, to reflect Council's policy.

1.1.1.2 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 an annual basis. Additions, deletions and amendments will be regularly circulated to those on the distribution list as held by the Administration Assistant, Engineering and Works Services Division on (08) 9781 0402.

1.1.1.3 A meeting or management order issued by the Department of Land Administration in the name of Council, is required for Council to have the authority to approve, carry out or direct works on reserve.

2 Reserves

2.1 Clearing

2.1.1.1 Council may consider approval of clearing of reserves by adjoining property owners and/or its staff where it can be shown that the reserve will be enhanced or developed for the community benefit and environmental impact is positive. Clearing for development or construction on any reserves requires written approval from Council. Written approval will be conditioned with the ongoing management and maintenance of the reserve.

2.1.1.2 Written approval for clearing of fire breaks, maintenance or safety may be obtained from the Director, Engineering and Works Services subject to the following conditions:

- No trees larger than 150mm in trunk diameter at 0.6m above the ground shall be removed. Pruning is limited to clearance of power lines a 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.

- That 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;

- That for rehabilitation of disturbed or cleared areas natural grasses and further planting and WA Peppermints or other approved local native species only, is permitted in coastal areas;

- That apart from firebreaks, reserves shall be retained as far as practicable as natural vegetation and in the natural contour form;

- That the cleared area be maintained free of debris and rubbish; and

- That the approval for clearing applies generally for the length of the property adjoining the reserve.

2.2 Development

2.2.1 Management Plan

2.2.1.1 Where required by the Ministry for Planning (MFP) acting as the subdivision agency for the WAPC or otherwise required by Council as a condition of subdivision or development or where agreed between Council and the developer or landowner, reserve areas adjoining or within the development shall be developed, rehabilitated or constructed in accordance with Council's specifications, conditions and where required - a Management Plan. All Management Plans are to be adopted by Council for all foreshore reserves.

2.2.1.2 An overall Concept Development and Management Plan of development for the reserve shall be submitted to Council for approval in principle prior to submitting detail working drawings. Council approval is not required in the case of Council's over budgeted works, however, consultation with adjoining property owners and residents is required before commencement of the works. In the case of dispute or objection, the matter shall be referred to Council.

2.2.1.3 A Maintenance Agreement based on the Management Plan shall be entered into with Council as part of Council approval with a proponent of reserve development. The Agreement shall be legal in nature and be prepared at the cost of the developer.

2.2.2 Clearing

2.2.2.1 Site plans shall be annotated to clearly show areas "to be cleared". Where approved, all standing timber, scrub and other vegetation, including roots to a depth of 300mm, are to be removed and disposed of in accordance with Council's requirements. Any trees designated for retention shall be protected from damage to roots and trunks.

2.2.2.2 100mm of topsoil from all cleared areas to be earth-worked, shall be stripped and stockpiled for later respreading as directed by Council's Officer.

2.2.2.3 Rehabilitation of disturbed or previously degraded areas will generally be required as a condition of approval for clearing or reserve development, or as a condition of development approval.

2.2.3 Land/Form - Earthworks

2.2.3.1 Change to the land/form of reserves requires Council approval. Once approved, the site shall be worked to the levels and grades shown on the approved drawings, suitable for the designated type of recreation activity or purpose, i.e. active, passive or conservation, etc.

2.2.4 Compaction

2.2.4.1 Fill, where applicable, shall be placed in layers not exceeding 300mm in thickness, be watered and rolled to achieve a minimum compaction of the surrounding natural soil.

2.2.5 Irrigation

2.2.5.1 Where irrigation of a reserve is approved by Council, the designer shall determine from Council's authorised representative preferred sprinklers, valves, cabinets, hoses and pipes, controllers, electricity and other equipment, and wherever possible specify identical or compatible equipment. A schedule of preferred equipment can be provided.

2.2.6 Planting

2.2.6.1 Plant Species lists of the most common natural and other native species are available from Council. (Refer Section 9b – Street/Road Verge – Landscaping, Revegetation and Stabilisation) The working drawings and specifications to be approved by Council, shall include a schedule stating type, species, number, size of pot, seeds, trees, shrubs, ground-covers, herbs and grasses to be planted. The plan shall show the location and density of planting the specifications shall show detail on how the plants are to be planted, fertilised watered and protected. A maintenance schedule is shown.

2.2.7 Post and Rail Fencing and Bollards

2.2.7.1 Where so specified, the perimeter of reserves adjoining roads or where barriers are to be used on reserves of any public space for protection of vegetation or access control, are to be fenced with CCA treated pine post bollards or post and rail fencing in accordance with the following:

- Nominal post diameter is not less than 150mm;
- The rail (where used) diameter is 100mm to 150mm, where required. The top of the rail shall be nominally 50mm below the post top;
- 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 where rails are required, and rail length is to be 3.6m, and the gap between end of rails is to be 600mm;
- Post spacing is to be not greater than 1.5m between centres where bollards only are required;

The post length for post and rail is to be 1200mm, set 450mm in the ground with 200mm concrete to 100 mm below ground level for post and rail, and 900mm above the ground. Bollards shall be 1200m to 1600mm long. 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 900m above ground and 450 to 600mm below ground. An alternative to concreting posts into the ground is fixing an anchor to the bottom of the post to prevent withdrawal.

- The post tops and rail ends shall be chamfered.

2.2.8 Private Property/Reserve Boundary Fencing

2.2.8.1 Where private property adjoins reserves, fencing shall be one of the following types and as specified by Council's Planning and Building Services Division:

- Open steel with masonry pillars;
- Open picket on post and rail;
- Solid masonry; or
- Pre-painted or powder coated steel.

2.2.8.2 Council is not responsible, under the Dividing Fences Act, for the cost of fencing boundaries of any reserve including public accessway and road reserves adjoining private property. This is the responsibility of the adjoining land owner.

2.2.9 Vegetation Protection Fence

The standard minimum protection fence for vegetation is a 3 plain wire white PVC coated and logged fence, set at the edge of vegetation. Posts 75-100 mm diameter shall be spaced at not greater than 4m with strainers 150-175 diameter, strutted and not greater than 100m spacing. Strainers shall be provided at each opening. Other fences may be approved as variations on the standard (Refer also Section 4.2.4 this Specification).

2.2.10 Playground Equipment

2.2.10.1 Playground equipment may be installed in each public open space development irrespective of active or passive use. Modular units are to be provided where a need is identified by Council through the Manager - Recreation Services. Consultation, where applicable, will take place with adjoining land owners regarding the location and type of equipment.

2.2.10.2 All equipment and its installation shall meet Australian Standards and the Occupational Safety and Health Act and Regulations.

2.2.11 Lake Areas

2.2.11.1 Lake areas (including basin, sump or open drains filled or partially filled with water for greater than 72 hours) constructed in public places shall conform to the following requirements:

(a) Lake banks shall be stable and not be steeper than one (1) vertical in five (5) horizontal. The preferred slope is one (1) in six (6). Where there are slopes in excess of one (1) in five (5) and in the vicinity of a drainage structures or where constructed banks are and otherwise unstable; an approved child and dog proof surround fence shall be provided. Where the lake not meeting the slope specification is more than 100 metres away from a residence, footpath, playground or school, a netting fence 1.20 metres high (above ground) may be used. Otherwise, a pool fence of not less than 1.35 metres high, set back 1 metre from the top of the bank and constructed to allow maintenance plant access. All banks shall be stabilised with top soil and grass or mulch and by the planting of reeds, shrubs and trees on and near the water line. All lake fences shall include a three (3) metre opening access gate. Barbed wire shall not be used. Fences must be approved by Council.

(b) Where safety requires, but aesthetic considerations are not essential; chain mesh fencing may be used, not less than 1800mm high and buried 150mm into the ground.

(c) Banks shall be compacted and firm. Council may require suitable fill to be imported and compacted to achieve the necessary compaction of the banks.

(d) All slopes shall be seeded and/or planted to obtain stabilisation as quickly as possible.

(e) On any closed lake where an outlet drainage system pipe (or equivalent) of 225mm diameter or larger, is fitted the pipe or culvert will be fitted with an approved hinged and locked metal grid gate suitably constructed and set at not greater than 45° slope to the horizontal for other than an enclosed basin or lake.

(f) Banks steeper than one (1) vertical to five (5) horizontal may be rock pitched for stabilisation and left unfenced up to a slope of not steeper than two (2) horizontal in one (1) vertical. Rock pitching shall extend to the invert level of the horizontal structure.

2.3 Use of Reserves for Drainage Purposes

2.3.1.1 It has been recognised that the provision of drainage outfall, storage and disposal areas is difficult in the Busselton City due to flat grades, high ground water tables or soil types and restrictions imposed by the Water Corporation, Water and Rivers Commission, the Department of Environmental (DOE) and the Department of Conservation and Land Management (CALM) with respect to discharging stormwater into river and wetland systems.

2.3.1.2 Council will give due consideration to development applications proposing to establish drainage compensation and nutrient and silt retention basins on proposed or existing public open space reserves where such applications comply with the following:

(a) It can reasonably be demonstrated that there is no other acceptable means of providing for drainage;

(b) The proposal to use the recreation area for drainage is approved by Council and submitted with a subdivision application to the Ministry for Planning;

(c) In the case of a developer, providing a written undertaking to 'develop' the reserve as required and specified by Council. The term 'develop' may include earthworks, establishment of lawns, landscaping, provision of reticulation, provision of playground equipment, public seating, paths, fencing, carparking, water supply, public conveniences, etc;

(d) The drainage purpose is acceptable to the Department of Land Administration (DOLA);

(e) The drainage purpose does not impose on the minimum area required for recreation within a development;

(f) Mosquito management is addressed;

(g) The drainage facility is not detrimental to the use of the reserve or to flora and fauna.

2.4 Verge Development

2.4.1.1 Criteria have been established to maintain a safe environment for motorists and pedestrians, provide access to services/manholes, hydrants, service pits and pillars, and to encourage landscaping to make verges attractive.

2.4.1.2 Council wishes to encourage and support the development of improved verges, either maintained grass style or dry garden style or a mixture of both.

2.4.2 Conditions

2.4.2.1 Council has a Local Law for Street Lawns and Gardens. Council will set the levels for verges.

2.4.2.2 The standard verge landscape, not requiring Council approval reticulation, is lawn with irrigation and up to two (2) approved local nature trees for every 20 metres of frontage. The irrigation system shall be installed and operated to avoid nuisance or hazard to pedestrians and vehicles, shall have all pipes at minimum depth of 300mm and use approved pop up type sprinklers set flush with the ground level approved by Council. Overspray of road and paths is not allowed.

A plan is required to be submitted for approval for all other forms of verge landscaping.

2.4.2.3 Street trees shall be offset approximately 2.5 - 3.5 metres from property boundaries and avoid power lines and all other services. No street trees or shrubs growing to greater than 1000mm in height are to be planted within 15 metres of street corners, nor shall street trees within three (3) metres of crossovers.

2.4.2.4 Subject to keeping a minimum of 1200mm width of verge from the back of the street kerb clear at all times, a garden of small vegetation, shrubs and ground covers maybe established. However, no large rocks or non frangible items can be placed on the road reserve unless Council approves the plan submitted. Where there is no street kerb, the clear distance to landscaping shall be 2500mm from the edge of the seal to planting. Verge kerbing, where approved shall be flush with the approved ground level.

2.4.2.5 Weed control using an 80mm thickness weed free mulch overlay is acceptable. Gravel, aggregate or wood chips are not permitted on road verges as a landscape material as loose material spillage onto roads and paths may cause hazard or nuisance.

2.4.2.6 Any improvements placed or constructed on the public road reserve are placed there at the risk of the property owner. Authorities will endeavour to preserve the layout, but no guarantee can be given, as all services authorities, including Council, have the legal right and obligation to construct and maintain services on the verge.

2.4.2.7 No assistance can be given by Council for ongoing operation or maintenance costs of verge landscaping.

2.4.2.8 Council will supply up to four (4) trees to a property owner depending on lot frontage, of an agreed species, provided the property owner agrees to plant and maintain them in a caring manner. Large trees, such as Tuarts and Norfolk Pines, may not be planted where the verge is less than 10m wide. Poisonous species, such as Cape Lilac Oleander, are not permitted. Spreading varieties, such as Coastal Moort must be set well back from traffic and pedestrian areas to avoid intrusion into sight lines.

2.4.2.9 Council may only consider approval of the full paving of verges (other than crossovers) where:

- The paving is in brick or block to limit stormwater run-off and is in keeping with the amenity of the area;
- The paving is not intended for permanent or as a substitute for required on site parking; and
- The plan submitted, design and construction are approved by Council; and may consider approval scaling or paving of 2/3 of the street verge, excluding the crossover.

2.4.2.10 Generally and where achievable and where street kerb exists the levels of verge areas shall be compatible with properties on either side and shall slope toward the kerb at a 1 in 50 grade (approximately) or the property line level should be 150mm above the top of the kerb.

2.4.2.11 Council may designate a location on one (1) or both sides of the road for a future footpath or dual use path.

2.4.2.12 Council policy is for a verge and public open space charge to be applied to each new lot created at subdivision. The funds acquired will be used to improve verges and reserves in the subdivision area.

2.4.3 Street and Reserve Trees - Picking

2.4.3.1 Council may allow selective picking a seed collection from shrubs and trees on Council verges and parklands for approved reasons such as, to assist with the rehabilitation of injured native wildlife or to regenerate native plant species. Written approval must be obtained from the Director, Engineering and Works Services and is subject to the following conditions:

- That the pickings are limited to twig size and from area approval 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 Council's Senior Parks & Depot Supervisor. If picking is felt to be detrimental to the location, the quantity, locations and frequency may be adjusted by Council's Senior Parks & Depot Supervisor;

- Seed collection must have the approval of CALM;
- 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.

3 Tree Planting

3.1 Trees in Paved Areas

3.1.1.1 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; and
- Poor or excessive pruning.

3.1.1.2 Assume that feeder roots are concentrated in the top 500mm - 600mm of the soil and extend to the drip-line of the leaf canopy. Paving should be at least 20% porous for this distance or leave a substantial area of exposed soil to at least three (3) times the expected diameter of the tree. The area at the base of the tree should be able to be watered by run-off or trickle irrigation for at least the first two (2) summers.

3.1.1.3 Protection of the exposed area is essential (use mulch or tree grates) to prevent soil compaction.

3.1.1.4 Remove and replace the surface paving with a metal tree grate and/or the application of mulching material.

3.1.1.5 Where possible, opportunities for natural infiltration of water and air should be retained, ie. porous paving material (eg. brick and sand) should extend at least beyond the expected canopy area of the tree at maturity. The expected canopy should not interfere with lights, roofs, traffic or pedestrians.

3.1.1.6 Radial brick patterns provide bigger spaces between bricks than rectangular patterns, which will help reduce the likelihood of tree roots distorting the pavement.

3.1.1.7 Root shields may be used for intrusive types of trees to protect structures or piping.

3.2 Protection of Trees from Excavation Works

3.2.1.1 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.

3.2.1.2 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.

3.2.1.3 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.

3.2.1.4 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. A further alternative is the use of root shields. Backfilling should be carried out as soon as practically possible.

3.2.1.5 If raising of the pavers/pavement is required, 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.

3.2.1.6 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, as the cutting of anchor roots can lead to windrow.

3.3 Site Drainage

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

3.3.1.2 When planting in heavy to medium clay subsoils, 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.

3.3.1.3 Drainage may be provided, by running an agricultural 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.

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

3.3.1.5 Over-watering of heavy textured soils leads to waterlogging 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.

3.4 Watering Systems in Paved Areas

3.4.1 Watering Systems

3.4.1.1 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 rootball when planting, leaving a length (150 mm with cap) protruding above the soil level which can conveniently be filled manually.

3.4.1.2 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.

3.4.1.3 Drip irrigation, micro-irrigation and trickle irrigation systems are the modern 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 microjets.

3.4.2 Basic Guidelines for Water System Operation

3.4.2.1 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.

3.4.2.2 When adjusting the amount of watering in different seasons and weather, alter the frequency rather than the volume.

3.4.2.3 Young trees can be adequately watered by a single or double trickle outlet positioned about 500 mm from the trunk.

3.4.2.4 The volume of water required each time.

3.5 Pruning in Urban Areas

3.5.1 Reasons for Pruning Trees in Paved Areas:

3.5.1.1 Lower branches may need to be pruned so that the mature height of the tree allows a minimum 2.4 metre clearance at ground level for pedestrians, and a minimum of 4.5 metres clearance above roadways.

3.5.1.2 Trees may grow into overhead wires or roof lines and should be selected so that the fully grown height is below the wires or gutters.

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

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

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

3.5.2 Description of Common Pruning Practices

3.5.2.1 *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.

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

3.5.2.3 *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.

3.5.2.4 *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".

3.5.2.5 *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.

3.6 Improving the Health of Existing Trees

3.6.1.1 Most mature trees in paved areas do not receive adequate water or air to the roots. A weekly soak during dry periods is the minimum requirement, and exposing soil in the root zone to air is important.

3.6.1.2 It is preferable to feed deciduous and evergreen species with a slow-release fertiliser at the specified rate, and to wet the soil after the application. For evergreen native species, use blood and bone at the specified rate or a slow release fertiliser tablet.

3.6.1.3 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.

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

3.6.1.5 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.

3.6.1.6 Consult an arboriculturist, horticulturist or local forest officer for advice on specialist tree maintenance.

4 Foreshores

4.1 General

4.1.1.1 Foreshores area special reserve situation. They are generally more vulnerable to natural and human drainage. e objective of this section is to provide an outline of the salient points required of a Coastal Beach/Dune Management Plan to cover both the developer's land and adjacent public lands. Council referral and approval is required for all works on foreshore reserves, other than rehabilitation and maintenance.

4.2 Guidelines for Construction of Access to Beaches

4.2.1.1 Erosion of beaches resulting from wave and wind action and is a natural process. In some areas, after periods of erosion reasonable stability is normally regained through the operation of natural forces. As development occurs and human influence becomes more evident on coastal areas, accelerated erosion of beaches is likely to occur. Denuding vegetated frontal dunes by foot traffic and/or grazing results in wind transport of sand in an inland direction. This movement decreases the amount of sand in the "sand cycle" between bay, beach and dunes, and can result in accelerated wave erosion due to the lowering in level of the beach and dunes. Structures such as walls and groynes may then be required to protect the shore. Development setbacks are applied to reflect the ability of the coast and coastal protection structures to protect the shoreline.

4.2.1.2 Natural frontal dunes can be stabilised against wind erosion by vegetative measures or where erosion and resultant damage is extreme by engineering structures such as seawalls. Vegetative stabilisation is the cheaper and more natural type of dune stabilisation. Where this type of stabilisation is used the points of access to the beach are susceptible to wind erosion. Fencing is usually required to control random access.

4.2.2 General Requirements for Beach Access Tracks

4.2.2.1 Access over a secondary and frontal dune system, to be effective, must comply with these specific requirements, (including river, estuary and wetland foreshores:

(a) The access must be conveniently placed, so that it will be used by the public.

(b) Where the access traverses sand, the sand surface must be so treated that it is not susceptible to wind or “human” erosion. This usually entails surfacing of the tracks with compacted limestone gravel and bitumen, board and chain walkways, mulch, or steps.

(c) Access tracks should be located OVER existing dunes and not through them. Care should be taken to ensure that the dune height is not reduced to less than 2.5m AHD. Location in this manner will help to prevent the ocean overtopping the dune and the formation of blow-outs along the track, or the excessive accumulation of sand. It will also simplify vegetative stabilisation of the areas alongside the access tracks.

(d) Provision should be made in the case of gravelled and sealed access tracks to minimise or prevent water erosion. This can be done by preventing excess run-off water on to the tracks, and by shaping the surface of the track to prevent concentration of water and enabling it to shed heavy rainfalls quickly.

(e) Access tracks should be sited and aligned so that sand blown from the beach does not accumulate in them to any great extent. The tracks should be aligned to be at 45° from the most destructive winds - south west and north west. Width should not be less than 1.5 metres, and up to three (3) metres where emergency vehicle access is required maximum slope should be 15%.

(f) Tracks should be completely fenced off to prevent damage to the vegetation and to encourage use of the track with suitably worded and prominently placed signs.

4.2.3 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.

4.2.4 Specifications for Fences (Refer also Sections 2.2.7 and 2.2.8)

Strainer Posts: Treated pine, split or sawn hardwood two (2) metres long, 200mm minimum diameter, at least 750mm in ground.

Intermediate Posts: 1.8 metres long. 100mm - 150mm diameter, at least 600mm in ground.

Struts 3.6 metres long, 80mm - 100mm diameter.

Strainer assemblies - maximum distance apart 100m.

Intermediate posts 4 to 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.

4.2.5 Specifications for Board and Chain Walkways

Slopes: Up to 30%.

Construction: 1.0 to 1.8 metre lengths of 80mm wide x 40mm thick sawn hardwood, at 200mm centres with round head galvanised bolts (60mm x 8mm diameter), nuts and washers, and connected by 6mm diameter link galvanised chain.

The top end of the board and chain walkway is fixed to one (1) metre galvanised steel picket fence posts sunk one (1) metre in the ground. The bottom end of the boardwalk is to be free to allow it to be lifted free when sand accumulates on it.

4.2.6 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.

4.2.7 Signs

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