

02/07/13

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### Executive Summary

This plan has been prepared to accompany a development application and outline the rehabilitation of the watercourse and riparian areas of Neverfail Creek within the site known as 82 Booralie Road, Terrey Hills. The plan has been commissioned by Bayview Links Pty Ltd who have also provided site instructions. Subsequent site inspections and field work were conducted between 14th May & 1st June 2013.

- This plan should be read in conjunction with the development plans and associated reports in particular the:
- Flora & Fauna Assessment, Proposed Development at 83 Booralie Road, Terrey Hills (Footprint Green, 2013),
- Arboricultural Impact Assessment 83 Booralie Road, Terrey Hills (Footprint Green, 2013);
- Landscape Plan (Dobson, 2013)

# Existing & Proposed Development

The site is located on the corner of Booralie Road and Laitoki Road, Terrey Hills. The site currently consists of a large open paddock area that extends over the majority of the site with a band of remnant vegetation along the front portion of the site towards Booralie Road. Scattered indigenous and exotic trees also occur along the site's Laitoki Road frontage and the southern portion of the site is covered with dense vegetation primarily consisting of noxious and environmental weed species.

Although degraded in some parts the band of vegetation along the Booralie Road frontage is considered to be a small pocket of the endangered Dufffys Forest ecological community and within this area there are 3 endangered Grevillea caleyi plants. Another Grevillea caleyi specimen remains in the Laitoki Road reserve in a modified habitat. As part of the development application this plan is aimed at retaining the endangered ecological community and the endangered species by protecting and rehabilitating their habitats.

The development itself involves construction of a Seniors Housing Development with basement car parking (Rush, 2013) with associated landscaping (Dobson, 2013) and rehabilitation of the riparian area that crosses the southern portion of the site.

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sheet 10- specifications



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drawing title cover page

# plan objectives & strategy

#### Objectives of the plan

The objective of the plan is to retain, protect and rehabilitate the habitats of the endangered Caley's Grevillea (Grevillea caleyi) and the endangered Duffys Forest ecological community on and immediately adjacent the site.

#### Background

Grevillea calelyi is listed as an endangered species in both the Threatened Species Conservation Act (NSW) 1995 and the Environmental Protection Biodiversity Conservation Act (Cwlth) 1999.

Grevillea caleyi is a spreading shrub and its distribution is restricted to the northern Sydney suburbs of Belrose, Terrey Hills, Duffys Forest and Ingleside. The species typically occurs within the Duffys Forest ecological community found on ridge tops with iron-rich laterite soils.

There are 4 Grevillea caleyi plants on and adjacent the subject site. The species is known to regenerate after fires from seed stored in the soil and the number of plants above ground is not considered to be a good guide in estimating the significance of sites. A more accurate estimation of the area occupied by Grevillea caleyi is the area of habitat (OEH, 2004).

The Duffys Forest ecological community is listed in the schedules of the Threatened Species Conservation Act (NSW) 1995 and is also restricted and mainly occurs in the suburbs of Belrose, Terrey Hills, Duffys Forest and Ingleside where it grows in lateritic soils and deeply weathered shale soils that mainly occur on ridge lines. The community is characterised by tree species of Eucalyptus capitellata, Eucalyptus sieberi, Eucalyptus oblonga, and Angophora costata.

#### Site history & potential for recovery

The habitats of Grevillea calevi and the Duffys Forest community on the site are considered to be small in area and are vulnerable to physical disturbances and weed establishment. The Grevillea caleyi within the Laitoki Road reserve grows out onto the road pavement and appears to be regularly tip pruned by passing traffic. The Duffys Forest community is also vulnerable to being displaced by the encroaching weeds such as Mountain Cedar Wattle (Acacia elata) and Coral Trees (Erythrina x sykesii).

With only pockets of habitat remaining the long term survival of this endangered species and endangered ecological community is questionable without some form of active management.

#### Strategy

The strategy in this plan aims to carry out bush regeneration weed control in the more viable areas to retain what floristic diversity remains, remove the non-indigenous canopy trees and undertake a committed effort to remove other environmental weeds from the adjacent more degraded habitats. Whilst no revegetation works are proposed within the remaining core Grevillea calelyi and the Duffys Forest habitats the adjacent areas are to be revegetated with species known to occur in the Duffys Forest community.

This strategy is consistent with the The Grevillea calevi Recovery Plan (DEC, 2004) for this site referred to in the recovery plan as Site 23, Management Actions for Site 23 referred to weed management being needed in remnant bushland.

This strategy is consistent with the The Grevinea caleyi Recovery Plan (DEC, 2004) for this site referred to in the plan as Site 23 which referred to weed management being needed in remnant bushland.

figure 2.1 - plan context with the site at 83 Booralie Road, Terrey Hills



### general site information

Landform Morphology	Simple slope, incised gully
Aspect	South
Geology	Hawkesbury Sandstone
Soil Landscape	Somersby Soil Landscape
Watercourse	Neverfail Gully Creek flowing to the south we
Catchment	Kierans Creek
Receiving Waters	Cowan Creek / Hawkesbury River
Vegetation	Forest and Cleared Lands containing Environ Exotic Species



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# legend



indigenous trees



non indigenous trees

potential Grevillea

Grevillea caleyi

plants

caleyi habitat



boundaries of management areas



# legend



indigenous trees



non indigenous trees



Grevillea caleyi plants



boundaries of management areas

(4)212)474

weed class scale

# characteristic exotic & non-indigenous native species

# characteristic indigenous native species

Booralie Rd frontage	Laitoki Road reserve	Genus species	Common Name
	~	Acacia baileyana	Cootamundra Wattle
-		Acacia elata	Mountain Cedar Wattle
-		Ageratina adenophora	Crofton Weed
-	~	Araujia sericiflora	Moth Vine
~	~	Asparagus aethiopicus	Asparagus Fern
~	~	Bidens pilosa	Cobbler's Peg
~		Brachychiton acerifolius	Illawarra Flame Tree
	~	Cinnamomum camphora	Camphor Laurel
-		Conyza sp.	Fleabane
~		Cortaderia selloana	Pampas Grass
	✓	Crocosmia x crocosmiiflora	Montbretia
~		Cytisus scoparius	Scotch Broom
-	~	Ehrharta erecta	Panic Veldtgrass
	~	Erythrina X sykesii	Coral tree
~		Euphorbia peplus	Petty Spurge
~	~	Hedychium gardnerianum	Ginger Lily
~		Jacaranda mimosifolia	Jacaranda
~	~	Lantana camara	Lantana
	~	Ligustrum lucidum	Large Leaf Privet
~	¥	Ligustrum sinense	Small Leaf Privet
~		Lilium formosanum	Formosan Lily
~	~	Nephrolepis cordifolia	Fishbone Fern
~		Onopordum acanthium	Scotch Thistle
~	~	Pennisetum clandestinum	Kikuyu Grass
~		Phoenix canariensis	Canary Island Date Palm
~		Phyllanthus tenellus	-
	~	Phytolacca octandra	Ink Weed
~		Ricinus communis	Castor Oil Plant
~		Schefflera actinophylla	Umbrella Tree
~	~	Senna pendula	Cassia
	~	Setaria gracilis	Slender Pigeon Grass
~		Setaria spp.	Pidgeon Grass
~	~	Solanum mauritianum	Wild Tobacco Tree
~		Solanum nigrum	Blackberry Nightshade
	~	Tradescantia fluminernsis	Wandering Jew
	~	Tropaeolum majus	Nasturtium
~		Vicia sativa	Vetch

Booralie Rd frontage	Laitoki Road reserve	Genus species	Common Name
	~	Acacia parramattensis	Parramatta Wattle
~	~	Allocasuarina littoralis	Black She-oak
~	~	Banksia serrata	Old Man Banksia
	~	Calochlaena dubia	Common Ground Fern
~		Ceratopetalum gummiferum	Christmas Bush
-		Commelina cyanea	Scurvy Weed
~	~	Corymbia gummifera	Red Bloodwood
-		Cyathochaeta diandra	-
-	~	Dianella caerulea	Blue Flax Lily
-		Dichondra repens	Kidney Weed
-		Dodonaea triquetra	Hop Bush
~		Echinopogon caespitosus	Tufted Hedgehog Grass
-		Elaeocarpus reticulatus	Blueberry Ash
~		Entolasia stricta	Wiry Panic
-		Eucalyptus capitellata	Brown Stringybark
~		Eucalyptus haemastoma	Scribbly Gum
	~	Eucalyptus pilularis	Blackbutt
-	~	Eucalyptus sieberi	Silver Top/Black Ash
~	~	Grevillea caleyi	Caley's Grevillea
-		Grevillea sericea	Pink Spider Flower
~		Hibbertia scandens	Climbing Guinea Flower
~	~	Homalanthus populifolius	Bleeding Heart
~		Lambertia formosa	Mountain Devil
	~	Melaleuca armillaris	Bracelet Honey-myrtle
~	~	Microlaena stipoides	Weeping Grass
~	~	Pittosporum undulatum	Native Daphne
~		Smilax glyciphylla	Sweet Sarsaparilla
~		Solanum aviculare	Kangaroo Apple



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grevillea caleyi & duffys forest mgmt plan - 83 booralie road, terrey hills



# legend



trees to be retained

trees to be removed



Grevillea caleyi plants



potential Grevillea caleyi habitat



boundaries of management areas & temporary tree protection fencing

drawing title stage 1 - prior to construction & earthworks - works & performance measures

# stage 1 - prior to earthworks & construction

stage 1 - performance measures (reproduced from previous sheet)

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# performance measures

- existing Grevillea caleyi & Duffys Forest habitats are to be retained in a condition that encourages the natural recruitment of indigenous species.
- all trees shown on this plan to be retained shall remain on site.
- weed control is to be carried out as required to achieve & maintain
- < 5% weed biomass.
- soil surface is to be stabilised to prevent erosion.
- there must be no signs of erosion or sediment deposition.
- protective fencing shall remain in a secure functional state.

#### stage 1- implementation procedure (refer previous sheet for stage 1 plan)

Task No.	Task	To be Carried Out By
1.1	The boundaries of the areas to be managed by this plan are to be marked out on the ground using star pickets.	Project Manager
1.2	A Project Ecologist is to be engaged to oversee specific tasks identified in this plan.	Project Manager
1.3	A site induction program shall be developed that will include the awareness and identification of ecologically sensitive areas including the Grevillea caleyi and Duffys Forest habitats.	Project Manager
.4	The site induction program shall be delivered to all contractors and consultants prior to them undertaking any works or inspections on the site.	Project Manager
.5	There are a number of dead eucalypts in the Management Areas and the soil within the Management Areas shall be sampled and analysed for the presence of <i>Phytophthora cinnamomi</i> . Depending upon the findings of the analysis, the levels of management & hygiene controls for people and equipment entering the Management Areas will need to conform with National Best Practice Guidelines.	Project Manager
.6	A qualified and experienced arboricultural consultant is to tag/mark all trees identified as being removed within the Management Areas and additional trees as shown on the preceding sheet 6 (refer tree details in Arboricultural Report).	Consulting Arboriculturalist
.7	A qualified and experienced arboricultural contractor is to be engaged to remove trees tagged / marked for removal.	Project Manager
.8	Under the supervision of the Project Ecologist, trees that are within the Management Area and identified for removal shall be removed to ground level and stumps shall be treated with Glyphosate herbicide by the arboricultural contractor to prevent reshooting.	Arboricultural Contractor
.9	Tree removal should be undertaken by the arboricultural contractor ensuring no damage to the Grevillea caleyi plants or habitats, the Duffys Forest habitats and vegetation of and other trees identified as being retained.	Arboricultural Contractor
.10	Indigenous trees that have been removed shall be mulched with the mulch stockpiled on site for future use as part of this plan. Branches from indigenous trees between 60-200mm dia. shall be stockpiled on site for future use as micro-habitat within the Management Areas.	Arboricultural Contractor
.11	A qualified and experienced bush regeneration contractor who is a member of the Australian Association of Bush Regenerators (refer specifications) shall be engaged to undertake works associated with this plan unless specified otherwise.	Project Manager
.12	Under the supervision of the Project Ecologist, the soil fill material and other debris shall be removed from along the southern boundary of the Booralie Road Woodland.	Project Manager / Bush Regeneration Contractor
.13	Tree Protection Fencing shall be installed around the Management Areas as shown on the Tree Protection Plan and specifications in the Arboricultural Impact Assessment and in accordance with this plan.	Project Manager
.14	Consideration shall be given to the pre-ordering of plant stock based upon the numbers and species identified in this plan (refer specifications).	Bush Regeneration Contracto
.15	Indigenous plants within the development areas that are capable of being transplanted (eg. Common Ground Fern, Bladey Grass) can be transplanted into the Management Areas	Bush Regeneration Contracto
.16	Initial weed control - All introduced exotic and non-indigenous species within the Management Areas and within 2m of the boundaries of the Management Areas shall be treated using standard bush regeneration weed control techniques (refer specifications).	Bush Regeneration Contracto
.17	Secondary weed control using standard bush regeneration weed control techniques (refer specifications) may be necessary in Stage 1 to achieve the Stage 1 performance measures.	Bush Regeneration Contracto
.18	Stockpiled mulch shall be spread over areas of exposed soil that are outside the <i>Grevillea caleyi</i> and Duffys Forest habitats (refer previous sheet) to minimise weed establishment.	Bush Regeneration Contracto
.19	Stockpiled branches or logs shall be spread randomly across Management Areas outside the Grevillea caleyi habitats (refer previous sheet).	Bush Regeneration Contracto
.20	The bush regeneration contractor must maintain records, details and photographs of the work undertaken during this period for inclusion in final reports.	Bush Regeneration Contracto
.21	A site audit is to be conducted by the Project Ecologist ensuring all the Stage 1 tasks have been carried out and the Stage 1 performance measures have been achieved. The audit report shall be submitted to the Project Manager	Project Ecologist
.22	Stage 2 works shall not commence until satisfactory completion of Stage 1 performance measures.	Bush Regeneration Contracto



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grevillea caleyi & duffys forest mgmt plan - 83 booralie road, terrey hills



legend



Grevillea caleyi plants

trees to be retained

protection fencing

potential Grevillea . caleyi habitat







boundaries of management areas & temporary tree

	Ву
e 1 performance	Bush Regeneration
-	Contractor
sultants prior to	Project Manager
state around the	Project Manager
cies within the	Bush Regeneration
t Areas shall be	Contractor
r specifications)	
ving the	
0 -	
achieving the	
efer	Bush Regeneration
e are no signs of	Contractor
e planting	Bush Regeneration
cations).	Contractor
otographs of the	Bush Regeneration
	Contractor
Stage 2 tasks	Project Ecologist
en achieved. The	
e 2 performance	Bush Regeneration
•	Contractor

To be Carried Out

# drawing title stage 2 - during construction - works, procedures & performance measures



Ph: (02) 99188877 Fax: (02) 99188876

ABN 34 097 138 817

passage of ground dwelling fauna

-	1	-	1	5

Task	To be Carried Out By
ntil satisfactory completion of Stage 2 performance	Bush Regeneration Contractor
can be removed.	Project Manager
be installed within the Management Area under the	Project Manager
ys Forest habitats the area within the Management ulch (refer specifications).	Bush Regeneration Contractor
S Forest habitats the commercially available smoke quarter of the habitats away from the Grevillea nanufacturer's recommendations.	Bush Regeneration Contractor
anagement Areas outside the <i>Grevillea caleyi</i> and with the densities (refer performance measures) ifications)	Bush Regeneration Contractor
ed exotic and non-indigenous species within the the boundaries of the Management Areas shall be ation weed control techniques (refer specifications) age 2 until the issue of the Occupation Certificate in this stage at each 2 monthly interval.	Bush Regeneration Contractor
pecifications) at 2 monthly intervals to achieve an	Bush Regeneration Contractor
est maintain records, details and photographs of the or inclusion in final reports.	Bush Regeneration Contractor
Project Ecologist ensuring all the Stage 3 tasks 3 performance measures have been achieved. The Project Manager	Project Ecologist
commence until satisfactory completion of Stage 3	Bush Regeneration Contractor

Task	To be Carried Out By
intil satisfactory completion of Stage 3 performance	Bush Regeneration Contractor
duced exotic and non-indigenous species within the using standard bush regeneration weed control ninimum intervals of: upation Certificate for a period of 4 months s in this stage at each 2 monthly interval, and n of 25 months after issue of the Occupation	Bush Regeneration Contractor
specifications) at 2 monthly intervals to achieve an	Bush Regeneration Contractor
s of stress, disease or poor vigour they shall be species options (refer specifications).	Bush Regeneration Contractor
ust maintain records, details and photographs of the or inclusion in final reports.	Bush Regeneration Contractor
Project Ecologist ensuring all the Stage 4 tasks 4 performance measures have been achieved. The Project Manager	Project Ecologist

terrey hills

#### specifications

### bush regeneration

Bushland Regeneration is the activities carried out to provide conditions that facilitate the natural recruitment or germination of endemic flora species. It primarily involves the progressive control of weed species in a systematic manner of primary weed control, follow-up weed control (often several follow -up sessions) and maintenance over an identified works area. Typically work areas progress from areas of little weeds and expand to adjacent works areas. It is recommended that these activities are undertaken by specialised and experienced bush regeneration contractors.

#### bush regeneration contractors

Bush regeneration contractors are companies or individuals who have experience and qualifications in bush regeneration activities. Contractors must provide an experienced site supervisor with minimum qualifications of a TAFE Certificate II in Bush Regeneration or Conservation & Land Management and must be eligible for membership to Australian Association of Bush Regenerators.

#### erosion & sediment controls

All erosion and sediment controls such as berms, sediment fences, rumble zones sediment basins and site drainage flow paths must be designed and constructed in accordance with Managing Urban Stormwater: Soils and Construction. 4th Edition (Landcom, 2004), New South Wales Government.

#### herbicide usage

Glyphosate based herbicides can be used in conjunction with weed control techniques and is to be used in accordance with the product label and registration. Herbicide usage must be undertaken in a manner or method that does not cause harm to endemic species or new plantings and there is no contamination of surface or ground waters.

#### organic mulch

Organic mulch material shall consist of a 75mm (unless otherwise specified) deep layer of chipped wood material of similar standard to Forest Blend ® and is to be free of non-organic material, contaminated chemicals such as hydrocarbons and weed seed.

#### plant maintenance & replacement

All plantings shall be maintained, (watered, weeded) so as to display good health and vigour. Apart from typical seasonal variations, plantings showing poor vigour, stress or disease will be replaced.

#### plant stock

All plant material will be tubestock or maxi-cell with the exception of native grasses where virocells can be used.

Plants used must be grown from seed or cuttings taken from provenance stock. Greening Australia or local commercial nurseries specialising in native species can be contacted as they have a range of seed from the local provenance. Provided that orders are placed in advance, consignment propagation can be carried out from local stock.

#### planting

Planting is to be carried out using standard horticultural practices. Because of the nature of the site and environmentally sensitive lands downstream, no fertiliser is to be used in conjunction with planting, however if considered necessary, water retaining crystals can be used. All tree & shrub plantings are to be planted with staked translucent or cardboard grow tubes.

#### planting species options & diversity

It is recognised that some species listed on this plan may be difficult to propagate or may not be readily available. To overcome this, a range of species options are listed.

In order to introduce diversity and avoid a mass monoculture of plantings, there must be a minimum of:

- 6 canopy species in roughly equal numbers,
- 10 understorey species in roughly equal numbers, and
- 7 ground cover species in roughly equal numbers.

#### weed control

Weed control is to be undertaken using standard bush regeneration techniques such as hand weeding or with the use of Glyphosate based herbicides when necessary (eg. cut & paint, stem scrape, spot spraving).

#### weed material disposal and temporary storage on site.

Weed material containing seed or weed material capable of spreading vegetatively shall be removed from site and disposed of at an appropriate location where it will not cause further environmental damage.

Temporary storage of weed material prior to disposal can occur on site where it is stored, outside drainage lines, on an impervious surface and it is covered with a material that adequately contains the weed debris.



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# species options for revegetation

(refer species diversity specification opposite)

# ground covers

Genus species	Common Name
Dianella caerulea	Blue Flax Lily
Dianella revoluta	Black-anther Flax Lily
Echinopogon caespitosus	Tufted Hedgehog Grass
Entolasia stricta	Wiry Panic
Eustrephus latifolius	Wombat Berry
Hibbertia scandens	Climbing Guinea Flower
Imperata cylindrica	Blady Grass
Lomandra longifolia	Spiny-headed Mat-rush
Microlaena stipoides	Weeping Grass
Smilax australis	Sarsaparilla
Smilax glyciphylla	Sweet Sarsaparilla
Themeda australis	Kangaroo Grass

# understorey shrubs

Genus species	Common Name
Acacia linifolia	Flax-Leaved Wattle
Banksia spinulosa	Hairpin Banksia
Boronia ledifolia	Ledum/Sydney Boronia
Bossiaea obcordata	Spiny Bossiaea
Dodonaea triquetra	Hop Bush
Grevillea sericea	Pink Spider Flower
Hakea dactyloides	Broad-leaved Hakea
Hakea sericea	Willow-leaved Hakea
Hakea teretifolia	Dagger Hakea
Homalanthus populifolius	Bleeding Heart
Kunzea capitata	-
Lambertia formosa	Mountain Devil
Solanum aviculare	Kangaroo Apple
Xanthorrhoea media	Grass Tree

#### tree species

Genus species	Common Name
Acacia parramattensis	Parramatta Wattle
Allocasuarina littoralis	Black She-oak
Banksia serrata	Old Man Banksia
Ceratopetalum gummiferum	Christmas Bush
Corymbia gummifera	Red Bloodwood
Elaeocarpus reticulatus	Blueberry Ash
Eucalyptus capitellata	Brown Stringybark
Eucalyptus haemastoma	Scribbly Gum
Eucalyptus sieberi	Silver Top/Black Ash
Melaleuca armillaris	Bracelet Honey-myrtle