CONACHER TRAVERS

environmental consultants

OFFSETTING STRATEGIES

FOR

CARRINGTON CENTENNIAL AGED CARE MASTERPLAN WEROMBI ROAD, GRASMERE

SEPTEMBER 2005
(REF: 5223)

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OFFSETTING STRATEGIES FOR CARRINGTON CENTENNIAL CARE

1.0 Introduction

Camden Council has developed a Natural Assets Policy which aims to facilitate ecological sustainable development throughout the Camden LGA. This is achieved by the development of a trading scheme which provides an offsetting mechanism to provide flexibility to implement the policy. This offsetting will ensure that future impacts upon land uses are considered in the context of the total catchment rather than in isolated parcels of land. This strategy involves protection, conservation and restoration of native vegetation in parcels of a size, quality and configuration which will enable the existing plant and animal communities to survive in the long term. Camden Council has graded the existing vegetation in order of significance.

Conacher Travers has identified offsetting options for the proposed development at Carrington Centennial Hospital. Appendix 1 details how the offsets were calculated taking into account the bonds requirements as set out in Section 6.4 of the council's asset policy.

2.0 Offsetting Options

Three options (Figures 1, 2 & 3) have been identified depending on the calculation of perceived development priorities.

- Option 1 favors the complete development of Area 2D which includes the proposed location for the aged care facility. This option does not allow removal of area 5A and partial removal of area 5E (0.94 ha) within the southern section of the site.
- Option 2 favors development of 40% of Area 2D which equates to the proposal of retaining a portion of the Ironbark Forest for road setback. This option will allow removal of area 5A (1.4 ha), removal of part of area 5e (1.2 ha) and retain regional and locally significant areas of vegetation.
- Option 3 favors development of 60% (1 ha) of Area 2D. This option will allow removal of part of area 5A (1 ha) and part of area 5E (1.2 ha). This option still retains regional and locally significant areas of vegetation.

Option 1 is an option based on the current masterplan proposal. Options 2 and 3 are an optimized strategy which balances habitat removal with the site's capability to accommodate offsetting in accordance with the Natural Asset Policy. The difference between the options 2 and 3 is that the APZ areas are not used as an offsets and the protected areas are more appropriate in the context of the proposed riparian zones.

3.0 Multiplication Factors

In accordance with section 6.3.1 of Council's Natural Asset Policy, *Conacher Travers* has applied the following multiplier ratios in option 1:

- To remove Regional Core habitat by protection of regional core habitat a multiplication factor of 6 applies (Protection Multiplier Table).
- To remove Regional Core habitat by protection of local core habitat a multiplication factor of 7 applies (Protection Multiplier Table).
- To remove Local Core habitat by protection of local core habitat a multiplication factor of 6 applies (Protection Multiplier Table).
- To remove Support for Core habitat by protection of regional core habitat a multiplication factor of 4 applies (Protection Multiplier Table).
- To remove support for Core habitat by protection of local core habitat a multiplication factor of 5 applies (Protection Multiplier Table).

- To remove Support for Core habitat by restoration of Riparian Buffer a multiplication factor of 4 applies (Restoration Multiplier Table).

The Offset Strategy recognises that the Camden Council's Natural Assets Policy has given a heavy weighting to Regional Significant Core Habitat requiring the highest level of offset protection and restoration. The strategy has also been guided by the policy in that Regionally and Locally Significant Core Habitat can only be offset by a "protection offset" rather than an "restoration offset". Regionally and Locally Significant Core Habitat can not be offset by restoration. Support to Core habitat can be traded by a "restoration offset".

Therefore the Offset Strategy follows the following principles:-

1. Regional and Locally Significant Core habitat has been offset by the protection of existing habitats on-site.
2. Support to Core habitat has been offset by protection of existing habitats and restoration of cleared lands on site.

The purchase of land to be dedicated to conservation as an offset is not considered viable at this point in time.

4.0 Offset Bonds and Restoration Costs

At this stage *Conacher Travers* has calculated the restoration bonds in accordance with the Camden Council's Natural Assets Policy which does not reflect the true restoration costs which may be significantly different depending on the restoration methods used. Please note that the Natural Assets Policy is unclear as to whether the bond applies to protection and restoration areas or only restoration areas. Verbal confirmation with Mr. Geoff Bell (22/08/05 and 7/9/05) has clarified that the bond only applies to the restoration areas and only in the event that development works commence prior to the establishment of protection and restoration works. Carrington Centennial Trust has offered a letter of guarantee for the implementation of restoration and protection offsets. In addition an approved Vegetation Management Plan is to be submitted to detail the implementation of the restoration and protection works.

5.0 Offsetting Options

5.1 Option 1 – Trade Off 100% Area 2D (2.45 ha), 100 % Area 4 (3.85 ha), 72% Area 5E (0.94 ha), Retain Area 5A (1.4 ha)

The advantage of this strategy is that all of area 2D is available for development for the aged care facility. The disadvantages are that only part of area 5E is able to be removed; this may enable a road to the proposed development areas. This is because "Local Core" habitat can only be offset with a "Protection Offset" on or offsite under the Camden Council's Natural Assets Policy. In addition area 5A cannot be removed as no land is available onsite for restoration offsite and additional land purchase offsite will be required.

5.2 Option 2 – Trade Off 40% Area 2D (1 ha), 100 % Area 4 (3.85 ha), 100% Area 5E (1.2 ha), 100% Area 5A (1.4 ha)

This option is in accordance with discussion at Camden City Council (08/08/05) to allow partial retention of the Cumberland Plain Woodlands in area 2D and area 2C. The advantage of this strategy is the Core Cumberland Plain Woodland habitat is retained and there is sufficient retention of vegetation to provide connectivity between areas 2D and 2C. This option has included the APZ areas adjacent to 2C (2G & 2F) as regional core habitat as they require no modifications except weed control to meet APZ standards. The APZ's been used to tradeoff an equivalent portion of area 2D. This option will enable the development of area 5E within the southern portion of the site to the east of the riparian zone (Figure 2 – Option 2).

5.3 Option 3 – Trade Off 40% Area 2D (1.47 ha), 100% Area 4 (3.85 ha), 100% Area 5E (1.2 ha), 26% Area 5A (0.36 ha)

This option is in accordance with the strategy discussed at Camden City Council (07/09/05) to allow partial retention of the Cumberland Plain Woodlands in area 2D and part of area 5A to support the proposed riparian zone. This option has not included the APZ areas adjacent to 2C (2G & 2F) as regional core habitat as discussed with Camden City Council (07/09/05). This option will also enable the development of area 5E within the southern portion of the site to the east of the riparian zone (Figure 3 – Option 3) including provision for an access road if required by Council.

6.0 Conclusions

Option 3 is perceived to be the best option as it follows the principles of the Camden City Council's Natural Asset Policy and achieves the most practicable protection and restoration outcome onsite. The option 3 clearly demonstrates a net improvement in the area of protection habitat from 30.4 ha to 37.0 ha including restoration areas 1A, 1B, 2A and 2B this is a 20% increase in Cumberland Plain Woodland habitat across the site. It also supports the proposed riparian zone enhancing its ecological functioning.

In accordance with discussions held at Council on the 7th September, 2005, *Conacher Travers* Pty Ltd will submit a final Vegetation Management Plan for approval by Council.

APPENDIX 1

DETAILS OF OFFSETTING OPTIONS

Option 1 – Trade Off 100% Area 2d (2.45 ha), 100 % Area 4 (3.85 ha), 72% Area 5e (0.94 ha), Retain Area 5a (1.4 ha)

In this strategy is the removal of regional significant area of 2d. This will require protection of regional and local significant areas of 2c, 2e, 6 and partial preservation of 5b. The remainder of 5b is used to offset partial removal of 5e. To allow removal of support for core area 4 will require the restoration of areas 1a, 1b, 2a and 2b which totals 16.04 ha of land. Removal of all of area 2d requires the following protection offsetting:-

In summary this option requires:

1. Protection Offset of Regional Core - Area 2c (6.39 ha)
2. Protection Offset of Regional Core - Area 2e (1.39 ha)
3. Protection Offset of Local Core - Area 6 (6.17 ha)
4. Protection Offset of Local Core - Area 5b (7.83 ha)
5. Restoration Offset of Support for Core – Area 1A, 1B, 2A, 2B (16.04 ha)

Trade-off Areas		**Protection Offset**		**Restoration Offset**		**NAP Bond Value**	**Works Estimate**
Area	ha	Area (Multiplier Factor)	ha	Area (Multiplier Factor)	ha	$	$
Protection Offset							
Regional 2D	2.45	Regional 2C (1:6)	6.39	N/A	N/A		$ 51,120 (1)
		Regional 2E (1:6)	1.39	N/A	N/A		$ 11,120 (1)
		Local 6 (1:7)	6.17	N/A	N/A		$ 49,360 (1)
		Local 5B (1:7) – partial	1.96	N/A	N/A		$ 15,680 (1)
		Subtotal	**15.91**			**Subtotal**	**$127,280**
Local 5E (partial)	0.94	Local 5B (1:6) partial	5.65	N/A	N/A		$ 45,200 (1)
Subtotal	**3.39**	**Subtotal**	**21.56**			**Subtotal**	**$172,480**
Restoration Offset							
Support 4	3.85	N/A	N/A	1A, 1B, 2A 2B (1:4)	16.04	$802,000	$1,026,560
Regional areas 2G & 2FAPZ's	1.75	Need Local Core (1:7)	12.25	Not possible to offset onsite (2)			
		Need Regional Core (1:6)	10.5	Not possible to offset onsite (2)			
				Subtotal		$ 802,000	$1,199,040
				Project Management (15%)			$ 179,856
				Total		**$ 802,000**	**$1,378,896**

Option 2 – Trade Off 40% Area 2D (2.31 ha), 100 % Area 4 (3.85 ha), 100% Area 5E (1.3 ha), 100% Area 5A (1.4 ha)

This strategy allows the removal of regional significant area 2D (1.0 ha). This will require protection of regional and local significant areas of 2c and 2e. The removal of area 5e will require the protection offset of area 5b. To allow removal of support for core area 4 and 5a will require the protection of the remainder of area 2D (1.45 ha), areas 2g & 2f (1.75 ha), area 6 (6.17 ha) and the restoration of areas 1a, 1b and 2b (12.8 ha). This difference between this option and option 1 is that all of 5e, 5a and 4 can be removed for development purposes. This option will depend upon the outcome of talks with council to use the APZ's as regional core.

In summary this option requires:

1. Protection Offset of Regional Core - Area 2c (6.39 ha)
2. Protection Offset of Regional Core - Area 2g & 2f (1.75 ha)
3. Protection Offset of Regional Core - Area 2e (1.39 ha)
4. Protection Offset of Local Core - Area 6 (6.17 ha)
5. Protection Offset of Local Core - Area 5b (7.61 ha)
6. Restoration Offset of Support for Core – Area 1A, 1B, 2B (12.88 ha)

Trade-off Areas		**Protection Offset**		**Restoration Offset**		**NAP Bond Value**	**Works Estimate**
Area	ha	Area (Multiplier Factor)	ha	Area (Multiplier Factor)	ha	$	$
Protection Offsets							
Regional 2D	1.00	Regional 2C (1:6)	6.39	N/A	N/A		$ 51,120(1)
		Regional 2E (1:6)	1.39	N/A	N/A		$ 11,120(1)
		Subtotal	**7.78**			**Subtotal**	**$ 62,240**
Support 5A (Partial)	0.8	Regional 2D (partial) (1:4)	1.45	N/A	N/A		$ 11,600(1)
		Regional 2G & 2F (1:4)	1.75	N/A	N/A		$ 14,000(1)
		Subtotal	**3.2**			**Subtotal**	**$ 25,600**
Support 5A (Partial)	0.58	Local 6 (1:5)	6.17	N/A	N/A		$ 49,360(1)
Support 4 (Partial)	0.65						
Subtotal	**3.03**	**Subtotal**	**17.15**	**Subtotal**			**$137,200**
Local 5E	1.30	Local 5B (1:6)	7.58	N/A	N/A		$ 60,880(1)
Restoration Offsets							
Support 4	3.22	N/A	N/A	1A, 1B, 2B (1:4)	13.68	$ 684,000	$ 870,400
				Subtotal			**$1,068,480**
				Project Management (15%)			$ 160,272
				Total		**$684,000**	**$1,228,752**

Option 3 – Trade Off 40% Area 2D (1.47 ha), 100% Area 4 (3.85 ha), 100% Area 5E (1.2 ha), 26% Area 5A (0.36 ha)

This strategy allows the partial removal of regional significant area 2D (1.0 ha). This will require protection of regional significant areas of 2c 2e and remainder of 2D. The removal of area 5e will require the protection offset of area 5b. To allow removal of support for core area 4 will require the restoration of areas 1a, 1b, 2b and part of area 2A (14.52 ha). This difference between this option and other options is that the multiplication factor will need to not be reduced but adheres to the Camden Council's Natural Asset Policy.

In summary this option requires:

7. Protection Offset of Regional Core - Area 2c (6.39 ha)
8. Protection Offset of Regional Core - Area 2e (1.39 ha)
9. Protection Offset of Regional Core – Area 2D (0.98 ha) partial
10. Protection Offset of Local Core - Area 6 (6.17 ha)
11. Protection Offset of Local Core - Area 5b (7.61 ha)
12. Restoration Offset of Support for Core – Area 1A, 1B, 2B, 2A (partial) (14.52 ha)

Trade-off Areas		**Protection Offset**		**Restoration Offset**		**NAP Bond Value**	**Works Estimate**
Area	ha	Area (Multiplier Factor)	ha	Area (Multiplier Factor)	ha	$	$
Protection Offsets							
Regional 2D (Partial)	1.47	Regional 2C (1:6)	6.39	N/A	N/A		$51,120(1)
		Regional 2E (1:6)	1.39	N/A	N/A		$11,120(1)
		Regional 2D (partial)	0.98	N/A	N/A		
Subtotal	**1.47**	**Subtotal**	**8.76**			**Subtotal**	**$62,240**
Support 5A (Partial)	1.01	Local 6 Partial (1:5)	5.05				$40,400(1)
Support 4 (partial)	0.22	Local 6 Partial (1:5)	1.12	N/A	N/A		$ 8,960(1)
Local 5E	1.2	Local 5B (1:6)	7.58	N/A	N/A		$60,640(1)
Subtotal	**2.53**	**Subtotal**	**13.75**			**Subtotal**	**$110,000**
Restoration Offsets							
Support 4 (partial)	3.42	N/A	N/A	1A, 1B, 2B (1:4)	13.68	$ 678,000	$867,840
Support 4 (partial)	0.21	N/A	N/A	2A (1:4) (partial)	0.84	$ 42,000	$ 53,760
				Subtotal	**14.52**	**$ 720,000**	**$921,600**
				Subtotal			**$1,093,840**
				Project Management (15%)			$164,076
				Total		**$720,000**	**$1,257,916**

Note (1) – These are based on a 2 year weed control program estimated at 40c/m^2/annum. Please note that these costs are not for bond purposes but an indicative cost of maintenance works within the protected offsets. These values are excluded from the bond amount.

Note (2) - The asset protection zones (areas 2G & 2F) are part of a previous DAs and therefore do not require approval (i.e. no APZ beyond that defined for the current building layout) and *Conacher Travers* considers that this area (2G & 2F) should not require offsets as no modification to the existing vegetation is required to meet APZ standards. Negotiation with Camden Council is required for approval of these areas to be used as protection offsets.

APPENDIX 2

FLORA CHARACTERISTICS OF THE SITE

A list of flora species observed on the subject site is provided in Tables A1.1 and A1.2 and full descriptions of the six vegetation communities identified within the subject site is provided below:-

Vegetation Community 1 – Cumberland Plain Woodland (Mixed Species Woodland):

Vegetation Communities 1 and 2 are both representative of the Endangered Ecological Community - Cumberland Plain Woodland. The Mixed Species Woodland is dominated by a mixture of Forest Red Gum, Grey Box and Ironbark, while the Grey Box Woodland is dominated by Grey Box and Forest Red Gum. The trees in the Mixed Species Woodland are of variable ages.

Occurrence - This vegetation community occurs in three sections in the eastern lot of the subject site and covers approximately 20 % of the lot.

Structure - Woodland with a canopy cover of approximately 10-30 % and height of approximately 15-20 metres. The understorey consists of a sparse shrublayer to 3 metres high and moderate to dense groundcover of herbs and grasses.

Disturbances - This vegetation community has been disturbed by partial clearing, rubbish dumping, trail construction and incursions of weeds.

Common Species

Trees: *Eucalyptus crebra* (Narrow-leaved Ironbark), *Eucalyptus moluccana* (Grey Box) and *Eucalyptus tereticornis* (Forest Red Gum).

Shrubs: *Bursaria spinosa* (Blackthorn).

Groundcovers: *Asperula conferta* (Common Woodruff), *Brunoniella australis* (Blue Trumpet), *Dichondra repens* (Kidney Weed), *Microlaena stipoides* (Weeping Grass) and *Themeda australis* (Kangaroo Grass).

Weeds: *Cirsium vulgare* (Spear Thistle), *Eragrostis curvula* (African Lovegrass), *Hypochaeris radicata* (Flatweed), *Lycium ferocissimum* (African Boxthorn), *Modiola caroliniana* (Red-flowered Mallow) and *Olea europea* ssp. *africana* (African Olive).

Vegetation Community 2 – Cumberland Plain Woodland (Grey Box Woodland):

The Grey Box Woodland contains a small number of relatively old trees, while the remainder are juvenile or in early maturity. The understorey in the Grey Box Woodland is distinctly more diverse than that in the Mixed Species Woodland.

Occurrence - This vegetation community occurs in two sections of the western lot of the subject site and covers approximately 50 % of that lot.

Structure - Woodland to open forest with a canopy cover of approximately 25-40% and height of approximately 10-20 metres. The understorey consists of a sparse to moderate shrublayer to 3 metres high and sparse to dense groundcover of herbs and grasses.

Disturbances - This vegetation community appears to be regrowth from previous clearing and has been disturbed by occasional grazing and incursions of weeds.

Common Species

Trees: *Eucalyptus moluccana* (Grey Box) and *Eucalyptus tereticornis* (Forest Red Gum).

Shrubs: *Bursaria spinosa* (Blackthorn).

Groundcovers: *Aristida vagans* (Wire Grass), *Austrostipa verticillata* (Slender Bamboo Grass), *Dichondra repens* (Kidney Weed), *Einadia trigonos* (Fishweed), *Microlaena stipoides* (Weeping Grass), *Sida corrugata, Themeda australis* (Kangaroo Grass) and *Vittadinia cuneata.*

Weeds: *Chamaesyce supina*, *Eragrostis curvula* (African Lovegrass), *Lycium ferocissimum* (African Boxthorn), *Olea europea* ssp. *africana* (African Olive) and *Plantago lanceolata* (Ribwort).

Vegetation Community 3 – Riparian Vegetation:

This vegetation community consists principally of a dense thicket of African Olive, with occasional emergent trees and groundcover only underneath breaks in the canopy.

Occurrence - This vegetation community occurs as a narrow strip along the Nepean River and covers approximately 5 % of the subject site.

Structure - Closed Shrubland with a canopy cover of approximately 90 % and height of approximately 2-8 metres, with occasional emergent trees. The understorey occurs as a moderate to dense groundcover of herbs and grasses, where breaks occur in the canopy.

Disturbances - This vegetation community has been disturbed by previous partial clearing and incursions of weeds.

Common Species

Trees: *Angophora subvelutina* (Broad-leaved Apple), *Casuarina cunninghamiana* (River Oak), *Eucalyptus amplifolia* (Cabbage Gum), *Eucalyptus baueriana* (Blue Box) and *Eucalyptus elata* (River Peppermint).

Groundcovers: *Dichondra repens* (Kidney Weed) and *Themeda australis* (Kangaroo Grass).

Weeds: *Lonicera japonica* (Honeysuckle), *Olea europea* ssp. *africana* (African Olive) and *Robinia pseudoacacia* (Black Locust).

Vegetation Community 4 – Grassland with Scattered Trees:

Occurrence - This vegetation community occurs in the northern and eastern sections of the subject site and covers approximately 35 % of the subject site.

Structure - Dense groundcover of herbs and grasses with scattered trees and shrubs.

Disturbances - This vegetation community is the result of former clearing activities.

Common Species

Trees: *Eucalyptus moluccana* (Grey Box) and *Eucalyptus tereticornis* (Forest Red Gum).

Shrubs: *Bursaria spinosa* (Blackthorn).

Groundcovers: *Asperula conferta* (Common Woodruff), *Cheilanthes sieberi* (Mulga Fern), *Einadia trigonos* (Fishweed) and *Themeda australis* (Kangaroo Grass).

Weeds: *Briza subaristata*, *Bromus hordaceus* (Soft Brome), *Cirsium vulgare* (Spear Thistle), *Dactylis glomerata* (Cocksfoot), *Eragrostis curvula* (African Lovegrass), *Hypochaeris radicata* (Flatweed), *Lolium perenne* (Perennial Ryegrass), *Modiola caroliniana* (Red-flowered Mallow), *Olea europea* ssp. *africana* (African Olive), *Paspalum dilatatum* (Paspalum), *Plantago lanceolata* (Ribwort) and *Vulpia myuros* (Rat's Tail Fescue).

Vegetation Community 5 – Parkland:

This vegetation community consists of a mixture of gardens and lawns, with a mixture of native and exotic trees and shrubs. It occurs in the vicinity of the buildings and occupies approximately 30% of the subject site,

Vegetation Community 6 – Aquatic Herbfield:

Occurrence - This vegetation community occurs in the areas normally inundated by the dam, or frequently inundated by the drainage lines and covers approximately 10 % of the subject site. As a result of the ongoing drought, a number of species have become established, which would not normally occur in this environment.

Structure - Moderate to dense herbfield to a height of approximately 1-2 metres.

Disturbances - This vegetation community is generally occupying areas subject to human based disturbance.

Common Species

Groundcovers: *Cynodon dactylon* (Common Couch), *Eleocharis sphacelata* (Tall Spike-rush), *Juncus usitatus* (Common Rush), *Marsilea mutica* (Nardoo) and *Typha orientalis* (Cumbungi).

Weeds: *Conyza albida* (Tall Fleabane), *Cyperus eragrostis* (Umbrella Sedge), *Lotus suaveolens* (Hairy Birds-foot Trefoil), *Ranunculus scleratus* (Celery Buttercup) and *Senecio madagascariensis* (Fireweed).

Table A1.1 - Native Flora Observations for the Subject Site

Scientific Name	Common Name	Family	Community
Trees			
Angophora floribunda	Rough-barked Apple	Myrtaceae	3
Angophora subvelutina	Broad-leaved Apple	Myrtaceae	3
Casuarina cunninghamiana	River Oak	Casuarinaceae	3 4
Eucalyptus amplifolia	Cabbage Gum	Myrtaceae	3
Eucalyptus baueriana	Blue Box	Myrtaceae	3
Eucalyptus crebra	Narrow Leafed Ironbark	Myrtaceae	1 2 3 4 5
Eucalyptus elata	River Peppermint	Myrtaceae	3
Eucalyptus moluccana	Grey Box	Myrtaceae	1 2 4 5
Eucalyptus tereticornis	Forest Red Gum	Myrtaceae	1 4 5
Shrubs			
Acacia binervia	Coast Myall	Mimosoideae	3
Acacia decurrens	Black Wattle	Mimosoideae	4
Acacia falcata	Sickle Wattle	Mimosoideae	1 4
Acacia floribunda	Sally Wattle	Mimosoideae	3 4
Acacia parramattensis	Sydney Green Wattle	Mimosoideae	1 2 3
Ajuga australis	Austral Bugle	Lamiaceae	1
Breynia oblongifolia	Coffee Bush	Euphorbiaceae	1
Bursaria spinosa	Blackthorn	Pittosporaceae	1 2 3 4
Callistemon salignus	Willow Bottlebrush	Myrtaceae	5
Cassinia compacta	-	Asteraceae	1 2
Dodonaea viscosa subsp. angustifolia	-	Sapindaceae	2
Ficus macrocarpa	Moreton Bay Fig	Moraceae	5
Hakea salicifolia	Willow Hakea	Proteaceae	5
Hymenanthera dentata	Tree Violet	Violaceae	4
Melaleuca styphelioides	Prickly-leaved Tea Tree	Myrtaceae	5
Melia azedarach	White Cedar	Meliaceae	2 4 5
Myoporum montanum	Western Boobialla	Myoporaceae	2
Pittosporum undulatum	Sweet Pittosporum	Pittosporaceae	5
Pomaderris discolor	-	Rhamnaceae	2
Senecio quadridentatus	Cotton Fireweed	Asteraceae	6
Vines and Mistletoes			
Amyema miquelii	Drooping Mistletoe	Loranthaceae	1 2 4
Clematis aristata	Clematis	Ranunculaceae	1 2
Clematis glycinoides	Forest Clematis	Ranunculaceae	1
Desmodium brachypodum	Large Tick-trefoil	Faboideae	1 2
Glycine clandestina	Twining Glycine	Faboideae	4
Glycine tabacina	Variable Glycine	Faboideae	1 2 4
Hymenanthera dentata	Tree Violet	Violaceae	1 4
Polymeria calycina	Bindweed	Convolvulaceae	4
Herbs			
Ajuga australis	Austral Trumpet	Lamiaceae	2
Aristida vagans	Wire Grass	Poaceae	2
Asperula conferta	Common Woodruff	Rubiaceae	1 2 4 5
Austrodanthonia bipartita	Wallaby Grass	Poaceae	2
Austrodanthonia sp.	Wallaby Grass	Poaceae	5
Austrodanthonia tenuior	Wallaby Grass	Poaceae	2 4
Austrostipa verticillata	Slender Bamboo Grass	Poaceae	2
Bothriochloa macra	Redleg Grass	Poaceae	2 4
Brunoniella australis	Blue Trumpet	Acanthaceae	1 2 4 5
Brunoniella pumilio	-	Acanthaceae	4
Caesia parviflora	Pale Grass Lily	Anthericaceae	1

Table A1.1 - Native Flora Observations for the Subject Site (Cont.)

Scientific Name	Common Name	Family	Community
Herbs (Cont.)			
Calotis lappulacea	Yellow Burr-daisy	Asteraceae	1 2
Carex inversa	Knob Sedge	Cyperaceae	2 4
Centella asiatica	Swamp Pennywort	Apiaceae	4
Chloris ventricosa	Tall Chloris	Poaceae	1 2
Chrysocephalum apiculatum	Common Everlasting	Asteraceae	2
Commelina cyanea	Scurvy Weed	Commelinaceae	1
Crassula sieberiana	Australian Stonecrop	Crassulaceae	4
Cymbonotus lawsonianus	-	Asteraceae	1 2
Cynodon dactylon	Common Couch	Poaceae	1 4 6
Desmodium gunnii	-	Faboideae	1 2
Dichondra repens	Kidney Weed	Convolvulaceae	1 2 3 4 5
Dysphania glomulifera	-	Chenopodiaceae	6
Einadia hastata	Berry Saltbush	Chenopodiaceae	1 2
Einadia nutans	-	Chenopodiaceae	2
Einadia polygonoides	-	Chenopodiaceae	1 2 4 5
Einadia trigonos	Fishweed	Chenopodiaceae	1 2 4 5
Eleocharis sphacelata	Tall Spike-rush	Cyperaceae	6
Epaltes australis	Spreading Nutheads	Asteraceae	6
Eremophila debilis	Winer Apple		2
Erodium crinitum	Blue Storksbill	Geraniaceae	4
Galium propinquum	-	Rubiaceae	2
Hypericum gramineum	Little St Johns Wort	Clusiaceae	1
Juncus usitatus	Common Rush	Juncaceae	2 4 6
Lachnagrostis filiformis	Blown Grass	Poaceae	1
Lagenifera stipitata	-	Asteraceae	2
Linum marginale	Native Flax	Linaceae	2
Lomandra filiformis	Wattle Mat-rush	Lomandraceae	1
Ludwigia peploides	Water Primrose	Onagraceae	6
Lythrum hyssopifolia	Hyssop's Loosestrife	Lythraceae	6
Microlaena stipoides	Weeping Grass	Poaceae	1 2
Oplismenus aemulus	Basket Grass	Poaceae	1 2
Oxalis perennans	-	Oxalidaceae	1 2 4
Persicaria hydropiper	Water Pepper	Polygonaceae	6
Plantago debilis	-	Plantaginaceae	2
Plantago gaudichaudii	-	Plantaginaceae	1 2
Pseudognaphalium luteoalbum	Jersey Cudweed	Asteraceae	4 6
Rumex brownii	-	Polygonaceae	1 4
Sida corrugata	-	Malvaceae	1 2 4
Sigesbeckia			4
Solanum prinophyllum	Forest Nightshade	Solanaceae	1 2
Solanum pungentium	Eastern Nightshade	Solanaceae	1 4
Sporobolus creber	Slender Rat's Tail Grass	Poaceae	1
Themeda australis	Kangaroo Grass	Poaceae	1 2 3 4
Typha orientalis	Broad-leaved Cumbungi	Typhaceae	6
Vittadinia cuneata	-	Asteraceae	1 2
Wahlenbergia communis	Bluebell	Campanulaceae	2 4
Wahlenbergia gracilis	Bluebell	Campanulaceae	4
Wahlenbergia stricta	Bluebell	Campanulaceae	2 4
Ferns			
Cheilanthes sieberi	Mulga Fern	Sinopteridaceae	1 2 4
Marsilea mutica	Nardoo	Marsileaceae	6

Table A1.2 - Exotic Flora Observations for the Subject Site

Scientific Name	Common Name	Family	Community
-	Exotic Palm	Arecaceae	5
Acacia baileyana	Cootamundra Wattle	Mimosoideae	5
Agapanthus praecox	Agapanthus	Amaryllidaceae	5
Ambrosia artemisifolia	Annual Ragweed	Asteraceae	2
Anagallis arvensis	Pimpernel	Primulaceae	1 4
Aptenia cordifolia	Heartleaf Ice Plant	Aizoaceae	1 4
Araucaria bidwilli	Bunya Pine	Araucariaceae	5
Araucaria cunninghamii	Hoop Pine	Araucariaceae	5
Araucaria heterophylla	Norfolk Island Pine	Araucariaceae	5
Araujia sericifera	Moth Plant	Asclepiadaceae	1 4
Avena fatua	Wild Oats	Poaceae	4
Briza subaristata	-	Poaceae	4c
Bromus cartharticus	Prairie Grass	Poaceae	2 4
Bromus hordaceus	Soft Brome	Poaceae	4 5
Byrophyllum delagoense	Mother of Millions	Crassulaceae	5
Callistemon sp. Cultivar	Crimson Bottlebrush	Myrtaceae	5
Capsella bursa-pastoris	Shepherd's Purse	Brassicaceae	4
Carthamus lanatus	Saffron Thistle	Asteraceae	2 4
Cerastium glomeratum	Mouse-ear Chickweed	Caryophyllaceae	4
Chamaesyce supina	-	Euphorbiaceae	1 2c 4c 5
Chenopodium murale	Nettle-leaf Goosefoot	Chenopodiaceae	4
Chloris gayana	Rhodes Grass	Poaceae	1 4
Cinnamomum camphora	Camphor Laurel	Lauraceae	5
Cirsium vulgare	Spear Thistle	Asteraceae	1 4
Conyza albida	Tall Fleabane	Asteraceae	4 6
Cratageus monogyna	Hawthorn	Rosaceae	3
Cyclospermum leptophyllum	Slender Celery	Apiaceae	4
Cyperus eragrostis	Umbrella Sedge	Cyperaceae	6
Dactylis glomerata	Cocksfoot	Poaceae	4
Datura stramonium			4
Echium plantagineum	Patterson's Curse	Boraginaceae	4
Eragrostis curvula	African Lovegrass	Poaceae	1c 2c 3 4c 5
Eucalyptus microcorys	Tallowwood	Myrtaceae	5
Eucalyptus sp.	Eucalypt	Myrtaceae	4 5
Euphorbia peplus	-	Euphorbiaceae	4
Facelis retusa	-	Asteraceae	4
Foeniculum vulgare	Fennel	Apiaceae	4
Gamochaeta americana	Cudweed	Asteraceae	1 4
Gomphocarpus fruticosus	Narrow Leaf Cotton Bush	Asclepiadaceae	1 4
Gomphrena celosioides	Gomphrena Weed	Amaranthaceae	1
Grevillea sp. Cuiltivar	-	Proteaceae	5
Hypericum perforatum	St John's Wort	Clusiaceae	4
Hypochaeris microcephala	White Flatweed	Asteraceae	4
Hypochaeris radicata	Flatweed	Asteraceae	1 4 5
Jasminum polyanthum	Jasmine	Oleaceae	2
Juncus bufonius	Toad Rush	Juncaceae	2
Lantana sp. Cultivar	-	Verbenaceae	1 2 4
Ligustrum lucidum	Broad-leaved Privet	Oleaceae	1 3 4
Ligustrum sinense	Small-leaved Privet	Oleaceae	1 3 4
Lolium perenne	Perennial Ryegrass	Poaceae	4
Lonicera japonica	Honeysuckle	Caprifoliaceae	1 3 4 5
Lotus suaveolens	Hairy Birds-foot Trefoil	Faboideae	4 6

Table A1.2 - Exotic Flora Observations for the Subject Site (Cont.)

Scientific Name	Common Name	Family	Community
Ludwigia peruviana	-	Onagraceae	6
Lycium ferocissimum	African Boxthorn	Solanaceae	1 2c 4 5
Malva sylvestris	Tall Mallow	Malvaceae	4
Medicago truncatula	Barrel Medic	Faboideae	4
Mentha sp. cultivar	Mint	Lamiaceae	6
Modiola caroliniana	Red-flowered Mallow	Malvaceae	1 2 4 5
Myrsiphyllum asparagoides	Bridal Creeper	Asparagaceae	1 4
Nephrolepis cordifolia	Fish-bone Fern	Davalliaceae	1 5
Nothoscordum borbonicum	Onion Weed	Alliaceae	1 4
Olea europea ssp. africana	African Olive	Oleaceae	1 2 3c 4 5
Opuntia stricta	Prickly Pear	Cactaceae	1 2
Opuntia vulgaris	Prickly Pear	Cactaceae	1 3
Osteospermum ecklonis	-	Asteraceae	1
Oxalis corniculata	Creeping Oxalis	Oxalidaceae	1 2 4 5
Paspalum dilatatum	Paspalum	Poaceae	4
Pennisetum clandestinum	Kikuyu	Poaceae	4
Petrorhagia nanteuilii	Prolific Pink	Caryophyllaceae	4 5
Petunia sp.	Petunia	Solanaceae	4
Pinus radiata	Radiata Pine	Pinaceae	4
Pinus sp.	Exotic Pine	Pinaceae	5
Plantago lanceolata	Ribwort	Plantaginaceae	1 2c 4 5
Plantago myosuros	-	Plantaginaceae	4
Polygonum arenastrum	Wire Weed	Poaceae	6
Populus nigra	Lombardy Poplar	Salicaceae	4
Ranunculus scleratus	Celery Buttercup	Ranunculaceae	6
Richardia humistrata	-	Rubiaceae	2 4
Robinia pseudoacacia	Black Locust	Faboideae	1 3 4 5
Rosa rubiginosa	Briar Rose	Rosaceae	2 4
Rubus anglocandicans	Blackberries	Rosaceae	4
Rumex crispus	Curled Dock	Polygonaceae	4 6
Salix babylonica	Weeping Willow	Salicaceae	4 6
Sapium sebiferum	Chinese Tallow Tree	Euphorbiaceae	5
Schinus areira	Peppercorn	Anacardiaceae	1 2 4 5
Senecio madagascariensis	Fireweed	Asteraceae	1 2 4 5 6
Setaria gracilis	Slender Pigeon Grass	Poaceae	1 4
Sida rhombifolia	Paddy's Lucerne	Malvaceae	1 2 4
Silene pratensis	White Campion	Caryophyllaceae	4
Sisyrinchium species A	Scourweed	Iridaceae	2 4
Solanum physalifolium	-	Solanaceae	1 4
Soliva sessilis	Jojo	Asteraceae	4 5
Sonchus asper	Prickly Sowthistle	Asteraceae	1 4
Sonchus oleraceus	Common Sowthistle	Asteraceae	1 4
Sporobolus africanus	Parramatta Grass	Poaceae	1 4
Stachys arvensis	Stagger Weed	Lamiaceae	4
Stenotaphrum secundatum	Buffalo Grass	Poaceae	5
Tagetes minuta	Stinking Roger	Asteraceae	4
Taraxacum officinale	Dandelion	Asteraceae	4
Tradescantia fluminensis	Wandering Jew	Commelinaceae	4
Trifolium glomeratum	Clustered Clover	Faboideae	1 4
Trifolium repens	White Clover	Faboideae	4 6
Urtica urens	Small Nettle	Urticaceae	4
Verbena bonariensis	Purple Top	Verbenaceae	1 4
Verbena rigida	Veined Verbena	Verbenaceae	1 4

Table A1.2 - Exotic Flora Observations for the Subject Site (Cont.)

Scientific Name	Common Name	Family	Community
Veronica persica	Creeping Speedwell	Scrophulariaceae	4
Vicia sativa	Common Vetch	Faboideae	4
Vulpia myuros	Rat's Tail Fescue	Poaceae	4 6
Westringia sp.	-	Lamiaceae	5
Xanthium occidentale	Noogoora Burr	Asteraceae	4 6
Xanthium spinosum	Bathurst Burr	Asteraceae	4

APPENDIX 3

PLANTING GUIDE

RIPARIAN PLANTING GUIDE

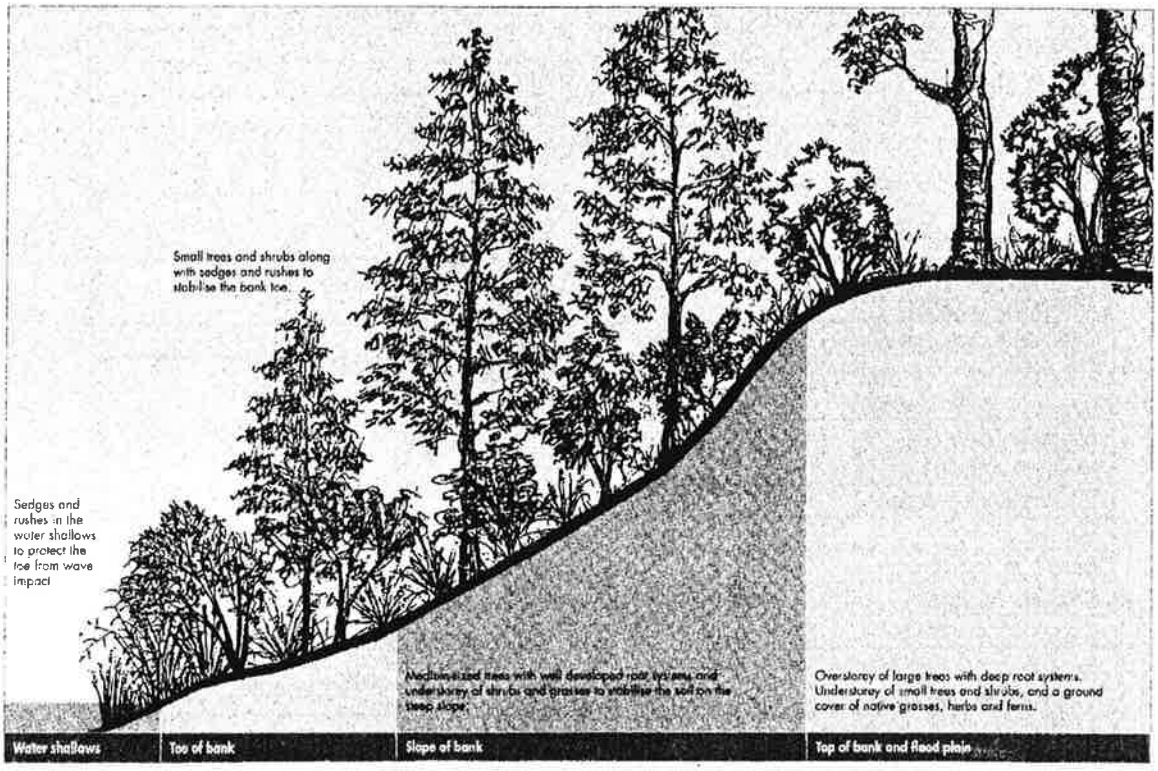

Table A3.1 Riparian Planting Guide

Scientific Name	Common Name
Trees	
Angophora floribunda	Rough-barked Apple
Angophora subvelutina	Broad-leaved Apple
Casuarina cunninghamiana	River Oak
Eucalyptus amplifolia	Cabbage Gum
Eucalyptus baueriana	Blue Box
Eucalyptus crebra	Narrow Leafed Ironbark
Eucalyptus elata	River Peppermint
Eucalyptus moluccana	Grey Box
Eucalyptus tereticornis	Forest Red Gum
Shrubs	
Acacia binervia	Coast Myall
Acacia decurrens	Black Wattle
Acacia falcata	Sickle Wattle
Acacia floribunda	Sally Wattle
Acacia parramattensis	Sydney Green Wattle
Ajuga australis	Austral Bugle
Breynia oblongifolia	Coffee Bush
Bursaria spinosa	Blackthorn
Callistemon salignus	Willow Bottlebrush
Cassinia compacta	-
Dodonaea viscosa subsp. angustifolia	-
Ficus macrocarpa	Moreton Bay Fig
Hakea salicifolia	Willow Hakea
Hymenanthera dentata	Tree Violet
Melaleuca styphelioides	Prickly-leaved Tea Tree

Table A3.1 Riparian Planting Guide (Cont.)

Scientific Name	Common Name
Shrubs (Cont.)	
Melia azedarach	White Cedar
Myoporum montanum	Western Boobialla
Pittosporum undulatum	Sweet Pittosporum
Pomaderris discolor	-
Senecio quadridentatus	Cotton Fireweed
Vines and Mistletoes	
Amyema miquelii	Drooping Mistletoe
Clematis aristata	Clematis
Clematis glycinoides	Forest Clematis
Desmodium brachypodum	Large Tick-trefoil
Glycine clandestina	Twining Glycine
Glycine tabacina	Variable Glycine
Hymenanthera dentata	Tree Violet
Polymeria calycina	Bindweed
Herbs	
Ajuga australis	Austral Trumpet
Aristida vagans	Wire Grass
Asperula conferta	Common Woodruff
Austrodanthonia bipartita	Wallaby Grass
Austrodanthonia sp.	Wallaby Grass
Austrodanthonia tenuior	Wallaby Grass
Austrostipa verticillata	Slender Bamboo Grass
Bothriochloa macra	Redleg Grass
Brunoniella australis	Blue Trumpet
Brunoniella pumilio	-
Caesia parviflora	Pale Grass Lily
Calotis lappulacea	Yellow Burr-daisy
Carex inversa	Knob Sedge
Centella asiatica	Swamp Pennywort
Chloris ventricosa	Tall Chloris
Chrysocephalum apiculatum	Common Everlasting
Commelina cyanea	Scurvy Weed
Crassula sieberiana	Australian Stonecrop
Cymbonotus lawsonianus	-
Cynodon dactylon	Common Couch
Desmodium gunnii	-
Dichondra repens	Kidney Weed
Dysphania glomulifera	-
Einadia hastata	Berry Saltbush
Einadia nutans	-
Einadia polygonoides	-
Einadia trigonos	Fishweed
Eleocharis sphacelata	Tall Spike-rush
Epaltes australis	Spreading Nutheads
Eremophila debilis	Winer Apple
Erodium crinitum	Blue Storksbill
Galium propinquum	-
Hypericum gramineum	Little St Johns Wort
Juncus usitatus	Common Rush
Lachnagrostis filiformis	Blown Grass
Lagenifera stipitata	-
Linum marginale	Native Flax

Table A3.1 Riparian Planting Guide (Cont.)

Scientific Name	Common Name
Herbs (Cont.)	
Lomandra filiformis	Wattle Mat-rush
Ludwigia peploides	Water Primrose
Lythrum hyssopifolia	Hyssop's Loosestrife
Microlaena stipoides	Weeping Grass
Oplismenus aemulus	Basket Grass
Oxalis perennans	-
Persicaria hydropiper	Water Pepper
Plantago debilis	-
Plantago gaudichaudii	-
Pseudognaphalium luteoalbum	Jersey Cudweed
Rumex brownii	-
Sida corrugata	-
Sigesbeckia	
Solanum prinophyllum	Forest Nightshade
Solanum pungentium	Eastern Nightshade
Sporobolus creber	Slender Rat's Tail Grass
Themeda australis	Kangaroo Grass
Vittadinia cuneata	-
Wahlenbergia communis	Bluebell
Wahlenbergia gracilis	Bluebell
Wahlenbergia stricta	Bluebell
Ferns	
Cheilanthes sieberi	Mulga Fern
Marsilea mutica	Nardoo

APPENDIX 4

WEED MANAGEMENT TECHNIQUES

WEED MANAGEMENT TECHNIQUES
FOR USE IN AREAS OF NATIVE VEGETATION RETENTION

Weeds are to be progressively removed in accordance with the following techniques recommended by the National Trust, NSW National Parks and Wildlife Service and Australian Association of Bush Regenerators.

Woody Weeds Removal Techniques:

Cut and Paint

- Make a horizontal cut close to the ground using secateurs, loppers or a bush saw; and
- Immediately apply herbicide to the exposed flat stump surface.

Considerations:

- Cuts should be horizontal to prevent herbicide from running off the stump, sharp angle cuts are hazardous;
- Herbicide must be applied immediately before the plant cells close (within 30 seconds) and translocation of herbicide ceases;
- If plants re-sprout, cut and paint the shoots after sufficient regrowth has occurred; and
- Stem scraping can be more effective on some woody weeds.

Stem Injection

- At the base of the tree drill 10mm diameter holes at a 45 degree angle into the sapwood;
- Fill each hole with herbicide immediately; and
- Repeat the process at 5 cm intervals around the tree.

Frilling or Chipping

- At the base of the tree make a cut into the sapwood with a chisel or axe;
- Fill each cut with herbicide immediately; and
- Repeat the process at 5 cm intervals around the tree.

Considerations:

- Plants should be actively growing and in good health;
- Deciduous plants should be treated in spring and autumn when leaves are fully formed;
- For multi-stemmed plants, inject or chip below the lowest branch or treat each stem individually; and
- Herbicides must be injected immediately before plant cells close (within 30 seconds) and translocation of herbicide ceases.

Small Hand-Pullable Plants Removal Techniques:

Hand Removal

- Remove any seeds or fruits and carefully place into a bag;
- Grasp stem at ground level, rock plant backwards and forwards to loosen roots and pull out; and
- Tap the roots to dislodge any soil, replace disturbed soil and pat down.

Considerations:

- Leave weeds so roots are not in contact with the soil eg. hang in a tree, remove from site or leave on a rock.

Vines and Scramblers Removal Techniques:

Hand Removal

- Take hold of one runner and pull towards yourself;
- Check points of resistance where fibrous roots grow from the nodes;
- Cut roots with a knife or dig out with a trowel and continue to follow the runner;
- The major root systems need to be removed manually or scrape/cut and painted with herbicide; and
- Any reproductive parts need to be bagged.

Stem Scraping

- Scrape 15 to 30 cm of the stem with a knife to reach the layer below the bark/outer layer; and
- Immediately apply herbicide along the length of the scrape.

Considerations:

- A maximum of half the stem diameter should be scraped. Do not ringbark;
- Larger stems should have two scrapes opposite each other; and
- Vines can be left hanging in trees after treatment.

Weeds with Underground Reproductive Structures Removal Techniques:

Hand Removal of Plants with a Taproot

- Remove and bag seeds or fruits;
- Push a narrow trowel or knife into the ground beside the tap root, carefully loosen the soil and repeat this step around the taproot;
- Grasp the stem at ground level, rock plant backwards and forwards and gently pull removing the plant; and
- Tap the roots to dislodge soil, replace disturbed soil and pat down.

Crowning

- Remove and bag stems with seed or fruit;
- Grasp the leaves or stems together so the base of the plant is visible;
- Insert the knife or lever at an angle close to the crown;
- Cut through all the roots around the crown; and
- Remove and bag the crown.

Herbicide Treatment – Stem Swiping

- Remove any seed or fruit and bag; and
- Using a herbicide applicator, swipe the stems/leaves.

Considerations:

- Further digging may be required for plants with more than one tuber;
- Some bulbs may have small bulbils attached or present in the soil around them which need to be removed;
- It may be quicker and more effective to dig out the weed;
- Protect native plants and seedlings; and
- For bulb and corm species the most effective time to apply herbicide is after flowering and before fruit is set.

Exotic vegetation should be removed and stockpiled in a clear area away from adjoining bushland. This stockpile should be removed from the site at a convenient time. As part of the regular maintenance of the restored area any regrowth of the exotic plant species should be removed and disposed of appropriately.

Use of Herbicides

Herbicides should not be applied 0 to 12 hours prior to rain occurring. This reduces the herbicides effectiveness as well as being transported in runoff to creeklines and waterways.

An advantage of herbicide use is the low time taken to spray weeds as compared to physically removing them, particularly for large infestations of weeds.

Buchanan (1989), recommends that the use of herbicides should be considered when:

1. there are small areas of dense weeds with few or no native plants to protect;
2. there are large areas of weeds;
3. the weeds are growing too rapidly for physical removal; and
4. the weeds are located in areas with a high potential for erosion if vegetation is removed.

The spraying of weeds must only be undertaken by persons with Chem-Cert or equivalent qualifications. The success of each treatment must be evaluated by the operator after a set period of time according to the labelled effectiveness for each herbicide. Care must be taken when applying herbicides near drainage lines to avoid excess use due to the sensitivity of the wetlands and waterways into which runoff will eventually flow.

APPENDIX 5

REVEGETATION METHODS

REVEGETATION METHODS

1 Timetable of Work

The Contractor shall provide a preliminary planting schedule which incorporates a draft timetable of works for the planting activities. This shall be submitted at the time of tendering. A final planting schedule shall be prepared in consultation with the Project Manager, and approved by the Project Manager within 14 days of award of Contract. This schedule should be designed to minimise the time the sites are exposed and take into account seasonal factors, availability of tube stock plants, and timing of construction works.

2 Site Preparation

Site preparation activities for all planting sites will include preliminary weed control, rubbish removal and (where necessary) minor earthworks (levelling, ripping). It is expected that any bare soil areas will be sown with a nurse crop to provide temporary soil stabilisation, and (where applicable) soil erosion control measures installed.

3 Plant Material

Plant material used to revegetation within the project area shall be sourced only from local bushland areas. Contractors are responsible for obtaining all necessary permits and licenses.

All plants are to be provided in a healthy condition. They must have good root development and a sturdy shoot system. Plant with an elongated or yellowed shoot system shall not be accepted.

Planting shall be undertaken immediately after delivery. If this is not possible, the Contractor shall be required to provide appropriate storage to keep the plants in good condition on the site, adequately protected from frost, wind, sun and vermin, and secured from vandals.

4 Planting Guidelines

Planting Densities and Niche species

The Contractor shall be responsible for planting according to the Site Planting Plan prepared by the client. This Plan will detail the required species and their distribution across the bushland reconstruction and landscaping sites and will be supplied to the successful Contractor. The Contractor shall be responsible for ensuring planting densities and appropriate niche species.

Only locally indigenous plants will be used. Niche preferences shall be considered in planting, with plants being placed in the correct position with regard to soil type, moisture, aspect and slope.

Plantings should be at a density which will result in a near natural canopy density at all structural levels (strata). Plant will be placed at average 2-3 units/m^2 in order to achieve the following densities.

- Canopy Trees @ 1 unit / 5m^2
- Sub-canopy (small trees / large shrubs) @ 1 unit / 2 m^2
- Shrubs @ 1 unit / 1.5 m^2
- Grasses and Ground Covers @ 3.5 units / m^2

Planting Methods

Planting holes shall be excavated to a depth of 150 mm and a diameter of 200 mm. Slow-release native plant fertiliser (low phosphorous formulated native plant fertiliser tablet/granules) shall be placed into the planting hole. In poorly structured soils, approximately 200 cubic centimetres of native plant soil mix is to be placed and incorporated into the planting hole with fertiliser and water storing granules.

Plants must be placed into moistened soil preferably by soaking 1-2 litres of water into each hole. After planting the soil shall be replaced and carefully firmed, leaving a slight depression around each plant to allow for water collection. Soil is to be replaced in the hole so that the base of the stem is level with the soil surface, not set below the soil, or sitting above.

All plants are to be thoroughly watered before planting and again after planting. If the weather is hot, a third watering shall be carried out within two (2) days or a t-tape or drip irrigation system set up to water plants on a weekly basis.

Plant Protection

The Contractor shall be responsible for adequately protecting plant material from frost, wind, sun, vermin and animals. Two (2) Litre cardboard guards (including 2 stakes) shall be around each plant and maintained throughout the maintenance period of up to 3 years. The use of Jute mats (mulch mats) is recommended where annual or grass regrowth is expected.

Mulching

After planting, the exposed ground should be thickly mulched with low-nutrient mulch such as chipped eucalyptus. A depth of approximately 75 mm and a diameter of 400 mm around each plant are recommended. No exotic plant material is to be used. Pine bark is not considered to be a suitable mulch material. The provenance of all mulch material must be known and approved by the Project Manager.

Mulch is not to be used in sand dunes ecosystems as the mulch inhibits plant establishment and provides a nutrient source for the growth of weeds in dune ecosystems.

Care should be taken to keep mulch material away from the stems of the newly planted tubestock. Alternately, a light sowing of a suitable nurse crop (Rye Corn or Japanese Millet) can be made between plantings to provide a protective microclimate. Sowing rates to be used are those recommended by the supplier and agreed with the Project Manager.

Maintenance and Weed Control

Tube stock must be suitably maintained (watering and weeding) are to be maintained over a 2 year period on the following basis:-

- 1-3 months post planting – weekly watering and maintenance.
- 4-12 months post planting – monthly watering and maintenance.
- 13-24 months post planting – quarterly watering and maintenance.

During the maintenance phase any plant losses in excess of 15% of the total number planted must be replaced at the expense of the Contractor.

Site maintenance shall consist of the following tasks:

- Weeding throughout the planting area;
- Watering tubestock;
- Replacing lost plants (as required); and
- Removing wind-blown or other rubbish from the planting area.

The Contractor shall provide a preliminary maintenance schedule which incorporates a timetable of works for each of the activities listed above.

APPENDIX 6

BUSH REGENERATION METHODS

BUSH REGENERATION METHODS

1 General Description of Work

This document outlines the general principles to be used in a bush regeneration and rehabilitation program. The term bush regeneration includes both weed control and re-vegetation (planting) in bushland and semi-bushland areas.

2 Definitions

Bush regeneration is defined as "the practice of restoring bushland by focusing on reinforcing and reinstating the ecosystem's on-going natural regenerative processes" (Australian Association of Bush Regenerators).

3 Aims of Bush Regeneration

- To create an environment where native plants are able to re-colonise degraded/cleared areas
- To restore degraded areas far as possible, to viable, manageable ecosystems
- To protect the bushland from further external disturbance events
- To preserve and enhance local and regional biodiversity;
- To enhance and extend habitat for native fauna.
- To protect the site's special features (natural,.geological, landscape and cultural)

4 Process

The Bush Regeneration process involves:

- *Primary Weeding* - initial weed clearance, through hand weeding and/or the use of herbicides
- *Secondary or Follow-up Weeding* - maintenance of sites which have already received primary weeding
- *Maintenance weeding* - monitoring/removal of weed re-growth and care of native plant seedlings (naturally occurring and planted)
- *Re-vegetation* - the use of locally indigenous species to restore an area via tubestock planting, direct seeding, transplanting and/or brush matting

In areas where degradation has been serious enough to severely deplete or extinguish native regenerative capacity, it may be necessary to reconstruct or fabricate a plant community as close as possible to the original. This will involve a variety of techniques, including weeding, soil remediation, planting and on-going site maintenance. Scale-scale soil stabilisation, earthworks, and remedial drainage works are often required.

5 Weed Control

Weed removal shall include any species likely to significantly invade bushland, prevent natural regeneration, or impede native seedling growth. Priority shall be given to species listed as 'noxious plants' in Camden LGA in the Schedules of the *NSW Noxious Weeds Act 1993*.

6 Weeding Techniques

Within the bush regeneration context weed control is described as the removal or control of weeds using hand removal and/or the application of selected herbicides. In specific circumstances, the use of machinery is used when the extent of the infestation is very large and will not cause significant erosion or destabilisation. Weeding techniques should be appropriate to the weed type, growth form and to the existing site conditions.

Wherever possible, weed removal should be carried out prior to annual seed set. Herbicide application via stem injection or foliar spray must not be applied to plants bearing ripe or semi-ripe fruit. It is important to plan herbicide control of target species according to a weeding calendar that recognises the weed's life form and seasonality (i.e. flowering, fruiting and seed set).

The techniques and methodologies used for bush regeneration shall conform to those identified in the National Trust Bush Regenerators Handbook (1991) and currently taught through the NSW TAFE Bushland Regeneration Certificate Course.

7 Labour

Bush regeneration work shall be carried out in a competent manner by experienced and qualified bush regenerators. The Bush Regeneration Team should consist of a maximum of one-third inexperienced team members, and should include:-

1. Field Supervisor – with a minimum Bush Regeneration TAFE Certificate II plus Certificate IV or an Environmental Science Degree, and 2 Years or greater than 200 hours of Bush Regeneration experience in similar vegetation communities.

2. Experienced Bush Regenerator – with a minimum of a Bush Regenerator TAFE Certificate II and 2 Years or greater than 200 hours of Bush Regeneration experience in similar vegetation communities.

3. Trainee Bush regenerator – Substantial completion of the majority of the Bush Regenerator TAFE Certificate II

8 Use of Herbicides

The herbicide of choice for bush regeneration work is glyphosate (Roundup). Roundup Biactive shall be used in wet areas (e.g. drainage lines, sediment basin).

Garlon (triclopyr) is recommended for control of Blackberry, and Brushoff (metsulfron) for the control of both Ground Asparagus and Bridal Creeper. Access or Brushoff are more effective in controlling Green Cestrum than Roundup.

The Contractor shall not use any other herbicide or chemical without the written consent of the Project Superintendent or their appointed representative.

Unless otherwise agreed with the Project Superintendent, herbicides application shall be limited to the following techniques:

- Cut-stump and poison (cut and dab)
- Stem injection
- Stem-scrape and poison
- Basal bark painting
- Selective spot-spraying

9 Mulch and Cut Brush

Any mulch imported onto the site shall be weed-free eucalyptus leaf mulch or woodchip. Mulch from Privet, Camphor laurel, Coral Tree, Poplar, Willow, aquatic or declared noxious weeds are not to be used. The Contractor shall ensure that any mulch used is properly composted before use.

Brush cut for erosion control and/or re-vegetation purposes shall be used only when cut branches are seed-laden. Branches shall be spread as quickly as possible to reduce seed loss during stockpiling. The collection of cut brush shall be limited to species occurring naturally in the bushland area. If seed and or brush are required to be collected from nearby Reserves, written permission must be obtained from the Bushland Management Officer, Camden City Council. Collection sites are to be agreed between the Contractor and the Project Superintendent prior to any collection of brush.

10 Weed Debris and Rubbish

Disposal of weed debris and other rubbish generated as a result of the work shall be the responsibility of the Contractor. Costs for disposal of rubbish (collection and tipping fees) shall be clearly stated in the tender proposal.

Disposal of weed material via burns piles is permitted only after approval has been obtained from the Project Superintendent. Any burning must be carried out as advised by the Environment Protection Authority and NSW Fire Brigade.

11 Soil Erosion

Where bush regeneration works have the potential to destabilise slopes or embankments, action such as the use of fibre matting and/or the placing of logs across the slope and fixing in place shall be employed to minimise the problem. Erosion matting and/or silt fencing may be required in a number of sites. These sites are to be identified in the tender document and allowance made for the purchase and placement of erosion control matting.

12 Reconstruction of Bushland (planting)

The Contractor is required to supply a set number of locally indigenous plants to be used in the bushland reconstruction areas. All plant material used on-site shall be grown from seed or cuttings collected in local bushland.

Plant material may be supplied as tubestock or as hykos. Virocells are not considered to be suitable for this site. The method of delivery (as above) should be clearly stated in the tender documents.

Planting methods are to conform to the *Revegetation Specifications.*

APPENDIX 7

HOW TO COLLECT NATIVE SEEDS

How to Collect Native Plant Seed Responsibly

(Version 1)

To select seeds that will grow into plants that are best adapted to local conditions, collect seed from near the area where it is proposed to do the planting. If there are no suitable native species immediately nearby, then collect seed from as close as possible and from the same general habitat (same soil type, distance from watercourse, exposure etc.). The more similar the habitat, the greater the likelihood of the propagated seedlings being suitable for the planting site. As a guide, plants within about a 3 km radius can be considered satisfactory.

Seed collected from too far away may not be adapted to the local conditions and may introduce new genes to the site, thereby altering local genetic integrity.

There is one exception to the "local" rule. If the population of any of the native species has fallen to a very low level (eg. less than ten individuals of any species), then *for those species* it is advisable to supplement that seed with collections from elsewhere (but as close as possible) to ensure that there is sufficient genetic diversity to minimise the potential for inbreeding.

Where there are no native species left in the area, and no reasonable stands of native species within 3 km, then the site will probably be better treated as a garden and plants could be obtained from commercial sources. Even so, seed derived from closer to the site is preferred over seed collected further away.

Principles to follow when collecting native plant seed:

(a) Before collecting, obtain any necessary permit from National Parks &Wildlife Service and seek permission from the land owner (private, council, Crown Lands, etc.).

(b) Collect seed from as many different plants of the same species as possible (minimum of 5).

(c) Collect seed from plants of varying vigour, but not individuals with obvious disease symptoms.

(d) Collect seed from plants with different growth forms (straight, branching, straggly etc.).

(e) Try to maintain at least 100 m between each parent of the same species, but do not collect only from the edges of a population and always include the central areas in the collection.

(f) Do not strip plants of seed - collect no more than about 20 % of seed from any one tree.

(g) Collect from various parts of each plant and collect equal amounts of seed from each plant.

(h) If possible, avoid collecting from solitary plants and concentrate on stands or groups of plants (this is to minimise the risk of collecting self-pollinated seed).

(i) Label seed containers: *species name, location, date collected, collector's name, how many plants collected from* - and preferably: *position in the landscape (e.g. water's edge), % of ripe seed, soil/geology, plant associations, aspect/altitude/slope, weeds present.*

(j) Dry out seed and store in a cool and dry place (a refrigerator is ideal) in air-tight containers.

Source: Royal Botanic Gardens Sydney, Greening Australia (NSW) & "Seed Collection of Australian Native Plants" (Ralph, M., 1994).[G:\RAW\LV\RESACCES\LANDUSE\3A_GENER\Vegetation Mgt\Seed1.doc]

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APPENDIX 8

PRELIMINARY COSTINGS

Task	Description	Effort/units required	Cost per unit	Total Cost (Estimate)
Protection Offsets (PO1)				
	Seed Collection	14 ha	$ 320 /day	$14,000
Protective Fencing	Supply and Installation	680 LM	$11.90/LM	$8,092
Weed Control	Machine Clearance	14 ha	$3,500/ha	$49,000
	Primary High Volume Spray	14 ha	$2640/ha	$36,960
	Secondary High Volume Spray	14 ha	$2640/ha	$36,960
	Hand Woody Weed Control	14 ha	$2,000/ha	$28,000
	Slashing, Spraying and Woody Weed Control	14 ha	$3400/ha	$47,600
Enrichment Planting (Only Nepean River Riparian Zone - 13600 m^2)	Trees	272	$4.25 per tree installed	$1,156
	Shrubs	1088	$4.25 per shrub installed	$4,624
	Watering of plants	1360	$1.76 per plant	$2,394
	Supply & install soil conditioner	1360	$0.61/plant	$830
	Supply & installation of protective guardings	1360	$1.75/plant	$2,380
Proj Management	15% contract value			$32,700
			Sub-total	$264,696
			Total (ex. GST)	$264,696
			GST	$26,470
			Total (Inc. GST)	$291,166

Task	Description	Effort/units required	Cost per unit	Total Cost (Estimate)
Restoration Offsets (R01)				
Preparation Works	Seed Collection	2.34 ha	$ 320 /day	$2,340
	Slashing	0.5 days	$550/day	$275
	Machine Clearance	0.2 ha	$3500/ha	$3,500
	Earthworks - Contour banks	2.34 ha	$1000/ha	$2,340
	Protective fencing	720 LM	$11.90/LM	$8,568
	Bed Preparation	2 days	$550/day	$1,100
	Direct Drilling - Trees, shrubs and grasses	23400 m^2	$1.45/$m^2$	$33,930
	Install Irrigation System	23400 m^2	$2.5/$m^2$	$58,500
Enrichment Planting	Trees	234	$4.25 per tree installed	$995
	Shrubs	1872	$4.25 per shrub installed	$7,956
	Watering of plants	2106 plants	$1.76/plant	$3,707
	Supply & install soil conditioner	2106 plants	$0.61/plant	$1,285
	Supply & installation of protective guardings	2106 plants	$1.75/plant	$3,686
	Weeding	23400 m^2	$0.70/$m^2$	$16,380
Weed Control	Primary Spraying	2.34 ha	$2,640/ha	$6,180
	Secondary Spraying	2.34 ha	$2,640/ha	$6,180
	Secondary Hand Weed Control	2.34 ha	$1,000/ha	$2,340
	Tertiary Hand Weed Control	2.34 ha	$5,000/ha	$11,700
Irrigation System	Maintenance and Regulation	6 days	$360/day	$2,160
	Decommission	5 days	$360/day	$1,800
Sediment Fences	Maintenance	8 days	$360/day	$2,880
	Decommission	1170 LM	$5/LM	$3,600
Proj Management	15% contract value			$26,859
			Sub-total	$205,921

Task	Description	Effort/units required	Cost per unit	Total Cost (Estimate)
Riparian Restoration Works (RR1)				
	Slashing	0.5	$550 per day	$275
	Earthworks - Contour banks	NIL	$ 1000/ha	$0
	Protective fencing	600 Lm	$11.9/Lm	$7,140
	Soil Translocation	NIL	NIL	$0
	Bed Preparation	2 days	$550/day	$1,100
	Direct Drilling - Trees, shrubs and grasses		$1.45 per m^2	$16,675
	Install Irrigation System		$2.5 m2	$28,750
Restoration Planting	Trees	115 units	$4.25 per tree installed	489
	Shrubs	575 units	$4.25 per shrub installed	2444
	Grasses	1 unit/m2 (supplementary planting only)	$2.00 per grass installed	23000
	Macrophyes	NIL	$3.50 per plant installed	0
	Watering of plants	plants	$1.76 per plant	$1,215
	Supply & install soil conditioner	12,190 plants	$0.61/plant	$7,436
	Supply & installation of protective guardings	690 plants	$1.75/plant	$1,208
Weed Control	Primary Spraying	1.15 ha	$2,500/ha	$2,875
	Secondary Spraying	1.15 ha	$2,500/ha	$3,036
	Secondary Hand Weed Control	1.15 ha	$1,000/ha	$1,150
	Tertiary Hand Weed Control	1.15 ha	$5,000/ha	$5,750
Irrigation System	Maintenance and Regulation	3 days	$360/day	$1,080
	Decommission	2 days	$360/day	$720
Sediment Fences	Maintenance	4 days	$360/day	$1,440
	Decommission	720 LM	$3/LM	$2,160
Proj Management	5% contract value			$14,700
			Sub-total	$122,643
			Total (ex. GST)	$328,564
			GST	$32,856
			Total (Inc. GST)	$361,421

Task	Description	Effort/units required	Cost per unit	Total Cost (Estimate)
Restoration Offsets (R02)				
Preparation Works	Slashing	0.5 days	$550/day	$275
	Mechanical Woody Weed Control	0.2 ha	$3,500/ha	$700
	Earthworks - Contour banks	2.4 ha	$1000/ha	$2,400
	Protective fencing	720 LM	$11.90/LM	$8,568
	Bed Preparation	2 days	$550/day	$1,100
	Direct Drilling - Trees, shrubs and grasses	24000 m^2	$1.45/$m^2$	$34,800
	Install Irrigation System	24000 m^2	$2.5/$m^2$	$60,000
Enrichment Planting	Trees	240	$4.25 per tree installed	$1,020
	Shrubs	1920	$4.25 per shrub installed	$8,160
	Watering of plants	2160 plants	$1.76/plant	$3,802
	Supply & install soil conditioner	2160 plants	$0.61/plant	$1,318
	Supply & installation of protective guardings	2160 plants	$1.75/plant	$3,780
Weed Control	Primary Spraying	2.4 ha	$2,640/ha	$6,336
	Secondary Spraying	2.4 ha	$2,640/ha	$6,336
	Secondary Hand Weed Control	2.4 ha	$1,000/ha	$2,400
	Tertiary Hand Weed Control	2.4 ha	$5,000/ha	$12,000
Irrigation System	Maintenance and Regulation	3 days	$360/day	$1,080
	Decommission	2 days	$360/day	$720
Sediment Fences	Maintenance	4 days	$360/day	$1,440
	Decommission	720 LM	$5/LM	$3,600
Proj Management	15% contract value			$23,975
			Sub-total	**$183,810**

Task	Description	Effort/units required	Cost per unit	Total Cost (Estimate)
Riparian Restoration Works (RR2)				
	Slashing	0.5	$550 per day	$275
	Earthworks - Contour banks	NIL	$ 1000/ha	$0
	Protective fencing	680 Lm	$11.9/Lm	$8,092
	Soil Translocation	NIL	NIL	$0
	Bed Preparation	1 days	$550/day	$550
	Direct Drilling - Trees, shrubs and grasses	7200 m^2	$1.45 per m^2	$10,440
	Install Irrigation System	7200 m^2	$2.5 m^2	$18,000
Restoration Planting	Trees	72 units	$4.25 per tree installed	$306.00
	Shrubs	360 units	$4.25 per shrub installed	$1,530.00
	Grasses	2 unit/m2 (supplementary planting only)	$2.00 per grass installed	$28,800.00
	Macrophyes	1200 units	$3.50 per plant installed	$4,200.00
	Watering of plants	432 plants	$1.76 per plant	$761.00
	Supply & install soil conditioner	432 plants	$0.61/plant	$9,048.00
	Supply & installation of protective guardings	432 plants	$1.75/plant	$756.00
Weed Control	Primary Spraying	2.4 ha	$2,640/ha	$1,900
	Secondary Spraying	2.4 ha	$2,640/ha	$1,900
	Secondary Hand Weed Control	2.4 ha	$1,000/ha	$720
	Tertiary Hand Weed Control	2.4 ha	$5,000/ha	$3,600
Irrigation System	Maintenance and Regulation	3 days	$360/day	$1,080.00
	Decommission	2 days	$360/day	$720.00
Sediment Fences	Maintenance	4 days	$360/day	$1,440.00
	Decommission	720 LM	$3/LM	$2,160.00
Proj Management	5% contract value			$13,494.00
			Sub-total	$109,772
			Total	$293,582
			GST	$29,358
			Total	$322,940

Task	Description	Effort/units required	Cost per unit	Total Cost (Estimate)
Restoration Offsets (R03)				
Preparation Works	Slashing	0.5 days	$550/day	$275
	Mechanical Woody Weed Control	2.72 ha	$3,500/ha	$9,520
	Earthworks - Contour banks	2.72 ha	$3,800/ha	$10,336
	Protective fencing	1360 LM	$11.90/LM	$16,184
	Bed Preparation	2 days	$550/day	$1,100
	Direct Drilling - Trees, shrubs and grasses	27200 m^2	$1.45/$m^2$	$39,440
	Install Irrigation System	27200 m^2	$2.5/$m^2$	$68,000
Enrichment Planting	Trees	272	$4.50 per tree installed	$1,224
	Shrubs	2176	$4.50 per shrub installed	$9,792
	Watering of plants	2448 plants	$1.76/plant	$4,308
	Supply & install soil conditioner	2448 plants	$0.61/plant	$1,493
	Supply & installation of protective guardings	2448 plants	$1.75/plant	$4,284
Weed Control	Primary Spraying	2.72 ha	$2,500/ha	$6,800
	Secondary Spraying	2.72 ha	$2,500/ha	$6,800
	Secondary Hand Weed Control	2.72 ha	$1,000/ha	$2,720
	Tertiary Hand Weed Control	2.72 ha	$5,000/ha	$13,600
Irrigation System	Maintenance and Regulation	12 days	$360/day	$4,320
	Decommission	5 days	$360/day	$1,800
Sediment Fences	Maintenance	8 days	$360/day	$2,880
	Decommission	1360 LM	$5/LM	$6,800
Proj Management	15% contract value			$31,751
			subtotal	$243,427
			Total(ex GST)	$243,427
			GST	$24,343
			Total	$186,921

Task	Description	Effort/units required	Cost per unit	Total Cost (Estimate)
Restoration Offsets (R04)				
Preparation Works	Slashing	0.5 days	$550/day	$275
	Primary Weed Control	1.77 ha	$3,500/ha	$6,195
	Earthworks - Contour banks	1.77 ha	$3,800/ha	$6,726
	Protective fencing	885 LM	$11.90/LM	$10,532
	Bed Preparation	2 days	$550/day	$1,100
	Direct Drilling - Trees, shrubs and grasses	17700 m^2	$1.45/$m^2$	$25,665
	Install Irrigation System	17700 m^2	$2.5/$m^2$	$44,250
Enrichment Planting	Trees	177	$4.50 per tree installed	$797
	Shrubs	1416	$4.50 per shrub installed	$6,372
	Watering of plants	1593 plants	$1.76/plant	$2,804
	Supply & install soil conditioner	1593 plants	$0.61/plant	$972
	Supply & installation of protective guardings	1593 plants	$1.75/plant	$2,788
Weed Control	Primary Spraying	1.77 ha	$2,500/ha	$4,425
	Secondary Spraying	1.77 ha	$2,500/ha	$4,426
	Secondary Hand Weed Control	1.77 ha	$1,000/ha	$1,770
	Tertiary Hand Weed Control	1.77 ha	$5,000/ha	$8,850
Irrigation System	Maintenance and Regulation	12 days	$360/day	$4,320
	Decommission	5 days	$360/day	$1,800
Sediment Fences	Maintenance	8 days	$360/day	$2,880
	Decommission	885 LM	$5/LM	$4,425
Proj Management	15% contract value			$21,206
			Sub-total	$162,578
			GST	$16,258
			Total	$177,981

Task	Description	Effort/units required	Cost per unit	Total Cost (Estimate)
Restoration Offsets (R05)				
Preparation Works	Slashing	0.5 days	$550/day	$275
	Primary Weed Control	1.76 ha	$3,500/ha	$6,160
	Earthworks - Contour banks	1.76 ha	$3,800/ha	$6,688
	Protective fencing	880 LM	$11.90/LM	$10,472
	Bed Preparation	2 days	$550/day	$1,100
	Direct Drilling - Trees, shrubs and grasses	17600 m^2	$1.45/$m^2$	$25,520
	Install Irrigation System	17600 m^2	$2.5/$m^2$	$44,000
Enrichment Planting	Trees	176	$4.50 per tree installed	$792
	Shrubs	1408	$4.50 per shrub installed	$6,336
	Watering of plants	1584 plants	$1.76/plant	$2,788
	Supply & install soil conditioner	1584 plants	$0.61/plant	$966
	Supply & installation of protective guardings	1584 plants	$1.75/plant	$2,772
Weed Control	Primary Spraying	1.76 ha	$2,500/ha	$4,400
	Secondary Spraying	1.76 ha	$2,500/ha	$4,400
	Secondary Hand Weed Control	1.76 ha	$1,000/ha	$1,760
	Tertiary Hand Weed Control	1.76 ha	$5,000/ha	$8,800
Irrigation System	Maintenance and Regulation	12 days	$360/day	$4,320
	Decommission	5 days	$360/day	$1,800
Sediment Fences	Maintenance	8 days	$360/day	$2,880
	Decommission	880 LM	$5/LM	$4,400
Proj Management	15% contract value			$21,094
			Sub-total	$161,723
			GST	$16,172
			Total	$177,047

Task	Description	Effort/units required	Cost per unit	Total Cost (Estimate)
Restoration Offsets (R06)				
Preparation Works	Slashing	0.5 days	$550/day	$275
	Primary Weed Control	1.75 ha	$3,500/ha	$6,125
	Earthworks - Contour banks	1.75 ha	$3,800/ha	$6,650
	Protective fencing	875 LM	$11.90/LM	$10,413
	Bed Preparation	2 days	$550/day	$1,100
	Direct Drilling - Trees, shrubs and grasses	17500 m^2	$1.45/$m^2$	$25,375
	Install Irrigation System	17500 m^2	$2.5/$m^2$	$43,750
Enrichment Planting	Trees	175	$4.50 per tree installed	$788
	Shrubs	1400	$4.50 per shrub installed	$6,300
	Watering of plants	1575 plants	$1.76/plant	$2,772
	Supply & install soil conditioner	1575 plants	$0.61/plant	$961
	Supply & installation of protective guardings	1575 plants	$1.75/plant	$2,757
Weed Control	Primary Spraying	1.75 ha	$2,500/ha	$4,375
	Secondary Spraying	1.75 ha	$2,500/ha	$4,375
	Secondary Hand Weed Control	1.75 ha	$1,000/ha	$1,750
	Tertiary Hand Weed Control	1.75 ha	$5,000/ha	$8,750
Irrigation System	Maintenance and Regulation	12 days	$360/day	$4,320
	Decommission	5 days	$360/day	$1,800
Sediment Fences	Maintenance	8 days	$360/day	$2,880
	Decommission	875 LM	$5/LM	$4,375
Proj Management	15% contract value			$20,984
			Sub-total	$160,875
			GST	$16,087
			Total	$183,907

Task	Description	Effort/units required	Cost per unit	Total Cost (Estimate)
Restoration Offsets (R07)				
Preparation Works	Slashing	0.5 days	$550/day	$275
	Primary Weed Control	1.78 ha	$3,500/ha	$6,250
	Earthworks - Contour banks	1.78 ha	$3,800/ha	$10,564
	Protective fencing	890 LM	$11.90/LM	$10,591
	Bed Preparation	2 days	$550/day	$1,100
	Direct Drilling - Trees, shrubs and grasses	17800 m^2	$1.45/$m^2$	$25,810
	Install Irrigation System	17800 m^2	$2.5/$m^2$	$44,500
Enrichment Planting	Trees	178	$4.50 per tree installed	$801
	Shrubs	1424	$4.50 per shrub installed	$6,408
	Watering of plants	1602 plants	$1.76/plant	$2,820
	Supply & install soil conditioner	1602 plants	$0.61/plant	$977
	Supply & installation of protective guardings	1602 plants	$1.75/plant	$2,804
Weed Control	Primary Spraying	1.78 ha	$2,500/ha	$4,450
	Secondary Spraying	1.78 ha	$2,500/ha	$4,450
	Secondary Hand Weed Control	1.78 ha	$1,000/ha	$1,780
	Tertiary Hand Weed Control	1.78 ha	$5,000/ha	$8,900
Irrigation System	Maintenance and Regulation	12 days	$360/day	$4,320
	Decommission	5 days	$360/day	$1,800
Sediment Fences	Maintenance	8 days	$360/day	$2,880
	Decommission	890 LM	$5/LM	$4,450
Proj Management	15% contract value			$21,890
			Sub-total	$167,820
			GST	$16,782
			Total	$38,671

APPENDIX 9

PROJECT TIMETABLE

APPENDIX 10

ENVIRONMENTAL AUDIT CHECKLIST

ENVIRONMENTAL AUDIT CHECKLIST				
DATE	**TASK**	**COMMENTS**	**ACTION TAKEN**	**INITIALS**
Immediate / 18 months prior to the start of the Construction Phase	Engage bush regeneration (seed collection and propagation) contractors. Ensure Bush regeneration consultant has applied for a Section132C licence under the TSC Act (1995) to NPWS.			
	Initiate a weed control program targeting noxious and problem environmental weeds.			
	Initiate propagation of native indigenous seed for revegetation works at the site. Seed collected according to the Guidelines provided in Appendix D.			
Monthly until the initiation of the Construction Phase.	Check with the contracted seed regeneration consultants that seed collection permit from NPWS has been issued;			
	Implement weed control program;			
	Liaise with seed collectors regarding the progress of seed collection and propagation, including equivalent species diversity as per the Planting Guide.			
2 months prior to the Construction Phase	Provenance certification of seed and tubestock to DIPNR by contract seed collector;			
	Finalise a starting date for the bulk earthworks with the Construction Engineers;			
	Order necessary planting, erosion and sediment control materials.			
Construction Phase	Continually install and maintain erosion and sediment control devices as per the necessary guidelines.			
	Revegetate as per the landscaping plans;			
	Monitor and maintain the plantings weekly for the first 10 weeks, monthly for 12 months, and quarterly after that for the remainder of the 2 years. Maintain and decommission the sediment and erosion control devices as per the guidelines.			
	Monitor and maintain plantings weekly for the first 10 weeks, monthly for 12 months, and quarterly after that for the remainder of the 2 years. Maintain and decommission the sediment and erosion control devices as per the guidelines.			
Post-Construction Phase	Contingency Revegetation works			
	Monitor and maintain plantings weekly for the first 10 weeks, monthly for 12 months, and quarterly after that for the remainder of the 2 years. Maintain and decommission the sediment and erosion control devices as per the guidelines.			

ENVIRONMENTAL AUDIT CHECKLIST				
DATE	**TASK**	**COMMENTS**	**ACTION TAKEN**	**INITIALS**
Post-Construction Phase (Cont.)	Check revegetation / rehabilitation areas to ensure success, including: o Terrestrial native plant coverage is 95% successful within the sites within 12 months of initiation of revegetation, and 90% successful after 2 years. o No / limited weed presence; o Existence of terrestrial stabilising grasses and small plants. Species diversity for the property should include at least 30 of the species identified in the Planting Guide (Appendix 1) that adequately represents the natural ecotone. All species listed in this Planting Guide (or equivalent replacements) are to be used over the property for revegetation purposes. o Four macrophyte plants per square metre with 100% cover achieved after two years maintenance. o Achievement of plant density and species richness guidelines. o A minimum of 80% of species from species list (Appendix 1) to be established. o All voids between rocks / scout protection to be filled and/or stable. o All foreshores, banks and beds of all waterbodies and watercourses are stable. o Monitor all rehabilitated areas for expected growth in accordance with Section II and if areas are retardant then repair works should occur immediately. o A contingency plan is to be brought into operation if plantings densities are not being achieved for whatever reason following approval by DIPNR. o Macrophytes will be monitored for excessive growth and eventual crushing/falling which may well trigger the need for removal. The project ecologist will determine the need for removal works. At no time should any works extend over an area greater than 5% of the total area planted under macrophytes. It would be expected that the harvesting method will be by hand. It would be expected that recruitment of macrophytes will occur naturally and will not require manual plantings to occur. The project ecologist will determine any need for additional manual plantings to occur. o In aquatic zones, a minimum of 4 macrophyte plants per square metres with 100% percentage cover is to be achieved after 2 years. Monitoring measures are to occur every 6 months to identify zones that would not achieve sufficient cover after two years. These measures were to apply in the event of a Section 3A permit being issued. The monitoring report was requested to be 1-2 pages in length.			
Biannually	Report on integrity of vegetation management program within the study area.			
	Check the integrity of associated riparian zone signage			