ARCADIA
LANDSCAPE ARCHITECTURE

SUTHERLAND HOSPITAL REDEVELOPMENT

LANDSCAPE SPECIFICATION (L-SP001)

Prepared by: Arcadia Landscape Architecture

Prepared for: Health Infrastructure

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TABLE OF CONTENTS

1.0 GENERAL NOTES

1.1 Definitions

Terms used in this Landscape Specification shall have the meanings assigned to them in the referenced standards and as follows:

CONSULTANT	ORGANISATION	TELEPHONE
Project Manager:	CBRE	+61 2 9333 3333
Architect:	HDR	02 99562666
Landscape Architect:	Arcadia Landscape Architecture Suite 68, 26-32 Pirrama Rd Pyrmont NSW 2009	8571 2900 Email: office@arcadiala.com.au
Civil Engineer:	ACOR	+61 9438 5098
Approved:	Shall mean as approved in writing by the Project Manager	
Equal to:	Shall mean equivalent in performance, quality and price to that specified and shall be approved in writing by the Project Manager	

1.2 Cross References

This Specification shall be read in conjunction with the General Conditions of Contract included in the general building works specification.

Conform to associated landscape sections included in this specification, as follows:

- Site Preparation,
- Hardscape Elements,
- Softscape Elements,
- Irrigation, and
- Plant Establishment and Maintenance.

Refer to the following consultant's documents and specifications:

- Architect's documentation for building elements, structures and finishes,
- Civil and Structural Engineer's documentation for bulk earthworks, roads, walls, retaining walls, footings, expansion joints, etc,
- Hydraulic Engineer's documentation for drainage and water supply, and
- Electrical Engineer's documentation for external lighting and electrical connections for pumps.

1.3 Interpretation of Drawings

The Landscape Contractor shall check all relevant dimensions on site before proceeding with the work. Under no circumstances shall dimensions be scaled from the drawings. No claim for extras arising from failure to obtain measurements and other information on site will be allowed.

The origin of levels is generally to the Australian Height Datum (AHD) or as otherwise shown on the drawings.

1.4 Workmanship and Materials

The whole of the landscape works shall be carried out by a competent Landscape Contractor who is experienced in horticultural practice, landscape construction and planting techniques. The Landscape

Contractor shall hold a current Building Contractors License and / or be a financial member of the Landscape Contractors Association.

All work shall be faithfully carried out in the most tradesperson-like manner in accordance with applicable trade and Australian Standards.

All materials shall be new and of the best quality and shall be approved before installation.

1.5 Quality Assurance

The Landscape Contractor is to implement and maintain a quality assurance system aligned with relevant Australian Standards. This system shall include as a minimum the following elements:

- The firm's general quality management system including quality manual, technical procedures, sample forms used in the quality management system and quality check lists is to be used.

In addition to the quality requirements outlined in the Contract documents, the Landscape Contractor shall have in place a system of record to identify:

- Supply source and types of materials required to complete the works,
- Method of installation,
- System certifications, and
- Certification of completeness.

1.6 Standards

Wherever reference is made to the Standards Association of Australia (SAA), Standard Specification (AS), Codes (ASC) or interim Codes (SAA Int.) the requirements of the additions and amendments to them current at the date of commencement shall apply to the relevant materials or operations and be deemed to be incorporated in this Specification.

The Landscape Contractor, if requested, shall furnish a certificate from the manufacturer that the materials or products delivered to the project meet the requirements of the relevant Standard. However, such certification shall not relieve the Landscape Contractor of the responsibility to comply with added requirements of this Specification. All materials and workmanship are to comply with the Building Code of Australia and the relevant Authority requirements.

1.7 Project Conditions

The Landscape Contractor and his sub-contractors shall visit the site and compare the contract documents with the area of the Works before tendering to ascertain for themselves the actual extent and nature of the work to be done and the nature of the ground. No claim will be accepted on account of the Landscape Contractor or his sub-contractors failure to do so. It is the responsibility of the Landscape Contractor to check the aspects of the required work and report any discrepancy to the Project Manager for a decision.

1.8 Access to Premises and Storage

The Landscape Contractor is required to make arrangements with the Project Manager (or representative), as necessary, for access or entry to premises (including material handling) to carry out installation of the works. Working hours shall comply with the local authority requirements.

Where possible, install materials directly in place. Store other materials in a secure location on site as directed by the Project Manager.

1.9 Reinstatement

Any injury or damage to property, both public and private, including buildings, services, roads, footways, paving, ground levels, retaining walls, fencing, passing and /or parked vehicles, existing vegetation including shrubs and trees and other property, shall be reinstated or made good by the Landscape Contractor to their own cost. Reinstatement is to match similar adjacent work and the whole left in a condition at least equal to that at the commencement of works.

1.10 Cleaning site

All areas affected by the landscape works are to be kept clean at all times, this includes collecting all empty plastic plant containers, labels and other rubbish daily during installation and disposing of them appropriately. There shall be no burning or burying of rubbish on site. All empty containers and debris shall be removed from site prior to the works being approved for commencement of maintenance.

2.0 SITE PREPARATION

2.1 Scope

The works included in this section shall include the following:

- Environmental protection,
- Tree removal and protection, and
- Site clearing.

2.2 Quality

Give sufficient notice so that inspection may be made of the following:

- Trees identified and marked to be removed or retained, and
- Enclosures to trees to be retained.

Submit details of materials proposed, including the following:

- Provision of cleared vegetation for mulching.

Submit the methods and equipment proposed for the minor earthworks, including the following:

- Dewatering and groundwater control and disposal of surface water,
- Control of erosion, contamination and sedimentation of the site, surrounding areas and drainage systems, and
- Dust control.

2.3 Environmental Protection

Plan and carry out the work so as to avoid erosion, contamination, and sedimentation of the site, surrounding areas, and drainage systems.

Temporary erosion control measures to include:

- Staging operations, such as clearing and stripping,
- Progressively restoring disturbed areas,
- Providing temporary drains and catch drains,
- Diverting and dispersing concentrated flows to points where the water can pass through the site without damage,
- Dispersing concentrated runoff with spreader banks or other structures,
- Constructing and maintaining silt traps to prevent discharge of scoured material to downstream areas,
- Installing temporary grassing,
- Installing temporary fencing,
- Inspecting, cleaning and repairing if required temporary erosion and sediment control works after each rain, and
- Removing temporary erosion control measures when they are no longer required.

Maintain dewatering measures on site. Keep groundwork free of water. Provide and maintain slopes, crowns and drains on excavations and embankments to ensure free drainage. Place construction, including fill, masonry, concrete and services, on ground from which free water has been removed. Prevent water flow over freshly laid work.

2.4 Trees to be Retained and Protected

Trees to be retained are as shown on the landscape drawings, and are to be protected prior to and during construction activities on the site. Identify and mark trees and shrubs to be retained using a suitable non-injurious, easily visible and removable means of identification.

Protect from damage the trees and shrubs to be retained, including those beyond the site area, both above and below the ground. If a tree becomes damaged during the works or it is proposed to perform work on a tree, give written notice immediately and obtain instructions.

Trees to be retained shall be protected in accordance with the latest edition of AS 4970. Generally, this includes, but is not limited to, the installation of tree protection fencing at the perimeter of the Tree Protection Zone. The fencing shall, as a minimum, consist of 1.8 metre high temporary chain wire panels supported by steel stakes, fastened together and supported to prevent movement, with a lockable opening for access. The fencing shall be maintained in good condition during the construction works period.

Display a warning sign in a prominent position at each entrance to the site, at 10 metre intervals along the tree protection fencing, and where the tree protection fence changes direction. Each sign shall advise Tree Protection Zone, No Access, and contact details. The signs shall be a minimum size of 600mm x 500mm using lettering in accordance with AS 1319 and AS 4970.

Remove fencing and signs on completion of all construction works only.

2.5 Tree Protection Zone (TPZ)

This guidance sets out the general principles that must be followed when working within a TPZ, and is based on the Australian Standards (2009) AS4970: *Protection of Trees on Construction Sites*.

Once the site works start, this guidance is specifically for the site personnel, to help them understand what has been agreed and to explain what is required to fully meet their obligations for tree protection.

This guidance should always be read in conjunction with the supporting Arborist Report. Note that all areas where precautions are required are documented on the plans. All protective measures should be installed according to the prevailing site conditions and agreed as satisfactory by the Project Arborist before any demolition or construction work begins.

The Tree Protection Zone

- The TPZ is a radial setback extending outwards from the centre of the trunk, equal to the DBH x 12.
- This area shall be protected by tree protective fencing as detailed.
- Any part of the TPZ outside of the tree protective fencing area must be isolated from work operations by protective barriers and/or root zone protection for the duration of the work.
- The Project Arborist shall approve the extent of the TPZ prior to commencement of works.
- The TPZ shall be mulched to a depth of 90mm with approved organic mulch e.g. leaf and wood chip as specified.
- Supplementary watering shall be provided in dry periods to reduce water or construction stress, particularly to those trees which may incur minor root disturbance.

Keep the area of the Tree Protection Zone free from construction activities that may cause damage to the tree, including:

- Modification of soil levels,
- Excavation and trenching,
- Cultivation of the soil,
- Mechanical removal of vegetation,
- Soil disturbance,
- Movement of natural rock,

- Storage of materials, plant, or equipment,
- Erection of site sheds,
- Affixing signage or hoarding to the trees,
- Preparation of building materials,
- Disposal of waste materials and chemicals,
- Movement of pedestrian or vehicular traffic,
- Temporary or permanent location of services, or the works required for their installation,
- Any other activity likely to damage the trunk, crown, or root system.

If encroachment is required into the tree protection zone, give notice and obtain instructions.

Arboricultural Supervision

Any work within TPZs requires a high level of care. Qualified arboricultural supervision is essential to minimise the risk of misunderstanding or misinterpretation. Ongoing work must be inspected regularly and, on completion, the work must be signed off by the Project Arborist to confirm compliance by the contractor.

Tree Protection Fencing, Root Zone and Trunk Protection

Prior to site establishment, tree protection fencing and root zone / trunk protection shall be installed to establish the TPZ for trees to be retained, in accordance with site conditions. These protective barriers shall be maintained entire for the duration of the construction program.

Tree protection fencing and root zone / trunk protection shall be removed following completion of construction. The mulch layer in the TPZ shall be retained and replenished where required to maintain a depth of 75mm.

Pruning

All pruning work required (including root pruning) should be in accordance with Australian Standard No. 4373-1996-Pruning of Amenity Trees.

Tree Damage

In the event of damage to a tree or the TPZ, the Project Arborist shall be engaged to inspect and provide advice on remedial action. This should be implemented as soon as practicable, and certified by the Project Arborist.

Post Construction Maintenance

In the event of any tree deteriorating in health after the construction period, the Project Arborist shall be engaged to provide advice on any remedial action. This should be implemented as soon as practicable, and certified by the Project Arborist.

Excavation Within TPZ

If excavation within the TPZ is required, the following measures shall be applied to preserve tree root systems:

- Excavation within TPZ must be carried out under the instruction and supervision of the Project Arborist.
- A root mapping exercise is to be undertaken and certified by the Project Arborist. Root mapping shall be undertaken by either ground penetrating radar, air spade, water laser, or by hand excavation using hand tools, taking care not to damage the bark and wood of any roots.
- The purpose of the root mapping shall be to locate woody structural roots greater than 40mm in diameter. Where possible, flexible clumps of smaller roots, including fibrous roots, should be retained if they can be displaced temporarily or permanently beyond the excavation without damage.

- If digging by hand, a fork shall be used to loosen the soil and help locate any substantial roots.
- Once roots have been located, a trowel shall be used to clear the soil away from them without damaging the bark.
- Exposed roots to be removed shall be cut cleanly with a sharp saw or secateurs.
- Roots temporarily exposed shall be protected from direct sunlight, drying out, and extremes of temperature by appropriate covering.

Fill Within TPZ

Placement of fill material within the TPZ of trees to be retained should be avoided where possible. However, where fill cannot be avoided:

- All fill material to be placed within the TPZ should be approved by the Project Arborist and consist of a coarse, gap-graded material to provide aeration and percolation to the root zone. Materials containing a high percentage of fines is unacceptable for this purpose
- The fill material should be consolidated with a non-vibrating roller to minimise compaction of the underlying soil.
- No fill material should be placed in direct contact with the trunk.

Demolition of Surfacing and Structures Within TPZ

- Surfacing: Any hard surfacing used as a vehicular road, parking, or pedestrian path including tarmac, solid stone, crushed stone, compacted aggregate, concrete, and timber decking.
- Structures: Any man-made structure above or below ground, including service pipes, walls, gate piers, buildings, and foundations. Typically, this would include drainage structures, services, carports, bin stores, and concrete slabs which support buildings.

Demolition and Access

Roots frequently grow adjacent to and beneath existing surfacing / structures, so great care is needed during access and demolition. Damage can occur through physical disturbance of roots and / or the compaction of soil around roots from the weight of machinery or repeated pedestrian passage. This is not generally a problem whilst surfacing / structures are in place, because they spread the load on the soil beneath, and further protective measures are not normally necessary. However, once they are removed and the soil below is newly exposed, damage to roots becomes an issue, and the following guidance must be implemented:

- No vehicular or repeated pedestrian access into TPZ permitted unless on existing hard surfacing or root zone protection.
- Regular vehicular and pedestrian access routes must be protected from compaction with temporary root zone protection as specified.
- Where a TPZ is exposed by the work, it must be protected as set out in AS4970 until there is no risk of damage from the development activity.

Removal of Surfacing / Structures

Removing existing surfacing / structures is a high risk activity for any adjacent roots and the following guidance must be observed:

- Appropriate tools for manually removing debris may include a pneumatic breaker, crowbar, sledgehammer, pick, mattock, shovel, spade, trowel, fork, and wheelbarrow.
- Machines with a long reach may be used if they can work from outside the TPZ, or from protected areas within the TPZ.
- Debris to be removed from the TPZ manually must be moved across existing hard surfacing or temporary root zone protection, in a way that prevents compaction of soil. Alternatively, it can be lifted out by machines provided this does not disturb the TPZ.
- Care must be taken throughout these operations not to damage roots.

Installation of Surfacing / Structures in TPZ

Basic Principles

New surfacing / structures in a TPZ are potentially damaging to trees because they may disturb the soil and disrupt the existing exchange of water and gases in and out of it. Adverse impact on trees can be reduced by minimising the extent of these changes within the TPZ.

- Surfacing: Suitable surfacing should be relatively permeable to allow water and gas movement, load spreading to avoid localised compaction, and require little to no excavation which limits direct damage. The actual specification of the surfacing is an engineering issue that needs to be considered in the context of the bearing capacity of the soil, the intended loading, and the frequency of loading.
- Structures: Where possible structures are to be constructed above ground level on piled supports, and redirecting water to where it is needed. Conventional strip foundations in the TPZ for any significant structure may cause excessive root loss and are likely to be unacceptable. However. Disturbance can be significantly reduced by supporting the above ground section of the structures on small diameter piles, piers, or on cast floor slabs set above ground level. The design should be sufficiently flexible to allow the piles to be moved if significant roots are encountered in the preferred locations.

Establishing the Depth of Roots

The precise location and depth of roots within the soil is unpredictable and will only be known when careful digging starts on site. Ideally, all new surfacing within a TPZ should be no-dig, i.e. requiring no excavation whatsoever, but this is rarely possible on undulating surfaces.

New surfacing normally requires an evenly graded sub-base layer, which can be made up to any high points with granular, permeable fills such as crushed stone or sharp sand. This sub-base must not be compacted as would typically happen in conventional surface installation. Some limited excavation is usually necessary to achieve this and may not be damaging to trees if carried out carefully, and large roots are not cut.

Tree roots and grass roots rarely occupy the same soil volume at the top of the soil profile, so the removal of a turf layer up to 50mm is unlikely to be damaging to trees. It may be possible to dig to a greater depth depending on local conditions, but this would need to be assessed by the Project Arborist.

Services in TPZ

For the purposes of this guidance, services are considered as structures. Excavation to upgrade existing services or to install new services within a TPZ may damage retained trees, and should only be chosen as a last resort. In the event that excavation emerges as the preferred option, the decision should be reviewed by the Project Arborist before any work is carried out. If excavation is agreed, all digging should be done carefully and follow the guidance as set out above.

Soft Landscaping in TPZ

For the purposes of this guidance, soft landscaping includes the re-profiling of existing soil levels, and covering the soil surface with new plants or an organic covering such as mulch. It does not include the installation of solid structures or compacted surfacing.

Soft landscaping activity after construction can be extremely damaging to trees. No significant excavation or cultivation shall occur within the TPZ, e.g. planting holes. Where new designs require levels to be increased to tie in with new structures or surrounding ground level, good quality and relatively permeable topsoil should be used for the fill. It should be firmed into place but not over-compacted, in preparation for turfing or careful shrub planting.

All areas close to tree trunks should be kept at the original ground level, and have a mulched finish rather than turf to reduce the risk of mowing damage.

Typical Tree Protection details

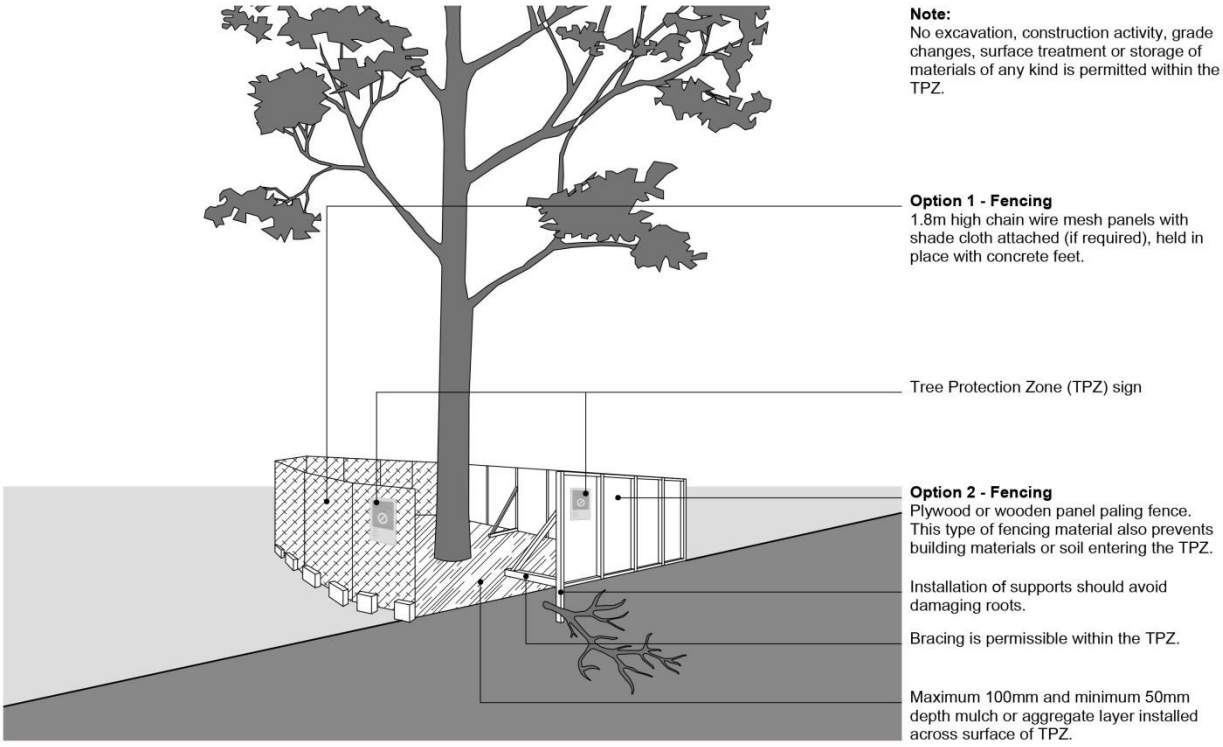

Diagram 1 -Tree Protection Fencing

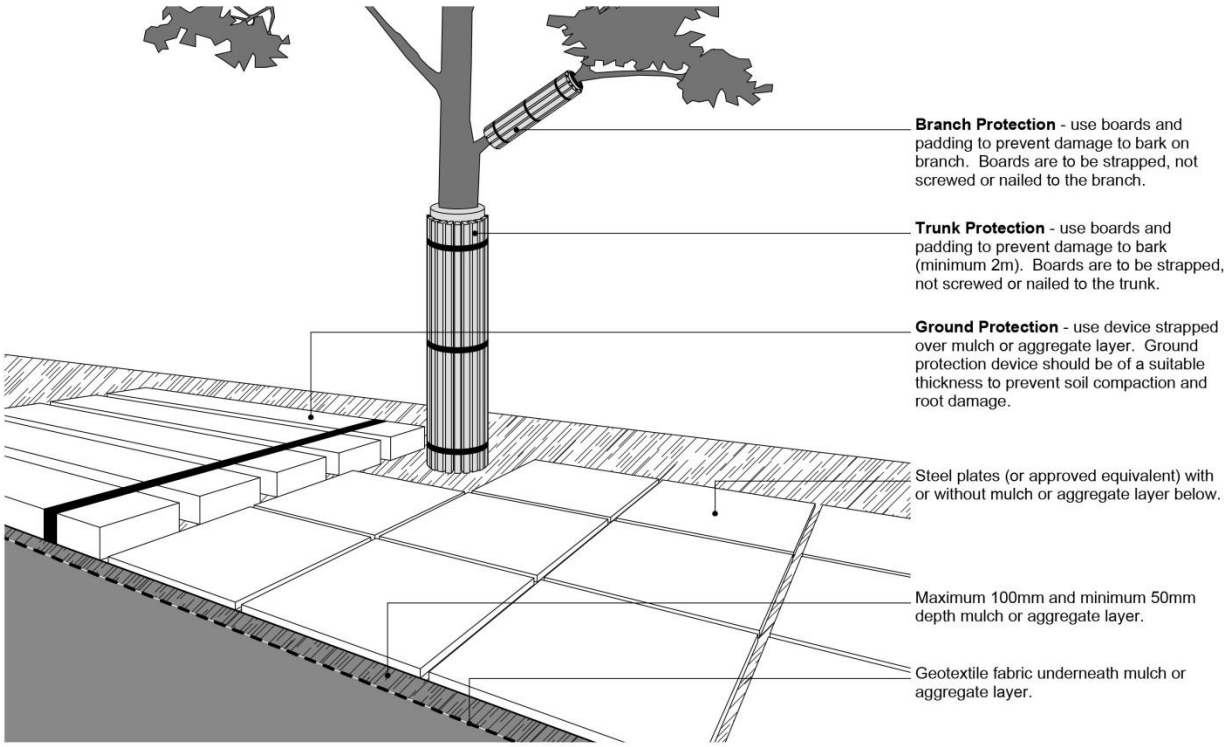

Diagram 2 - Examples of Branch, Trunk and Ground Protection

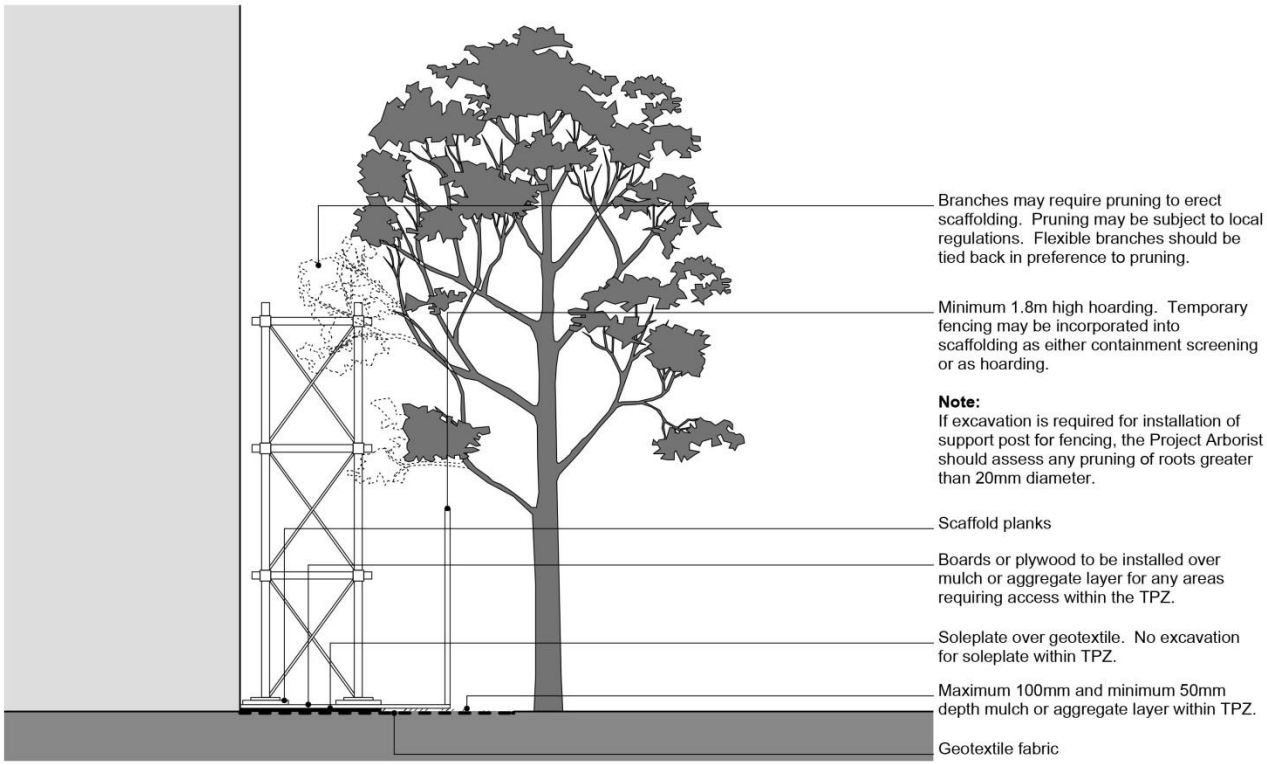

Diagram 3 - Indicative Scaffolding within a Tree Protection Zone (TPZ)

2.6 Existing Services

Before commencing any earthworks, locate and mark existing underground services in the areas which will be affected by the earthworks operations including clearing, excavation and trenching.

Do not excavate by machine within 1000mm of existing underground services.

2.7 Site Clearing

Clear only the following works:

- Areas to be occupied by works such as roads, buildings, structures, walls, paving, excavation, regrading and landscaping,
- Other areas designated to be cleared, and
- Extent of area necessary for the performance of the works.

Remove everything on or above the site surface, including rubbish, scrap, grass, vegetable and organic debris, scrub, trees (except trees to be retained), stumps, boulders and rubble. Grub out stumps and roots over 75mm diameter to a minimum depth of 500mm below sub-grade under buildings, embankments or paving, or 300mm below finished surface in unpaved areas. Remove grass to a depth just sufficient to include the root zone. Remove old works, including slabs, foundations, pavings, drains and manholes found on the surface.

2.8 Weed Eradication

Eradicate weeds using environmentally acceptable methods, such as non-residual glyphosate herbicide in any of its registered formulae, at the recommended maximum rate.

Regularly remove, by hand, rubbish and weed growth throughout grassed, planted and mulched areas. Remove weed growth from an area 750mm diameter around the base of the trees in grassed areas. Continue eradication throughout the course of the works and during the planting establishment period.

2.9 Spoil

Remove surplus excavated material and surplus site clearance material form the site.

Put cleared vegetation through a chipper. Reduce to pieces not larger than 75 x 50 x 15 mm and stockpile for re-use as mulch.

Do not bury boulders, concrete fragments and the like on site.

3.0 HARDSCAPE ELEMENTS

3.1 Scope

The works included in this section shall include the supply of labour and materials to install and/or construct:

- Retaining walls,
- Fences,
- Precast concrete paving,
- Insitu concrete paving,
- Decomposed granite paving,
- Furniture,
- Edging
- Softfall paving.

3.2 Quality

Give sufficient notice so that inspection may be made of the following:

- Completed sub-grade, sub-base and base course preparation,
- Set-out of walls and fences,
- Completed trial set-out for all paving types,
- Completed pavements, and
- Set-out of edging.

Submit samples of the following finishes, showing the full range of texture and colour of the material:

- Concrete block wall,
- Precast concrete paver,
- Decomposed granite, and
- Edge.

Prepare 1000 x 1000mm sample panels of the following designated finishes, including samples of junctions and trim details:

- Precast concrete paving,
- Insitu concrete paving,
- Decomposed granite paving,

Provide at least 2 panels of the following, fixed in position and including fixings and finishes:

- Fence

3.3 Retaining Walls

Installation shall be in accordance with structural engineer's documentation. Tolerance for fixings and embedded items in precast units shall be to AS 3610 and AS 3850.1 as applicable.

Fix the units securely and accurately in their final positions. Provide components and materials, including fasteners, braces, shims, jointing straps, sealant, flashings, grout and mortar.

Do not lift or support units at other than designated points. Use handling methods which do not overstress, warp or damage the units. Do not place lifting attachments, holes and other temporary fixings for handling purposes on visible face units. Remove temporary attachments after erection. Seal or otherwise make good recesses.

Protect the units against staining, discolouration and damage.

Supply and install the following wall types:

- Wall Type (W1a/W1b): In situ Concrete Wall
  - Location: Refer Landscape Plans,
  - Type: In situ Concrete
  - Colour: Off White
  - Size: Refer Detail,
  - Footings: concrete slab to engineer's details,
  - Reinforcing: to engineer's details,
  - Waterproofing: to engineers details,

- Wall Type (W2): Sandstone log wall
  - Location: Refer Landscape Plans,
  - Type: Sandstone logs
  - Size: 500x500x1000mm logs,
  - Supplier: Equal to Gosford Quarries
  - Footings: concrete slab to engineer's details,
  - Reinforcing: to engineer's details,
  - Waterproofing: to engineers details,
  - Joints: nominal 5mm mortar joints, colour to match brickwork,

3.4 Waterproofing to Retaining and Planter Walls

Apply waterproof membrane to back of reinforced concrete block walls of retaining and planter walls, and concrete slabs in accordance with engineer's details and manufacturer's recommendations.

The waterproofing shall be fully warranted for a period of 20 years. Installation of the waterproofing shall be fully guaranteed for a minimum of 15 years.

3.5 Paving and Steps Materials and Components

Materials and components are to incorporate the following:

- Sub-grade:
  - Sand, gravel or quarry rubble as fill,
  - Minimum dry density ratio: 98% to AS 1289.5.2.1,
  - Thickness tolerance: – 5mm, and
  - Level tolerance: – 25mm.
- Base-course:
  - Well-graded crushed rock or gravel, free from deleterious material,
  - Maximum particle size 26.5mm,
  - Uniformly graded,
  - Maximum clay content 6% by mass,
  - Minimum dry density ratio: 98% to AS 1289.5.2.1,
  - Thickness tolerance: – 5mm, and
  - Level tolerance: generally – 0, + 25mm, but at existing structures – 0, + 10mm.
- Bedding sand:
  - Coarse, well-graded, washed sand, free from deleterious material including organic matter and soluble salts or other contaminants liable to cause efflorescence or reduce slip resistance, and
  - Grading: maximum particle size 4.75mm and not more than 30% passing 0.3mm sieve.
- Bedding cement:
  - Type GP to AS 3972.
- Insitu concrete:
  - Standard: to AS 1379 and AS 3600,
  - References: to be read in conjunction with engineer's specification,

  - Thickness: to engineer's detail, but generally, 100mm for light traffic, and 150mm for medium traffic,
  - Reinforcement: to engineer's details, but generally F62 mesh with 30mm minimum cover for pedestrian only areas, and F82 mesh placed centrally for vehicular areas,
  - Aggregate: 70% basalt, 30% cowra quartz graded to 10mm in size,
  - Joints: to engineer's details, but generally expansion joints at maximum 6m spacing and at junctions with fixed structures including buildings and other paving finishes, and control joints at maximum 2m spacing,
  - Wood float finish: wood float across the pavement to give an even textured slip-resistant surface, and
  - Finished surface: uniform in appearance and free from depressions in which water can lie, with a texture depth of 2 – 2.5mm.
- Precast concrete pavers:
  - Standard: to AS/NZS 4455,
  - Dimensional category: DPA1 and DPB1,
  - Minimum thickness: 40mm,
  - Minimum abrasion index: 1.2,
  - Resistance to salt attack category: exposure,
  - Minimum unconfined compressive strength: 12 MPa,
  - Breaking load: 2 kN,
  - Maximum deviation of the finished surface under a 3 metre straight edge laid in any direction: 10mm, and
  - Maximum deviation across junctions between adjacent pavement surfaces: 2mm
- Jointing sand:
  - Clean, fine sand or screened bedding sand, and
  - Passing a 1.18mm sieve.

3.6 Paving Preparation and Installation

Remove topsoil containing grass roots. Fill and compact as necessary. Ensure strength and stiffness is similar throughout, including soft spots and service trenches. If necessary, loosen the sub-grade to a depth of 200mm and adjust the moisture content before compaction. Spray sub-grade with a soil steriliser.

Spread the base-coarse material to correct loose thickness of 75mm by approved mechanical means. Do not transport new material over uncompacted material unless prior approval is given. Compact the base-coarse material by approved mechanical means. Bring the base-coarse materials to the optimum moisture content prior to and during placement. Do not add water during compaction except for light sprinkling if necessary to replace evaporation loss. Bring the compacted base-coarse to the required levels within a tolerance from the level indicated on plans. Any required contours of the pavement will be achieved by shaping the base-coarse. During compaction all soft or yielding, and other unsuitable material shall be removed and replaced with approved material. Grade the base course to provide 1-2% cross fall to all paved surfaces to drain toward garden beds and away from buildings.

Install a dividing strip the full width of junctions between different pavement finishes, with the top edge flush with the finished pavements.

Leave pavements clean on completion.

3.7 Insitu Concrete Paving

Supply and install insitu concrete paving as follows:

- Paving Type (P1): Insitu Concrete Paving
  - Location: as shown on landscape drawings,
  - Type: Standard Portland Grey
  - Product: Boral or Approved Equivalent
  - Finish: Broomed, no tooled edges and saw cut joints
  - Reinforcing: to engineer's details,

- Base Course: 100mm depth FCR to engineer's details.

- Paving Type (P4): Exposed Ag Paving
  - Location: as shown on landscape drawings,
  - Type: insitu concrete with washed exposed aggregate finish,
  - Finish: exposed aggregate,
  - Supplier: Equal to CCS Oxide Colour
  - Colour: Ghost Gum
  - Size: 100mm depth to engineer's details,
  - Reinforcing: to engineer's details,
  - Base Course: 100mm depth FCR to engineer's details, and
  - Joints: expansion and control joints as specified and to engineer's details.

3.8 Precast Concrete Pavers

Install the sand bedding layer roughly uniform to a maximum thickness of 30mm after compaction, or the mortar bedding layer (using a mix of 1:3 cement:sand) at least 12mm thick. Do not disturb the bedding course before the paving units are laid. Lay end pavers on a mortar bedding course.

Lay pavers in pattern as specified below. After laying precast concrete pavers on sand bed, fill the joints flush with jointing sand, and tamp the units using a vibrating plate compactor. Refill joints as required. Tamp the pavers on mortar bed using a rubber mallet only, and fill joints with mortar mix.

Supply and install precast concrete pavers as follows:

- Paver Type (P2): Unit pavers on pedestals
  - Location: rooftop Level 3 as shown on landscape drawings,
  - Paver Type: Precast Paver.
  - Supplier: Equal to Stone Outdoor
  - Finish: Etch,
  - Colour: Boston
  - Size: 600x600x38mm
  - Pedestals: Poly pad support, Versa jack or equal

- Paver Type (P3): Feature Crazy Pave on grade
  - Location: As shown on landscape drawings,
  - Paver Type: Sandstone crazy pave, 30mm thick
  - Supplier: Equal to Gosford Quarries,
  - Bedding: 25mm mortar bed, mortar colour to match sandstone,
  - Base Course: structural slab to engineer's details, and
  - Joints: nominal 3-5mm mortar joints.

3.9 Furniture

Supply and install proprietary items in accordance with the manufacturer's recommendations, as follows:

- Furniture Type (F1a): Bench Seat on concrete
  - Location: as shown on landscape drawings,
  - Type: Timber battens on top of wall type W1b
  - Fixing: Galvanised hidden fixings,
  - Frame and bench end cappings: Stainless Steel 304 powder coated
  - Colour: Charcoal
  - Battens: Spotted Gum

- Furniture Type (F1b): Bench Seat on concrete with backrest and armrest
  - Location: as shown on landscape drawings,

  - Type: Timber battens on top of wall type W1b; Custom backrest and armrest,
  - Fixing: Galvanised hidden fixings,
  - Frame and bench end cappings: Stainless Steel 304 powder coated
  - Colour: Charcoal
  - Battens: Spotted Gum

- Furniture Type (F2a): Bench Seat on sandstone
  - Location: as shown on landscape drawings,
  - Type: Timber battens on top of wall type W2
  - Fixing: Galvanised hidden fixings,
  - Frame and bench end cappings: Stainless Steel 304 powder coated
  - Colour: Charcoal
  - Battens: Spotted Gum

- Furniture Type (F2b): Bench Seat on concrete with backrest and armrest
  - Location: as shown on landscape drawings,
  - Type: Timber battens on top of wall type W2; Custom backrest and armrest,
  - Fixing: Galvanised hidden fixings,
  - Frame and bench end cappings: Stainless Steel 304 powder coated
  - Colour: Charcoal
  - Battens: Spotted Gum

- Furniture Type (F3): Sandstone boulders
  - Location: as shown on landscape drawings,
  - Supplier: Equal to Gosford Quarries
  - Fixing: See detail for design intent

- Furniture Type (B1): Bollard - Fixed
  - Location: as shown on landscape drawings,
  - Manufacturer: Equal to Street Furniture Australia
  - Product Type: Slim Bollard B5, flat top
  - Fixing: Concealed fixing with pavement cut to fit bollard collar

- Furniture Type (B2): Bollard - Removable
  - Location: as shown on landscape drawings,
  - Manufacturer: Equal to Street Furniture Australia
  - Product Type: Slim Bollard B5, flat top
  - Fixing: Concealed fixing with pavement cut to fit bollard collar

- Furniture Type (BR): Bike Rack
  - Location: as shown on landscape drawings,
  - Manufacturer: Equal to D.O.Smith and Sons,
  - Product Type: B004
  - Fixing: Sub-surface; refer manufacturers specification

3.10 Edging

Edging shall be used as a separation between gardens (including tree planting) and lawns.

Supply and install edging as follows:

- Edging Type (SE): Mild Steel Metal
  - Location: as shown on landscape drawings,
  - Installation: set edging flush with adjoining surfaces, pegs shall be securely fixed to the steel edging at the required location to provide a neat fit, with peg tops 25mm below the top of the edging, fix edging to pegs using galvanised nails,
  - Type: galvanised mild steel,
  - Size: 100 x 3mm nominal in longest practicable lengths,

  - Pegs: 10 x 10 x 200mm long, and
  - Fixings: fillet welded.

- Furniture Type (PT): Planting Trellis
  - Location: as shown on landscape drawings,
  - Material / Type: Prefabricated steel fence, Stainless Steel Trellis,
  - Height: TBC
  - Rails: 16 mm thick Steel, locate two (2) rails with the top rail and bottom rails located as per the detail,
  - Palings: 102 x 19mm,
  - Finish: micaceous iron oxide finish,
  - Fixing to Wall: subsurface plates under finishes,
  - Trellis: Equal to Ronstan, AGS5 Easy Green Wire Trellis, Vertically placed,
  - Fixing: Refer to Manufacturers Specification,
  - Shop Drawings: to be prepared for checking and approval,

3.11 Waterproofing to Planter Walls

Apply waterproof membrane to back of planter walls, and concrete slabs in accordance with engineer's details and manufacturer's recommendations.

The waterproofing shall be fully warranted for a period of 20 years. Installation of the waterproofing shall be fully guaranteed for a minimum of 15 years.

Install on even, clean surface without any debris, rocks, or pebbles under.

Supply and install water proofing membrane as follows:

- Polymeric single-ply Roofing Membrane
  - Supplier / Manufacturer: equal to Evalon V as supplied by Evalon (phone 9648 1864),
  - Backing: Polyester Fleece

3.12 Tactile Paving Indicators

Tactile paving indicators shall be provided in accordance with the latest edition of AS 1428.

Supply and install tactile paving indicators as follows:

- Tactile Indicators TI: Tactile Indicator Studs
  - Location: to ramps, as shown on landscape drawings,
  - Type: tactile indicator studs,
  - Supplier: equal to Safespot (02 9518 8011) Millenium range – studded concentric circle design with smooth bevelled edge,
  - Material/Colour: Stainless steel,
  - Size: 35dia x 5mm height,
  - Pattern: to manufacturers specification, to meet AS1428,
  - Installation: Epoxy fixing, in accordance with manufacturer's recommendations, using an approved accredited installer.

4.0 SOFTSCAPE ELEMENTS

4.1 Scope

The works included in this section shall include the supply of labour and materials to install and/or construct:

- Soil preparation,
- Soil works,
- Planting preparation,
- Planting installation,
- Mulching,
- Turfing, and
- Grass seeding.

4.2 Quality

Give sufficient notice so that inspection may be made of the following:

- Softwork areas set-out,
- Sub-grades cultivated or prepared before placing topsoil,
- Topsoil spread before planting or turfing or seeding,
- Plant holes excavated and prepared for planting,
- Plant material set-out before planting,
- Planting, staking and tying completed,
- Turfing completed, and
- Grass seeding completed.

Place orders for all plants with approved nurseries and provide evidence of order within fourteen (14) days of being awarded the contract. All plant material shall be obtained from approved suppliers. A warranty shall be provided by the supplier declaring that plants and their containers are true to the specified species and free from diseases, pests, weeds and the like.

Submit representative samples of each of the following materials, packed to prevent contamination and labelled to indicate source and content:

- Soil mix types, including chemical composition,
- Mulch, and
- Plant sample for each plant species or variety.

4.3 Soil Testing

Sampling: As recommended in AS 4419 Appendix A.

Undertake at least two (2) soil tests, in locations as advised by Project Manager, and provide results and recommendations for the improvement of plant growth and to adjust the soil to achieve appropriate planting medium (including pit levels) for successful plant growth.

Provide a complete chemical composition test equal to that provided by Sydney Environment and Soil Laboratory, telephone (02) 9980 6554.

4.4 Subsoil

Excavate all garden beds to bring the subsoil to at least 300mm below finished design levels. Shape the subsoil to fall to subsoil drains where applicable. Do not excavate within the drip line of trees to be retained.

Excavate all turf and grass areas to bring the subsoil to at least 100mm below finished design levels. Shape the subsoil to fall to subsoil drains where applicable. Do not excavate within the drip line of trees to be retained.

Cultivate the subsoil to a further depth of 100mm. Remove stones exceeding 25mm, clods of earth exceeding 50mm, and weeds, rubbish or other deleterious material brought to the surface during cultivation. Do not disturb services or tree roots, if necessary cultivate these areas by hand. During cultivation, thoroughly mix in materials required to be incorporated into the subsoil, as recommended in the soil testing results and to manufacturer's recommendations. Trim the surface to design levels after cultivation.

4.5 Drainage Provision to On Slab Planting Areas

Supply and install drainage provision to all on slab planting areas and planter boxes.

The Landscape Contractor shall check the waterproofing is installed in accordance with the "Waterproofing to Retaining and Planter Walls" section (refer "Hardscape Elements" above) and with engineer's details and manufacturer's recommendations, and notify of any breaks or inadequacies prior to installation.

Supply and install a polypropylene cellular drainage cell equal to 'Atlantis' drainage cell complete with a continuous geotextile filter fabric liner to all planting areas on slab, in accordance with manufacturer's instructions and details. Drainage cell and filter fabric shall extend across the base of planters on slab and up planter side walls to the underside of the mulch layer.

Geotextile filter fabric is to be installed over all drainage cell material. Allow to tape the fabric over the top of the planter walls to ensure soil mix does not escape into drainage outlets/holes.

Install a minimum 50mm double washed coarse river sand over all geotextile lining prior to installation of soil mix.

Install a 75mm diam slotted PVC pipe with geotextile sleeve and matching cap in a vertical configuration to provide visual access and flushing capability directly over drainage outlets provided from the planters. Ensure that the pipe runs directly from a level below the mulch down directly to the drainage cell, with the geofabric turned up and secured around the base of the pipe.

4.6 Topsoil

Import topsoil for the garden and turf areas, unless the topsoil can be provided from material recovered from the site, as recommended in the soil testing results.

Improved topsoil is to comply with the soil testing results, and as a minimum the following relevant test criteria:

- Improved topsoil particle size (% passing by mass)
  - AS sieve aperture

	Soil Textures		
	Fine	Medium	Course
2.36	100	100	100
1.18	90-100	95-100	95-100
0.60	75-100	75-100	70-90
0.30	57-90	55-85	30-46
0.15	45-70	38-55	10-22
0.075	35-55	25-35	5-10
0.002		2-15	2-8

- Improved topsoil properties

Property	Type	Amount
Nutrient levels	Phosphorous (P) (mg/L)	0.7-4
	Potassium (K) (mg/L)	35-250
	Sulphur (S) (mg/L)	>40

	Calcium (Ca) (mg/L)	50-350
	Nitrogen (N) (mg/L)	≤100
	Nitrogen drawdown (NDI 150)	>0
Additives	Gypsum (kg/m^2)	0.25
	Compost	to AS 4454
Other properties	Organic matter (% by mass)	20 maximum
	Wettability	>5mm/min
	Soil reaction (pH)	6-7
	Electrical conductivity (dS/m)	<1.2 w/v testing method
	Soluble salts (% by mass)	0.1
	Permeability	2-100cm/hr

Spread the topsoil on the prepared subsoil and grade evenly, compact lightly and uniformly in 150mm layers. Avoid differential subsidence and excess compaction and produce a finished topsoil surface which has the following characteristics:

- Finished to design levels, allowing for mulch or turf, which is to finish flush with adjoining hard surfaces such as paths and edge,
- Smooth and free from stones or lumps of soil,
- Graded to drain freely, without ponding, to catchment points,
- Graded evenly to adjoining surfaces, and
- Ready for planting.

Supply and install the following imported topsoil mixes:

- Soil Mix Type A
    - 60% soil mix (60% coarse sand and 40% black soil),
    - 10% mushroom compost,
    - 10% pine bark fines,
    - 10% composted sawdust, and
    - 10% composted manures.
- Soil Mix Type B
    - 80% washed river sand, and
    - 20% black soil.

Spread topsoil to the following typical depths:

- Planting on ground
    - Improved Site Soil or Soil Mix Type A: top 300mm of soil profile, and
    - Soil Mix Type B: below top 300mm of soil profile to 100mm below base of rootball.
- Planting on slab
    - Soil Mix Type A: top 300mm of soil profile, and
    - Soil Mix Type B: below top 300mm of soil profile (depth varies).
- Trees on ground
    - Soil Mix Type A: top 300mm of soil profile, and
    - Soil Mix Type B: below top 300mm of soil profile to 100mm below base of rootball base for trees <75L and 300mm below rootball base for trees ≥75L.
- Turf areas
    - Soil Mix Type B: 150mm.

4.7 Compost

Provide, in accordance with AS 4454, well-rotted vegetative material or animal manure, free from harmful chemicals, grass and weed growth.

4.8 Fertiliser

Provide proprietary fertilisers, delivered to the site in sealed bags marked to show manufacturer or vendor, weight, fertiliser type, N:P:K ratio, recommended uses and application rates.

The following application is to be used as a minimum, and may vary in accordance with results and recommendations established from soil tests:

- Trees – apply two (2) pellets /300mm top grown (maximum 8/tree) of Kokei pellets or equivalent.
- Mass planted areas – apply 500g/m2 of Nutricote Blue slow release fertiliser (with N:P:K ratio of 16:4.4:8.3) or equivalent.
- Turf and grass seeded areas – apply to manufacturer's recommendations granulated pelletised chicken manure (with N:P:K ratio of 9:4:6) prior to laying or seeding and biannually, as well as Nitram 6 weeks after laying.

4.9 Embankment Stabilisation

Where necessary to prevent soil erosion or soil movement, stabilise embankments. As a minimum this should be on slopes $\geq$ 1 in 3.

Stabilise embankments using biodegradable fibre reinforced with heavy weight polymer mesh. Install in accordance with manufacturer's specification, including 300 x 300 mm anchor trenches at top and bottom, backfilled with soil and compacted, and U-shaped galvanised steel pegs at 1000 x 1000 mm intervals generally and 250mm at overlaps.

Plant after matting is installed.

4.10 Plants

Supply plants in accordance with the landscape drawings and schedules, which have the following characteristics:

- Large healthy root systems, with no evidence of root curl, restriction or damage,
- Vigorous, well established, free from disease and pests, of good form consistent with the species or variety,
- Hardened off, not soft or forced, and suitable for planting in the natural climatic conditions prevailing at the site, and in particular shade conditions,
- Grown in their final containers for not less than twelve weeks,
- Trees, unless required to be multi-stemmed, shall have a single leading shoot, and
- Containers shall be free from weeds and of appropriate size in relation to their container.

All plant specimens are to be true to name and variety listed in the plant schedules on the landscape drawings. Make no substitutions of species type or container size unless approved by the Landscape Architect and Project Manager.

Plants shall not exhibit signs of having been stressed at any stage during their development and delivery due to inadequate watering, excessive shade/sunlight, physical damage or have restricted growth due to nursery conditions.

4.11 Plant Delivery and Labelling

Plants are to be delivered to site in a covered vehicle to prevent wind damage. Plants are to be placed in the vehicle in a manner that prevents them from moving and sustaining any damage. Plants damaged on delivery shall be rejected and replaced at the Landscape Contractor's cost. Deliver plant material to the site on a day to day basis, and plant immediately after delivery.

Label at least one plant of each species or variety in a batch with a durable, legible tag. Maintain the tags for the plant establishment period.

4.12 Installation of Plants

Do not plant in unsuitable weather conditions such as extreme heat, cold, wind or rain. In other than sandy soils, suspend excavation when the soil is wet, or during frost periods.

Do not vary the plant locations from those shown on the drawings unless otherwise directed. If it appears necessary to vary the locations and spacings to avoid service lines, or to cover the area uniformly, or for other reasons, apply for directions. Allow for sufficient notice for approval by the Landscape Architect and Project Manager of the location of mature and feature trees and plants.

For tree plantings, excavate a hole to twice the diameter of the root ball and at least 200mm deeper than the root ball. Break up the base of the hole to a further depth of 100mm, and loosen compacted sides of the hole to prevent confinement of root growth.

Following excavation of the planting hole place and spread 15gms of wetting agent equal to 'terra-sorb', pre-mixed with one (1) litre of water, at the bottom of each planting hole, at the following rates:

- Virocell or Virotube: 1 tablet, or
- Semi-advanced plants (<75L): 2 tablets, or
- Advanced (≥75L): 3 tablets.

Thoroughly water the plants before planting, immediately after planting, and as required to maintain growth rates free of stress. No plant material shall show signs of water stress at any time.

When placing, remove the plant from the container with minimum disturbance to the root ball. Ensure that the root ball is moist and place it in its final position, in the centre of the hole and plumb, and with the top soil level of the plant root ball level with the finished surface of the surrounding soil. All plants are to be positioned in the centre of the hole.

In planting beds and individual plantings, apply fertiliser pellets, as recommended in the soil testing results and in accordance with the manufacturer's recommendations around the plants at the time of planting. Provide proprietary fertilisers, delivered to the site in sealed containers displaying manufacturer or vendor's name, weight, fertiliser type, N:P:K ratio, recommended uses and application rates.

Backfill the planting holes with topsoil mixture. Lightly tamp and water to eliminate air pockets. Ensure the topsoil is not placed over the top of the rootball, so that the plant stem remains the same height above the ground as it was in the container.

4.13 Root Barriers

Supply and install root control barriers to all new and existing tree plantings, where their proximity poses a threat to the stability of road kerbs, road paving and footpaths and other hard landscape elements such as walls, fences, steps, and garden edging. As a minimum this should be installed where trees are located within 2 metres of the element, and are to extend along the element for 2 metres either side of the tree trunk.

Root barriers shall be equal to Root Wall, as supplied by Treemax, and installed alongside the landscape element to be protected in accordance with manufacturer's recommendations.

4.14 Mulching

Garden mulch shall conform to AS4454 and be free of deleterious and extraneous matter such as soil, weeds, sticks, wood slivers, stones and vegetative reproductive parts of undesirable plants.

Mulch shall be approved recycled mulch recovered from site clearing, if available, otherwise equal "Forest Fines" as supplied by Australian Native Landscapes.

Before placing mulch ensure that soil depths are correct and that the soil surface is even and ready to receive mulch as a consistent layer.

Place mulch in all garden beds to a depth of 75mm, when all specified plants are installed, clear of all plant stems, and rake to an even surface flush with the surrounding finished levels and evenly graded between design surface levels. The specified depth shall be achieved after the mulch has settled.

4.15 Stakes and Ties

Stakes shall be durable hardwood, straight, free from knots or twists, pointed at one end, in the following quantities and sizes for each of the various plant pot sizes:

- Plants (≥25L): One (1) of 38 x 38 x 1200mm,
- Semi-advanced plants (≥75L): Two (2) of 50 x 50 x 1800mm, or
- Advanced (≥100L): Three (3) of 50 x 50 x 2400mm.

Drive stakes into the ground a minimum one third of their length, making sure they are plumb, equal in height and avoids damage to the plants root system.

Provide ties fixed securely to the stakes, one tie at half the height of the main stem, others as necessary to stabilise the plant, allowing a small degree of movement but not affording any damage to the stem. Ties shall be 50 mm hessian webbing installed around the stake and stem in a figure of eight pattern and stapled to the stake.

4.16 Hydroseeding, Ecoblanket or approved equivalent

Setting Out
A. Boundaries of planted areas shall be clearly marked and acceptance shall be obtained from the Clients Nominated Representative before starting work.

Chemicals
The Clients Nominated Representative shall be notified of any intention to apply chemicals, the product to be used and the dose rates. Permission shall be received from the Clients Nominated Representative before usage.

Empty or unwanted containers and chemicals, including unused diluted tank mixture, shall be disposed of in a safe way in accordance with all relevant statutory legislation. Disposal shall be off Site.

Fertilisers and Ameliorants Generally
A. Suitable fertilisers/ ameliorants shall be accepted by the Clients Nominated Representative.
B. Quantities/ rates of application of fertilisers/ ameliorants shall be in accordance with the manufacturer's written recommendations based on the topsoil analysis.

Cultivation
A. Any compacted topsoil shall be broken up to full depth. The top of all topsoil shall be reduced to a tilth suitable for blade grading (10mm down particles). Undesirable material brought to the surface, including roots and foreign matter, shall be removed. Refer also to section 0751 for requirements.

Grading
A. When topsoil is reasonably dry and workable it shall be graded to smooth, flowing contours, with falls for adequate drainage. All minor hollows and ridges shall be removed. Refer also to specification for sub-grade requirements.

Topsoil Levels
A. Topsoil levels shall be adjusted by blade grading. If the required levels cannot be achieved by movement of the existing soil, the Clients Nominated Representative shall be notified and instructions obtained. Refer also to specification for sub-grade requirements.

Crop Edges

A. Unless otherwise stated, finished levels after settlement shall be flush with adjoining paving, kerbs, manholes, etc.
B. Acceptance shall be obtained from the Clients Nominated Representative of all levels and grading before planting.

Final Cultivation

A. After final grading, the soil shall be firmed lightly and uniformly and the top 25mm shall be reduced to a fine tilth by harrowing with spike/ chain harrows or accepted cultivators. All stones more than 50mm in any dimension shall be removed. Hand operational tools shall be used for adjacent structures/ awkward corners/ areas inaccessible to machinery. Refer also to specification for sub-grade requirements.

Production and Specification of Seed

Hyrdo seed Mix 1 (APZ Area)

Microlaena stipoides var Griffen 10.0 (Kg/ha) Application Rat)

Hydro seed Mix 2 (APZ Area)

Rytidosperma geniculatum var Oxley 10.0 (Kg/ha) Application Rat

Hyrdo seed Mix 3 (VMP Area)

In line with RMS Specification R178

Imperata cylindrica var. major seed 24.0 (Kg/ha)
Oplismenus aemulus seed 4.0 (Kg/ha)
Themeda 'Triandra' pelletised seed 2.0 (Kg/ha)

Hyrdo seed Mix 4

In line with RMS Specification R178

Ptilothrix deustaseed 4.0 (Kg/ha)
Oplismenus imbecillis seed 4.0 (Kg/ha)
Themeda 'Tangara' pelletised seed 2.0 (Kg/ha)

Sowing Crops

A. Seed shall be sown during early Spring or Autumn.
B. Seed shall be spread evenly at the specified rate(s) and applied in two equal sowings in transverse directions.
C. The ground shall be lightly harrowed or raked.
D. On light soils the ground shall be rolled and cross-rolled after seeding using a lightweight roller

Seed Supply

Provide seed mixtures which are thoroughly pre-mixed with a bulking material such as safflower meal. Seed stock is to be certified local provenance only.
Supply a specification to industry standards of hydromulching application of indigenous grassland species to areas indicated. Seed stock to be certified local provenance only.

Product: Covercrop Hydromulch Mix

A. Covercrop seed hydroseed in accordance with RMS QA Specification R178.
B. Hydromulch over cultivated subgrade.

Final seed mix application to be subject to availability and is to be approved by Landscape Architect and Project Manager and appropriate design consultant prior to application.

Quality of Seed

A. Fresh seed shall be purchased for each growing season. Seed purchased for previous seasons shall not be used.
B. Germination capacity shall be not less than 80%.
C. Purity of mixture shall be not less than 90%.
D. Total weed seed content shall be no more than 0.5%.

E. Total content of other crop seeds shall be no more than 1%.
F. Results of testing for germination, purity and composition, which shall be carried out at an Official Seed Testing Station, shall be submitted when requested by the Clients Nominated Representative.

The hydromulching mixture is to contain a slurry of seed mixture, fertilizer, mulch and water, with application rates as follows:

- Location: to parks and banks, as shown on the landscape drawings
- Seed mix: native grasses certified as local provenance only, at 5-10kg/Ha or to rate recommended by supplier,
- Mulch Type: defibrated pinus radiata fibre or approved equivalent at 1500-2000kg/Ha or to rate recommended by supplier,
- Fertiliser Type: to suit native grasses, at 250-500kg/Ha or to rate recommended by supplier,
- Binder: bituminous emulsion or approved equivalent, at 250-500kg/Ha or to rate recommended by supplier, and
- Water: at a rate, suitable to the site conditions, sufficient to assist in the distribution of the seed, fertilizer and mulch.

Prepare the area for hydromulching by scarifying to provide a firm friable seed bed. If the area is to have added topsoil, place it before scarifying.

Thoroughly mix the slurry in a purpose made mechanical mixer.

Moisten the topsoil to its full depth before applying the slurry. Apply the slurry with, a suitable marker dye mixed through, using high pressure pumping equipment operated by trained personnel. Spray the mixed slurry under pressure, maintaining a thoroughly mixed supply, operating on a front so that the mixture is evenly distributed over the area. Complete each front before commencing the next.

Water the seeded area with a fine spray until the topsoil is moistened to its full depth. Continue watering until germination. Keep the surface damp and the topsoil moist but not waterlogged. After germination, water to maintain a healthy condition, progressively hardening off to the natural climatic conditions.

Protective Measures or Fencing
A. Newly planted areas shall be protected with timber posts and mesh and locally available 1.2m high fencing,
to the acceptance of the Clients Nominated Representative.
B. Fencing shall be maintained until crops has sufficiently established/ taken, and then removed.
C. Any damage to crops shall be made good
.

4.17 Hydromulching

Supply a specification to industry standards of hydromulching application of indigenous grassland species to areas indicated. Seed stock to be certified local provenance only. Final seed mix application to be subject to availability and is to be approved by Landscape Architect and Project Manager and appropriate design consultant prior to application.

The hydromulching mixture is to contain a slurry of seed mixture, fertilizer, mulch and water, with application rates as follows:

- Location: to parks and banks, as shown on the landscape drawings
- Seed mix: native grasses certified as local provenance only, at 5-10kg/Ha or to rate recommended by supplier,
- Mulch Type: defibrated pinus radiata fibre or approved equivalent at 1500-2000kg/Ha or to rate recommended by supplier,
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- Binder: bituminous emulsion or approved equivalent, at 250-500kg/Ha or to rate recommended by supplier, and

- Water: at a rate, suitable to the site conditions, sufficient to assist in the distribution of the seed, fertilizer and mulch.

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Water the seeded area with a fine spray until the topsoil is moistened to its full depth. Continue watering until germination. Keep the surface damp and the topsoil moist but not waterlogged. After germination, water to maintain a healthy condition, progressively hardening off to the natural climatic conditions.

At completion of hydromulching process install equal to Jutemaster FM to full extent of treated area in accordance with manufacturers' recommendations.

5.0 IRRIGATION

5.1 Scope

The works included in this section shall include all the necessary components to:

- Design, supply, install, balance and commission multiple permanent irrigation systems,
- Prepare and submit irrigation design documents and plans for relevant authority and project approval that fully describe the system to be installed,
- Conform to Water Board and other relevant authorities' approvals, rules and regulations,
- …Supply and install all necessary pipes, fittings and pumps for providing a separate automatic system for irrigating all garden and turf areas in the public domain areas, and
- …Supply and install all necessary pipes, fittings and pumps for providing separate individual automatic systems for irrigating all garden and turf areas in each of the units/houses on the site.

The final irrigation design and installed system shall take into account:

- The requirements to comply with water use restrictions dictated by authorities,
- Water saving and conservation components,
- Using a drip system rather than the use of sprinklers,
- …Using the on-site irrigation storage tanks for irrigation reticulation, …or…Connection to the existing potable water supply throughout the site,
- Controlling water flow to deliver only the necessary volume to sustain plant vigour, and
- Reducing water delivery rates, volumes and frequencies as plants mature and find their own water sources in the soil and lower strata.

Areas to be irrigated: Individual tree plantings, mass garden beds, planting on slab. The APZ will have establishment watering in order for seed / plant growth.

5.2 Quality

Give sufficient notice so that inspection may be made of the following:

- Work ready for specified testing,
- Underground or enclosed work ready to be covered up or concealed, and
- Final testing of the completed system.

Prepare and submit detailed shop drawings and a full performance programme for the required irrigation systems, including, but not limited to, irrigation pipes and fittings layout and irrigation controllers and valves locations. A transparency of all shop drawings is to be submitted to the Project Manager and Landscape Architect for review and approval prior to the supply and installation of the works.

Prepare and furnish to the Project Manager before the date of practical completion, 'work as executed' drawings of the irrigation, to the same scale and on the same sized standard sheets as the contract drawings, showing the locations of all pipes and fittings, including depths of underground pipework, position of control valves, and the like. Provide written instructions for the operation and maintenance of the automatic irrigation system.

5.3 System

The irrigation system shall be an automatic fixed drip system, with an irrigation controller self operated via a soil moisture sensor. The system shall be compatible to the type of plant material and rates of water required. Where appropriate adjustable and fully serviceable. The layout of the entire irrigation is to ensure that each individual plant receives the required amount of water to maintain healthy and vigorous growth.

The irrigation system shall be such that, component theft, vandalism, over-spray and wetting of paths shall be reduced to a minimum or completely eliminated by the use of drip, pop-up sprinklers and judiciously

placed fixed spray emitters. Do not use fine mist type emitters that provide a drifting mist that may wet paths and the buildings.

5.4 Materials and Items

The system shall incorporate the following components:

- Valve boxes: All water supply points and timers shall be housed in lockable waterproof irrigation style valve boxes for easy access and location. The valve box should be manufactured from fibreglass or high density thermo plastic material. The valve lid is to incorporate a locking mechanism.
- Automatic control valves: 24V solenoid actuated hydraulic valves with flow control and a maximum operating pressure rating 1MPa. Provide stainless steel bonnet holding down bolts and internal metal parts of stainless steel, able to be serviced without removal from the line. Provide a gate valve of the same size immediately upstream of each automatic control valve. House both valves in a high impact plastic valve box with high impact plastic cover at finished ground level.
- Quick coupling valves: Provide DN 20 double lugged bronze quick coupling valves with neoprene seats mounted on DN 20 copper risers offset at least 150mm from the supply pipe. Provide valve boxes and covers set flush with the finished surface.
- Pressure regulating valves: Provide pressure regulating valves at offtake points, which are adjustable between 100-700 kPa. Provide an 800µm filter sized to suit the flow immediately upstream from the pressure regulating valve, and provide gate valves upstream from the filter and downstream from the pressure regulating valve. Mount the assembly in an accessible position in the valve box, access pit or adjacent building, and provide backflow prevention.
- Soil moisture sensors: Provide fixed ceramic moisture sensors. Connect to the irrigation controller via moisture control units.
- Control wires: Connect the automatic control valves and soil moisture sensors to the controller with double insulated underground cables laid alongside piping where possible. Lay intertwined for the full length without joints except at valves, sensors and branches of common wires. Provide waterproof connectors. Provide expansion loops at changes of direction and at joints.
- Irrigation controllers: Provide manual cycle and individual station operation, manual on/off operation of irrigation without loss of programme, 240V input and 24V output capable of operating 2 control valves simultaneously, 24 hour battery programme backup and power surge protection. Mount cabinet in a waterproof lockable cabinet. Provide a 240V electrical connection supply, with an isolating switch at the controller.

5.5 Installation

Work shall be done by or under the direct supervision of appropriately licensed personnel.

The final installation of the system shall include the following features:

- All components except the visible top of pop-up sprinklers shall be installed in a manner that is concealed below ground or below mulch,
- All tubing below mulch shall be pinned into place with galvanised steel spikes to prevent the tubing bending up through the mulch layer,
- All valve boxes shall be supported in the ground on brickwork,
- Valve box lids shall be set level with garden mulch levels and in concealed locations,
- All control fittings such as valves and the like shall be fully accessible within concealed valve boxes in the landscaping,
- All mainline and lateral pipework shall be concealed from view,
- No tube junctions shall be placed in conduits or under slabs where access is not possible,
- Use Class B copper piping on underside of slabs,
- All joints shall be fitted tightly, sealed and made leak proof, with no internal projections, burrs or obstructions,
- Each separate system shall be controlled by one control panel located in a secure area,
- Back flow and master valve assemblies shall be sized as follows:
    - Flow rate 10-17 lpm use 25mm backflow and master valve assembly,

    - Flow rate 71-150 lpm use 40mm backflow and master valve assembly, or
    - Flow rate 151-240 lpm use 50mm backflow and master valve assembly.
- Space dripline tubing at maximum 450mm centres and maximum 200mm from garden edges, and
- Pipework shall be in accordance with AS 1477 and AS 2032.

Flush piping system through with clear water at a velocity sufficient to remove foreign matter, and until only clean water is discharged at outlets. Leave the system free of foreign matter on completion.

5.6 Commissioning

The entire system shall be tuned and tested to deliver an adequate amount of water to all plants and turf. Test the system in the presence of the Landscape Architect and/or irrigation designer to facilitate the issue of a Certificate of Practical Completion.

Maintain the system for the duration of the establishment maintenance period as detailed elsewhere in the specification.

6.0 PLANT ESTABLISHMENT AND MAINTENANCE

6.1 Generally

The Landscape Contractor shall rectify defects during installation and that become apparent in the works under normal use for the duration of the contract Defects Liability Period.

The Landscape Contractor shall maintain the contract areas by the implementation of industry accepted horticultural practices for 52 weeks. The landscape maintenance works shall include, but not be limited to, the following:

- Replacing failed plants,
- Pruning,
- Insect and pest control,
- Fertilising,
- Maintaining mulch,
- Mowing,
- Watering,
- Rubbish removal, and
- Cleaning of the surrounding areas.

6.2 Logbook

Keep a Maintenance Logbook recording when and what maintenance work has been done and what materials, including chemical materials, have been used. The records shall show when and where identified chemicals were used and why. Submit the initial logbook for inspection prior to Practical Completion and again at the end of the Defects Liability Period as a prerequisite for granting Practical and Final Completion Certificates.

Record all major events and activities in the logbook.

Make the logbook available for inspection on request.

6.3 Plants

Trees, shrubs and groundcovers shall at all times show signs of healthy vigorous growth. Spent flower heads or stalks shall be removed immediately following flowering.

Replace failed plants. A "failed" plant may not mean complete death of soft tissue but failure due to poor growth, appearance, or unacceptable time for plant to re-establish new growth following damage or vandalism. Replacement plants shall be in a similar size and quality and identical species or variety to the plant that has failed. Replacement of plants shall be at the cost of the Landscape Contractor unless advised otherwise. Failure of the plant shall be at the sole discretion of the Landscape Architect.

6.4 Pruning

Whatever pruning work is requested by the Landscape Architect shall be performed, including any pruning of damaged growth or miscellaneous pruning considered as beneficial to the condition of the plants. All pruning works shall be undertaken in a manner equal to acceptable horticultural practice.

6.5 Spraying

Avoid spraying if ever possible.

Immediately report to the Project Manager any evidence of intensive weed infestation, insect attack or disease amongst plant material. Submit all proposals to apply chemicals and obtain approval before starting this work.

When approved, spray with herbicide, insecticide, fungicide as appropriate in accordance with the manufacturers' recommendations. Record in the logbook all relevant details of spraying activities including:

- Product brand / manufacturer's name,
- Chemical / product name,
- Chemical contents,
- Application quantity and rate,
- Date of application and location,
- Results of application, and
- Use approval authority.

6.6 Fertilising

Fertilise gardens with a proprietary slow release fertiliser applied in accordance with the manufacturer's directions and recommendations. Record in the logbook all relevant details of fertilising including:

- Product brand / manufacturer's name,
- Fertiliser / product name,
- Application quantity and rate, and
- Date of application and location.

6.7 Stakes and Ties

Adjust and replace as required to ensure plants remain correctly staked. Remove those not required at the end of the planting establishment period (Defects Liability Period).

6.8 Mulched Surfaces

Maintain the surface in a clean, tidy and weed free condition and reinstate the mulch as necessary to ensure correct depth as before specified.

6.9 Mowing and Top Dressing

Mow the turf to maintain a grass height of between 30-50mm. Do not remove more than one third of the grass height at any one time. Remove grass clippings from the site after each mowing.

Top dress to a maximum of 10mm as necessary to fill depressions and hollows in the surface.

6.10 Irrigation and Watering

Maintain the irrigation system to sure that each individual plant receives the required amount of water to maintain healthy and vigorous growth, adjust and rectify as required.

Provide additional watering, if necessary.

6.11 Erosion Control Measures

Where necessary, maintain the erosion control devices in a tidy and weed free condition and reinstate as necessary to ensure control measures are effective where deemed necessary.

6.12 Weeding and Rubbish Removal

During the plant establishment period remove by hand, rubbish and weed growth that may occur or re-occur throughout all planted, mulched and paved areas.

6.13 Urgent Works

Not withstanding anything to the contrary in the Contract, the Project Manager may instruct the Landscape Contractor to perform urgent maintenance works that place the completed contract works at risk. If the Landscape Contractor fails to carry out the work within seven (7) days of such notice, the Project Manager (or representative) reserves the right without further notice to employ others to carry out such urgent and specified work and charge it to the Landscape Contractor. Such work shall include but not limited to the inspection and clearing of drains in the pavement and gardens.

6.14 Completion

A final inspection shall be made by the Project Manager, Landscape Contractor and Landscape Architect before the completion of the Plant Establishment Maintenance Period (Defects Liability Period). Any items requiring rectification shall be repaired before completion of the relevant works and finally approved prior to certification.

6.15 Maintenance Schedule

Table	ACTIVITY	FREQUENCY						ACTION
		D	W	2W	M	3M	3or6M	Daily, Weekly, Monthly
1	Logbook		+					Complete a logbook entry every day at site. All actions listed below require a logbook entry. Upon request, make the logbook available for inspection. Submit copies of new entries in the logbook to the Contract Administrator on a monthly basis. Please note that more frequent, short, occasional inspection should result in less maintenance work when problems are observed earlier than they might otherwise have been seen.
2	Plant replacement		+					Inspect and replace failed plants within 2 weeks of observation of failure. Match species, size (original) and location of new with old.
3	Mulch		+					Inspect and replace mulch deficiencies within 2 weeks of observation. Prior to placing new mulch aerate the soil by fork turning to a depth of at least 100mm, roughly level the soil and then place mulch. Do not disturb major plant roots while aerating soil.
4	Erosion control			+				Inspect every two weeks and repair ground, soil and mulch immediately. Maintain erosion control device as necessary.
5	Stakes and ties			+				Inspect every two weeks, adjust and/or replace as necessary but remove as plants mature and are able to support themselves.
6	Weed and rubbish removal			+				Inspect and remove immediately upon observation. Leave no waste on site. Dispose of waste material at a designated waste disposal site.
7	Pruning			+				Inspect every 2 weeks and prune as necessary to remove dead wood, improve plant shape and promote healthy vigorous new growth.
8	Spraying			+				Inspect every 2 weeks and action as necessary. Do not spray if other non-chemical methods will satisfy the need to remove insects. Spray for disease control only when absolutely necessary.

9	Urgent works		+					Complete within 1 week (7 days) of notification. Inspect and clear drains.
10	Planting and fertilising			+			3m+	Inspect every 2 weeks and remove spent flowers and dead stalks as they become apparent. Fertilise gardens every 3 months or other frequency in accordance with fertiliser manufacturer's directions.
11	Watering	+		+				Water when and where necessary every day at site and at least every 2 weeks generally. Do not allow soil and plants to dehydrate. Allow for prolonged rain, windy and dry periods. Water in the early morning or late afternoon to avoid excessive evaporation during the heat of the day.
12	Mowing, top-dressing and edging			+		+	6m+	Summer fortnightly. Winter monthly. Top-dress 6 monthly.