Pacific Highway Upgrade: Woolgoolga to Ballina

TRANSPORT FOR NSW

GLENUGIE UPGRADE - BIODIVERSITY OFFSET STRATEGY

Final

13.2544.0923

July 2020

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Pacific Highway Upgrade: Woolgoolga to Ballina

Project no:	EN04570 / IA189400
Document title:	Glenugie Upgrade - Biodiversity Offset Strategy
Document no:	Document No.
Revision:	v.8
Date:	20 July 2020
Client name:	Transport for NSW
Client no:	13.2544.0923
Project manager:	Chris Thomson
Author:	Chris Thomson
File name:	C:\Users\cthomson\Documents\GLENUGIE\Glenugie_BOS_FINAL_ 10 12 2019.docx

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Document history and status

Revision	Date	Description	By	Review	Approved
Rev01	19/09/2014	Draft	A. Carty	C. Thomson	A. Carty
Rev02	14/01/2015	Draft	C. Thomson	A.Carty	A.Carty
Rev03	27/02/2019	Draft	C.Thomson	RMS	C.Thomson
Rev04	05/04/2019	Final	C.Thomson	RMS	C.Thomson
Rev05	15/05/2019	Final v.5	C.Thomson	RMS	C.Thomson
Rev06	14/10/2019	Final v.6	C. Thomson	RMS	C.Thomson
Rev07	10/12/2019	Final v.7	C.Thomson	RMS	C.Thomson
Rev08	20/07/2020	Final v.8	C.Thomson	TfNSW	C.Thomson

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Contents

Executive Summary

Transport for NSW (TfNSW) has completed an upgrade of a seven-kilometre section of the Pacific Highway at Glenugie, south of Grafton. This Biodiversity Offset Strategy has been prepared to address the Commonwealth Conditions of Approval for the project relating to biodiversity offsets for the clearing of no more than 65 hectares of vegetation that includes no more than 30 hectares of habitat for Square-fruited Ironbark and 65 hectares of habitat for Spotted-tailed Quoll, Large-eared Pied Bat, Grey-headed Flying Fox, Regent Honeyeater and Swift Parrot. This Strategy identifies a proposed offset area, located approximately two kilometres east of the Glenugie Upgrade.

TfNSW purchased a 607-hectare property at Glenugie (offset property) and commissioned a series of ecological investigations to identify the most suitable area of the property for offsetting the impacts from the Glenugie Upgrade. This strategy describes the physical and landscape features of the TfNSW property including the extent and condition of vegetation communities, flora and fauna and habitats, and the presence of listed threatened species and ecological communities.

An offset area of 300 hectares has been identified in this strategy that meets the Commonwealth Conditions of Approval including: 110 hectares of occupied habitat for the threatened Square-fruited Ironbark (*Eucalyptus tetrapleura*); 120 hectares of habitat for nationally listed threatened fauna; and 70 hectares of land suitable for revegetation of Square-fruited Ironbark. This strategy demonstrates how the habitats on the offset area are comparable and of similar/greater quality than habitats impacted by the Glenugie Upgrade with a focus on Matters of National Environmental Significance.

Several threatened fauna species are reported to have high potential to occur on the offset area based on suitable habitat resources and previous records in the locality, which includes among others the nationally listed Swift Parrot, Large-eared Pied Bat, Grey-headed Flying-Fox and Regent Honeyeater. The fauna habitats on the property consist of Spotted Gum - Ironbark open forest, riparian and floodplain moist forests, Scribbly Gum dry sandy forest and open grassland habitat with scattered trees.

The residual area of the property not being utilised as an offset for the Glenugie upgrade is proposed to be used to offset part of the other TfNSW projects in the region, such as the Woolgoolga to Ballina (W2B) upgrade project. The residual area supports around 250 hectares of remnant vegetation and 53 hectares of cleared lands. The residual area of 250 hectares of remnant vegetation has potential to be used to offset impacts to vegetation on the W2B project and as habitat offsets for threatened species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and *Biodiversity Conservation Act* 2016 (BC Act) significantly impacted by the W2B project. The residual area provides habitat for several nationally listed threatened species that are being significantly impacted by the W2B project comprising Spotted-tail Quoll, Swift Parrot, Regent Honeyeater, Koala and habitats occupied by *Eucalyptus tetrapleura*.

Substantial areas of habitat regeneration were observed in cleared areas of the property between September 2014 and September 2019. Areas of habitat regeneration include saplings of Square-fruited Ironbark (*Eucalyptus tetrapleura*) as well as a range of other associated native flora including trees, shrubs and groundcover species.

To ensure the conservation and management of the offset property in perpetuity, TfNSW propose to enter into an in-perpetuity Biodiversity Stewardship Agreement under the New South Wales *Biodiversity Conservation Act 2016*. Biodiversity Stewardship Agreements are attached to the Land Title and require the current and all future landholders to carry out management actions to improve the biodiversity on a site and not to undertake activities that will reduce the biodiversity values. Ongoing management of the offset property will be detailed in a site-specific Management Action Plan supported with funding provided by TfNSW through the Biodiversity Stewardship Agreement Fund. TfNSW will undertake actions identified in the Management Action Plan until such time that the property is sold. Future landholders will then take on this responsibility.

TfNSW will be responsible for the implementation of the Square-fruited Ironbark revegetation plan and monitoring, until such time as ownership of the property is transferred, at this stage any subsequent monitoring as described in the BSA and funded management plan is the responsibility of the property owner.

This strategy provides an initial framework for management of the site that will be further developed through the Biodiversity Stewardship Agreement, Management Action Plan and Square-fruited Ironbark Revegetation Plan.

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1. Introduction

1.1 Pacific Highway Upgrade Glenugie

Transport for NSW (TfNSW) has completed an upgrade of a seven-kilometre section of the Pacific Highway at Glenugie between Franklins Road and Eight Mile Lane south of Grafton (i.e. the Glenugie Upgrade) on the mid-north coast of NSW as part of the Pacific Highway Upgrade Program. The Commonwealth Conditions of Approval for the Glenugie Upgrade detailed specific requirements limiting the clearing of no more than 65 hectares of vegetation that includes no more than 30 hectares of habitat for Square-fruited Ironbark and 65 hectares of habitat for Spotted-tailed Quoll, Large-eared Pied Bat, Grey-headed Flying Fox, Regent Honeyeater and Swift Parrot and offsetting impacts to biodiversity which are commensurate with the degree of vegetation clearing and impacts to threatened species associated with the project.

Compliance with the Conditions of Approval is addressed in this Biodiversity Offset Strategy which provides details of an offset area identified as part of Lot 1 (DP1199690) Sunnyside Road, Glenugie. This Biodiversity Offset Strategy describes the extent and condition of the ecological values (vegetation communities and fauna habitats) on the entire TfNSW property, including the distribution and abundance of listed threatened species and listed threatened ecological communities. The Strategy also includes discussion on how and where the TfNSW property adequately meets the Conditions of Approval for the Glenugie Upgrade. This relates to offsetting ecological values impacted by the project and details of the proposed conservation mechanism and future management framework for the site.

1.2 Biodiversity Offset Requirements

Approval for the Glenugie Upgrade was obtained on the 17th December 2009 (NSW Government Department of Planning) and 13th January 2010 (Commonwealth Government Department of Environment, Water, Heritage and the Arts). In both instances, approval was granted with a set of conditions relating to offsetting the impacts on biodiversity. The relevant conditions are listed in Table 1-1. Refer to Section 4.5 and Table 4.3 for details of how each condition has been addressed.

Table 1-1: Conditions of Approval for the Glenugie Upgrade

Section	Biodiversity Offset Requirement	Section of this report
75J	NSW Environmental Planning and Assessment Act 1979	
2.3(a)	Land offsets intended for the conservation of existing Square-fruited Ironbark Eucalyptus tetrapleura individuals or translocation of individuals affected by the project.	This Strategy
130 (1) and 133	Commonwealth Environment Protection and Biodiversity Conservation Act, 1999.	
3(a)	The acquisition and conservation of land containing a minimum of 110 hectares of habitat for the Square-fruited Ironbark that is equal or greater quality to that removed for the Pacific Highway Upgrade at Glenugie;	Section 1.3 & Section 3.6
3(b)	The acquisition and conservation of land containing a minimum of 70 hectares that will be revegetated to provide habitat for the Square-fruited Ironbark that is equal or greater quality to that removed for the Pacific Highway Upgrade at Glenugie	Section 1.3 & Section 3.10
3(c)	Details of revegetation work required to achieve the requirements of conditions 3(b). The works must be consistent with advice from a suitably qualified expert;	Section 6
3(d)	The land referred to in condition 3(a) and 3(b) must provide linkage between existing stands of Square-fruited Ironbark and/or be adjacent to existing stands of Square-fruited Ironbark;	Section 1.3 & Figure 3.4
3(e)	The land referred to in condition 3(a) and 3(b) must be located within 100 km of the Pacific Highway Upgrade at Glenugie;	Section 1.3 & Figure 1-1

3(f)	Research into the extent, population, genetics and the success of regeneration of habitat for the Square-fruited Ironbark;	Section 6 and Appendix E
3(g)	The acquisition and conservation of land containing a minimum of 120 hectares of habitat for the Large-eared Pied Bat, Grey-headed Flying Fox, Regent Honeyeater and Swift Parrot;	Section 4
3(h)	The land referred to in condition 3(g) must be located within 50 km of Grafton;	Section 1.3 & Figure 1-1
3(i)	The land referred to in condition 3(a), 3(b) and 3(g) must be protected by a legal instrument under the relevant nature conservation legislation, that ensures the land is conserved in perpetuity;	Section 4.6 & Section 5
3(j)	The strategy must include commitments to ongoing management of the land referred to in condition 3(a), 3(b) and 3(g) in perpetuity.	Section 5
3(k)	The strategy must include key milestones, performance indicators, corrective actions and timeframes for the completion of all actions outlined in the strategy.	Table 4.3, Section 5 and Section 6
3(l)	The strategy must be developed in consultation with the Department.	Comments were received from DoE on early drafts of the Biodiversity Offset Strategy documents (refer Appendix F) The comments received have been incorporated into this Final Biodiversity Offset Strategy.

1.3 Proposed Offset Area

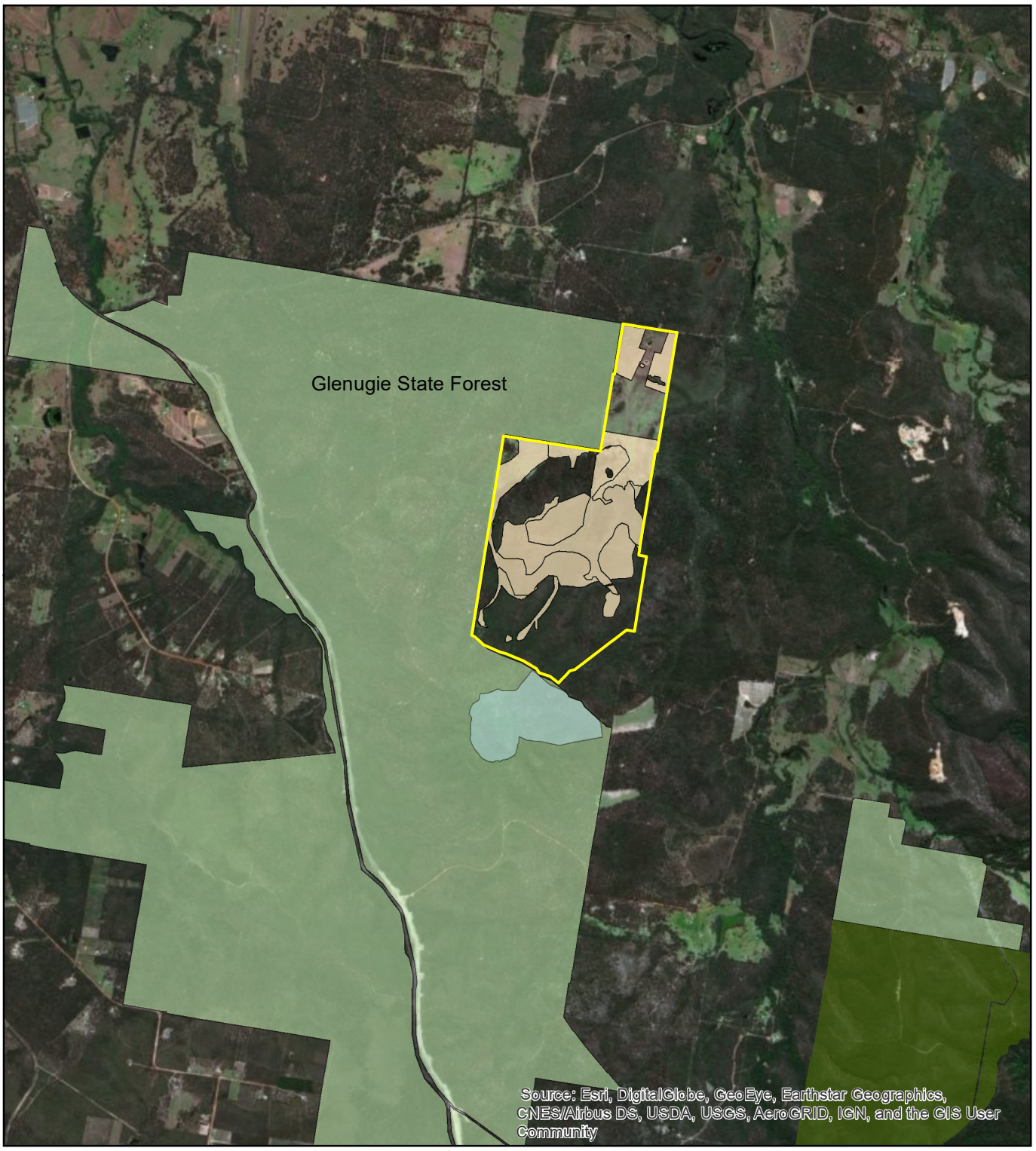
TfNSW owns a 607-hectare property at Lot 1 (DP1199690) Sunnyside Road, Glenugie (the TfNSW property). It is approximately 16 km south-east of Grafton and 2 km east of the Glenugie Upgrade. The proximity of the site to the upgrade and Grafton satisfies conditions 3(e) and 3(h) of the project approval in terms of geographic location.

An ecological values assessment has been conducted over the entire property to inform this Biodiversity Offset Strategy and is described herein. The results of the site assessment confirm that there is sufficient area on the property supporting greater than 110 hectares of high quality habitat for the threatened Square-fruited Ironbark (*Eucalyptus tetrapleura*) (MNES), 70 hectares of disturbed habitat suitable for Square-fruited Ironbark revegetation and 120 hectares of habitat for the federally listed fauna species (the Large-eared Pied Bat, Grey-headed Flying Fox, Regent Honeyeater and Swift Parrot) and therefore satisfies the requirements of Conditions 3(a), 3(b) and 3(g). The 300-hectare area that satisfies Conditions 3(a), 3(b) and 3(g) of the TfNSW property is referred to herein as the 'offset area'.

The TfNSW property adjoins Glenugie State Forest on the southern and western boundaries and forested freehold lands on the eastern and northern boundaries. The habitats on the offsite area are contiguous with habitats on a number of state forest and national park properties including Glenugie, New Foundland and Candole State Forest and Yuraygir State Conservation Area and National Park. The locality of the TfNSW property is shown in Figure 1-1. The property is located between the key habitats associated with Glenugie State Forest to the west and Yuraygir National Park to the east and lies within an important regional wildlife corridor link between these habitats.

The TfNSW property is currently zoned Rural 1(a) with a total area of 607 hectares comprising a mix of remnant and regrowth forest, with cleared grazing land. The site has a history of grazing, associated with clearing of the northern portion and the construction of fences and several dams. Selective timber harvesting has been conducted through the remainder of the forested land including track formation. There is a shed and fenced paddocks at the northern and central western portions of the property.

Figure 1-1 Locality of the TfNSW property



Legend

- TfNSW owned property
- State Forest
- National Park Estate
- Glenugie Peak Flora Reserve
- Gleugie Offset Area

DATA SOURCES
Jacobs 2019

GDA94_Zone56
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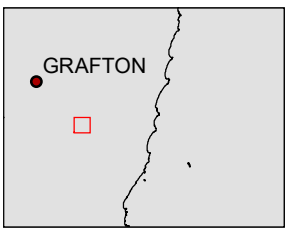
Kilometres



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17/06/2013

1.4 Aims and Objectives of the Offset Strategy

The aim of the Biodiversity Offset Strategy is to investigate and identify the suitability of the TfNSW property for meeting the biodiversity offset requirements stipulated in the conditions of approval and outlines the strategy for conservation of any identified offset area and future ongoing management. The specific objectives of the strategy include:

- Identifying, describing and mapping the ecological values of the TfNSW property to identify any areas which are consistent with the offset requirements under conditions 3(a), 3(b) and 3(g) to demonstrate the suitability of the site for meeting the offset requirements.
- Determine the presence or likely presence of threatened flora and fauna species and populations based on habitat assessment and database review to demonstrate how the TfNSW property addresses condition 3(g).
- Determine appropriate revegetation strategies for condition 3(b) and provide details of these (condition 3(c)).
- Determine key milestones, performance indicators, corrective actions and timeframes for all proposed biodiversity offset actions (condition 3(k))
- Determine appropriate monitoring and management actions required for the ongoing management of the biodiversity offset area (condition 3(j)).
- Demonstrate how the Biodiversity Offset Strategy addresses conditions 3(d), 3(e), 3(h), 3(i), 3(f) and 3(l).

2. Methodology

A range of ecological surveys have been conducted on the property between 2010 and 2019 to assess and map biodiversity values and to observe and measure the degree of natural regeneration occurring on the site, particularly habitat for *Eucalyptus tetrapleura*. The current report focuses largely on the initial surveys (2014-16) which were aimed at confirming the vegetation types and habitats present on the site and their suitability to Matters of NES. Discussion is also provided on the monitoring of regeneration of *Eucalyptus tetrapleura.*

The initial assessments were conducted to identify the biodiversity values on the TfNSW property using a data review and field-based assessment focused on identifying the landscape values, flora and fauna diversity and vegetation and habitat for threatened species. The first stage involved a review of regional biodiversity spatial data and vegetation mapping which was followed by a preliminary field surveys in 2010 then more detailed field assessments in 2012. Follow up field surveys have occurred between 2014 and 2019. Details of the survey methods used are described in Section 2 and the results of the surveys presented in Section 3.

2.1 Data Review

Database searches were undertaken to identify the extent of documented vegetation types in the locality and identify records of threatened flora and fauna species, populations, ecological communities, migratory species and critical habitats within proximity to the TfNSW property. The data sources used in the review included:

- Broad-scale regional vegetation mapping; CRAFTI (NPWS 1998).
- OEH Bionet (Atlas of NSW Wildlife) for records of threatened species in the region.
- EPBC Act Protected Matters on-line Search Tool.
- High-Resolution Aerial Photography.

The vegetation communities of the property were assigned to eight vegetation types according to the broad-scale regional mapping provided in the CRAFTI dataset (NPWS 1998). The data was matched to vegetation communities described in the Biometric Vegetation Types Database (DECC 2008a) and then ground-truthed as part of the field assessment.

2.2 Flora and Fauna Survey

Both the Pacific Highway Glenugie Upgrade and proposed Sunnyside Road offset site were assessed using the former Biobanking methodology under the *Threatened Species Conservation Act* (1995). This Act was replaced by the BC Act in 2016. Under the BC Act, Biobanking agreements established through the TSC Act will be transitioned to BSAs and, where a proposed Biobanking agreement has not been finalised before February 2018, additional survey work is required. To satisfy these requirements, surveys using the Biodiversity Assessment Method (BAM) were completed in 2018 using the methodology established under the BC Act. These surveys will update and expand upon information collected on the Sunnyside Road property during survey work that was undertaken in 2012 and 2014 using the Biobanking methodology and are reported in a separate Biodiversity Stewardship Site Assessment Report (BSSAR) being prepared to support the application for a stewardship site under the provisions of the NSW BC Act. The following information refers to the original 2014-2015 site assessment work.

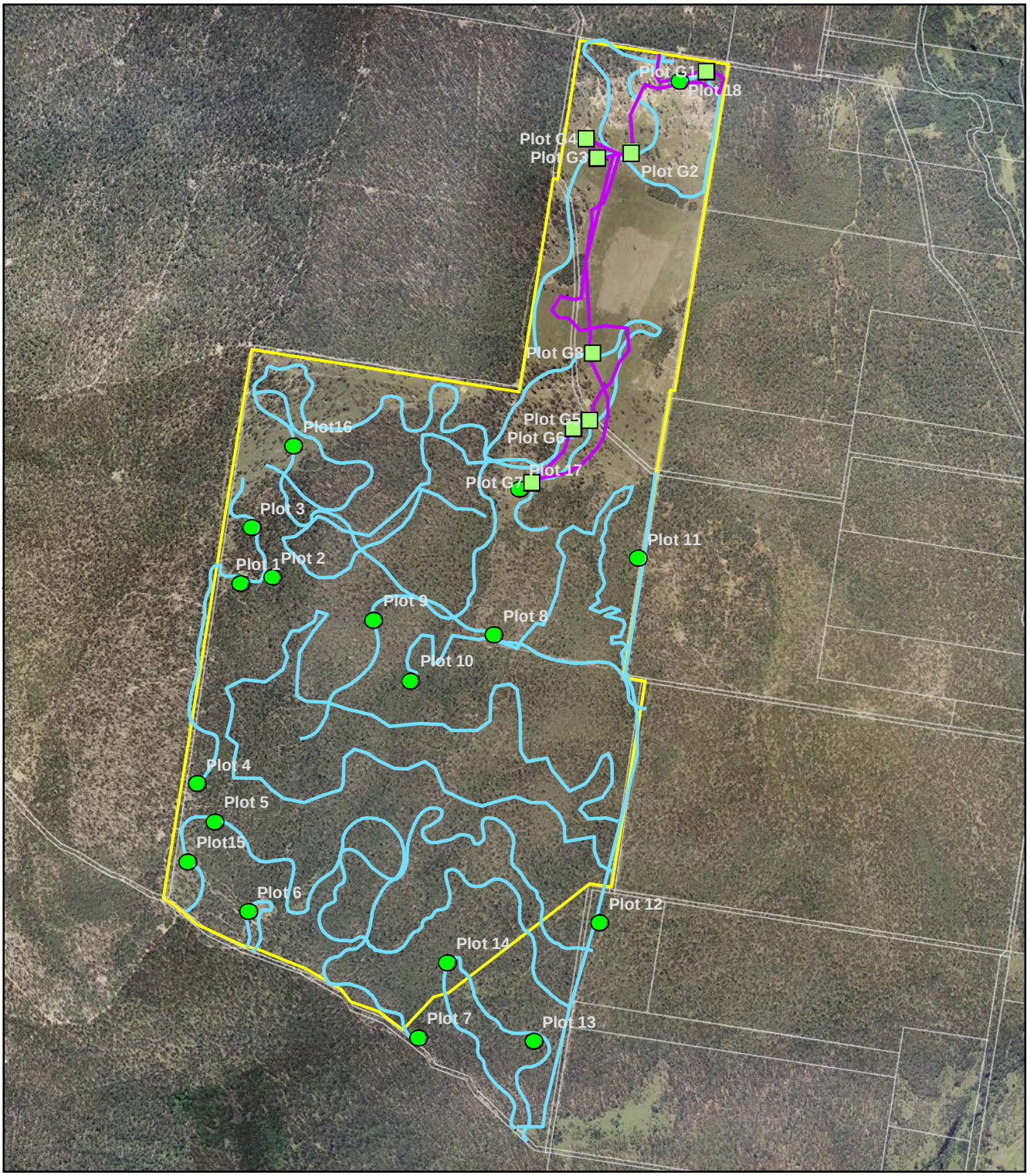
Plot-based and transect assessments and general traverses have been used to identify and document the vegetation and habitat types present, their condition and extent. The location of transects and plot-based surveys are illustrated in Figure 2-1.

The field surveys focused on the following tasks:

- A general flora and fauna survey to determine the floristic diversity, ground-truth the regional vegetation association mapping and identify the range of fauna habitats present.
- Classifying and mapping plant communities and determine equivalence with state and nationally listed threatened ecological communities, and the Biometric Vegetation Types Database (DECC 2008a).

- Targeted searches for threatened flora species, including mapping the extent of *Eucalyptus tetrapleura, Melaleuca irbyana* and any other threatened flora species.
- Assessing the condition of the vegetation against recognised benchmarks in the DECC (2008a) database using the Biobanking condition assessment methodology (Seidel and Briggs 2008) for comparison with the habitats impacted on the Glenugie Upgrade.
- Documenting opportunistic sightings of fauna species and/or other indirect evidence of fauna species (i.e. scats, tracks, hair, feathers, bones, scratchmarks, feeding signs, etc).
- Opportunistically identify and map important fauna habitat attributes such as vegetation structure, hollow trees, connectivity and landscape features with a focus on threatened fauna known or likely to occur in the TfNSW property.
- Inspecting cleared/disturbed areas of the TfNSW property to determine the suitability for revegetation of *Eucalyptus tetrapleura* and determining appropriate rehabilitation methods and ongoing monitoring and management requirements.

Figure 2-1: Field Methodology



LEGEND

- Condition Assessment Plots
- Condition Assessment Plots (September 2014)
- General Traverses
- General Traverses (September 2014)
- TfNSW owned property

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Kilometres

DATA SOURCES
LPI 2007
Jacobs 2014

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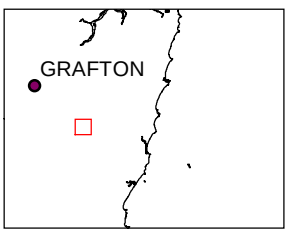

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Newcastle Spatial Team - Prepared by : AC
Checked by : CT

2.3 Condition Assessment

A vegetation / habitat condition assessment was conducted using the Biobanking condition assessment methodology (Seidel and Briggs 2008) to assess the condition of the vegetation in relation to regional condition benchmarks for each Biometric vegetation type present. Field data was recorded using the Biobanking methodology plot layout, which consists of a 20 x 20 metre plot (0.04 ha), a 20 x 50 metre plot (0.1 ha) and a 50-metre line transect as depicted in Figure 2-2.

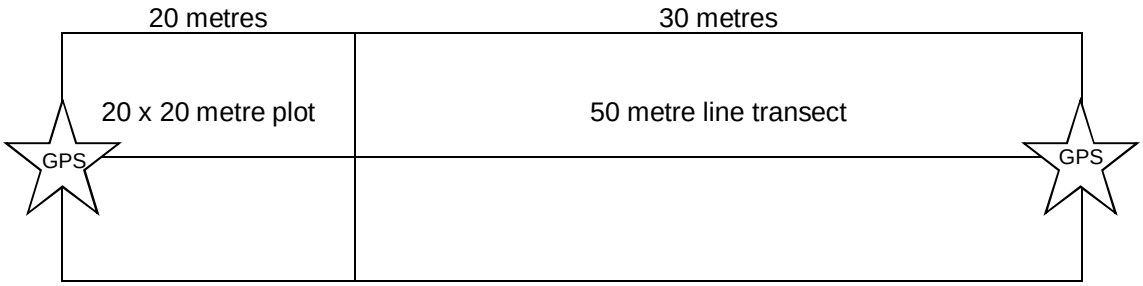

Figure 2-2: Biobanking plot layout used in the field surveys

The condition assessment involved the collection of quantitative plot data on the number of native species; over-storey and mid-storey cover abundance, groundcover attributes including native and exotic species cover; the number of hollow bearing trees; over-storey regeneration and length of fallen logs.

Native canopy and mid-storey cover were visually estimated at 10 points along the 50-metre line transect to provide an estimated projected foliage cover for the plot. The projected foliage cover (%) of ground covers (native grasses, shrubs, other and exotic species), was calculated by recording their presence/absence at 50 points along the 50-metre line transect.

The plot data for each site attribute was compared against the relevant benchmark for the dominant vegetation types, scored and then ranked. The final score for each vegetation plot was then assigned one of the following condition ratings:

- High = 80 to 100.
- Moderate = 50-80
- Low =0-50

The vegetation types and benchmark scores used for the assessment are taken from DECC (2008b) and are presented in Table 2-1.

Table 2-1: Vegetation types and benchmark score used in the condition assessment (DECC 2008b)

Biometric vegetation type	Native Plant Species Richness	Native Over-storey Cover		Native Mid-storey Cover		Native Ground Cover-grasses		Native Ground Cover-shrubs		Native Ground Cover-other		Number of Trees with Hollows	Total Length of Fallen Logs (m)
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX		
Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the North Coast	35 species	10%	35%	5%	18%	10%	60%	0%	40%	5%	60%	1	5
Narrow-leaved Red Gum woodlands of the lowlands of the North Coast	35 species	10%	35%	5%	18%	10%	60%	0%	40%	5%	60%	1	5
Orange Gum (Eucalyptus bancroftii) open forest of the North Coast	30 species	20%	50%	5%	50%	10%	60%	5%	60%	10%	50%	1	10
Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast	32 species	10%	50%	5%	45%	0%	50%	10%	60%	5%	40%	1.5	10
Spotted Gum - Grey Ironbark - Pink Bloodwood open forest of the Clarence Valley lowlands of the North Coast	30 species	20%	50%	5%	50%	10%	60%	5%	60%	10%	50%	1	10
Spotted Gum - Grey Box - Grey Ironbark dry open forest of the Clarence Valley lowlands of the North Coast	30 species	20%	50%	5%	50%	10%	60%	5%	60%	10%	50%	1	10

2.4 Assessment of Habitat Regeneration

Field assessments were undertaken in September 2014, January 2017, October 2017 and September 2019 to observe and measure the degree of natural regeneration occurring on the site, particularly habitat for *Eucalyptus tetrapleura*. Vegetation / habitat condition assessments were undertaken within areas of regenerating habitat using the Biobanking condition assessment methodology (Seidel and Briggs 2008) as described in Section 2.3, to assess the condition of the vegetation in relation to regional condition benchmarks.

Counts of regenerating trees and shrubs were also undertaken within the 20x20 metre plots. The number of saplings/seedlings of each species was counted to understand the species composition regenerating in particular the regeneration of *Eucalyptus tetrapleura* trees. The heights and cover of the regenerating trees and shrubs were also recorded. Numerous photographs of the regenerating areas were also taken.

2.5 Survey Effort

A total of 26 plots were sampled across the vegetated and regenerating portions of the site, including 8 plots undertaken in cleared/regenerating areas during September 2014 to assess habitat regeneration on the TfNSW property. Observations on the site suggests the data collected was representative of the vegetation communities and condition classes present and was considered sufficient for assessing the condition of the habitats in the study area relative to the benchmark scores. Note that some of the plots are located outside of the TfNSW property boundary due to modifications to the boundaries following the original condition assessment, however the vegetation types and condition in these areas are representative of the habitat conditions on the TfNSW property. The number of condition assessment plots undertaken in each vegetation type is summarised in Table 2-2.

Note the original vegetation classification and mapping conducted in 2012 and 2014 included 26 assessment plots and mapped vegetation over a total of 603 hectares. Further detailed assessments were undertaken in 2018 to support a Biodiversity Stewardship Site application. This work completed 44 plots and resulted in minor adjustments to the vegetation mapping described in the report and mapped vegetation over a total area of 607 hectares (the additional area accounts for a paper road added to the site). The later data was based on the most comprehensive survey to date and is documented in the biodiversity stewardship site assessment report (BSSAR; Jacobs 2019). This report describes the results from the earlier preliminary vegetation condition surveys (2012-2014).

Table 2-2: Condition assessment plots

Vegetation type	Area (ha)	No. of plots surveyed (2012)	Additional plots (2014)
Moderate to High Condition			
Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the North Coast	32.27	2	0
Narrow-leaved Red Gum woodlands of the lowlands of the North Coast	13.25	1	0
Orange Gum (Eucalyptus bancroftii) open forest of the North Coast	39.68	1	0
Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast	170.18	2	0
Spotted Gum - Grey Ironbark - Pink Bloodwood open forest of the Clarence Valley lowlands of the North Coast	171.47	8	0
Spotted Gum - Grey Box - Grey Ironbark dry open forest of the Clarence Valley lowlands of the North Coast	18.49	1	0
Low Condition			
Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the North Coast	20.23	1	1
Narrow-leaved Red Gum woodlands of the lowlands of the North Coast	70.97	1	0

Vegetation type	Area (ha)	No. of plots surveyed (2012)	Additional plots (2014)
Spotted Gum - Grey Ironbark - Pink Bloodwood open forest of the Clarence Valley lowlands of the North Coast	63.83	1	7
Spotted Gum - Grey Box - Grey Ironbark dry open forest of the Clarence Valley lowlands of the North Coast	3.09	0	0
TOTAL	603.46	18	8

3. Results

3.1 Physical Environment

The TfNSW property is located in the NSW North Coast bioregion within the Northern Rivers Catchment Management Area. This region is significant for biodiversity in Australia as it includes the 'Macleay–McPherson Overlap' an area where a combination of climatic and geographic conditions has resulted in the co-occurrence of both temperate and tropical species many at the limits of their distribution (Burbidge 1960).

The topography of the TfNSW property comprises low undulating hills at the southern and northern ends and floodplain areas throughout the central portion of the site (refer to Figure 3-1). There are three main drainage lines which flow in a south to northerly direction towards the central floodplain area. The catchment for these drainage lines includes the north facing slope of Glenugie Peak and the vegetated hills at the southern end of the property.

The property is within the Grafton-Whiporie Basin and Clarence-Richmond Alluvial Plains landscapes of the Clarence Basin as defined by Mitchell (2003) and these are briefly described below and the distribution on the TfNSW property is mapped in Figure 3-1.

Vegetation on this landscape is dominated by dry sclerophyll forest. The Clarence-Richmond Alluvial Plains landscape unit is associated with the floodplain areas of the site which have mostly been cleared of vegetation. Soils include deep brown earths and structured brown clay on floodplains.

Figure 3-1: Mitchel landscapes and topography

LEGEND

- TfNSW owned property
- 10 metre contour lines

Mitchell Landscapes

- Clarence - Richmond Alluvial Plains
- Flat Top Basalts
- Grafton - Whiporie Basin

0 1
Kilometres

DATA SOURCES
LPI 2007
Jacobs 2014

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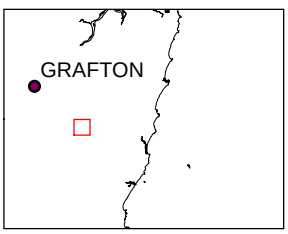


3.2 Landscape Connectivity

Information on key habitats and movement corridors in the landscape surrounding the TfNSW property was obtained from the Key Habitats and Corridors project (DEC 2003) and Climate Change Corridors project (DECC 2007). These projects adopted a strategic approach to landscape conservation in north-east NSW by identifying regional key fauna habitats and linking habitat corridors, including current corridor locations and corridors likely to become important in the face of future climate change.

Key habitats are typically large areas of remnant vegetation such as reserves, and state forests and regional corridors have been identified to link these key habitats. The TfNSW property is located between the key habitats associated with Glenugie State Forest to the west and Yuraygir National Park to the east and lies within an important link between these habitats (Figure 3-2).

3.3 Flora Diversity

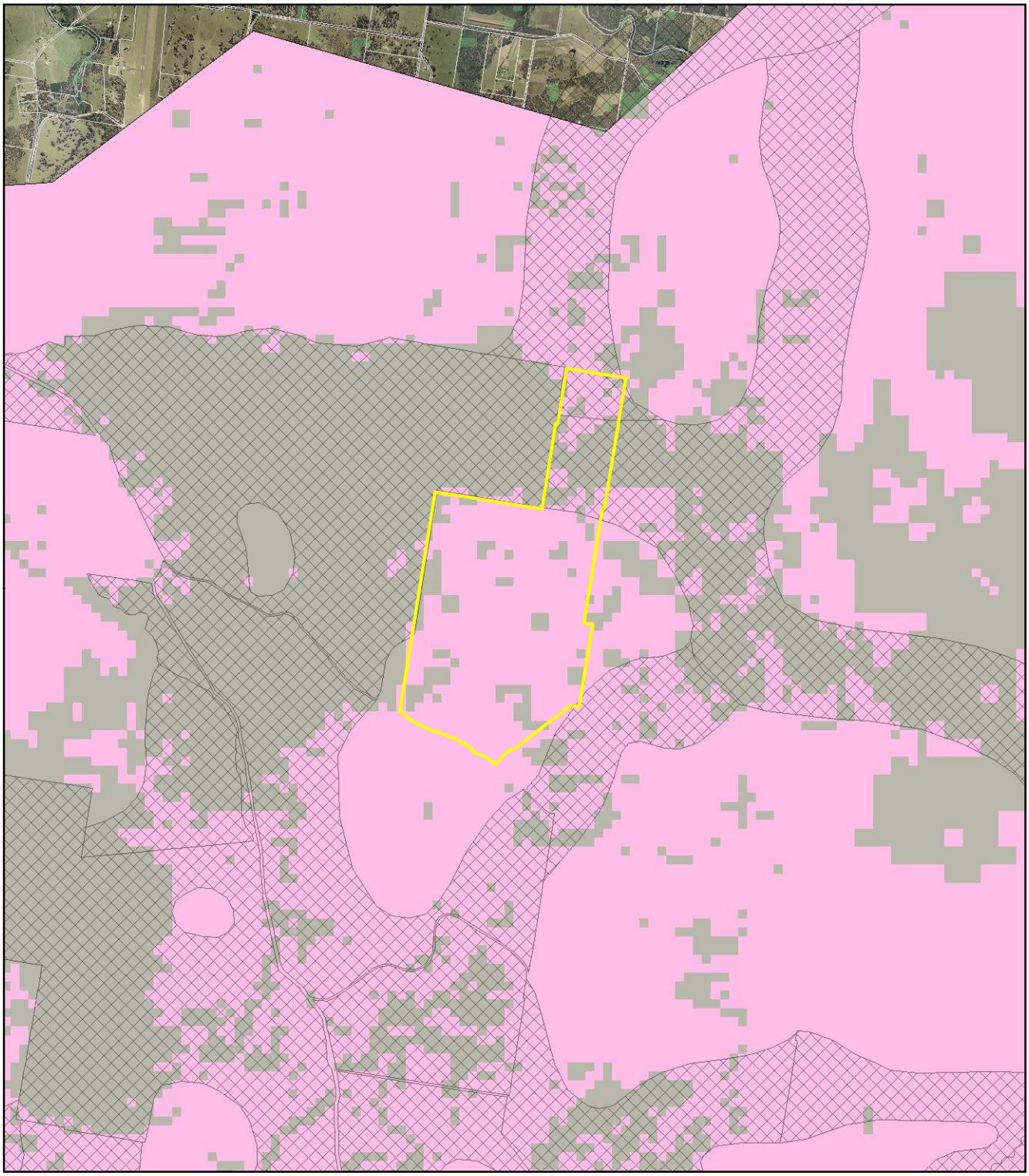
The TfNSW property supports a high diversity of flora species with a total of 275 species being identified from 68 families. Of the 275 species recorded 38 are exotic species of which three species are listed in the NSW North Coast Regional Strategic Weed Management Plan 2017-2022 (North Coast Local Land Services 2017), four are threatened species and one is listed under the Rare or Threatened Australian Plants (RoTAP) database (Briggs and Leigh 1996). The summary of the floristic attributes of the property are provided in Table 3-1 and the entire list of flora species recorded are provided in Appendix C.

Table 3-1: Threatened, RoTAP and noxious species recorded on the TfNSW property

Floristic Attribute	Species	Status
Threatened species	Eucalyptus tetrapleura (Square-fruited Ironbark)	Vulnerable (BC Act and EPBC Act)
	Melaleuca irbyana (Weeping Paperbark)	Vulnerable (BC Act)
	Maundia triglochinoides	Vulnerable (BC Act)
	Centranthera cochinchinensis (Swamp Foxglove)	Endangered (BC Act)
RoTAP	Arthrochilus prolixus	2K*
Regionally significant (Sheringham and Westaway 1995)	Scleria rugosa (A sedge)	Common throughout TfNSW property in moister situations
Regional priority weeds and weeds of concern	Baccharis halimifolia (Groundsel Bush)	NSW North Coast LLS north coast regional priority weed
	Cinnamomum camphora (Camphor Laurel)	NSW North Coast LLS – species of concern
	Lantana camara	

* 2 = Geographic Range in Australia less than 100 km; K = Poorly Known

Figure 3-2: Landscape connectivity (key habitats and corridors)



LEGEND

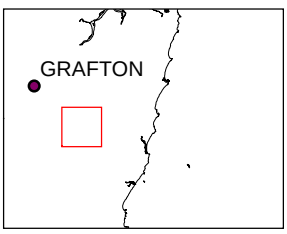
- TfNSW owned property
- Key Habitats
- Fauna Corridors
- Dry Corridors (Climate Change)

0 2

Kilometres

DATA SOURCES
LPI 2007
DECC 2007
DEC 2005

1:65,000



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Newcastle Spatial Team - Prepared by : AC
Checked by : CT

3.4 Vegetation Communities

The vegetation communities on the property were classified according to DECC (2008a), these are described in Table 3-2 based on the dominant species, landscape position, legal status, cleared estimate and the approximate area of intact vegetation on the TfNSW property. Six vegetation communities have been identified and their distribution is illustrated in Figure 3-3.

3.5 Threatened Ecological Communities

Of the vegetation types present, the *Narrow-leaved Red Gum woodlands of the lowlands of the North Coast* and *Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the North Coast* are identified in the Vegetation Types Database (DECC 2008a) as being part of the endangered ecological community "Sub-tropical Coastal Floodplain Forest of the NSW North Coast Bioregion" (SCFF) listed under the NSW Biodiversity Conservation Act, 2016 (BC Act). The distribution and condition of these vegetation types identified as being SCFF is displayed in Figure 3-3.

There is approximately 455 hectares of intact SCFF on the property, confined to lower elevated creek and floodplain areas and are dominated by a mixed Eucalypt canopy. Dominant canopy species observed in SCFF vary throughout the study area and include Thin-leaved Red Gum (*Eucalyptus seeana*), Forest Red Gum (*Eucalyptus tereticornis*), Swamp Turpentine (*Lophostemon suaveolens*), Pink Bloodwood (*Corymbia intermedia*), Red Mahogany (*Eucalyptus resinifera*) and Square-fruited Ironbark (*Eucalyptus tetrapleura*), often occurring with a dense Paperbark (*Melaleuca* spp.) understorey.

As these lower elevated habitats support higher soil fertility suitable for agricultural activities, much of the SCFF habitat on the property has been cleared or partially cleared and grazed in the past, and these areas are considered currently low condition. The total area of low condition SCFF comprises 91 hectares (refer to Figure 3-3). These low condition areas support a mix of the original native flora and exotic pasture species, with regenerating trees and shrubs (refer to Section 3.10).

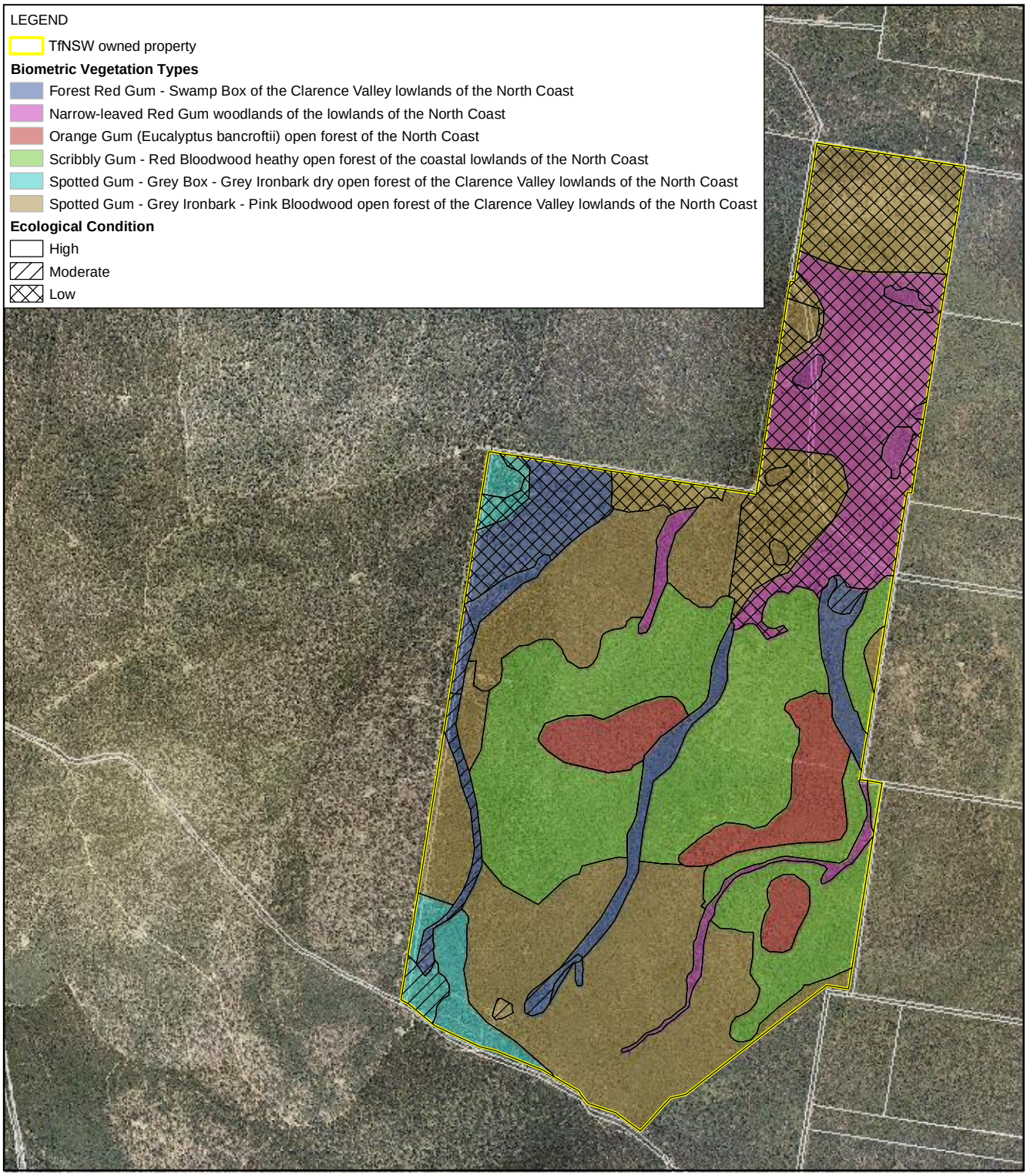
Table 3-2: Vegetation types on the TfNSW property at Sunnyside Road, Glenugie (DECC 2008a)

Biometric Vegetation Type (ID Code*)	Dominant Canopy Species	Main Associated Species	Landscape Position	Legal Status (NSW BC Act)	Cleared Estimate#	Area of high/moderate condition on the property (ha)	Area of low condition (suitable for regeneration)
Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the North Coast (FF1)	Forest Red Gum (Eucalyptus tereticornis), Swamp Box (Lophostemon suaveolens)	Pink Bloodwood (Corymbia intermedia), Grey Ironbark (Eucalyptus siderophloia)	On high and low quartz sediments in the Clarence lowlands.	Endangered	60%	32.27	20.23
Narrow-leaved Red Gum woodlands of the lowlands of the North Coast (FF2)	Narrow-leaved Red Gum (Eucalyptus seeana)	Large-leaved Spotted Gum (Corymbia henryi) Pink Bloodwood (Corymbia intermedia), Grey Ironbark (Eucalyptus siderophloia), Swamp Box (Lophostemon suaveolens), Cabbage Gum (Eucalyptus amplifolia subsp. sessiliflora), Swamp Oak (Casuarina glauca), Broad-leaved Apple (Angophora subvelutina)	On low poorly drained sites near coastal streams and swamps.	Endangered	40%	13.25	70.97
Orange Gum (Eucalyptus bancroftii) open forest of the North Coast (SF1)	Orange Gum (Eucalyptus bancroftii)	Scribbly Gum (Eucalyptus signata), Smudgy Apple (Angophora woodsiana)	Heavy textured, infertile alluvial soils on poorly drained flats.	n/a	75%	39.68	-
Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast (SF2)	Scribbly Gum (Eucalyptus signata), Red Bloodwood (Corymbia gummifera)	Pink Bloodwood (Corymbia intermedia), Needlebark Stringybark (Eucalyptus planchoniana), Turpentine (Syncarpia glomulifera), Bastard White Mahogany (Eucalyptus umbra), Smudgy Apple (Angophora woodsiana), Bailey's Stringybark (Eucalyptus baileyana)	On coastal lowlands on sandy soils derived from metasediments from the Maria River north to the Richmond River.	n/a	25%	170.18	-
Spotted Gum - Grey Ironbark - Pink Bloodwood open forest of the Clarence Valley lowlands of the North Coast (SG1)	Large-leaved Spotted Gum (Corymbia henryi), Spotted Gum (Corymbia variegata), Grey Ironbark (Eucalyptus siderophloia)	Small-fruited Grey Gum (Eucalyptus propinqua), Pink Bloodwood (Corymbia intermedia)	On slopes and ridges in undulating terrain of the Clarence lowlands	n/a	50%	171.47	63.83
Spotted Gum - Grey Box - Grey Ironbark dry open forest of the Clarence Valley lowlands of the North Coast (SG2)	Large-leaved Spotted Gum (Corymbia henryi), Grey Box (Eucalyptus moluccana), Grey Ironbark (Eucalyptus siderophloia)	Red Ironbark (Eucalyptus fibrosa), Swamp Box (Lophostemon suaveolens), Forest Red Gum (Eucalyptus tereticornis), Rough-barked Apple (Angophora floribunda) Thin-leaved Stringybark (Eucalyptus eugenioides)	Mainly confined slopes and hills on low quartz sediments in the Clarence lowlands.	n/a	45%	18.49	3.09

* Veg Codes FF= Floodplain, SF= Sandy Forest, SG = Spotted Gum dominated forest

Cleared estimate for the Biometric Vegetation Types database (DECC 2008a).

Figure 3-3: Vegetation communities and ecological condition



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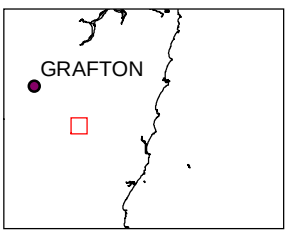
Kilometres



DATA SOURCES
LPI 2007
Jacobs 2014

1:26,000

3.6 Threatened Flora and Rare Species

Four threatened flora species have been identified on the TfNSW property and there is a high potential for additional threatened flora populations to be present particularly cryptic species such as orchids, sedges, grasses and forbs.

3.6.1 *Eucalyptus tetrapleura* (Square-fruited Ironbark)

Eucalyptus tetrapleura is present in all vegetation communities identified on the TfNSW property as shown in Figure 3-4 including cleared areas where the species was formerly present. The species is locally abundant both within and adjacent to the property, including scattered occurrences throughout the partially cleared grazing land which are adjacent to existing stands of *Eucalyptus tetrapleura*.

The areas where a previous distribution of *Eucalyptus tetrapleura* is evident pre-clearing are highly suitable for habitat revegetation for this species. The specific details regarding the distribution and extent of *Eucalyptus tetrapleura* habitat in the study area is specified in Table 3-3. There is an area of 54.28 hectares of low condition regrowth containing scattered *Eucalyptus tetrapleura* which has been previously selectively cleared and grazed. This area is targeted for assisted regeneration of the species. The restoration of *Eucalyptus tetrapleura* habitat was targeted including cleared areas with regenerating trees and shrubs in the central area and northern end of the site

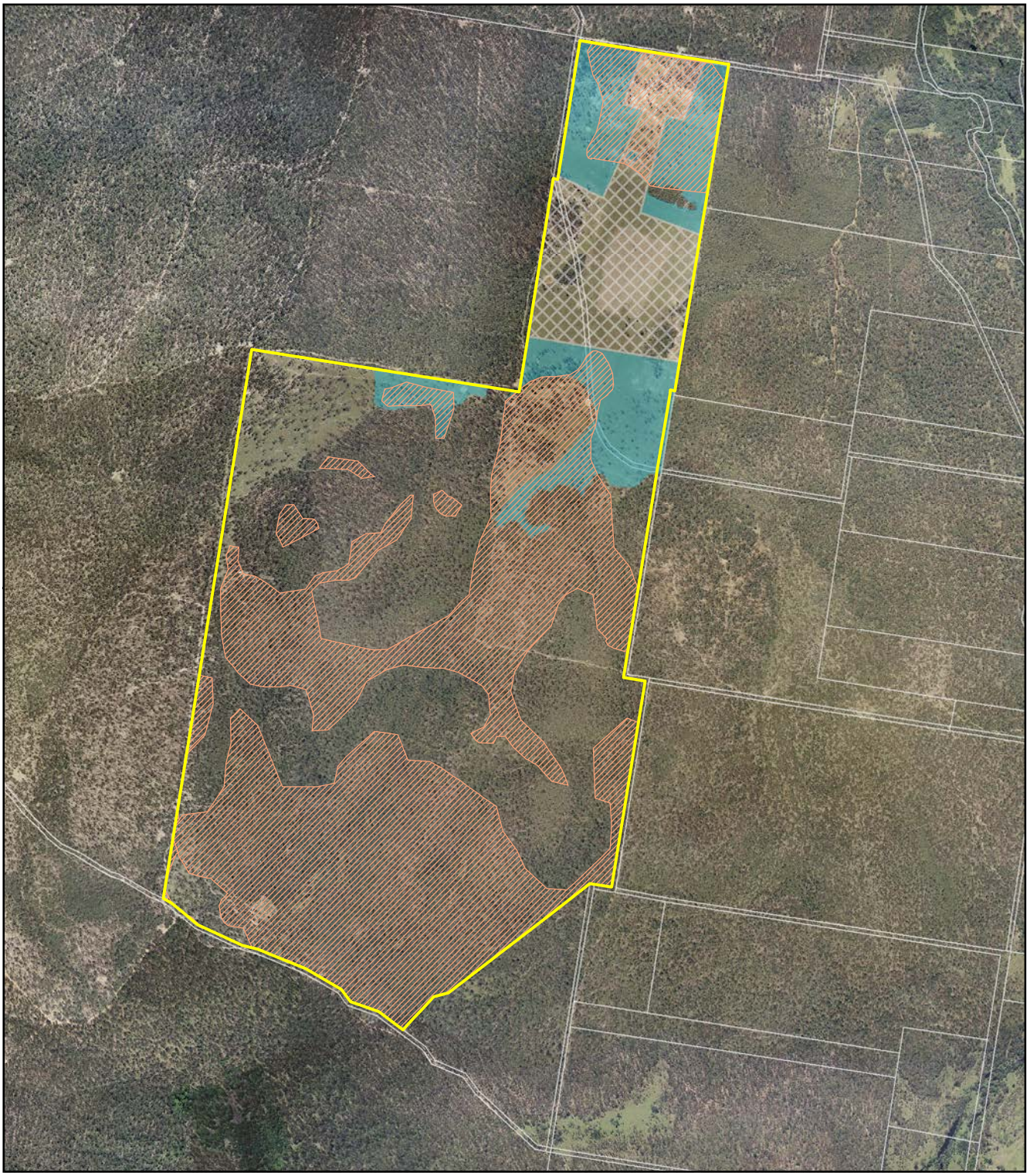
The areas on the TfNSW property identified as occupied low condition habitat for *Eucalyptus tetrapleura* comprise 54 hectares where individuals were recorded in partially cleared land and 101 hectares of unoccupied low condition habitat where much of this area is considered to previously have supported *Eucalyptus tetrapleura* prior to be being cleared. An area of 70 hectares, including 54 ha of low condition occupied and 16 ha of low condition unoccupied habitat, was identified. The proposed habitat regeneration area is shown on Figure 4-1 and is regarded as highly suitable for revegetation of *Eucalyptus tetrapleura* and therefore included in the offset area.

Genetic analysis of samples collected from the TfNSW property confirm field identification of *Eucalyptus tetrapleura,* which can be problematic when no fruit or flower buds are present, including mature specimens in remnant vegetation and saplings regenerating in areas that had previously been cleared (RBG&DT, 2017).

Table 3-3: Areas of habitat for Eucalyptus tetrapleura on the TfNSW property

Classification	Definition	Area (ha)
Occupied Habitat		
Moderate to High Condition	The known distribution of Eucalyptus tetrapleura within moderate to high condition remnant vegetation	236.26
Low Condition (regrowth)	The known distribution of Eucalyptus tetrapleura within regrowth classed as low condition vegetation	54.28
	Total Occupied Habitat	290.53 ha
Cleared areas (includes areas formerly occupied by Eucalyptus tetrapleura)	Cleared areas where Eucalyptus tetrapleura was not present, some of these areas are considered likely to once supported the species and therefore are considered likely to comprise suitable habitat	101
	Total on Glenugie Offset portion	180 ha (includes 70 ha regeneration area comprising low condition and cleared areas formerly occupied by the species)

Figure 3.4 *Eucalyptus tetrapleura* distribution



LEGEND

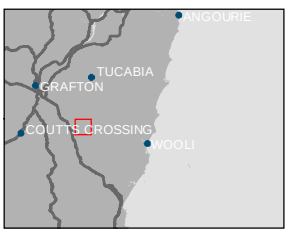
- TfNSW owned property
- *Eucalyptus tetrapleura* distribution
- Stewardship Site Exclusion Zone
- *Eucalyptus tetrapleura* rehabilitation area (70 ha)

0 1
Kilometres

1:26,000

DATA SOURCES

Jacobs 2019



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Newcastle Spatial Team - Prepared by : KM
Checked by : JC

3.6.2 Melaleuca irbyana

A population of *Melaleuca irbyana* was identified on the TfNSW property which is part of a larger population extending to the west of the TfNSW property into Glenugie State Forest (Figure 3-5). The population was recorded within an area partially cleared for grazing which will be protected and allowed to regenerate under a Biodiversity Stewardship Agreement (refer to Plate 1). Approximately 100-120 individuals are present representing all age classes. The population appears to have slightly expanded since previous surveys during March 2010 with several juveniles recorded outside of the 2010 mapped distribution.

3.6.3 Maundia triglochinoides

A relatively large population of the threatened aquatic herb *Maundia triglochinoides* (Vulnerable, BC Act) was recorded within small pools along the major drainage lines running along the eastern boundary and central areas of the TfNSW property (refer to Plate 2). The distribution of *Maundia triglochinoides* at the TfNSW property is illustrated in Figure 3-5.

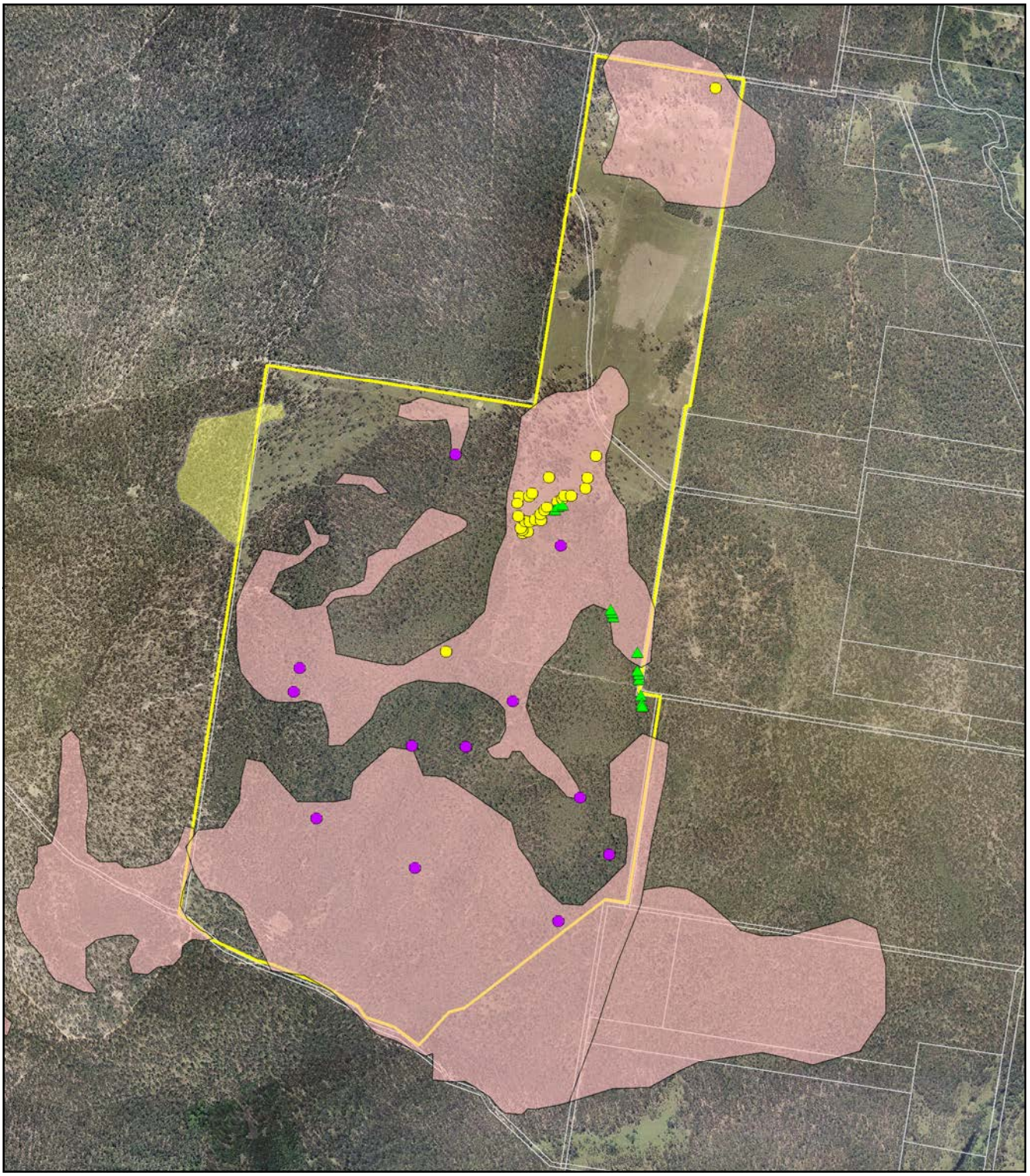
Plate 1: Partially cleared habitat where *Melaleuca irbyana* was recorded

Plate 2: *Maundia triglochinoides* in a pool on creek running along eastern boundary of the TfNSW property

3.6.4 Swamp Foxglove (Centranthera cochinchinensis)

A large population of the threatened herb species *Centranthera cochinchinensis* (Swamp Foxglove) (Endangered, BC Act) was recorded in the open grassland habitats on the edges of the floodplain in the central cleared portion of the TfNSW property (refer to Plate 3) as shown in Figure 3-5. A single plant was also recorded on the central trail area and a further single plant was recorded in open grassland at the northern end of the property (Figure 3-5). The distribution of *Centranthera cochinchinensis* on the property is likely to be more extensive then is indicated in Figure 3-5 as the distribution has been mapped based on opportunistic sightings. Targeted surveys during the peak flowering season should be undertaken to gain appreciation of the total distribution of *Centranthera cochinchinensis* on the TfNSW property and to assist in developing appropriate management measures to maintain existing habitat for this species.

Figure 3-5: Threatened and rare flora species



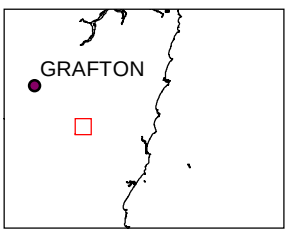
LEGEND

- TfNSW owned property
- Eucalyptus tetrapleura (Vulnerable, TSC and EPBC Act)
- Melaleuca irbyana (Endangered, TSC Act)
- Maundia triglochinoides (Vulnerable, TSC Act)
- Centranthera cochinchinensis (Endangered, TSC Act)
- Arthrochilus prolixus (RoTAP)

0 1
Kilometres

DATA SOURCES
LPI 2007
Jacobs 2014

1:26,000



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Newcastle Spatial Team - Prepared by : AC
Checked by : CT

3.6.5 Rare Flora Species

Several rare and regionally significant species were recorded on the TfNSW property. An orchid species (*Arthrochilus prolixus*) listed under the RoTAP database was recorded in high abundance in numerous areas throughout the offset property (refer to Plate 4) and a regionally significant species, *Scleria rugosa* (Sheringham and Westaway 1995). The property supports a high diversity of sedge species including several species at their distributional limit, including *Fimbristylis tristachya, Fimbristylis cinnamometorum* and *Fuirena ciliaris*. There are also several forms of Common Fringe-sedge (*Fimbristylis dichotoma*) as well as a unique form of the common species Pastel Flower (*Pseuderanthemum variabile*) which may be worthy of recognition.

Plate 3: *Centranthera cochinchinensis* in open grassland habitats in central area of property

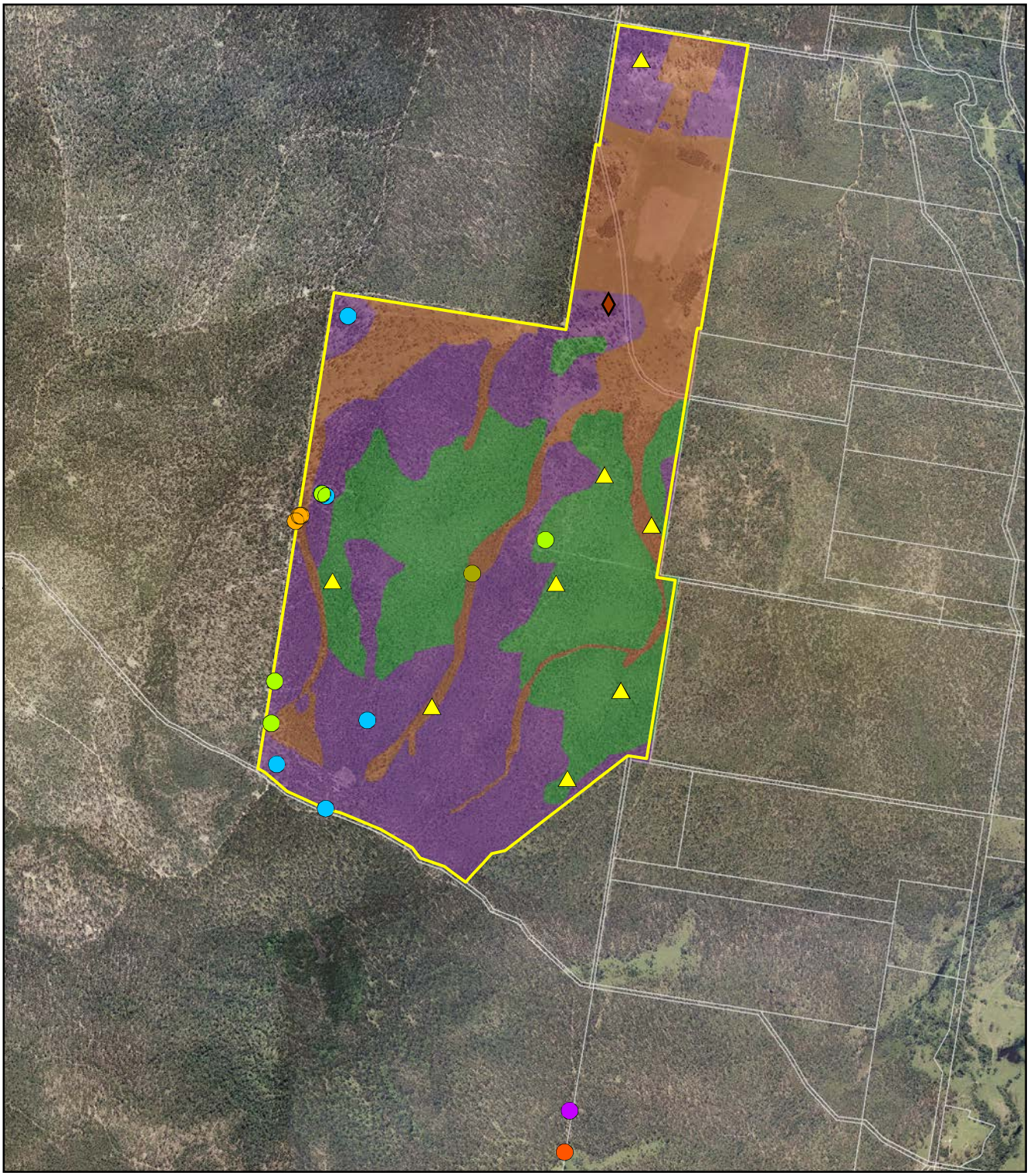
Plate 4: Relatively large colonies of *Arthrochilus prolixus* were recorded across the property

3.7 Fauna Habitats

The site supports four main fauna habitat types as specified in Table 3-4. The distribution of fauna habitats is mapped in Figure 3-6.

The structure and floristic attributes of the fauna habitats varies across the site with a high degree of patchiness in the landscape. In forested areas there is a mix of dense shrubby understorey and open grassy patches which provides a range of microhabitats suited to a diversity of fauna species. This includes habitat for species which prefer a predominantly open grassy understorey and open grass to more cover-dependent species reliant on denser middle and understorey vegetation. Important fauna habitat attributes present include an abundance of hollow trees, stags and logs, exposed creek banks, sandy friable soils, ephemeral creeks, relict farm dams swampy depressions, floodplain areas and riparian habitats.

Figure 3-6: Fauna habitat and threatened fauna



LEGEND

TfNSW owned property

Fauna Habitats

- Dry Sandy Woodland
- Riparian / Floodplain Forest
- Spotted Gum Ironbark Forests
- Mature hollow trees observed

Threatened Fauna (BC Act) Recorded

- Black-chinned Honeyeater
- Brown Treecreeper
- Green-thighed Frog
- Grey-crowned Babbler
- Little Lorikeet
- Powerful Owl
- Rufous Bettong

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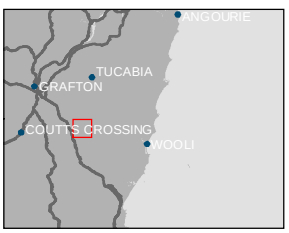
Kilometres

1:30,000

DATA SOURCES



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Newcastle Spatial Team - Prepared by : KM
Checked by : JC

Table 3-4: Fauna habitat on the property and quantification of microhabitat features

Fauna Habitat Type	Biometric Types	Average No. of tree hollows /ha	Average length of Fallen Logs/ha (m)	Area (ha)
Spotted Gum – Ironbark forests	Spotted Gum - Grey Ironbark - Pink Bloodwood open forest of the Clarence Valley lowlands of the North Coast	61	837	215.2
	Spotted Gum - Grey Box - Grey Ironbark dry open forest of the Clarence Valley lowlands of the North Coast			
Dry sandy forest	Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast	57	679	180.9
	Orange Gum (Eucalyptus bancroftii) open forest of the North Coast			
Riparian / Floodplain Forest	Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the North Coast	63	873	30.6
	Narrow-leaved Red Gum woodlands of the lowlands of the North Coast			
Open Grassland with scattered trees	n/a	0	43	123.3
Total (includes only the offset areas and not property exclusion zones)				550

3.7.1 Dry eucalypt forest habitat (Spotted Gum – Ironbark)

The dominant habitat types in the study area are associated with the dry open sclerophyll forest dominated by Large-leaved Spotted Gum (*Corymbia henryi*), in association with Broad-leaved Ironbark (*Eucalyptus fibrosa)* or Square-fruited Ironbark (*Eucalyptus tetrapleura).* These are highly comparable with the habitats recorded in the Glenugie Upgrade project footprint and are widespread throughout the Glenugie area and Glenugie State Forest. This habitat type along with the Riparian / Floodplain Forest provides specific nectivorous food resources for the federally listed Regent Honeyeater and Swift Parrot identified in the Conditions of Approval 3(g).

Evidence of selective logging was noted throughout the Spotted Gum-Ironbark forests, although this practice has been limited compared to Glenugie State Forest and the Glenugie Upgrade project footprint. This factor has not significantly reduced the condition of the habitat, and therefore habitat resources present are considered of high condition and expected to provide important habitat for populations of threatened fauna. An average of 61 tree hollows and 837 metres of fallen logs per hectare was recorded in the Biobanking plots during field investigations in this habitat type. The average number of habitat trees is considered high.

3.7.2 Dry sandy eucalypt forest habitat

Forested habitats on sandy soils are also abundant including dry sclerophyll woodland and open forest dominated by Scribbly Gum (*Eucalyptus signata*) and Bancroft's Gum (*Eucalyptus bancroftii*) as well as a Square-fruited Ironbark (*Eucalyptus tetrapleura*) in some locations. These habitats have had relatively minimal disturbance from logging and grazing and are in a very high condition, supporting a diverse and mature floristic structure with abundant shelter, breeding and foraging resources for fauna including fallen timber and hollow trees. An average of 57 tree hollows and 679 metres of fallen logs per hectare was recorded in the Biobanking plots during field investigations in this habitat type.

3.7.3 Riparian / Floodplain Forest

Riparian and floodplain forests consist of moist sclerophyll forest dominated by Forest Red Gum (*Eucalyptus tereticornis*), Swamp Turpentine (*Lophostemon suaveolens*) and Narrow-leaved Red Gum (*Eucalyptus seeana*). The majority of these habitats have had limited disturbance and are in a high condition, however several small areas have been partially cleared and managed to improve grazing opportunities and have been identified as having a moderate condition due to the modified canopy, shrub and ground layers, decreased flora diversity, presence of exotic flora and decreased habitat values.

The fauna habitat values were highest in this habitat type with numerous large mature hollow trees and stags observed in several locations and a diversity of microhabitats including creek banks, in stream pools, sediments and abundant fallen timber. An average of 63 tree hollows and 873 metres of fallen logs per hectare was recorded in the Biobanking plots during field investigations in this habitat type.

3.7.4 Open Grassland with scattered trees

Areas of open grassland with scattered trees are dominant on the floodplain areas in central portions of the property. Scattered trees include those species dominant in the riparian / floodplain forests. These areas have been cleared for pasture and it appears some areas have been seeded with exotic pasture mixes. Much of the grassland areas still retain a high proportion of native vegetation cover with an average of 26 native flora species recorded in the three Biobanking plots undertaken in this habitat type.

3.7.5 Aquatic habitats

Ephemeral freshwater aquatic habitats are also present throughout all portions of the site comprising small ephemeral creeks and drainage lines, relict farm dams and surface water associated with poorly drained areas on the floodplain areas. These areas provide habitat for a range of amphibians and waterbirds as well as other fauna species and are an important habitat attribute of the property.

3.8 Fauna Diversity

A complete fauna survey was not conducted on the TfNSW property, although based on opportunistic observations a total of 92 species were recorded from 42 families. The diversity of fauna noted, and the range of habitats present suggest that the site has potential to exhibit high faunal diversity. Of the 92 species recorded 63 were birds, 13 mammals, 10 reptiles and 6 amphibians. This included six introduced species, six threatened species and one migratory species. The list of fauna species opportunistically recorded is provided in Appendix D. A targeted survey was conducted in December 2017 for the Green-thighed Frog (*Litoria brevipalmata*), details are described in Section 3.8.3.

3.8.1 Threatened Fauna

A total of eight threatened fauna species and one migratory fauna species have been confirmed on the property both opportunistically and through targeted survey. A further two threatened bird species (Grey-crowned Babbler and Brown Treecreeper) were recorded approximately 800 metres south of the property but could be expected to occur in the comparable habitats of the TfNSW property. The locations of sightings and evidence of threatened fauna in the study area is displayed in Figure 3-6. This includes mapping of the area of potential habitat for the Green-thighed Frog (*Litoria brevipalmata*) (vulnerable species BC Act) which was identified from a targeted survey to determine the available offsets for other projects.

Plate 5: A juvenile Rufous Bettong (*Aepyprymnus rufescens*) encountered on the edge of the cleared floodplain area

Plate 6: Aquatic habitats along drainage lines with fringing vegetation

A high diversity of species from all fauna groups would be expected to occupy the habitat types on the TfNSW property including several threatened forest fauna species. A list of known and predicted threatened fauna species is provided as Table 3-5.

Table 3-5: List of threatened fauna confirmed and predicted to occur on the TfNSW property

Species	Status+		No. of records *	Confirmed or potential to occur on the TfNSW property
	EPBC Act	BC Act		
Species identified directly or indirectly through evidence				
Black-chinned Honeyeater (Melithreptus gularis gularis)		V	33	Confirmed
Brown Treecreeper (Climacteris picumnus)		V	29	Confirmed
Grey-crowned Babbler (Pomatostomus temporalis temporalis)		V	35	Confirmed
Little Lorikeet (Glossopsitta pusilla)		V	42	Confirmed
Powerful Owl (Ninox strenua)		V	26	Confirmed
Rufous Bettong (Aepyprymnus rufescens)		V	139	Confirmed
Green-thighed Frog (Litoria brevipalmata)		V	2	Confirmed
Emu (Dromaius novaehollandiae)		E2	59	Confirmed
Threatened species considered to potentially occur due to suitable habitat				
Barking Owl (Ninox connivens)		V	6	High
Beccari's Freetail-Bat (Mormopterus beccarii)		V	1	High
Black-Breasted Buzzard (Hamirostra melanosternon)		V	0	Moderate
Black-necked Stork (Ephippiorhynchus asiaticus)		V	90	Moderate
Brolga (Grus rubicunda)		V	11	Moderate
Brush-tailed Phascogale (Phascogale tapoatafa)		V	28	High
Bush Stone-Curlew (Burhinus grallarius)		E1	25	High
Diamond Firetail (Stagonopleura guttata)		V	9	High
Eastern Bent-Wing Bat (Miniopterus schreibersii oceanenis)		V	2	High
Eastern Cave Bat (Vespadelus troughtoni)		V	0	High
Eastern Chestnut Mouse (Pseudomys gracilicaudatus)		V	0	Moderate
Eastern False Pipistrelle (Falsistrellus tasmaniensis)		V	1	High
Eastern Freetail-Bat (Mormopterus norfolkensis)		V	5	High

Species	Status+		No. of records *	Confirmed or potential to occur on the TfNSW property
	EPBC Act	BC Act		
Eastern Long-Eared Bat (Nyctophilus bifax)		V	0	High
Eastern Pygmy-Possum (Cercartetus nanus)		V	0	Moderate
Giant Barred Frog (Mixophyes iteratus)	E	E1	2	High
Glossy Black-Cockatoo (Calyptorhynchus lathami)		V	91	High
Greater Broad-Nosed Bat (Scoteanax rueppellii)		V	3	High
Grey-headed Flying-Fox (Pteropus poliocephalus)	V	V	42	High
Hoary Wattled Bat (Chalinolobus nigrogriseus)		V	17	High
Hooded Robin (Melanodryas cucullata)		V	2	High
Koala (Phascolarctos cinereus)	V	V	41	High
Large-eared Pied Bat (Chalinolobus dwyeri)	V	V	0	High
Little Bentwing-Bat (Miniopterus australis)		V	18	High
Long-nosed Potoroo (Potorous tridactylus)	V	V	0	Moderate
Masked Owl (Tyto novaehollandiae)		V	10	High
Painted Honeyeater (Grantiella picta)		V	0	High
Pale-Headed Snake (Hoplocephalus bitorquatus)		V	0	High
Regent Honeyeater (Xanthomyza Phrygia)	E, M	E1	0	High
Southern Myotis (Myotis macropus)		V	2	High
Speckled Warbler (Pyrrholaemus sagittatus)		V	1	High
Spotted-tailed Quoll (Dasyurus maculates)	E	V	6	High
Square-tailed Kite (Lophoictinia isura)		V	7	High
Squirrel Glider (Petaurus norfolcensis)		V	14	High
Stephens' Banded Snake (Hoplocephalus stephensii)		V	1	High
Swift Parrot (Lathamus discolour)	E, M	E1	13	High
Three-toed Snake-tooth Skink (Coeranoscincus reticulatus)	V	V	0	Moderate
Varied Sitella (Daphoenositta chrysoptera)		V	3	High
White-crowned Snake (Cacophis harriettae)		V	0	High
Yellow-bellied Glider (Petaurus australis)		V	108	High
Yellow-bellied Sheathtail-Bat (Saccolaimus flaviventris)		V	2	High

3.8.2 Habitat for federally listed threatened fauna species

Of note is the abundance of specific food resources for the federally listed Regent Honeyeater and Swift Parrot identified in the Condition of Approval 3(g) comprising known preferred feed tree species including Large-leaved Spotted Gum (*Corymbia henryi*) and Forest Red Gum (*Eucalyptus tereticornis*) as well as an abundance of several other winter flowering eucalypt species potentially favoured by these species including ironbark's, red gums and bloodwoods. Habitat for the other two federally listed species in Condition of Approval 3(g) Large-eared Pied Bat and Grey-headed Flying Fox is widespread on the TfNSW property including all forested areas and scattered paddock trees.

3.8.3 Habitat for Green-thighed Frog (*Litoria brevipalmata*) BC Act

A targeted survey was conducted in December 2018 for the Green-thighed Frog (*Litoria brevipalmata*) a vulnerable species listed under the BC Act. The species was recorded at three locations and around 123 hectares of suitable habitat was identified and mapped on the property (Figure 3-7). The majority of the habitat identified (92.1 hectares) occurs within the designated Glenugie offset area, while the remaining 31.3 hectares is within residual land used for other offsets. The Glenugie offset area generates 210 species credits, further details are described in a separate Biodiversity Stewardship Site Assessment Report (BSSAR) (Jacobs 2018).

Table 3-6: Habitat type and area mapped for the Green-thighed Frog on the TfNSW property

Vegetation / Habitat Type	Total area	Glenugie offset	Residual offset
Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the North Coast (PCT837)	85.2 ha	81.7 ha	3.5 ha
Narrow-leaved Red Gum woodlands of the lowlands of the North Coast (PCT971)	19.7 ha	9.5 ha	10.3 ha
Spotted Gum - Grey Box - Grey Ironbark dry open forest of the Clarence Valley lowlands of the North Coast (1209)	18.4 ha	0.9 ha	17.5 ha
TOTAL	123.3 ha	92.1 ha	31.3 ha

3.8.4 Migratory Fauna

The migratory species Satin Flycatcher was observed at several locations on the TfNSW property and it is expected that several other migratory species would utilise habitats of the offset area. The TfNSW property is likely to provide important habitat as defined under the EPBC Act for some of these species with potential nesting and foraging opportunities including exposed creekbanks and trees fringing ponds (refer to Plate 6) and swampy floodplains with remnant and regenerating trees. A list of known and predicted migratory fauna species is provided as Table 3-7.

Table 3-7: List of migratory fauna confirmed and predicted to occur on the TfNSW property

Species	Status+ (EPBC Act)	Important habitat*	Confirmed and potential to occur on the TfNSW property
Satin Flycatcher (Myiagra cyanoleuca)	Mt	Yes	Confirmed
White-throated Needletail (Hirundapus caudacutus)	Mt	Unlikely	High
Cattle Egret (Ardea ibis)	Mw	Yes	High
Great Egret (Ardea alba)	Mw	Yes	High
Rainbow Bee-eater (Merops ornatus)	Mt	Yes	High

+; M – migratory species; t – migratory (terrestrial); w – migratory (wetland)

* As defined under the EPBC Act an area of 'important habitat' for a migratory species is:

- Habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species; and/or
- Habitat that is of critical importance to the species at particular life-cycle stages; and/or
- Habitat utilised by a migratory species which is at the limit of the species range; and/or
- Habitat within an area where the species is declining.

3.8.5 Introduced Fauna

A total of six introduced fauna species were recorded from the field surveys including:

- Wild Dog (*Canis lupus familiaris*) (refer to Plate 7)
- Fox (*Vulpes vulpes*)
- Goat (*Capra aegagrus hircus*)
- Rabbit (*Oryctolagus cuniculus*)
- Horse (*Equus caballus*) (refer to Plate 8)
- Cattle (*Bos Taurus*)

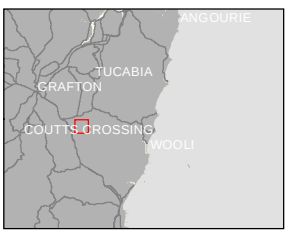
Figure 3-7: Green-thighed Frog habitat and offset areas

LEGEND

- TfNSW owned property
- Green-thighed Frog Habitat
- Glenugie Project (Fauna Habitat)
- Glenugie Project (Occupied E. tetraplura habitat)
- Glenugie Project (Reveg Area)
- W2B

0 0.8

Kilometres



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DATA SOURCES

Plate 7: Wild Dogs (*Canis lupus familiaris*) encountered on the TfNSW property

Plate 8: Wild Horses (*Equus caballus*) encountered on the TfNSW property

3.9 Vegetation and Habitat Condition

The mean Biobanking condition scores obtained from the field assessments are summarised in Table 3-8. Three condition classes have been defined (low, medium, high) based on benchmark thresholds for each vegetation type and the distribution of these three vegetation classes is illustrated in Figure 3-3. Refer to Appendix A for the data regarding scoring and weighting of site attributes.

Table 3-8: Summary of vegetation condition ranges for each condition class

Category	Weighting (%)	Low Condition (cleared areas)	Moderate Condition (partially disturbed/cleared areas)	High Condition (intact vegetation)
Native Plant Species Richness	25	At least 50% of benchmark	At benchmark (at least 30-35 indigenous native species)	At benchmark (at least 30-35 indigenous native species)
Native Over-storey Cover	10	0	Within benchmark or not greater than 50% above or below upper and lower benchmark values	Within benchmark or not greater than 50% above or below upper and lower benchmark values
Native Mid-storey Cover	10	0	Within benchmark or not greater than 50% above or below upper and lower benchmark values	Within benchmark or not greater than 50% above or below upper and lower benchmark values
Native Ground Cover-grasses	2.5	0% to 100% of benchmark	0% to 100% of benchmark	0% to 100% of benchmark
Native Ground Cover-shrubs	2.5	0% to 100% of benchmark	0% to 100% of benchmark	0% to 100% of benchmark
Native Ground Cover-other	2.5	0% to 100% of benchmark	0% to 100% of benchmark	0% to 100% of benchmark
Exotic Species	5	10-90% cover	6-66% cover	0% cover
Number of Trees with Hollows	20	0	0	1-10+
Overstorey regeneration	12.5	0-1	1	1
Total Length of Fallen Logs (m)	10	0-benchmark	Above benchmark	Above benchmark
Total Score	100	17-50	62-80	85-100

Overall, despite minor disturbances to some areas of intact vegetation in the study area, the majority of the remnant vegetation is in a very high condition and has therefore resulted in the condition assessment identifying high conservation value vegetation across the majority of the TfNSW property. The cleared and grazed sections include small isolated patches of vegetation and scattered trees, and there is evidence of resilience in the seed

bank with a moderate diversity of native groundcovers and natural regeneration of trees and shrubs indicating a moderate to high recovery potential.

A summary of the Biobanking scores and a condition rating for each vegetation zone is presented in Table 3-9 and the full set of site value scores are provided in Appendix B.

Note the original vegetation classification and mapping included 26 assessment plots and mapped a total of 603 hectares. A further detailed assessment was conducted in 2018 as part of the biodiversity stewardship site assessment. This work completed 44 plots and resulted in minor adjustments to the vegetation mapping described in the report and mapped vegetation over a total area of 607 hectares. The later data was based on the most comprehensive survey to date and is documented in the biodiversity stewardship site assessment report (BSSAR; Jacobs 2019).

Table 3-9: Summary of each vegetation zone

Vegetation Zone Code	Vegetation type	Area (ha)	No. of Plots	Mean Biobanking Score	Potential Biobanking Score Range
High Condition (429.34 hectares)					
FF1-H	Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the North Coast	20.57	1	90.4	85-100
FF2-H	Narrow-leaved Red Gum woodlands of the lowlands of the North Coast	13.25	1	92.5	85-100
SF1-H	Orange Gum (Eucalyptus bancroftii) open forest of the North Coast	39.68	1	96.7	85-100
SF2-H	Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast	170.18	2	99.6	85-100
SG1-H	Spotted Gum - Grey Ironbark - Pink Bloodwood open forest of the Clarence Valley lowlands of the North Coast	170.87	8	94.6	85-100
SG2-H	Spotted Gum - Grey Box - Grey Ironbark dry open forest of the Clarence Valley lowlands of the North Coast	14.8	1	96.7	85-100
Moderate Condition (15.98 ha)					
FF1-M	Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the North Coast	11.7	1	71	62-80
SG1-M	Spotted Gum - Grey Ironbark - Pink Bloodwood open forest of the Clarence Valley lowlands of the North Coast	0.6	0	71	62-80
SG2-M	Spotted Gum - Grey Box - Grey Ironbark dry open forest of the Clarence Valley lowlands of the North Coast	3.69	0	71	62-80
Low Condition (158.12 ha)					
FF1-L	Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the North Coast	20.23	2	48	17-50
FF2-L	Narrow-leaved Red Gum woodlands of the lowlands of the North Coast	70.97	1	42	17-50
SG1-L	Spotted Gum - Grey Ironbark - Pink Bloodwood open forest of the Clarence Valley lowlands of the North Coast	63.83	8	22	17-50
SG2-L	Spotted Gum - Grey Box - Grey Ironbark dry open forest of the Clarence Valley lowlands of the North Coast	3.09	0	37	17-50
TOTAL		603.46	26		

3.9.1 High Condition

Most of the intact areas of vegetation on the TfNSW property were assessed to have a high condition rating based on the Biobanking condition assessment plots and are categorised by intact structural layers, a high floral diversity, little/no weed invasion and an abundance of hollow trees and fallen timber (refer to Plate 9).

3.9.2 Moderate Condition

Some riparian areas have been partially cleared and under scrubbed for agricultural purposes and have been defined as having a moderate condition categorised by a modified vegetation structure including dense growth of Blady Grass (*Imperata cylindrica*), moderate to high native floral diversity, a moderate abundance of exotic weed species and low levels of fallen timber and hollow trees (refer to Plate 10). There are also several areas of dry sclerophyll forest which are in a regenerating state supporting a very high density of juvenile trees and shrubs which have also been classed as having a moderate condition.

Plate 9: High condition vegetation (Spotted Gum - Ironbark Forest)

Plate 10: Moderate condition vegetation (Forest Red Gum Forest)

3.9.3 Low Condition

Cleared areas have been identified as low condition and are categorised as having no or very little canopy and mid-storey cover, a modified groundcover dominated by a mix of native and exotic flora although maintaining moderate levels of native floral diversity, regeneration of overstorey and midstorey species, and a low abundance of fallen timber and hollow trees.

3.10 Habitat Regeneration

The areas on the TfNSW property identified as occupied low condition habitat for *Eucalyptus tetrapleura* comprise 54 hectares where individuals were recorded in partially cleared land and 101 hectares of unoccupied low condition habitat where at least 16 hectares are considered to previously have supported *Eucalyptus tetrapleura* prior to be being cleared. From this, an area of 70 hectares was identified, as shown on Figure 3-4 which is regarded as being highly suitable for revegetation of *Eucalyptus tetrapleura* and therefore included in the offset area.

More recent field assessments on the TfNSW property (September 2014, January 2017, October 2017 and September 2019) assessed the natural regeneration of habitat within the 70-hectare area (refer Figure 3-8 for monitoring plots. The restoration of *Eucalyptus tetrapleura* habitat was targeted, including cleared areas with regenerating trees and shrubs in the central area and northern end of the site. A total of eight condition assessment plots were undertaken in 2014, 2017 and again in 2019 and the results of these are summarised in

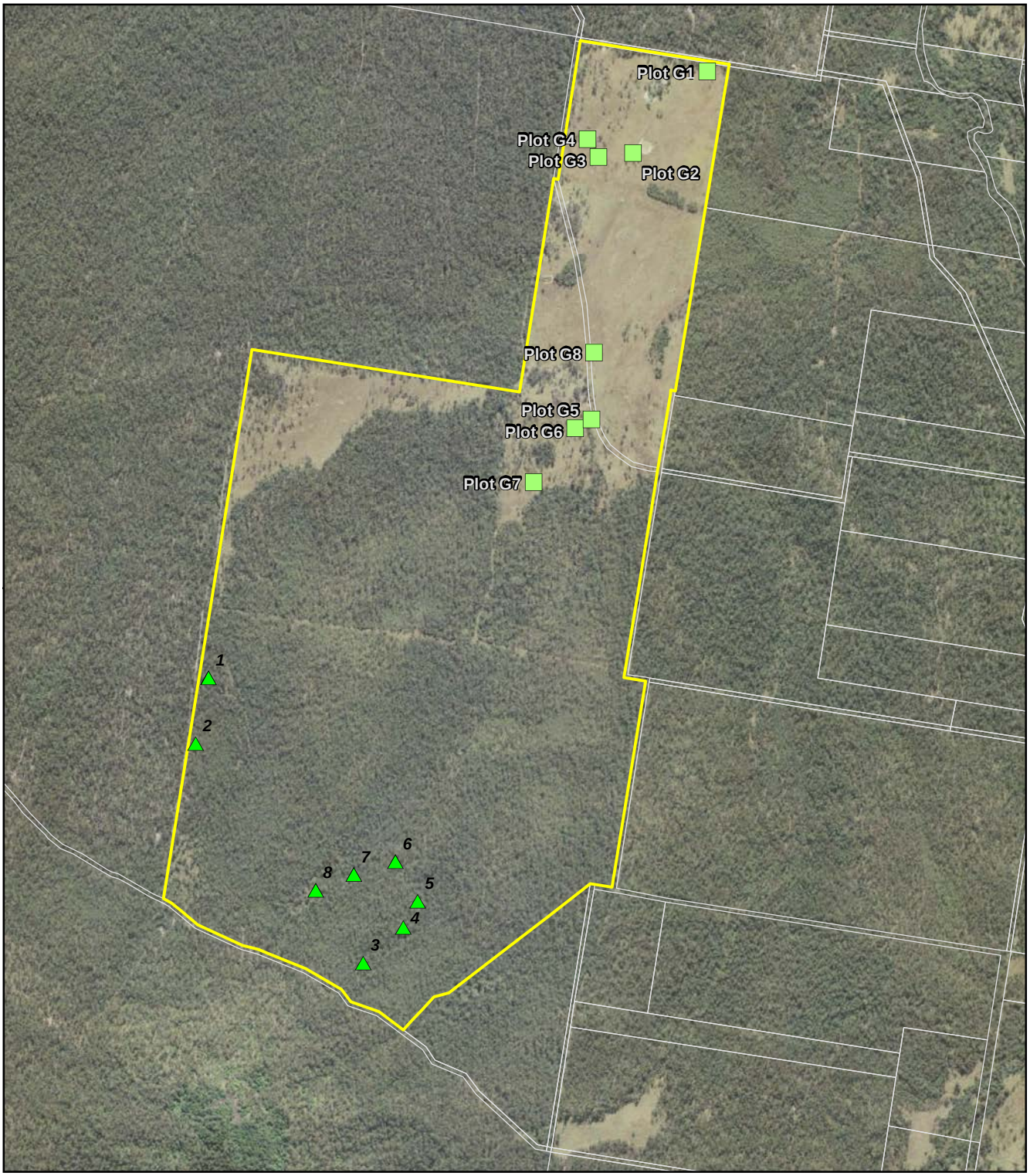
Table 3-10, along with the results from condition assessment plots undertaken in cleared/regenerating areas of the TfNSW property in 2012.

Table 3-10: Summary of condition assessment plots undertaken in regenerating vegetation

Plot	Native flora diversity	Mid-storey cover (%)	Native groundcover (%)	Exotic groundcover (%)	Number of regenerating trees (saplings/seedlings)		
					*Eucalyptus tetrapleura	Other overstorey species	Mid-storey species
September 2019							
G1	33	1	71	2	2	9	40
G2	24	0	57	23	125	1	5
G3	22	0	68	11	23	170	6
G4	29	1	63	5	19	191	14
G5	16	0	7	40	8	44	27
G6	17	17	38	5	35	39	143
G7	24	16	19	10	10	22	218
G8	23	1	12	55	18	29	4
Mean	24	5	42	19	30	63	57
October 2017							
G1	30	2	82	9	0	14	34
G2	26	1	52	39	121	0	4
G3	28	1	45	45	39	141	6
G4	27	1	64	27	6	176	16
G5	21	1	10	59	10	77	26
G6	25	9	28	26	47	69	104
G7	24	16	35	20	8	17	316
G8	25	1	4324	44	9	31	8
Mean	26	4	43	34	30	66	64
September 2014							
G1	26	3.5	88	12	0	30	13
G2	14	2.5	56	36	147	0	0
G3	21	3	20	34	42	137	2
G4	24	0.5	90	10	4	88	2
G5	21	0	18	72	0	74	39
G6	16	3	40	46	30	74	73
G7	19	6	60	36	13	63	8
G8	18	1	30	64	16	14	13
MEAN	20	2	50	39	32	60	20
March 2012							
16	27	0	56	44	n/a		
17	26	2	88	10			
18	25	0	10	90			
MEAN	26	1	51	48			

*October 2017 and September 2019 assessment undertaken by North Coast Aerial Mapping (Harre'/ Richards) mapped as closely as possible to the September 2014 plot sites however markers had been removed. This is likely to result a small degree of variation in the data and conclusions that can be drawn.

Figure 3.8 Location of Eucalyptus tetrapleura monitoring plots



LEGEND

- Condition Assessment Plots (September 2014)
- Stem Density Assessment Plots
- TfNSW owned property

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Kilometres

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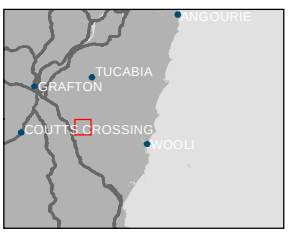
DATA SOURCES
DFSI 2018
Jacobs 2019



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Newcastle Spatial Team - Prepared by : KM
Checked by : JC

Note that the native flora diversity is likely to be substantially greater as well as native groundcover considering the timing of the survey following dry and cold winters with several frosts resulting in a lack of identifiable plant material during the surveys, and reduced groundcover of native flora.

A comparison between condition assessment plots assessed during March 2012, September 2014, October 2017 and September 2019 is provided in Table 3-10. As can be seen there was fluctuation in the level of flora diversity, with the lowest recorded diversity occurring in 2014 and the highest in 2012 and 2017. This is more likely to be associated with the survey timing in early spring during 2014 and a lack of identifiable plant material being present, rather than due to reductions in ecological condition. Consistently lower levels of exotic groundcover have been recorded over successive monitoring events indicating that the assisted regeneration undertaken since 2014 is allowing for the natural decline of exotic species. A dramatic increase in mid-storey cover was recorded between 2014 and 2017 /2019 surveys which can be attributable to the substantial regeneration of saplings/seedlings of overstorey and midstorey species. The progressive regeneration of trees and shrubs is also evident from the photographs taken during March 2012 (refer to Plate 11 and 12) compared to those taken during September 2014 (refer to Plate 13 and 16 from the northern end of property, and Plate 19 and 21 in the central areas of the site), 2017 (refer to Plate 14 and 18 from the northern end of property, and Plate 20 and 22 in the central area) and 2017(refer to Plate 15 & 18 showing the northern end of the property). Similar native groundcover attributes were recorded over the monitoring events although a slight reduction could be attributable to the increase in mid storey cover and prevailing weather conditions preceding monitoring events.

The numbers of tree and shrub saplings/seedlings were recorded within 20 x20 metre plots during September 2014, October 2017 and September 2019 and the results are summarised in Table 3-10. An average abundance of 800 saplings per hectare of *Eucalyptus tetrapleura* were recorded in condition assessment plots in addition to an average 1500 saplings per hectare of other overstorey species and 500 saplings per hectare of mid-storey species in September 2014. A very high abundance of *Eucalyptus tetrapleura* saplings was recorded in Plot G2 as can be seen in 2014 (Plate 13), in 2017(Plate 14) and in 2018 (Plate 15. Substantial regeneration of Eucalyptus tetrapleura and other overstorey species were also observed in other condition assessment plots including Plot G3 (Plates 16, 17 & 18), Plot G6 (Plate 19 and Plate 20) and Plot G7 (Plate 21 and Plate 22) in 2014 and 2017. *Eucalyptus tetrapleura* was recorded in Plot G8 for the first time in 2019 and Plot 4 showed a 3 to 4 fold increase of this species in 2019 compared to previous monitoring events. Larger saplings of *Eucalyptus tetrapleura* were also observed in the central area of the site (refer to Plate 23). A fire burnt areas of regeneration prior to September 2014 however most saplings were resprouting from the base (refer to Plate 24) and had not been killed. Substantial regeneration was evident to the north of cattle exclusion fencing in the north of the property in February 2017 (Plate 25 and plate 26).

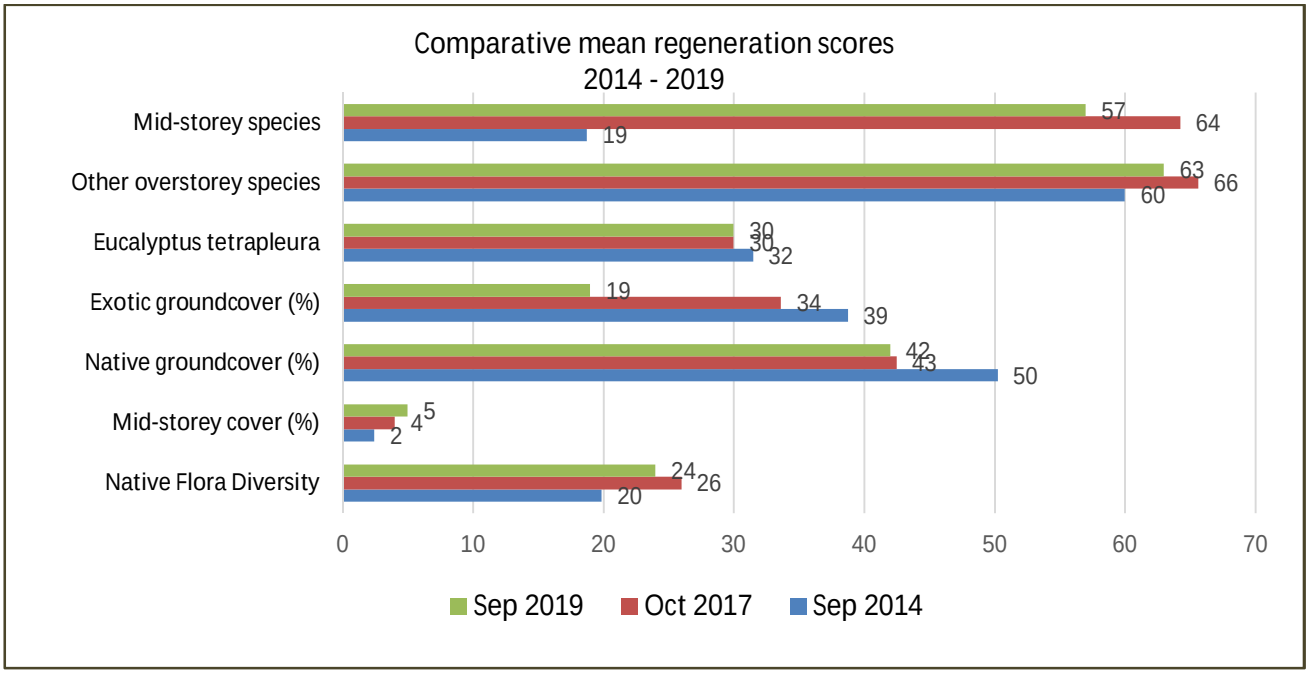


Figure 3-9: Comparative scores for E.tetrapleura regeneration plots sampled in 2014 (blue bars), 2017 (red bars) and 2019 (green bars)

NCAM 2019, in addition to assessing existing *E. tetrapleura* regeneration plots, established an additional 8 plots in good condition native vegetation within the property to determine a baseline for monitoring the regeneration of *E. tetrapleura* in regeneration plots. The number of Square-fruited Ironbark plants in 3 age/size classes as measured through diameter at breast height (dbh) (juvenile <5cm dbh; sapling >5cm <15cm dbh; adult >15cm dbh) were recorded in each plot. The density plots were located within the Square-fruited Ironbark Offset Area (six plots) or in good condition Spotted Gum – Grey Ironbark – Pink Bloodwood open forest (two plots) (refer Figure 3-8)

Stem density plots in good condition native vegetation ranged from 4 to 22 (mean = 14) stems of Square-fruited Ironbark per 400m^2 plot, with stem numbers tending to decline with age (dbh) (Table 3-11) Juvenile plant numbers varied from zero to 12 per plot, saplings from 1 to 7 plants and adults from 1 to 5 plants.

Table 3-11: Measured Square-fruited Ironbark density be age class at eight remnant plots

Plot	Easting	Northing	Juveniles (< 5cm dbh)	Saplings (>5cm <15cm dbh)	Adults (> 15cm dbh)	Total no. stems per quadrat	Total no. stems per hectare
1	506042	6701673	0	3	1	4	100
2	505985	6701380	12	7	3	22	550
3	506730	6700403	8	7	4	19	475
4	506909	6700561	5	1	3	9	225
5	506973	6700679	9	2	3	14	350
6	506875	6700855	6	7	5	18	450
7	506688	6700798	9	2	3	14	350
8	506519	6700727	3	2	4	9	225
		Mean	7	4	3	14	341

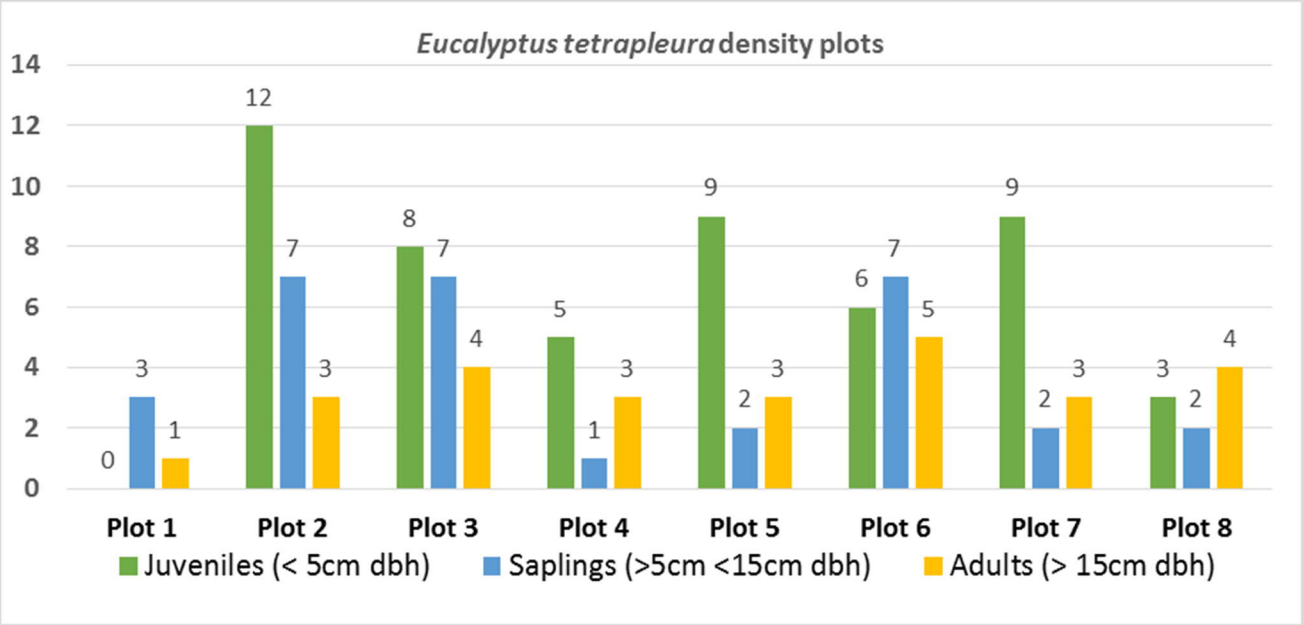


Figure 3.9. Results for measured Square-fruited Ironbark density at remnant plots (n=8) by age class (dbh = diameter at breast height)

These results reveal a considerable difference in stocking density between good condition forested areas and regenerating area of the property with a mean of 341 stems per hectare versus 800 stems per hectare in regeneration plots. These results indicate that there is likely to be a decline in the number of *Eucalyptus tetrapleura* over time in the regeneration plots and this needs to be taken into consideration when making management decisions as regeneration progresses.

By calculating the sample standard deviation of the tallies for each age/size class in the density plots, a proposed benchmark stocking rate / density can be derived for Square-fruited Ironbark, as shown below in Table 3-12.

Table 3-12: Proposed benchmark stocking rate / density for planting of Square-fruited Ironbark

Age/size class	Juveniles (< 5 cm dbh)	Saplings (5 cm – 15 cm dbh)	Adults (> 15cm dbh)	Total no. stems per quadrat (all classes)
Proposed Benchmark (± 1 SD)	3 to 11	1 to 7	1 to 5	7 to 21

Plate 11: Low condition vegetation at the northern end of the site supporting *Eucalyptus tetrapleura* in March 2012.

Plate 12: Low condition vegetation in the central area of the site supporting *Eucalyptus tetrapleura* in March 2012.

Plate 13: Regeneration of *Eucalyptus tetrapleura* saplings in Plot G2 September 2014

Plate 14: Regeneration of *Eucalyptus tetrapleura* saplings in Plot G2 October 2017 (photo: NCAM)

Plate 15: Regeneration of *Eucalyptus tetrapleura* saplings in Plot G2 April 2018 (photo: TfNSW)

Plate 16: Regeneration of *Eucalyptus tetrapleura* saplings and other overstorey species in Plot G3 – September 2014

Plate 17: Regeneration of *Eucalyptus tetrapleura* saplings and other overstorey species in Plot G3 –October 2017 (photo: NCAM)

Plate 18: Regeneration of *Eucalyptus tetrapleura* saplings and other overstorey species in Plot G3 –April 2018 (photo: TfNSW)

Plate 19: Regeneration of *Eucalyptus tetrapleura* saplings and other overstorey and mid-storey species in Plot G6 – September 2014

Plate 20: Regeneration of *Eucalyptus tetrapleura* saplings and other overstorey and mid-storey species in Plot G6 – October 2017 (photo: NCAM)

Plate 21: Regeneration of *Eucalyptus tetrapleura* saplings and other overstorey species in Plot G7 - September 2014

Plate 22: Regeneration of *Eucalyptus tetrapleura* saplings and other overstorey species in Plot G7 -October 2017 (photo: NCAM)

Plate 23: A larger *Eucalyptus tetrapleura* sapling in the central area of the offset site

Plate 24: Regenerating saplings re-sprouting from the base following a fire on part of the property in 2016.

Plate 25: Regenerating groundcover to the north of the central rural exclusion area -February 2017 (photo: TfNSW)

Plate 26: Regeneratiing mid and overstorey species to the north of the central rural exclusion area -February 2017. Note the dividing fence in the mid-ground. (photo: TfNSW)

Condition of Approval 3f requires research into the extent, population genetics and the success of regeneration of habitat for the Square-fruited Ironbark. To address the third part of this condition, O'Donnell (2017) undertook a regional assessment of the success of regeneration of the habitat of Square-fruited Ironbark. This study focused on lands held by TfNSW, State Forests and councils within the known distributional range of the species.

Potential threats and limitations to the success of regeneration of the species were reviewed by the study and field observations were used to confirm known limitations identified in the available literature. Threats identified included:

- Fire management,
- Grazing pressures,
- Weed and other pest species
- Habitat fragmentation and gene flow
- Commercial harvesting and habitat clearing for development

Three additional plots to those established by Jacobs were assessed within regeneration areas on the TfNSW offset property. Results of the assessment indicate a high level of regeneration of Square-fruited Ironbark within each of the three plots. The findings correlate with assessment undertaken by Jacobs in 2014 and NCAM in 2017.

The study confirmed that the approach being taken by TfNSW, that is, assisted natural regeneration, provides a suitable method to re-establish this species across its former range – particularly in recently cleared lands where remnant trees remain and where there is a high likelihood of seed stored in the soil. The current and future management of the TfNSW offset property addresses the range of threats identified for the species by O'Donnell, 2017 as limiting factors in its successful regeneration, namely:

- The exclusion of grazing for a minimum 2-year period during early establishment of saplings. TfNSW however propose to exclude grazing across the entire offset area in perpetuity. To achieve this, funding will be provided for the installation and ongoing maintenance of exclusion fencing.

- The threat from weeds will be addressed through the property's site-specific Management Action Plan developed as part of a BSA. Weed management is an action that is required throughout the life of the BSA with funding provided to manage weeds on an annual basis. A review of the weed management plan is scheduled to occur every 6 years throughout the life of the agreement. This review will allow the opportunity to amend practices and address any new threats posed to the conserved habitats within the property.

- Threats from inappropriate fire regimes will be managed through ecological burns as part of fire management that forms an integral part of the Management Action Plan. This plan will be implemented by TfNSW and any future landholder. The fire management component of the Management Action Plan will include an acceptable interval range within which controlled burns may be undertaken - based on the ecology of the vegetation community. As this species occurs across much of the property and in all vegetation types, it is expected that the temporal variation during which control burns will be permitted, will allow further recruitment from seed stored in the soil or fruiting events over the life of the agreement.

- No further habitat fragmentation or timber harvesting will be permitted within the proposed offset areas. As all offset areas adjoin existing stands of Square-fruited Ironbark that are held under other land tenures, genetic flow and potential for reestablishment of the species within surrounding lands, were these lands to be cleared or grazed, would be afforded by the species protection within the offset property.

4. Meeting the Conditions of Approval

4.1 Introduction

The following information compares the ecological values identified on the entire TfNSW property with the impacted vegetation types from the Glenugie Upgrade to identify a suitable 'offset area'. A designated offset area of 300 hectares is illustrated in Figure 4-1 which includes 110 hectares of *Eucalyptus tetrapleura* habitat, 120 hectares of habitat for threatened fauna species and 70 hectares of land for revegetation of *Eucalyptus tetrapleura*. Details on the proposed conservation mechanism for the offset area and ongoing management framework are then provided.

4.2 Habitat quality

A comparison of vegetation condition between the offset area and impact sites has been undertaken using the Biobanking condition assessment method and comparison of field data. The results of the assessment are provided below in Table 4-1, detailing vegetation types and condition scores in the impact and offset areas.

Table 4-1: Comparison of condition scores at impact and the TfNSW property (including the proposed offset area)

Biometric Vegetation Type	Average condition score	
	Impact	Offset
Spotted Gum - Grey Ironbark - Pink Bloodwood open forest of the Clarence Valley lowlands of the North Coast	80	95
Narrow-leaved Red Gum woodlands of the lowlands of the North Coast	86	92
Orange Gum (Eucalyptus bancroftii) open forest of the North Coast	88	97
Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast	n/a	99
Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the North Coast	n/a	80

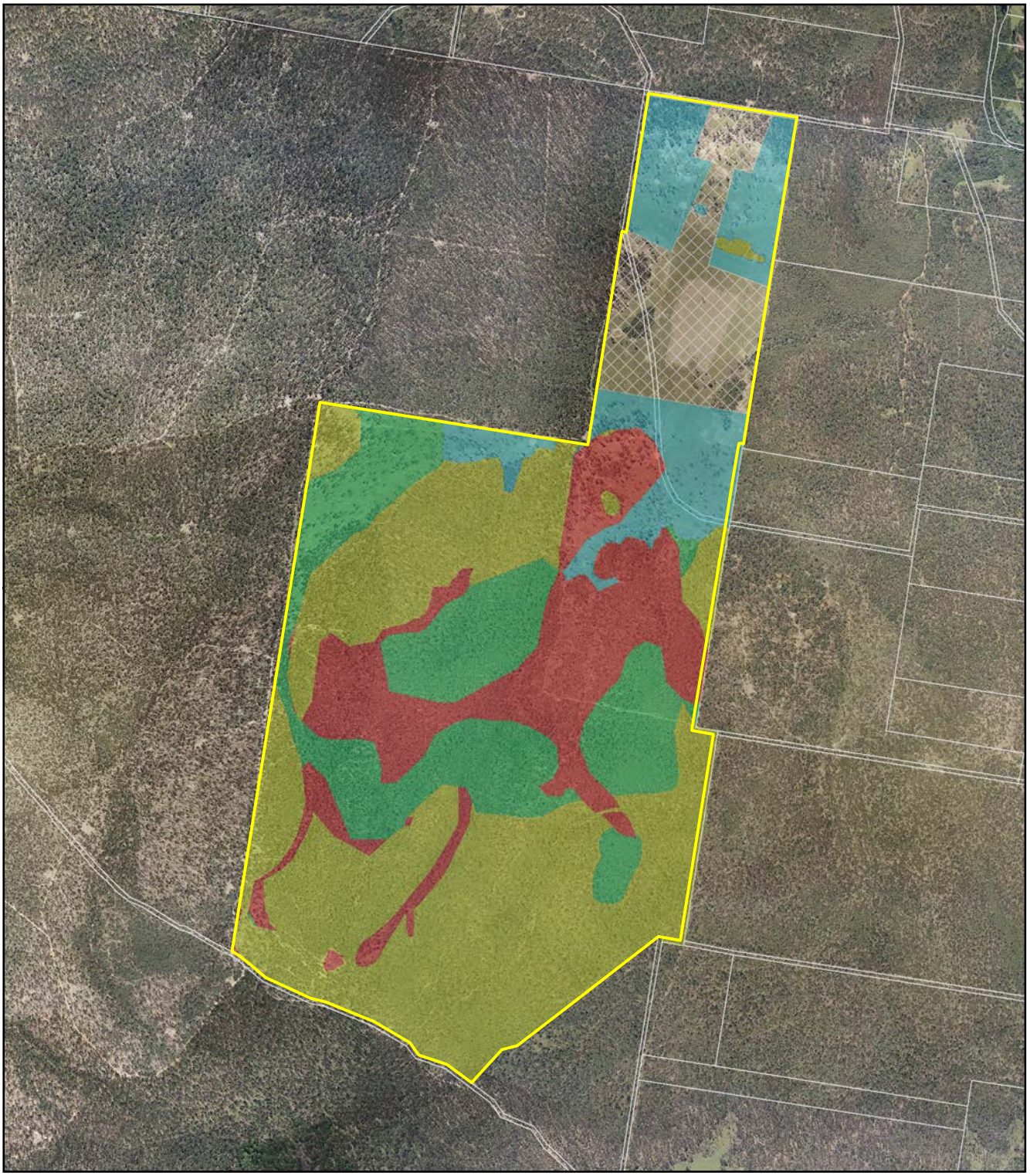
In all cases the vegetation condition scores recorded on the TfNSW property and in particular the proposed offset area are higher than the vegetation condition scores recorded in the impact area, being between 6 and 19 points higher. This is reflective of the historical differences in land-use of the two areas. The major difference in ecological condition between the two sites is the high abundance of hollow-bearing trees on the TfNSW property. Considering the above comparison, the offset area meets the '*equal or greater quality*' component of Condition of Approval 3(a).

4.3 Selection of Offset Area

The Conditions of Approval stipulate the acquisition and conservation in perpetuity of a minimum offset area of 300 hectares to comprise:

- 110 hectares of Square-fruited Ironbark woodland of similar or better condition to that removed.
- 70 hectares of Square-fruited Ironbark woodland suitable for revegetation.
- 120 hectares of threatened species habitat.

Figure 4-1: Proposed offset zones



LEGEND

TfNSW owned property

Offset

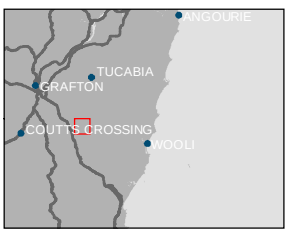
- Stewardship Site Exclusion Zone
- Glenugie Project (Fauna Habitat 120 ha)
- Glenugie Project (Occupied *E. tetraplura* habitat 110 ha)
- Glenugie Project (Reveg Area 70 ha)
- W2B (250 ha)

0 1

Kilometres

DATA SOURCES
DFSI 2018
Jacobs 2019

1:26,000



4/04/2019 | J:\IE\Projects\04_Eastern\IA189400\22 Spatial_GIS\Directory\Templates\BOS_site 28\IA189400_BOS28_F009a_OffsetZones_r1v2.mxd
Newcastle Spatial Team - Prepared by : KM
Checked by : JC

A summary of the ecological values impacted by the Glenugie Upgrade, and present within the entire TfNSW property and the proposed 300 hectare offset area for the Glenugie upgrade are shown in Table 4-2. These data were used to select an appropriate 300 hectare offset area to meet the Conditions of Approval. The property provides sufficient habitat, both in area and condition, to adequately meet these requirements. This includes a 230-hectare portion of the property that exhibits high value habitat for the Square-fruited Ironbark and the subject threatened fauna species and is of greater quality than the habitats removed for the Glenugie Upgrade. An additional 70 hectares of former habitat for Square-fruited Ironbark that has been selectively cleared and used for light grazing has been identified for revegetation of the species.

Table 4-2: Quantitative summary of impacts versus offsets for vegetation types, threatened species and fauna habitat

Ecological attributes	Area impacted for Glenugie Upgrade(ha)	Area of equivalent on the TfNSW property(ha)	Area of equivalent on Glenugie offset area (ha)
Threatened flora species			
Eucalyptus tetrapleura (area of habitat)	36	290	110
Fauna habitat			
Spotted Gum Ironbark Forests	74.6	215.2	17.5
Riparian / Floodplain Forest	5.3	30.66	28.9
Dry Sandy Woodland	5.1	180.96	74.2
Total fauna habitat			120.6 ha

4.4 Proposed Conservation Mechanism

The Sunnyside Road offset site will be conserved as a Biodiversity Stewardship Agreement (BSA) under the NSW *Biodiversity Conservation Act* (2016) (BC Act). The NSW Government established BSAs under Part 5 Division 2 of the BC Act. Due to the completion of the Glenugie Offset Strategy during a transition time between old and new biodiversity conservation legislation in NSW, two methods of determining the biodiversity values on the Sunnyside Road property have been used as detailed below.

Both the Pacific Highway Glenugie Upgrade and proposed Sunnyside Road offset site were assessed using the Biobanking methodology under the *Threatened Species Conservation Act* (1995). This Act was replaced by the BC Act in 2016. Under the BC Act, Biobanking agreements established through the TSC Act will be transitioned to BSAs and, where a proposed Biobanking agreement has not been finalised before February 2018, additional survey work is required. To satisfy these requirements, surveys were completed in 2018 using the methodology established under the BC Act. These surveys have updated and expanded upon information collected on the Sunnyside Road property during survey work in 2012 and 2014 using the Biobanking methodology. This has included substantially more plot work (total 44 vegetation plots) resulting in minor adjustments to the vegetation community area and classification of condition. The updated work in presented in the Biodiversity Stewardship Site Assessment Report (BSSAR, Jacobs 2020, in prep).

The *Biodiversity Conservation Act 2016*, *Biodiversity Conservation Regulation* 2017 and Biodiversity Assessment Method (BAM) (OEH, 2017) complete the legal framework that provides for the creation of biodiversity credits that can be sold on the open market.

Credits are created when a landowner enters into a BSA to maintain or improve their land's biodiversity values by undertaking management actions. The land is then known as a stewardship site. The agreement is attached to the land title and includes provisions that require current and future landowners to:

- Carry out management actions to improve biodiversity values on the site.
- Not undertake activities that will reduce the biodiversity values of the site.

When a landowner sells their credits, a specified minimum amount from the sale proceeds (a portion or all of the Total Fund Deposit) is paid into the Biodiversity Stewardship Payments Fund. Annual payments are then made

to the landowner from the fund. This endowment runs with the land in perpetuity to benefit current and future owners.

As the landowner of the Sunnyside Road offset site, TfNSW will initiate a BSA with the NSW Biodiversity Conservation Trust (BCT), retire the required number of credits generated on the property and deposit all of the Total Fund Deposit required into the Biodiversity Stewardship Payments Fund prior to on-selling the property to a third party with the BSA in place. Securing of the site through a BSA provides for the management of the site in perpetuity.

All ecosystem credits generated from the 300 ha Glenugie offset area will be retired within three months of the credits being generated and recorded in the credit register maintained by the BCT. Surplus credits not required to be offset under this package will be retained for other projects.

The BCT assume responsibility for monitoring, compliance and enforcement of all Biodiversity Stewardship agreements as outlined in the Biodiversity Conservation Trust Compliance Policy (BCT, 2019). BCT monitor compliance through annual reports submitted by owners of Biodiversity Stewardship sites, inspections and compliance audits. BCT and DPIE have a range of enforcement responses at their disposal, applied on a risk basis. These include:

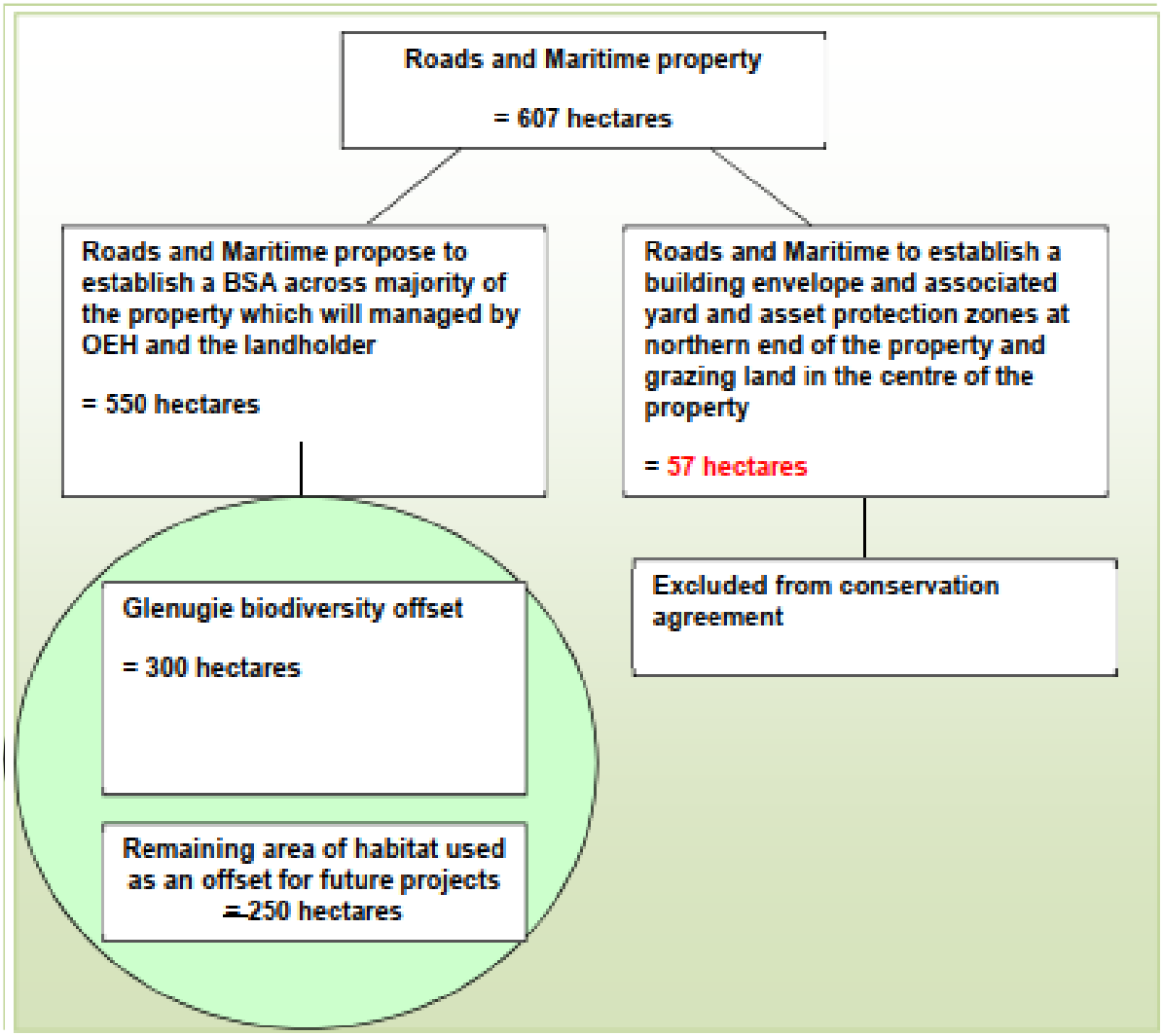
- Warning letters and inspections.
- Suspension or cancellation of biodiversity credits if management actions, as specified in a site's site-specific Management Actions Plan, have not been carried out.
- Biodiversity Credits Enforcement Orders, directing a person to retire credits if management actions are not carried out. Alternatively the Minister may direct an agreement holder to carry out work or other actions to rectify a breach of a Biodiversity Stewardship agreement.
- Civil proceedings in the Land and Environment Court to remedy or restrain a breach of any Biodiversity Stewardship agreement.
- Criminal proceedings, if the BCT forms a reasonable view that an agreement holder is likely to have committed an offence against the Biodiversity Conservation Act 2016, the BCT will refer the matter to DPIE for consideration.

A BSA is the strongest covenant available on private lands in NSW and extinguishes all land uses on land under the agreement other than conservation unless the BSA is varied or terminated by the NSW Minister for the Environment to permit alternative uses. Certain mining rights may be granted over a BSA site, and certain development can be carried out by public authorities on a BSA site, but any impacts from these activities must be offset again as an addition to any offsetting activities required by a given project in its own right.

The precise terms of the BSA will be developed by the BCT in consultation with TfNSW, but will include the following broad conditions:

- Exclusion of activities that will result in impacts on habitat for the affected threatened fauna, including timber harvesting, vegetation clearing, grazing, apiary, exclusion of domestic cats or dogs from the conservation area, or uncontrolled public access.
- Management of the property in accordance with the management actions plan which will include reference to site specific management activities consistent with Section 5.4 of this offset strategy (see draft management actions plan included with Appendix H.
- Ongoing monitoring in accordance with Section 5.5 of this offset strategy.

A diagram showing the proposed area of the offset site to be protected via the BSA is provided in Figure 4-2.



- Figure 4-2: Diagram showing the divisions of the TfNSW property and proposed Glenugie Biodiversity Offset

4.4.1 Conservation covenants

BSAs are in-perpetuity conservation covenants under the BC Act. A property specific Management Action Plan is prepared for each BSA.

TfNSW intend to enter into a BSA for the offset site. BSAs are suitable offset mechanisms because:

- A BSA is an in-perpetuity conservation covenant, registered on the certificate of title, and binding on successors in title;
- The BCT monitors compliance with the terms of BSA and provides landholder support. BSAs are legally enforceable in the NSW Land and Environment Court. In event of a breach of a BSA, the BCT can direct rectification work be carried out or enter the land to undertake the works itself.
- A BSA may not be terminated other than in accordance with the BC Act.
- A Management Action Plan will be developed by an accredited BSA assessor in conjunction with TfNSW for the biodiversity offset site. The Management Action Plan will identify a works plan to implement the aims, objectives and management actions identified in section 5 and 6 of this offset strategy

TfNSW intend to sell the offset site after the BSA has been registered on the title of the property. TfNSW will implement the Management Action Plan whilst the property remains in TfNSW ownership. BCT will make payments to future landholders from the Biodiversity Stewardship Agreement Fund, as set out in the BSA, to implement management actions.

New property owners will be required to comply with the BSA.

Payments will be made subject to milestones outlined in the Management Action Plan being met. The BCT will monitor compliance with the terms of the BSA.

4.5 Compliance with Conditions of Approval

The compliance of the offset area and associated strategy for meeting the Conditions of Approval are specified below in Table 4-3.

Table 4-3: Conditions of Approval and Offset Area compliance

Condition of Approval		TfNSW property (Offset Area) Compliance
3(a)	*The acquisition and conservation of land containing a minimum of 110 hectares of habitat for the Square-fruited Ironbark that is equal or greater quality to that removed for the Pacific Highway Upgrade at Glenugie.*	The TfNSW property contains a total of 290 hectares of occupied habitat for *Eucalyptus tetrapleura* of which 236.26 hectares is in moderate to high condition and 54.28 hectares in low condition (regrowth) and is in comparable or greater quality habitat condition than those recorded at the Glenugie Upgrade (refer to Section 4.2). From this, an area of 110 hectares of high-quality habitat for the Square-fruited Ironbark was identified and included in the offset area (refer to Figure 4-1). This area is considered of greater or equal quality than the area impacted by the Glenugie Upgrade.
3(b)	*The acquisition and conservation of land containing a minimum of 70 hectares that will be revegetated to provide habitat for the Square-fruited Ironbark that is equal or greater quality to that removed for the Pacific Highway Upgrade at Glenugie.*	The areas on the TfNSW property identified as occupied low condition habitat for *Eucalyptus tetrapleura* comprise 54 hectares where individuals were recorded in partially cleared land and 101 hectares of unoccupied low condition habitat where much of this area is considered to previously have supported *Eucalyptus tetrapleura* prior to be being cleared. From this, an area of 70 hectares, including 54 ha of low condition occupied habitat and 6 ha of low condition unoccupied habitat was identified, as shown on Figure 4-1 which is regarded as being highly suitable for revegetation of *Eucalyptus tetrapleura* and therefore included in the offset area. Natural regeneration of *Eucalyptus tetrapleura* saplings is currently occurring in the proposed 70-hectare habitat restoration area (refer to Section 3.10 for results of monitoring regeneration success).

Condition of Approval		TfNSW property (Offset Area) Compliance
3(c)	*Details of revegetation work required to achieve the requirements of conditions 3(b). The works must be consistent with advice from a suitably qualified expert;*	The framework for habitat revegetation for *Eucalyptus tetrapleura* is provided in Section 6 of this strategy. The habitat regeneration works is coupled with the research into the *'success of regeneration'* component of Condition 3(f), Assisted natural regeneration of *Eucalyptus tetrapleura* saplings is currently occurring in the proposed 70-hectare habitat restoration area (refer to Section 3.10).
3(d)	*The land referred to in condition 3(a) and 3(b) must provide linkage between existing stands of Square-fruited Ironbark and/or be adjacent to existing stands of Square-fruited Ironbark.*	The offset area adjoins and is contiguous with Glenugie State Forest and the Glenugie Peak Flora Reserve. The *Eucalyptus tetrapleura* on the offset area is part of the Glenugie sub-population impacted by the Glenugie Upgrade and therefore is directly linked to the broader population being impacted by the project. There are also populations adjoining the offset on freehold land along the northern and eastern boundaries (refer to Figure 3-4).
3(e)	*The land referred to in condition 3(a) and 3(b) must be located within 100 km of the Pacific Highway Upgrade at Glenugie.*	The offset area is approximately 2 km east of the Pacific Highway Upgrade at Glenugie (refer to Figure 1-1).
3(f)	*Research into the extent, population, genetics and the success of regeneration of habitat for the Square-fruited Ironbark;*	These research requirements have been split into two main studies (refer to Appendix E) comprising the extent and genetics of the *Eucalyptus tetrapleura* population as one study which has been undertaken across the distribution of *Eucalyptus tetrapleura* (i.e. 50 km radius of Grafton) and the success of revegetation as a separate research project which has been undertaken on the offset area in the 70 hectares designated for revegetation of *Eucalyptus tetrapleura*.
3(g)	*The acquisition and conservation of land containing a minimum of 120 hectares of habitat for the Large-eared Pied Bat, Grey-headed Flying Fox, Regent Honeyeater and Swift Parrot;*	All four species are considered to potentially occur or utilise the habitats on the offset area on the basis of known food resources in particular. There are no breeding, roosting habitats for these species, which are specialised and localised. For example, the Swift Parrot only breeds in Tasmania, the Large-eared Pied Bat roosts in caves, and there are limited breeding sites for the Grey-headed Flying-Fox and Regent Honeyeater throughout their range. Of the habitats identified on the TfNSW property there is around 190 hectares of Spotted Gum - Ironbark Forest and 45.5 hectares of Riparian / Floodplain Forest containing suitable feed tree species for the Swift Parrot and Regent Honeyeater, Grey-headed flying-fox and Large-eared pied Bat. The latter two species are also expected to occur in the dry sandy forest (c. 210 hectares) and the open grassland habitat with scattered trees (158 hectares). From this, an area of 120 hectares of suitable habitat of equal or greater quality as those impacted by the Glenugie Upgrade was identified (refer Figure 4-1) including a large proportion of Spotted Gum - Ironbark forests and riparian/floodplain habitats.

Condition of Approval		TfNSW property (Offset Area) Compliance
3(h)	*The land referred to in condition 3(g) must be located within 50 km of Grafton;*	The offset area is 16 km from Grafton (refer to Figure 1-1).
3(i)	*The land referred to in condition 3(a), 3(b) and 3(g) must be protected by a legal instrument under the relevant nature conservation legislation, that ensures the land is conserved in perpetuity;*	To ensure in perpetuity conservation of the site, TfNSW propose to protect the offset area via a BSA under the BC Act. Current and future landholders will be required to manage the site in accordance with the BSA in perpetuity and the BCT will be responsible for ensuring compliance with the agreement.
3(j)	*The strategy must include commitments to ongoing management of the land referred to in condition 3(a), 3(b) and 3(g) in perpetuity.*	The terms of the BSA will be guided by the management measures identified in this report for the offset site. The BSA will be accompanied by a Management Action Plan which documents the condition of the land at the date of entering into the agreement. The Management Action Plan identifies management issues specific to the land protected by the BSA. A Management Action Plan will be developed for the biodiversity offset site to implement the aims, objectives and management actions identified in section 5 and 6 of this report. TfNSW will undertake the works whilst the property is in their ownership and provide funds to Biodiversity Conservation Agreement Fund that will be distributed to future owners to implement the works once the property is sold. The ongoing management and monitoring measures specified in this biodiversity offset strategy will inform the specific management actions to be implemented in the Management Action Plan. These management actions will be developed to address the various ecological attributes of the offset area including weeds, pests, fire and threatened species management (refer to Section 5).
3(k)	*The strategy must include key milestones, performance indicators, corrective actions and timeframes for the completion of all actions outlined in the strategy.*	Key milestones, performance indicators, corrective actions and timeframes are outlined in this strategy (refer to Section 4.7). Further details regarding rehabilitation and management work on the property will be detailed in a Management Action Plan based on the final covenant configuration of the TfNSW property.
3(l)	*The strategy must be developed in consultation with the Department.*	Comments have been received from DoE on draft Biodiversity Offset Strategy documents. The comments received have been incorporated into the Final Biodiversity Offset Strategy.

4.6 Proposed Management Approach

TfNSW will register an in perpetuity Biodiversity Stewardship Agreement (BSA) over most of the property. All ecosystem credits generated from the 300 ha Glenugie offset area will be retired within three months of the credits being generated and recorded in the credit register maintained by the NSW Biodiversity Conservation Trust.

The BSA will contain provisions concerned with the protection of the biodiversity offset values and revegetation works within the proposed offset area. Residual areas of the property that are in low condition and not proposed to be protected by the BSA will be available for future landholders to undertake other activities.

A Management Action Plan will be developed for the offset property with actions informed by this offset strategy and funded by TfNSW through the Biodiversity Stewardship Agreement Fund. TfNSW will implement management actions whilst the property is in their ownership.

Future property owners will be required to comply with the BSA and Management Action Plan which will include any remaining management activities outlined and be funded through the Biodiversity Stewardship Agreement Fund.

4.7 Key Milestones for Delivery of the Strategy

Key milestones of the offset strategy are listed in Table 4-4 along with associated Conditions of Approval, status and indicative dates for the achievement of these milestones.

Table 4-4: Key milestones of the Glenugie offset strategy and commitment timeframe

No.	Key milestones	Relevant Conditions of Approval	Status and commitment	Date to be achieved
1	Acquisition of land supporting the required biodiversity features	3(a), 3(b), 3(d), 3(e), 3(g), 3(h)	The proposed Glenugie offset property has been acquired by TfNSW and supports the specified biodiversity attributes specified in these Conditions of Approval	Completed June 2010
2	Conservation of land supporting the required biodiversity features	3(a), 3(b), 3(d), 3(e), 3(g), 3(h), 3(i)	TfNSW will submit the BSA application to the NSW Biodiversity Conservation Trust with 3 months of the approval of this strategy. All ecosystem credits generated from the 300 ha Glenugie offset area will be retired within three months of the credits being generated and recorded in the credit register maintained by the NSW Biodiversity Conservation Trust.	No later than 12 months from approval of the Offset Strategy
3	Details of revegetation work required	3(c)	A Square-fruited Ironbark Revegetation Plan has been prepared and included as Section 6 of this offset strategy.	At time of an approved Biodiversity Offset Strategy.
4	Research into the extent, population and genetics for the Square-fruited Ironbark	3(f)	This part of the research project was undertaken by Royal Botanic Gardens and Domain Trust and John O'Donnell with details provided in Section 7 and Appendix E of this offset strategy	Completed in April 2017

No.	Key milestones	Relevant Conditions of Approval	Status and commitment	Date to be achieved
5	Commitments to ongoing management of the offset area	3(j)	TfNSW propose to establish an in-perpetuity BSA conservation covenant over the offset site under the BC Act. The agreement will be accompanied by a property specific Management Action Plan funded through the Biodiversity Stewardship Agreement Fund.	No later than 12 months from approval of the Offset Strategy
6	Commencement of revegetation works and research into the success of regeneration of habitat for the Square-fruited Ironbark	3(b), 3(c)	Assisted regeneration has been ongoing since 2014 with cattle exclusion and weed control to assist in reestablishment of *E. tetrapleura* and permanent monitoring locations have been established. Research into the success of regeneration of habitat for the Square-fruited Ironbark has been ongoing since 2014 and details are provided in Appendix E of this offset strategy	2014
7	Completion of revegetation works and research into the success of regeneration of habitat for the Square-fruited Ironbark	3(b), 3(c)	A five-yearly management and monitoring period have been specified for the regeneration of habitat for the Square-fruited Ironbark on the offset area over the next 20 years. It is envisaged that the future quality (>50 years) of the 70 hectares of regenerated habitat will be able to be demonstrated with ongoing management identified at the end of each 5-year period to satisfy the '*equal or greater quality*' component of Condition of Approval 3(b).	2040

4.8 Residual land used to offset other TfNSW projects

The residual area of the property not being utilised as an offset for the Glenugie upgrade is proposed to be used to offset other TfNSW projects. The residual area supports around 250 hectares of remnant vegetation, 57 hectares of cleared/regenerating lands and potential threatened species habitat. The residual area of the property is identified in Figure 4-3.

The residual area of 250 hectares of remnant vegetation at the Glenugie site has potential to be used to offset impacts upon vegetation and threatened species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), *Threatened Species Conservation Act 1995* or *Biodiversity Conservation Act* 2016.

5. Offset Area Management Framework

5.1 Background

TfNSW propose to establish an in-perpetuity BSA conservation covenant over the offset site under the BC Act. The agreement will be accompanied by a property specific Management Action Plan which documents the condition of the natural heritage values, provides management goals and recommendations, and is developed based on the principles of adaptive management. The Square-fruited Ironbark Revegetation Plan for 70 hectares of the site would be included as an annexure to the property management plan.

TfNSW will be responsible for implementing the revegetation plan whilst the property remains in TfNSW ownership. The TfNSW intends to on-sell the property at which point in time the future landholder will be responsible for permitting the continued implementation of the plan. It is likely that this will involve the landholder being required to permit third-party contractors to access the site for the purposes of implementation, maintenance and monitoring of the revegetation plan.

The BSA will include terms to permit the continued implementation of the revegetation plan to continue to be implemented.

5.2 Aims and Objectives

The aim of the management framework is to address the Condition of Approval 3(j) of the biodiversity offset requirements. The objective of this condition is to detail appropriate management measures and actions to maintain the ecological values of the offset, and states that *the* [biodiversity offset] *strategy must include commitments to ongoing management of the land referred to in condition 3(a), 3(b) and 3(g) in perpetuity.*

In this regard, the management of the property shall aim primarily at preserving in perpetuity the flora and associated fauna values of the site in a natural and undisturbed condition to:

a) Protect and preserve vegetation across the site, including biodiversity offsets for *Eucalyptus tetrapleura*, other threatened flora populations, threatened fauna habitats and Subtropical Coastal Floodplain Forest on Coastal Floodplains.

b) Provide areas of land for rehabilitation of *Eucalyptus tetrapleura* habitat and protect in perpetuity.

c) Protect and preserve high condition vegetation on the site as fauna habitat offsets for the threatened Large-eared Pied Bat, Grey-headed Flying Fox, Regent Honeyeater and Swift Parrot.

d) Provide areas for future scientific study, so long as such work does not upset the essentially undisturbed state of the property.

e) Assist in understanding the growth processes in the natural forest.

f) Manage the site in such a manner as to protect and enhance the property's conservation values.

g) Manage the site in such a manner to ensure weeds, feral animals and fire risk is managed across the site to protect site values and adjacent properties from these threats.

5.3 Threats to Biodiversity

A number of threats to biodiversity were noted at the property during the field surveys and these would form the basis of development of management actions. Proactive management of the current threats to biodiversity in the offset area and the overall property, would effectively improve the condition of the disturbed and degraded habitats on the site. Table 5-1 summarises the current biodiversity threats on the property which are a result of past and present land use activities.

Table 5-1 Threats to biodiversity at the TfNSW property

Key threats	Likely cause	Site locations
Soil compaction	Large machinery involved in clearing vegetation	Mostly on the rural zone holdings but also associated with soft soils around drainage areas, including crossing of creeks and associated sedimentation and erosion.
Grazing	Cattle and horses leading to trampling of vegetation, introducing weeds and gradually changing the structure and diversity of vegetation. These animals were observed on the property.	All forested areas
Weed invasion	General site disturbance (machinery, use of tracks and trails, stock trampling). High priority weeds – *Baccharis halimifolia* (Groundsel Bush); *Cinnamomum camphora* (Camphor laurel), *Lantana camara*.	Particularly in clearings and edge areas such as along tracks through forest.
Inappropriate fire regime (intensity and fire frequency).	While the fire history is unknown, there are signs of fire damage, such as loss of mature trees, and a very dense regrowth of early colonisers such as *Acacia* and *Melaleuca* spp.	Particularly adjoining the boundaries of the State Forest
Disturbance due to selective logging	Selective logging and stockpiling, soil compaction and loss of mature trees with potential to create hollows.	Across the site
Feral animals	Appear uncommon although are likely to occur. Horses, pigs, foxes and dogs have been observed on the property and in the adjacent Glenugie State Forest.	Across the site

5.4 Management Framework

An important component of every BSA is a detailed Management Action Plan, which details long- and short-term conservation land management actions. The Management Action Plan details the conditions the land owner must observe in accordance with the BSA and strategies to achieve sustainable land management and assist habitat restoration. The Management Action Plan is developed and agreed to when the BSA is finalised. Funding to assist the implementation of the plan is provided by TfNSW to the Biodiversity Stewardship Agreement Fund, from which annual payments are made to the landholder to undertake the required management actions. The recommended management framework for the offset area is detailed in Table 5-2.

Table 5-2 Recommended Glenugie offset area management framework

Objective	Strategy	Measures of success
Achieve an appropriate conservation agreement and land zonings for the site Protection and conservation of key biodiversity values of the site under a conservation agreement including those values that require protection in perpetuity.	Formalise covenant on property for conservation of biodiversity values in perpetuity	300 hectares of land minimum protected under BSA.
Management of impacts from adjacent land uses	Ensure that management of residual lands are consistent with the	Clear delineation of residual lands and offset areas.

Objective	Strategy	Measures of success
	objectives of the biodiversity offset areas	Adequate fencing of the proposed offset area maintained in perpetuity to exclude livestock and feral horses entering the site from residual lands and adjoining landholdings including private property and State Forest boundaries. Establishment of access trails to provide access to residual lands and management vehicles.
Manage pest animals	Comply with the Regional Pest Animal Management Plan	Implementation of pest animal management actions for the offset area. Measured reduction in evidence of pest animal species (refer to Section 4.5).
Manage weed species	Comply with the Regional Weed Management Plan	Implementation of weed management actions for the offset area. Measured reduction of cover of exotic species and weeds reduced to a maintenance level of control in perpetuity (refer to Section 4.5).
Fire management	Comply with the Regional Fire Management Plan	Implementation of fire management actions for the offset area including biodiversity management. Research into the effects of fire on the regeneration of vegetation communities of fire including *Eucalyptus tetrapleura* and other threatened flora populations (refer to Section 4.5).

5.5 Monitoring program

A monitoring program is required to determine the effectiveness of any proposed management actions for the conservation and management of threatened flora populations, fauna habitat and threatened ecological communities and proposed revegetation areas. The monitoring program will include monitoring of the 70 hectares of habitat revegetation specified in Section 5.

The monitoring program includes specific objectives, performance measures and corrective actions. The context of the monitoring program includes:

- Threatened flora and fauna populations.
- Square-fruited Ironbark revegetation activities.
- Weeds
- Feral animals
- Fire management

TfNSW and future landholders would monitor biodiversity values at the offset property as part of their management of the management of the Biodiversity Stewardship Agreement. Monitoring would include an annual assessment of the general extent and quality of habitat and the effectiveness of management actions for a minimum of 20 years. The following monitoring programs and reports would apply to the offset property:

- Vegetation and habitat monitoring, comprising a monitoring program to be completed by the landholder annually, for a minimum of 20 years and including preparation of annual overviews of the condition of vegetation and habitat reporting on data collected from five yearly vegetation integrity plot monitoring.
- Pest fauna control monitoring, comprising annual survey of pest fauna populations and documenting of control activities for a minimum of 20 years.
- Monitoring of weed management and fire management.

These monitoring programs and reports are described below.

5.5.1 Vegetation and Habitat

A vegetation and habitat monitoring program would be completed by the landholder annually, for a minimum of 20 years. Details of the vegetation and habitat condition would be included as part of the annual monitoring and reporting required under the stewardship site management plan for the property's Biodiversity Stewardship Agreement.

The annual monitoring of vegetation and habitat condition by the landholder would comprise:

- Monitoring of the photo points to record the condition of habitat and the effectiveness of management actions. Photo point locations would be way pointed using a GPS and marked with star pickets to facilitate locating during subsequent monitoring events and consistent photo capture. A portrait photo (illustrating vegetation structure) and a landscape photo (illustrating ground cover) should be taken and notes taken on general vegetation condition, extent of weed infestation, ground cover, any management issues such as erosion or dieback and any observed change since the last monitoring round.
- Five yearly survey of established vegetation integrity plots to compare with baseline data collected for the BSSAR.
- A summary of general observations of vegetation condition, degree of weed infestation, any management issues such as erosion or dieback and any observed change since the last monitoring round across the entire site.
- Description of any observed management problems or threats and proposed remedial action as required.

5.5.2 Vertebrate pest control

The landholder would conduct dedicated monitoring of pest fauna populations and prepare summary report every year. The monitoring program would be developed in consultation with a Local Land Services control officer and include techniques such as setting of camera traps, setting up of sand pits with bait stations and free feed, predator scat analysis and coordination with ongoing control programs as appropriate. Where the need is identified monitoring may be followed by a round of pest fauna control, principally targeting wild dogs and foxes, using soft-jaw trapping and/or shooting undertaken by appropriately licensed and qualified staff where possible. Any baiting undertaken will be conducted according to best practice standards.

Control programs would be developed in consultation with the Local Land Services wild dog officer and would be consistent with regional plans and programs.

A brief pest fauna control report would be prepared and included with reporting requirements of the management plan for the Biodiversity Stewardship Agreement comprising:

- Dates and locations of monitoring activities.
- Numbers and species of animals recorded during monitoring.
- Dates and locations of pest fauna control activities.

- A brief description of group control programs encompassing the site or other relevant programs coordinated by Local Land Services and related to the pest control activities on site.
- Numbers and species of animals captured or killed during pest fauna control activities.
- Incidental observations of native animals.
- A summary of general observations of pest fauna abundance and activity throughout the preceding 12 months.

Control programs would be targeted to other pest fauna (e.g. goats, pigs, rabbits) as appropriate if populations or impacts are detected during monitoring.

5.5.3 Square-fruited Ironbark habitat revegetation monitoring

A total of 8 monitoring plots have been established to monitor the revegetation of *E.tetrapleura*. Monitoring of these plots commenced in 2014 and will continue for at least a 25-year period. Details of monitoring results to date are provided in Section 3.10 and further details of the monitoring program are provided in Section 6. Monitoring of these plots will occur as part of the site's Vegetation Integrity Plot monitoring and will be used to guide the adaptive management approach applied to revegetation areas. Further details are provided in Section 3.10 and Section 6

NCAM 2019 established a further 8 plots in good condition native vegetation on the property. These plots were established to determine a benchmark for quantifying the natural mean stocking rates of *Eucalyptus tetrapleura* with the intent of applying these benchmarks to the regeneration plan. Further details are provided in Section 3.10 and Section 6

5.6 Residual lands management

The residual lands include areas that will be protected for conservation as an offset for other TfNSW projects and areas that will not be protected under a conservation agreement.

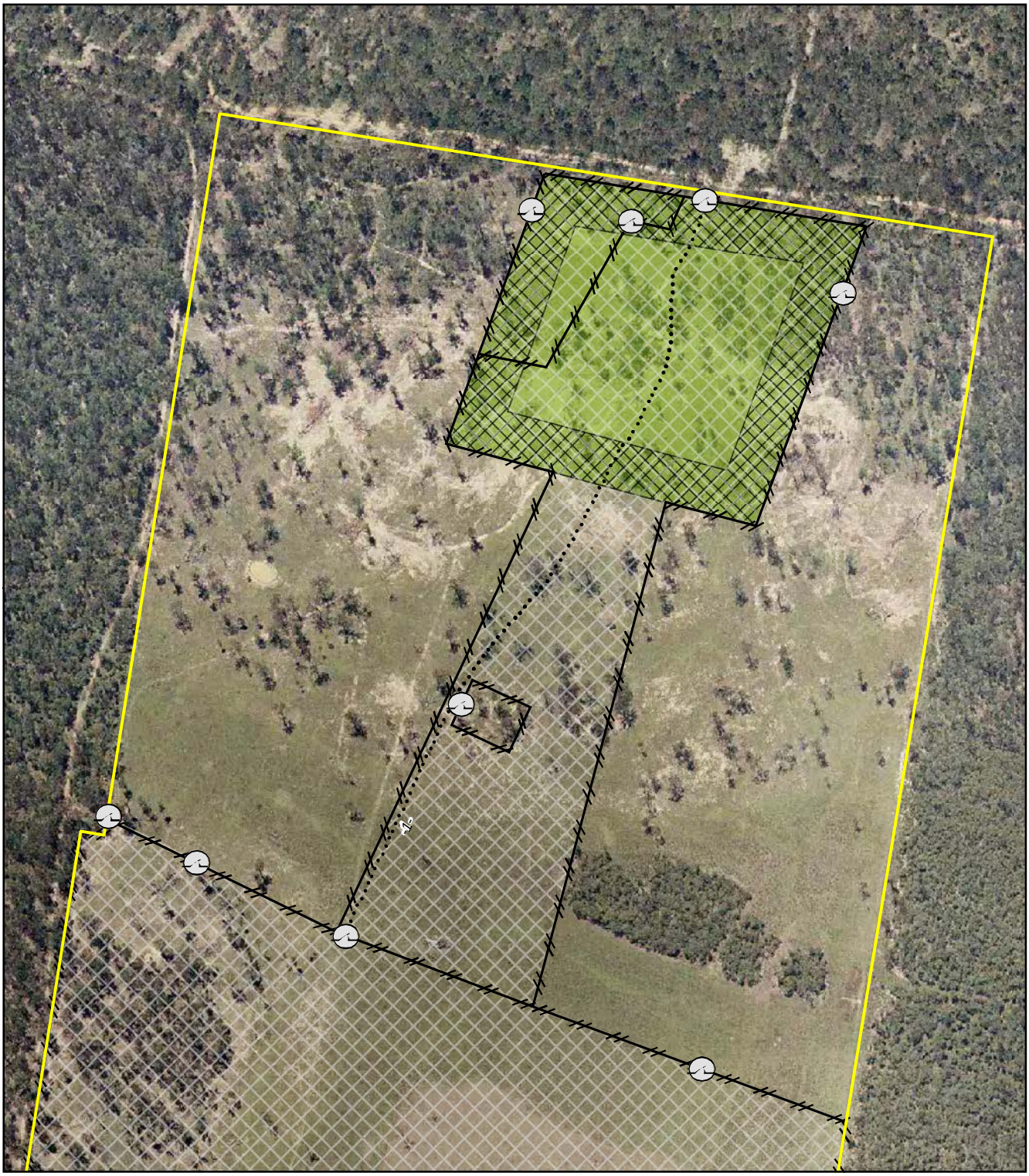
The property includes additional areas that will not be protected under a conservation agreement. These areas will remain available for a future landholder for activities including agriculture and dwelling construction. Residual areas will be delineated by standard rural fencing to limit the potential for stock incursions into the offset area while allowing for native fauna movement throughout the property.

The configuration of the exclusion areas has been designed to maximise the protection of flora and fauna within the conservation areas and to allow appropriate management of the site. Exclusion areas include highly cleared landscapes in the centre of the property and a 5-ha building envelope in the north of the property adjacent to Sunnyside Road.

Landholders will be required to maintain the exclusion fencing within the property and along the property boundaries in perpetuity. Fence construction, maintenance and insurance are funded through TfNSW's contribution to the Biodiversity Stewardship fund. The fences will be maintained to protect remnant and re-establishing vegetation within the conservation zones from the large population of wild horses and stock from periodic grazing leases on adjoining State Forest land and private properties.

The proposed exclusion areas, building envelope and asset protection zones on the property are identified in Figure 5-1 along with potential fencing and access arrangements.

Figure 5-1 Proposed building area, asset protection zone, fencing and access track detail



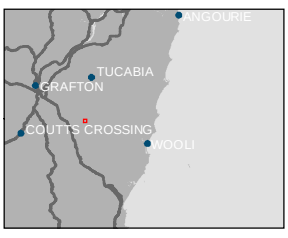
LEGEND

- TfNSW owned property
- Stewardship Site Exclusion Zone
- Asset Protection Zone (40 m wide)
- Building Envelope / APZs (7 ha)
- Gate
- Track
- Fence

0 0.18
Kilometres

DATA SOURCES
Jacobs 2019

1:5,000



JACOBS

4/04/2019 | J:\IE\Projects\04_Eastern\IA189400\22 Spatial_GIS\Directory\Templates\BOS_site 28\IA189400_BOS28_F011_Structures_r1v1.mxd
Newcastle Spatial Team - Prepared by : KM
Checked by : JC

6. Square-fruited Ironbark Revegetation Plan

6.1 Aims and objectives

The Square-fruited Ironbark Revegetation Plan covers the 70 hectares of the offset area set aside for revegetation of *Eucalyptus tetrapleura* to meet the Condition of Approval 3(b) for the Glenugie Upgrade, comprising:

'The acquisition and conservation of land containing a minimum of 70 hectares that will be revegetated to provide habitat for the Square-fruited Ironbark that is equal or greater quality to that removed for the Pacific Highway Upgrade at Glenugie'

A total of 70 hectares of cleared land has been identified on the offset area as suitable for revegetation of the species (Figure 4-1). The suitability of the land is based on matching the soil type and landscape position from other known locations for this species and noting the presence of natural regeneration of the species within this area following removal of grazing.

The objective to achieve the above aim is to assist the natural regeneration of the species using the methods and techniques discussed in the following sections based on an adaptive management framework, where potential threats and opportunities are identified and managed through periodic monitoring.

6.2 Management Framework

The Stewardship Site Management Plan forms an integral part of the Biodiversity Stewardship Agreement. It includes specific requirements for the management of weeds, feral animals and fire that have specifically considered the management of Square-fruited Ironbark revegetation areas within the property.

The Square-fruited Ironbark Revegetation Plan has been developed by suitably qualified experts, Peter Richards and Craig Harre of North Coast Aerial Mapping (NCAM) and Jacobs personnel in consultation with TfNSW and will be incorporated into the BSA Site Management Plan. This will ensure ongoing monitoring and management of the rehabilitation areas by successive property owners and will ensure funding through the Total Fund Deposit in perpetuity.

As part of an adaptive management framework, sub-plans within this Site Management Plan include detailed information on:

- the potential approaches to management of each specific site attribute including specific approaches for intact and regenerating native vegetation areas
- the selected approaches that will be implemented for each area
- trigger points for adoption of alternative management techniques
- a monitoring and review regime to be undertaken by appropriately experienced and qualified ecologist / bush regenerators and the landholder that will include:
    - Annual reporting of site monitoring, management actions taken and biodiversity outcomes to the Biodiversity Conservation Trust of NSW
    - Minimum 5 yearly Vegetation Integrity Plot monitoring events over the next 20 years
    - Reviews of weeds, feral animals and fire management sub-plans every 5 or 6 years
    - Annual photo point monitoring of plots that will be submitted to the BCT along with the Annual Report

The potential management approaches detailed in the Site Management Plan provide the basis upon which adaptive management can be applied as a result of monitoring to identify successes and failures of the management approach being implemented. The following sections detail the management approach that will be implemented and potential alternative approaches in the event that milestones are not met.

6.3 Primary Management Approach - Assisted Natural Regeneration

The existing condition of the proposed revegetation areas for *Eucalyptus tetrapleura* (refer to Figure 4-1) is classed as low to moderate, with a highly modified structure supporting scattered trees and shrubs, and a mixed groundcover of native and exotic species which vary in cover/abundance throughout these areas. Some of these areas have been previously cleared based on the interpretation of past aerial imagery and the existing levels of native flora diversity and regeneration observed. Pasture seed mixes appear to have been applied in some areas which have increased the exotic vegetation cover, however the potential resilience of these areas is considered high with evidence of tree and shrub recruitment (including *Eucalyptus tetrapleura*) and a high proportion of the native flora diversity still present (25-26 species).

The identified 70 hectares of revegetation areas for *Eucalyptus tetrapleura* as shown in Figure 4-1 (herein referred to as the revegetation areas) have been selected based on the most suitable areas of habitat (i.e. former areas of occupation) which could be efficiently revegetated to provide habitat for *Eucalyptus tetrapleura*. Therefore, the main revegetation activities that will be employed are assisted regeneration techniques minimising disturbance to the existing soil profile and associated seed bank, rather than ripping/tilling the soil, and/or spreading native seed or planting and maintaining tube stock.

The natural regeneration of *Eucalyptus tetrapleura* habitat was assessed during September 2014, January 2017, October 2017 and September 2019 (refer to Section 3.10). Substantial areas of regenerating trees and shrubs were observed in the low condition areas of the offset site, including the proposed 70-hectare revegetation area. A high to moderate abundance of *Eucalyptus tetrapleura* saplings were recorded in some areas of the proposed revegetation area, as well as a diversity of other canopy and mid-storey species.

The most resilient revegetation areas will require minimal intervention due to the presence of a high diversity of native species and a limited range of exotic species. In these areas, management efforts will focus on ensuring exclusion of stock and feral animals and any associated soil disturbances. Areas of the property where fencing currently excludes exotic herbivores have consistently demonstrated the highest level of native species diversity.

In less resilient revegetation areas, where monitoring over successive surveys shows that regeneration is not trending towards benchmark for native flora diversity and *Eucalyptus tetrapleura* stocking rates, additional management actions will be taken. NCAM (2019), recommends that the most appropriate adaptive management action is controlled burning in relevant areas of the rehabilitation area to reduce the abundance of exotic groundcovers and promote germination of native seed stored in the soil. If required, ecological burns will be implemented as part of the properties fire management regime which is funded on a 5 –yearly cyclical basis.

The Site Management Plan includes an ongoing weed management strategy and provides for annual funding for weed management activities. High threat weeds and weeds that are deemed to be hindering the regeneration progress will be targeted throughout the revegetation areas in perpetuity.

Where monitoring demonstrates that the revegetation areas are not trending towards benchmark for floristic diversity and *Eucalyptus tetrapleura* stocking rates, adaptive management will occur in consultation with appropriately qualified and experienced ecologists / bush regenerators. Table 6-1 details the monitoring tasks, milestones and timeframes where adaptive management approaches would be triggered. Monitoring will be undertaken using recognised methods to assess vegetation condition as outlined in Section 6.5.

6.4 Weed Management

A weed management program is required to control any significant infestations and minimise competition with native species regeneration particularly regenerating trees and shrubs. The Integrated Weed Management Plan component of the Stewardship Site Agreement will be implemented across the entire BSA area and includes measures to manage weeds in the revegetation area in perpetuity. Under this plan, the main weed infestations will be brought to a maintenance level within the first 10 years with ongoing management and reporting undertaken annually over the life of the agreement. TfNSW commenced this program in 2014 with management of weeds including Balloon Cotton Bush, Groundsel Bush, Lantana and Smooth Senna. The weed management plan will be reviewed every 6 years to determine appropriateness of the control program and updated where required if emerging weed issues are identified.

6.4.1 Spot-treatments

The most effective and efficient measure to control weeds in the revegetation areas is likely to be spot treatment of high priority and environmental weed species where they occur including herbicide application and removal and disposal. Herbicide application around regenerating trees and shrubs will occur where necessary to limit competition with groundcovers and encourage regeneration.

6.5 Alternative Management Options

Throughout the revegetation areas, where there is a higher level of disturbance such as trails, surrounding constructed dams, and areas where exotic ground covers are abundant and/or there is a lack of native shrub and tree regeneration, alternative revegetation methods will be employed, if deemed necessary through periodic monitoring, to assist the natural regeneration.

A range of methods will be considered as part of any scientific study to assess the effectiveness of revegetation methods for *Eucalyptus tetrapleura* including responses to grazing, weed invasion and natural regeneration techniques. NCAM (2019) established 8 plots in good condition native vegetation on the property to determine a benchmark for quantifying the natural mean stocking rates of *Eucalyptus tetrapleura* with the intent of applying these benchmarks to the regeneration plan. Any future supplementary regeneration requirements should refer to these data. Supplementary regeneration such as direct seeding map only be required if monitoring finds that density is below these natural benchmark densities.

6.5.1 Brush-matting

Brush matting is a recognised revegetation method which is likely to be highly suitable for the revegetation areas. This method involves selectively trimming branches of shrubs and trees bearing seed. The seeds drop out of the brush, the leaves dry and fall off and form mulch, and the remaining twigs act as protection for emerging seedlings against sun, wind and possibly grazing. However, this method is relatively labour intensive, and approval may be needed to obtain sufficient amounts of brush from the property. If there are logistical problems identified with the broad-scale application of these methods, it would be restricted to smaller disturbed areas of bare soil such as trails that are proposed to be closed and constructed dam walls.

The most suitable species for brush matting are those that retain seed capsules on the plant but which shed seed when the branch dries, such as Myrtaceous species (*Melaleuca*, *Baeckea*, *Leptospermum Corymbia, Angophora, Callistemon* and *Eucalyptus* spp.) which are present in high abundance, along with *Allocasuarina* spp. and *Hakea* spp. The harvesting and spreading of brush will need to be well planned to coincide with the occurrence of ripe fruit on these species.

6.5.2 Direct seeding

Locally collected seed will be spread over some of the revegetation areas if the native seed bank is identified as being depleted or there is a high cover of exotic species. Prior to direct seeding, weed control and possibly some level of soil scarification will be required depending on the species being spread. Exposure of base soil will be avoided where possible.

6.5.3 Plant stock

Considering the large area being restored, any large-scale planting program would be very labour intensive and time consuming, and therefore will only be employed if other assisted regeneration methods are deemed to be ineffective and a more significant level of intervention is required. Local indigenous seed will be used for any propagation programs as recommended in the Research into the population genetics of *Eucalyptus tetrapleura* and related species report prepared by RBG&DT, 2017.

6.5.4 Controlled burns

Controlled burns in the relevant parts of the rehabilitation areas will be undertaken if required as an adaptive management action designed to promote the recruitment of native species and reduce competition from exotic groundcover species. Controlled burns in the revegetation areas will be undertaken if monitoring results reveal a decline in native flora diversity and an increase in exotic groundcover occurs over successive surveys. The effectiveness of controlled burns will be measured through monitoring the regeneration in permanent plots and comparison of pre and post fire floristic monitoring data. Post fire monitoring will occur within 3 and 6 months after burns to ensure that recruitment of native species is not hindered by competition from exotic species. Where required, redirection of weed control efforts will occur during the post fire period.

A fire management plan for the entire offset area is required under the BSA and includes maximum and minimum timeframes between burns in the revegetation areas. Given that the site is dominated by Dry Sclerophyll vegetation communities the general minimum and maximum intervals between burns are between 7 and 50 years. The Site Management Plan divides the site into proposed ecological burn cells where burns will be undertaken at specific points in time over the life of the agreement. The 6 - yearly reviews of the fire management plan will incorporate a revised strategy, where deemed necessary, to account for findings of revegetation plot monitoring.

6.6 Monitoring Program

Monitoring of the revegetation areas will be incorporated into the monitoring program for the entire offset area. The monitoring program has been designed to identify three main components comprising:

- Potential and existing threats to biodiversity.
- Changes to vegetation condition.
- Changes in threatened population sizes

Vegetation plot monitoring between 2014 and 2019 has shown an increase in native floristic diversity and a decline in the cover of exotic species. This monitoring will continue for the following 20 years. The site's Management Plan details the plot locations and specifies the methodology to be followed for monitoring events. The monitoring methodology followed by Jacobs and NCAM between 2014 and 2019 (Biobanking Assessment Methodology (BBAM)),(refer Appendix A) will be continued for consistency in data collection and analysis.

The recommended components of the monitoring program are detailed in Table 6-1, including potential adaptive management measures. These measures are intended to be implemented for the entire offset area.

Table 6-1 Monitoring activities

Monitoring Task	Methods	Milestone	Adaptive Management Trigger (where milestone not met)	Adaptive Management Actions	Timeframe
Regeneration of Eucalyptus tetrapleura in revegetation areas	Assessment of existing monitoring plots, including counts of E. tetrapleura stems by age/size class. Comparison of stem tallies with derived benchmark stocking rate for E. tetrapleura.	Stocking rates are trending towards benchmark densities	Stocking rates fall below or remain above benchmarks	Controlled burn in relevant parts of rehabilitation areas.	5 years monitoring, ongoing monitoring under BSA management plan (20 years)
Vegetation condition in revegetation areas	Condition assessment of existing monitoring plots within regeneration areas. BBAM (2008) assessment methodology will be used to maintain consistency since inception of program.	Native flora diversity, native groundcover, and mid-storey and overstorey are trending towards benchmark.	Native flora diversity declines and exotic groundcover increases over successive monitoring events	Controlled burn in relevant parts of rehabilitation areas and / or application of other management techniques identified in the Site Management Plan as recommended by a bush regenerator or ecologist.	Two monitoring events over next 5 years. Ongoing 5-yearly monitoring under BSA management plan (20 years)
Weed Management	Assessment by bush regenerator / ecologist	Weeds reduced to maintenance level within the first 10 years of the BSA	No reduction or an increase in exotic cover	Apply alternative weed management strategy as recommended by an ecologist / bush regenerator	Annually in consultation with a bush regenerator or ecologist while primary weed control works are occurring and then at a minimum every 6 years as part of the Integrated Weed Management Plan Review. The landholder will annually report on the areas of weed infestation treated as part of the Annual Report submitted to the BCT.
Feral Animal Management including wandering stock	Landholder and / or specialist contractor to undertake annual monitoring and proactive and reactive control where pest species are identified. Any stock that enter the revegetation area will be removed immediately.	Reduced feral animal abundance over successive monitoring events	No change or increase in feral animal abundance over successive monitoring events	Reassess boundary fencing and apply alternative active management methods as recommended by an ecologist and or pest control specialist.	Annually by the landholder. The Feral Animal Control Plan will be reviewed at a minimum every 6 years. The landholder will report annually on feral animal and wandering stock control as part of

Monitoring Task	Methods	Milestone	Adaptive Management Trigger (where milestone not met)	Adaptive Management Actions	Timeframe
					the Annual Report submitted to the BCT.

7. Research into the extent, population and Genetics of the Square-fruited Ironbark

Research into the extent, population and genetics of the Square-fruited Ironbark was undertaken by the Royal Botanic Gardens and Domain Trust (RBG&DT) following fieldwork undertaken by John O'Donnell to identify the suitable study populations. The following provides a brief description of the findings that are provided in full in Appendix E.

7.1.1 Aims and Objectives

The study aimed to build on current knowledge of the Square-fruited Ironbark following on from studies conducted for the Glenugie upgrade.

The RBG&DT study assessed the genetic diversity and genetic structure within the whole distribution of Square-fruited Ironbark and investigated the extent of hybridisation with other local ironbarks.

The four main objectives of the study were to:

1. Determine the genetic distinctness of *E. tetrapleura* from other close ironbark relatives.
2. Assess any potential differences between the populations of Square-fruited Ironbark, the degree of genetic variation within populations and the degree to which it is geographically and ecologically determined.
3. Assess levels of gene flow between populations and if relevant provision of provenance boundaries based on the genetic structure obtained from the genome-wide data
4. Characterise the mating system of *E. tetrapleura* i.e. the degree to which it has a typical eucalypt mating system and the potential for inbreeding to impact on population viability

7.1.2 Method

A sampling strategy was devised following input from field observations provided by John O'Donnell undertaken during research into the success of regeneration of habitat of the Square-fruited Ironbark.

A total of 245 samples were taken across 28 sites including TfNSW's offset property. These samples included a range of ironbark species including 170 *E. tetrapleura*.

DNA was extracted from the samples and submitted for genomic analysis.

7.1.3 Results

The study found that *E. tetrapleura* is a genetically differentiated species and it actively hybridises with co-distributed ironbarks. Similar levels of genetic diversity were found to exist within *E. tetrapleura* as in related taxa, and the species was found to be represented by a single genetic provenance.

The RBG&DT findings show that *E. tetrapleura* is most likely more narrowly distributed (only south of the Clarence River), and potentially rarer (due to miss-identifications) than previously suggested. Though many of the ironbarks north of the Clarence River resembled *E. tetrapleura* the genetic data indicated that these are all of hybrid origin.

Of note, the TfNSW offset property is located within the core *E. tetrapleura* distributional area and analysis of samples confirmed that the site has both mature and establishing 'pure' forms of the species.

8. References

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Appendix A. Scoring and Weighting of Site Attributes

Scoring and weighting of the site attributes (adapted from Table 3. of Seidel and Briggs 2008)

Site Attribute	Site Attribute Score (see notes below)				Weighting for site attribute score
	0	1	2	3	
Native Plant Species Richness	0	>0 – <50% of benchmark	50–<100% of benchmark	≥ benchmark	25
Native Over-storey Cover (%)	0–10% or >200% of benchmark	>10–<50% or >150–200% of benchmark	50–<100% or >100–150% of benchmark	within benchmark	10
Native Mid-storey Cover (%)	0–10% or >200% of benchmark	>10–<50% or >150–200% of benchmark	50–<100% or >100–150% of benchmark	within benchmark	10
Native Ground Cover-grasses (%)	0–10% or >200% of benchmark	>10–<50% or >150–200% of benchmark	50–<100% or >100–150% of benchmark	within benchmark	2.5
Native Ground Cover-shrubs (%)	0–10% or >200% of benchmark	>10–<50% or >150–200% of benchmark	50–<100% or >100–150% of benchmark	within benchmark	2.5
Native Ground Cover-other (%)	0– 10% or >200% of benchmark	>10–<50% or >150–200% of benchmark	50–<100% or >100–150% of benchmark	within benchmark	2.5
Exotic Plant Cover (%)	>66%	>33–66%	>5–33%	0–5%	5
Number of Trees with Hollows	0 (unless benchmark includes 0)	>0–<50% of benchmark	50–<100% of benchmark	≥ benchmark	20
Proportion of over-storey species occurring as regeneration	0	>0–<50%	50–<100%	1	12.5
Total Length of Fallen Logs (m)	0–10% of benchmark	>10–<50% of benchmark	50–<100% of benchmark	≥ benchmark	10

Note:

The term '*within benchmark*' means a measurement that is within (and including) the range of measurement identified as the *benchmark* for that vegetation type. The term '<*benchmark*' means a measurement that is less than the minimum measurement in the *benchmark* range. The term '>*benchmark*' means a measurement that is greater than the maximum measurement in the benchmark range.

Appendix B. Site Value Scores

Final Score and the relationship to the Condition Rating

0 to 16	low
17 to 33	low-moderate
34 to 50	moderate
51 to 67	moderate-high
68 to 89	high
90 - 100	very high

Note:

- Data from each site attribute for each plot was compared against the benchmark and assigned a site value score. The site value score represents the overall condition of the vegetation compared against the benchmark.
- Each site condition attribute is allocated a score from 0 to 3 (0=low, 1 = moderate, 2 = high, 3 = very high) based on the difference between its measured value and its benchmark (refer to Appendix A)
- Each score is then calculated as a proportion (0=0, 1=0.33, 2=0.66, 3=1) and multiplied by the weighting
- The total of the 10 site attribute weightings results in a Final Score for each plot
- Each plot was then assigned a condition of rating of low, low-moderate, moderate, moderate-high, and high and very high based on the above scale.
- Within these arbitrary categories the final score distinguishes differences of vegetation/habitat condition between plots.

Spotted Gum - Grey Ironbark - Pink Bloodwood open forest of the Clarence Valley lowlands of the North Coast

Site	Plot 1	SCORE	WT	Plot 3	SCORE	WT	Plot 4	SCORE	WT	Plot 6	SCORE	WT
Native Plant Species Richness	34	3	25	28	2	16.7	32	3	25	26	2	16.66
Native Over-storey Cover (%)	24.5	3	10	30	3	10	44.5	3	10	22.5	3	10
Native Mid-storey Cover (%)	38.5	3	10	14.5	3	10	3.5	2	6.66	49.5	3	10
Native Ground Cover-grasses (%)	48	3	2.5	40	3	2.5	46	3	2.5	34	3	2.5
Native Ground Cover-shrubs (%)	0	0	0	4	2	1.66	0	0	0	2	1	0.83
Native Ground Cover-other (%)	8	2	1.66	2	1	0.83	4	1	0.83	8	2	1.66
Exotic Plant Cover (%)	0	3	5	0	3	5	0	3	5	0	3	5
Number of Trees with Hollows	1	3	20	1	3	20	1	3	20	1	3	20
Over-storey Regeneration	1	3	12.5	1	3	12.5	1	3	12.5	1	3	12.5
Total Length of Fallen Logs (m)	49.5	3	10	85.6	3	10	107.8	3	10	110.4	3	10
Total Score			96.66			89.2			92.5			89.15
Condition			V-H			V-H			V-H			V-H

Spotted Gum - Grey Ironbark - Pink Bloodwood open forest of the Clarence Valley lowlands of the North Coast

Site	Plot 7	SCORE	WT	Plot 11	SCORE	WT	Plot 13	SCORE	WT	Plot 14	SCORE	WT
Native Plant Species Richness	41	3	25	48	3	25	46	3	25	32	3	25
Native Over-storey Cover (%)	19.5	3	10	25.5	3	10	37.5	3	10	23	3	10
Native Mid-storey Cover (%)	25	3	10	32.5	3	10	8.5	3	10	34.5	3	10
Native Ground Cover-grasses (%)	56	3	2.5	26	3	2.5	40	3	2.5	14	3	2.5
Native Ground Cover-shrubs (%)	0	0	0	2	1	0.83	0	0	0	0	0	0
Native Ground Cover-other (%)	12	3	2.5	24	3	2.5	6	2	1.66	8	2	1.66
Exotic Plant Cover (%)	0	3	5	0	3	5	0	3	5	0	3	5
Number of Trees with Hollows	1	3	20	1	3	20	1	3	20	1	3	20
Over-storey Regeneration	1	3	12.5	1	3	12.5	1	3	12.5	1	3	12.5
Total Length of Fallen Logs (m)	92.9	3	10	97.5	3	10	60.6	3	10	81	3	10
Total Score			97.5			98.3			96.7			96.66
Condition			V-H			V-H			V-H			V-H

Spotted Gum - Grey Ironbark - Pink Bloodwood open forest of the Clarence Valley lowlands of the North Coast - LOW CONDITION

Site	Plot 18	SCORE	WT
Native Plant Species Richness	25	2	16.66
Native Over-storey Cover (%)	0	0	0
Native Mid-storey Cover (%)	0	0	0
Native Ground Cover-grasses (%)	2	2	1.66
Native Ground Cover-shrubs (%)	2	2	1.66
Native Ground Cover-other (%)	6	2	1.66
Exotic Plant Cover (%)	90	0	0
Number of Trees with Hollows	0	0	0
Over-storey Regeneration	0	0	0
Total Length of Fallen Logs (m)	0	0	0
Total Score			21.64
Condition			V-H

Spotted Gum - Grey Box - Grey Ironbark dry open forest of the Clarence Valley lowlands of the North Coast

Site	Plot 5	SCORE	WT
Native Plant Species Richness	49	3	25
Native Over-storey Cover (%)	40.5	3	10
Native Mid-storey Cover (%)	10	3	10
Native Ground Cover-grasses (%)	34	3	2.5
Native Ground Cover-shrubs (%)	0	0	0
Native Ground Cover-other (%)	8	2	1.66
Exotic Plant Cover (%)	0	3	5
Number of Trees with Hollows	1	3	20
Over-storey Regeneration	1	3	12.5
Total Length of Fallen Logs (m)	67.8	3	10
Total Score			96.66
Condition			V-H

Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast

Site	Plot 2	SCORE	WT	Plot 8	**SCORE**	**WT**
Native Plant Species Richness	41	3	25	38	**3**	**25**
Native Over-storey Cover (%)	27.5	3	10	12.5	**3**	**10**
Native Mid-storey Cover (%)	28	3	10	23	**3**	**10**
Native Ground Cover-grasses (%)	72	3	2.5	46	**3**	**2.5**
Native Ground Cover-shrubs (%)	10	3	2.5	4	**2**	**1.66**
Native Ground Cover-other (%)	10	3	2.5	40	**3**	**2.5**
Exotic Plant Cover (%)	0	3	5	0	**3**	**5**
Number of Trees with Hollows	2	3	20	2	**3**	**20**
Over-storey Regeneration	1	3	12.5	1	**3**	**12.5**
Total Length of Fallen Logs (m)	105.1	3	10	35.5	**3**	**10**
Total Score			100			**99.2**
Condition			V-H			**V-H**

Orange Gum (Eucalyptus bancroftii) open forest of the North Coast

Site	Plot 9	SCORE	WT	
Native Plant Species Richness	49	3	25	
Native Over-storey Cover (%)	14.5	2	6.66	
Native Mid-storey Cover (%)	13.5	3	10	
Native Ground Cover-grasses (%)	32	3	2.5	
Native Ground Cover-shrubs (%)	18	3	2.5	
Native Ground Cover-other (%)	34	3	2.5	

Exotic Plant Cover (%)	0	3	5	
Number of Trees with Hollows	1	3	20	
Over-storey Regeneration	1	3	12.5	
Total Length of Fallen Logs (m)	63	3	10	
Total Score			96.66	
Condition			V-H	

Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the North Coast

Site	Plot 10	SCORE	WT	Plot 15	**SCORE**	**WT**
Native Plant Species Richness	42	3	25	37	**3**	**25**
Native Over-storey Cover (%)	35.5	2	6.66	6.5	**2**	**6.66**
Native Mid-storey Cover (%)	32.5	1	3.33	4.5	**2**	**6.66**
Native Ground Cover-grasses (%)	54	3	2.5	76	**2**	**1.66**
Native Ground Cover-shrubs (%)	0	3	2.5	0	**3**	**2.5**
Native Ground Cover-other (%)	14	3	2.5	16	**3**	**2.5**
Exotic Plant Cover (%)	0	3	5	8	**2**	**3.33**
Number of Trees with Hollows	1	3	20	0	**0**	**0**
Over-storey Regeneration	1	3	12.5	1	**3**	**12.5**
Total Length of Fallen Logs (m)	33.1	3	10	160	**3**	**10**
Total Score			89.99			**70.8**
Condition			V-H			**V-H**

Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the North Coast - LOW CONDITION

Site	Plot 16	SCORE	WT
Native Plant Species Richness	27	2	16.66
Native Over-storey Cover (%)	0	0	0
Native Mid-storey Cover (%)	0	0	0
Native Ground Cover-grasses (%)	30	3	2.5
Native Ground Cover-shrubs (%)	0	3	2.5
Native Ground Cover-other (%)	26	3	2.5
Exotic Plant Cover (%)	44	1	1.66
Number of Trees with Hollows	0	0	0
Over-storey Regeneration	1	3	12.5
Total Length of Fallen Logs (m)	13	3	10
Total Score			48.32
Condition			V-H

Narrow-leaved Red Gum woodlands of the lowlands of the North Coast

Site	Plot 12	SCORE	WT	
Native Plant Species Richness	44	3	25	
Native Over-storey Cover (%)	28.5	3	10	
Native Mid-storey Cover (%)	29.5	1	3.33	
Native Ground Cover-grasses (%)	62	2	1.66	
Native Ground Cover-shrubs (%)	0	3	2.5	
Native Ground Cover-other (%)	16	3	2.5	
Exotic Plant Cover (%)	0	3	5	
Number of Trees with Hollows	**8**	**3**	**20**	
Over-storey Regeneration	**1**	**3**	**12.5**	
Total Length of Fallen Logs (m)	**68.7**	**3**	**10**	
Total Score			**92.49**	
Condition			**V-H**	

Narrow-leaved Red Gum woodlands of the lowlands of the North Coast - LOW CONDITION

Site	Plot 17	SCORE	WT	
Native Plant Species Richness	26	2	16.66	
Native Over-storey Cover (%)	0	0	0	
Native Mid-storey Cover (%)	2	1	3.33	
Native Ground Cover-grasses (%)	20	3	2.5	
Native Ground Cover-shrubs (%)	0	3	2.5	
Native Ground Cover-other (%)	68	2	1.66	
Exotic Plant Cover (%)	10	2	3.33	
Number of Trees with Hollows	0	0	0	
Over-storey Regeneration	1	3	12.5	
Total Length of Fallen Logs (m)	0	0	0	
Total Score			42.48	
Condition			V-H	

Appendix C. Opportunistic list of flora on the property

Key to codes used in Appendix C
i = introduced; t = threatened, r = RoTAP, n = native species suspected to introduced to the site

	FAMILY	*Scientific Name*	*Common Name*	
Ferns				
	ADIANTACEAE	*Adiantum aethiopicum*	Maidenhair Fern	
	ADIANTACEAE	*Cheilanthes sieberi* subsp. *sieberi*	Slender Cloak-fern	
	BLECHNACEAE	*Blechnum cartilagineum*	Gristle Fern	
	DENNSTAEDTIACEAE	*Pteridium esculentum*	Bracken	
	LINDSAEACEAE	*Lindsaea microphylla*	Lacy Wedge-fern	
Flowering Plants - Dicotyledons				
	ACANTHACEAE	*Brunoniella australis*	Blue Trumpet	
	ACANTHACEAE	*Pseuderanthemum variable*	Pseuderanthemum	
	AMARANTHACEAE	*Alternanthera denticulata*	Lesser Joyweed	
	APIACEAE	*Centella asiatica*	Swamp Pennywort	
	APIACEAE	*Cyclospermum leptophyllum*	Slender Celery	i
	APIACEAE	*Hydrocotyle peduncularis*	Hairy Pennywort	
	APIACEAE	*Hydrocotyle tripartita*	Tree-foil Pennywort	
	APIACEAE	*Platysace ericoides*	Heathe Platysace	
	APOCYNACEAE	*Asclepias curassavica*	Redhead Cottonbush	
	APOCYNACEAE	*Gomphocarpus fruticosus*	Narrow-leaved Cotton Bush	i
	APOCYNACEAE	*Parsonsia straminea*	Common Silkpod	
	ASTERACEAE	*Ambrosia* sp.	Ragweed	i
	ASTERACEAE	*Aster subulatus*	Wild Aster	i
	ASTERACEAE	*Baccharis halimifolia*	Groundsel Bush	i
	ASTERACEAE	*Bidens pilosa*	Cobblers Peg	i
	ASTERACEAE	*Brachyscome microcarpa*		
	ASTERACEAE	*Calotis cuneifolia*	Purple Burr-daisy	
	ASTERACEAE	*Chrysocephalum apiculatum*	Yellow Buttons	
	ASTERACEAE	*Cirsium vulgare*	Spear Thistle	i
	ASTERACEAE	*Conyza sp.*	Fleabane	i
	ASTERACEAE	*Crassocephalum crepidioides*	Thickhead	i
	ASTERACEAE	*Eclipta platyglossa*	Eclipta	
	ASTERACEAE	*Enydra fluctuans*	Enydra	
	ASTERACEAE	*Epaltes australis*	Spreading Nut-heads	
	ASTERACEAE	*Euchiton sphaericus*		
	ASTERACEAE	*Gamochaeta americana*	Cudweed	i
	ASTERACEAE	*Hypochaeris radicata*	Catsear	i
	ASTERACEAE	*Lagenophora stipitata*	Bottle-daisy	
	ASTERACEAE	*Ozothamnus diosmifolius*	Tall Paperdaisy	
	ASTERACEAE	*Senecio madagascariensis*	Fireweed	i

	FAMILY	*Scientific Name*	*Common Name*	
	ASTERACEAE	*Senecio sp.*	Fireweed	
	ASTERACEAE	*Sigesbeckia orientalis*	Indian Weed	
	ASTERACEAE	*Sonchus oleraceus*	Common Sow-thistle	i
	ASTERACEAE	*Taraxacum officinale*	Dandelion	i
	ASTERACEAE	*Vernonia cinerea* var. *cinerea*	Vernonia	
	ASTERACEAE	*Xanthium occidentale*	Noogoora Burr	i
	CAMPANULACEAE	*Wahlenbergia gracilis*	Sprawling Bluebell	
	CASUARINACEAE	*Allocasuarina littoralis*	Black She-oak	
	CASUARINACEAE	*Casuarina glauca*	Swamp Oak	
	CLUSIACEAE	*Hypericum gramineum*	Narrow-leaf St. Johns Wort	
	CLUSIACEAE	*Hypericum japonicum*	Matted St. Johns Wort	
	CONVOLVULACEAE	*Dichondra repens*	Kidney Weed	
	CONVOLVULACEAE	*Polymeria calycina*	Woodland Bindweed	
	DILLENIACEAE	*Hibbertia dentata*	Twining Guinea-flower	
	DILLENIACEAE	*Hibbertia diffusa*	Prostrate Guinea-flower	
	DILLENIACEAE	*Hibbertia vestita*	Hairy Guinea-flower	
	DROSERACEAE	*Drosera peltata*	Rosette Sundew	
	ERICACEAE	*Epacris pulchella*	Coral Heath	
	ERICACEAE	*Leucopogon juniperinus*	Juniper Beard-heath	
	ERICACEAE	*Leucopogon melaleucoides*		
	ERICACEAE	*Melichrus procumbens*	Jam Tarts	
	ERICACEAE	*Monotoca scoparia*	Prickly Broom-heath	
	FABACEAE-CAESALPINIOIDEAE	*Senna septemtrionalis*	Cassia	i
	FABACEAE-FABOIDEAE	*Bossiaea rhombifolia*	Square-leaf Bossiaea	
	FABACEAE-FABOIDEAE	*Chamaecrista rotundifolia var. rotundifolia*		i
	FABACEAE-FABOIDEAE	*Daviesia ulicifolia*	Gorse Bitter-pea	
	FABACEAE-FABOIDEAE	*Desmodium gunnii*	Slender Tick Trefoil	
	FABACEAE-FABOIDEAE	*Desmodium rhytidophyllum*	Rusty Tick-trefoil	
	FABACEAE-FABOIDEAE	*Glycine clandestina* agg.	Twining Glycine	
	FABACEAE-FABOIDEAE	*Gompholobium pinnatum*	Pinnate Wedge-pea	
	FABACEAE-FABOIDEAE	*Jacksonia scoparia*	Dogwood	
	FABACEAE-FABOIDEAE	*Medicago sp.*	Medic	i
	FABACEAE-FABOIDEAE	*Phyllota grandiflora*	Heath Phyllota	
	FABACEAE-FABOIDEAE	*Pultenaea euchila*	Pale Bush-pea	
	FABACEAE-FABOIDEAE	*Pultenaea retusa*	Blunt-leaf Bush-pea	
	FABACEAE-FABOIDEAE	*Pultenaea paleacea*	Narrow-leaf Bush-pea	
	FABACEAE-FABOIDEAE	*Zornia dyctiocarpa var. dyctiocarpa*	Zornia	
	FABACEAE-MIMOSOIDEAE	*Acacia falcata*	Sickle Wattle	
	FABACEAE-MIMOSOIDEAE	*Acacia floribunda*	Sally Wattle	
	FABACEAE-MIMOSOIDEAE	*Acacia melanoxylon*	Blackwood	

	FAMILY	*Scientific Name*	*Common Name*	
	FABACEAE-MIMOSOIDEAE	*Acacia ulicifolia*	Prickly Moses	
	GOODENIACEAE	*Dampiera stricta*	Blue Dampieria	
	GOODENIACEAE	*Goodenia bellidifolia*	Goodenia	
	GOODENIACEAE	*Goodenia heterophylla*	Variable-leaf Goodenia	
	GOODENIACEAE	*Goodenia paniculata*	Panicled Goodenia	
	GOODENIACEAE	*Velleia spathulata*	Spoon-leaf Velleia	
	HALORAGACEAE	*Gonocarpus micranthus* subsp. *micranthus*	Creeping Raspwort	
	HALORAGACEAE	*Gonocarpus tetragynus*	Poverty Raspwort	
	HALORAGACEAE	*Haloragis heterophylla*	Variable Raspwort	
	LAMIACEAE	*Ajuga australis*	Austral Bugle	
	LAMIACEAE	*Plectranthus parviflorus*	Cockspur Flower	
	LAURACEAE	*Cassytha glabella*	Devils Twine	
	LAURACEAE	*Cassytha pubescens*	Devils Twine	
	LAURACEAE	*Cinnamomum camphora*	Camphor Laurel	i
	LENTIBULARIACEAE	*Utricularia caerulea*	Blue Bladderwort	
	LOBELIACEAE	*Lobelia alata*	Angled Lobelia	
	LOBELIACEAE	*Lobelia gracilis*	Trailing Lobelia	
	LOBELIACEAE	*Pratia purpurascens*	White Root	
	LOGANIACEAE	*Mitrasacme alsinoides*		
	LORANTHACEAE	*Amyema sp.*		
	MALVACEAE	*Sida rhombifolia*	Paddys Lucerene	i
	MENISPERMACEAE	*Stephania japonica*	Snake Vine	
	MENYANTHACEAE	*Nymphoides geminata*	Marshwort	
	MORACEAE	*Ficus rubiginosa ?*	Port Jackson Fig	
	MORACEAE	*Morus alba*	Mulberry	
	MYOPORACEAE	*Eremophila debilis*	Winter Apple	
	MYRTACEAE	*Angophora floribunda*	Rough-barked Apple	
	MYRTACEAE	*Angophora subvelutina*	Broad-leaved Apple	
	MYRTACEAE	*Angophora woodsiana*		
	MYRTACEAE	*Baeckea linifolia*	Weeping Baeckea	
	MYRTACEAE	*Callistemon salignus*	Willow Bottlebrush	
	MYRTACEAE	*Corymbia gummifera*	Red Bloodwood	
	MYRTACEAE	*Corymbia henryi*	Spotted Gum	
	MYRTACEAE	*Corymbia intermedia*	Pink Bloodwood	
	MYRTACEAE	*Eucalyptus amplifolia*	Cabbage Gum	
	MYRTACEAE	*Eucalyptus bancroftii*	Orange Gum	
	MYRTACEAE	*Eucalyptus crebra*	Narrow-leaf Ironbark	
	MYRTACEAE	*Eucalyptus fibrosa*	Broad-leaf Ironbark	
	MYRTACEAE	*Eucalyptus globoidea ?*	White Stringybark	
	MYRTACEAE	*Eucalyptus moluccana*	Grey Box	
	MYRTACEAE	*Eucalyptus propinqua*	Small-fruited Grey Gum	

	FAMILY	*Scientific Name*	*Common Name*	
	MYRTACEAE	*Eucalyptus resinifera* subsp. *hemilampra*	Red Mahogany	
	MYRTACEAE	*Eucalyptus seeana*	Narrow-leaved Red Gum	
	MYRTACEAE	*Eucalyptus siderophloia*	Northern Grey Ironbark	
	MYRTACEAE	*Eucalyptus signata*	Northern Scribbly Gum	
	MYRTACEAE	*Eucalyptus tereticornis*	Forest Red Gum	
	MYRTACEAE	*Eucalyptus tetrapleura*	Square-fruited Ironbark	
	MYRTACEAE	*Leptospermum polygalifolium*	Yellow Tea-tree	
	MYRTACEAE	*Leptospermum trinervium*	Flaky-bark Tea-tree	
	MYRTACEAE	*Lophostemon suaveolens*	Swamp Turpentine	
	MYRTACEAE	*Melaleuca alternifolia*	Oil Tea-tree	
	MYRTACEAE	*Melaleuca irbyana*		
	MYRTACEAE	*Melaleuca nodosa*	Ball Honey-myrtle	
	MYRTACEAE	*Melaleuca sieberi*	Sieber's Paperbark	
	MYRTACEAE	*Melaleuca thymifolia*	Thyme Paperbark	
	MYRTACEAE	*Sannantha similis*		
	OLEACEAE	*Notelaea longifolia*	Large Mock Olive	
	OXALIDACEAE	*Oxalis exilis*	Yellow Oxalis	
	PHYLLANTHACEAE	*Breynia oblongifolia*	Breynia	
	PHYLLANTHACEAE	*Glochidion ferdinandi var. ferdinandi*	Cheese Tree	
	PHYLLANTHACEAE	*Phyllanthus hirtellus*	Thyme Spurge	
	PHYLLANTHACEAE	*Phyllanthus virgatus*	Small-leaf Spurge	
	PHYLLANTHACEAE	*Phyllanthus sp.*		
	PHYLLANTHACEAE	*Poranthera microphylla*	Small Poranthera	
	PLANTAGINACEAE	*Plantago sp.*	Plantain	
	POLYGONACEAE	*Persicaria decipiens*	Slender Knotweed	
	POLYGONACEAE	*Rumex brownii*	Swamp Dock	
	PROTEACEAE	*Banksia oblongifolia*	Spoon-leaf Banksia	
	PROTEACEAE	*Banksia spinulosa* var. *spinulosa*		
	PROTEACEAE	*Grevillea humilis*	Linear-leaf Grevillea	
	PROTEACEAE	*Hakea laevipes* subsp. *laevipes*		
	PROTEACEAE	*Hakea salicifolia*	Willow Hakea	
	PROTEACEAE	*Lomatia silaifolia*	Crinkle Bush	
	PROTEACEAE	*Persoonia stradbrokensis*		
	RHAMNACEAE	*Alphitonia excelsa*	Red Ash	
	RUBIACEAE	*Opercularia aspera*	Common Stinkweed	
	RUBIACEAE	*Opercularia diphylla*	Stinkweed	
	RUBIACEAE	*Richardia brasiliensis*	Mexican Clover	i
	RUBIACEAE	*Richardia stellaris*		i
	SAPINDACEAE	*Dodonaea triquetra*	Hop Bush	
	SCROPHULARIACEAE	*Centranthera cochinchinensis*	Swamp Foxglove	t
	SCROPHULARIACEAE	*Hygrophila angustifolia*		

	FAMILY	*Scientific Name*	*Common Name*	
	SCROPHULARIACEAE	*Veronica plebeia*	Trailing Speedwell	
	SOLANACEAE	*Solanum nigrum*	Black Nightshade	i
	STACKHOUSIACEAE	*Stackhousia muricata*		
	STYLIDIACEAE	*Stylidium debile*	Frail Trigger Plant	
	THYMELEACEAE	*Pimelea linifolia* subsp. *linifolia*	Slender Rice Flower	
	VERBENACEAE	*Lantana camara*	Lantana	i
	VERBENACEAE	*Verbena bonariensis*	Purple Top	i
	VERBENACEAE	*Verbena rigidus*	Creeping Verbena	i
	VIOLACEAE	*Hybanthus stellarioides*		
	VITACEAE	*Cayratia clematidea*	Slender Grape	
Flowering Plants - Monocotyledons				
	ANTHERICACEAE	*Arthropodium milleflorum*	Vanilla Lily	
	ANTHERICACEAE	*Caesia parviflora var. parviflora*	Pale Grass-lily	
	ANTHERICACEAE	*Laxmannia gracilis*	Grass Wire-lily	
	ANTHERICACEAE	*Tricoryne elatior*	Yellow Rush-lily	
	COMMELINACEAE	*Commelina cyanea*	Scurvy Weed	
	COMMELINACEAE	*Murdannia graminea*	Grass Lily	
	CYPERACEAE	*Baumea articulata*	Jointed Twig-rush	
	CYPERACEAE	*Baumea juncea*	Slender Twig-rush	
	CYPERACEAE	*Baumea sp.*	A Twig-rush	
	CYPERACEAE	*Baumea teretifolia*	Wrinkle-nut Twig-rush	
	CYPERACEAE	*Carex inversa*	Knob Tassel-sedge	
	CYPERACEAE	*Cyperus brevifolius*	Mullumbimby Couch	i
	CYPERACEAE	*Cyperus flaccidus*	Lax Flat-sedge	
	CYPERACEAE	*Cyperus haspan subsp. haspan*		
	CYPERACEAE	*Cyperus polystachyos*	Bunchy Flat-sedge	
	CYPERACEAE	*Cyperus sp.*		
	CYPERACEAE	*Cyperus trinervis*		
	CYPERACEAE	*Eleocharis dietrichiana*	Spike-rush	
	CYPERACEAE	*Eleocharis gracilis*	Slender Spike-rush	
	CYPERACEAE	*Eleocharis philippinensis*		
	CYPERACEAE	*Eleocharis pusilla*	Small Spike-rush	
	CYPERACEAE	*Eleocharis sphacelata*	Tall Spike-rush	
	CYPERACEAE	*Fimbristylis cinnamometorum*		
	CYPERACEAE	*Fimbristylis dichotoma*	Common Fringe-rush	
	CYPERACEAE	*Fimbristylis tristachya*		
	CYPERACEAE	*Fuirena ciliaris*		
	CYPERACEAE	*Gahnia aspera*	Rough Saw-sedge	
	CYPERACEAE	*Lepidosperma laterale*	Variable Sword-sedge	
	CYPERACEAE	*Ptilothrix deusta*	Ptilanthelium	
	CYPERACEAE	*Schoenoplectus mucronatus*	Angled Club-rush	

	FAMILY	*Scientific Name*	*Common Name*	
	CYPERACEAE	*Schoenus apogon*	Common Bog-rush	
	CYPERACEAE	*Schoenus brevifolius*	Zig-zag Bog-rush	
	CYPERACEAE	*Scleria rugosa*		
	ERIOCAULACEAE	*Eriocaulon scariosum*	Common Pipewort	
	HAEMODORACEAE	*Haemodorum planifolium*	Bloodroot	
	IRIDACEAE	*Patersonia glabrata*	Cauline-leaf Purple-flag	
	IRIDACEAE	*Sisyrinchium* sp. A	Scourweed	i
	JUNCACEAE	*Juncus continuus*	Sand Rush	
	JUNCACEAE	*Juncus cognatus*	Rush	i
	JUNCACEAE	*Juncus polyanthemus*	Many-flowered Rush	
	JUNCACEAE	*Juncus prismatocarpus*	Branching Rush	
	JUNCACEAE	*Juncus* sp.		
	JUNCACEAE	*Juncus usitatus*	Common Rush	
	JUNCAGINACEAE	*Maundia triglochinoides*	Maundia	t
	JUNCAGINACEAE	*Triglochin procerum* sens. st.	Twisted Water Ribbons	
	LOMANDRACEAE	*Lomandra filiformis* subsp. *coriacea*	Wattle Mat-rush	
	LOMANDRACEAE	*Lomandra longifolia* subsp. *longifolia*	Spiny Mat-rush	
	LOMANDRACEAE	*Lomandra multiflora* subsp. *multiflora*	Many-flowered Mat-rush	
	LUZURIAGACEAE	*Eustrephus latifolius*	Wombat Berry	
	LUZURIAGACEAE	*Geitonoplesium cymosum*	Scrambling Lily	
	ORCHIDACEAE	*Arthrochilus prolixus*		r
	ORCHIDACEAE	*Chiloglottis trilabra*		
	ORCHIDACEAE	*Cryptostylis subulata*	Large Tongue-orchid	
	ORCHIDACEAE	*Cymbidium suave*	Snake Flower	
	ORCHIDACEAE	*Eriochilus cucullatus*	Parsons Band	
	ORCHIDACEAE	*Genoplesium sp.*	Midge Orchid	
	ORCHIDACEAE	*Pterostylis* sp.	Greenhood	
	PHILYDRACEAE	*Philydrum lanuginosum*	Frogsmouth	
	PHORMIACEAE	*Dianella caerulea* var. *caerulea*	Leafy Blue Flax Lily	
	PHORMIACEAE	*Dianella longifolia* var. *longifolia*	Long-leaf Flax Lily	
	PHORMIACEAE	*Dianella revoluta* var. *revoluta*	Black-anther Flax Lily	
	POACEAE	*Andropogon virginicus*	Whisky Grass	i
	POACEAE	*Aristida benthamii*	Three-awned spear grass	
	POACEAE	*Aristida vagans*	Three-awned Spear Grass	
	POACEAE	*Aristida warburgii*		
	POACEAE	*Austrodanthonia* sp.	Wallaby Grass	
	POACEAE	*Austrostipa pubescens*	Tall Spear Grass	
	POACEAE	*Axonopus fissifolius*	Narrow-leaved Carpet Grass	i
	POACEAE	*Bothriochloa macra*	Red-leg Grass	
	POACEAE	*Capillipedium spicigerum*	Scented-top Grass	
	POACEAE	*Chloris gayana*	Rhodes Grass	i

	FAMILY	*Scientific Name*	*Common Name*	
	POACEAE	*Chloris truncata*	Windmill Grass	
	POACEAE	*Chloris ventricosa*	Tall Windmill Grass	
	POACEAE	*Cymbopogon refractus*	Barbed Wire Grass	
	POACEAE	*Cynodon dactylon*	Common Couch	n
	POACEAE	*Dichelachne micrantha*	Short-hair Plume Grass	
	POACEAE	*Dichelachne rara*	Spreading Plume Grass	
	POACEAE	*Digitaria diffusa*	Open Summer-grass	
	POACEAE	*Digitaria parviflora*	Small-flower Finger Grass	
	POACEAE	*Echinopogon caespitosus*	Hedgehog Grass	
	POACEAE	*Echinopogon ovatus*	Hedgehog Grass	
	POACEAE	*Entolasia marginata*	Margined Panic	
	POACEAE	*Entolasia stricta*	Wiry Panic	
	POACEAE	*Eragrostis brownii*	Brown's Lovegrass	
	POACEAE	*Eragrostis cilianensis*	Stinkgrass	i
	POACEAE	*Eragrostis curvula*	African Lovegrass	i
	POACEAE	*Eragrostis leptostachya*	Paddock Lovegrass	
	POACEAE	*Imperata cylindrica*	Blady Grass	
	POACEAE	*Ischaemum australe var. australe*	Ischaemum	
	POACEAE	*Lachnagrostis filiformis*	Blown Grass	
	POACEAE	*Microlaena stipoides* var. *stipoides*	Weeping Grass	
	POACEAE	*Oplismenus aemulus*	Broad-leaf Beard-grass	
	POACEAE	*Oplismenus imbecillis*	Narrow-leaf Beard-grass	
	POACEAE	*Ottochloa gracillima*		
	POACEAE	*Panicum decompositum*	Native Millet	
	POACEAE	*Panicum simile*	Two-colour panic	
	POACEAE	*Paspalidium distans*	Paspalidium	
	POACEAE	*Paspalum dilatatum*	Paspalum	i
	POACEAE	*Paspalum notatum*	Bahia Grass	i
	POACEAE	*Paspalum orbiculare*	Ditch Millet	
	POACEAE	*Setaria gracilis*	Slender Pigeon Grass	i
	POACEAE	*Sporobolus africanus*	Parramatta Grass	i
	POACEAE	*Themeda australis*	Kangaroo Grass	
	POTAMOGETONACEAE	*Potamogeton tricarinatus*		
	RESTIONACEAE	*Lepyrodia scariosa*	Chaffy Scale-rush	
	XANTHORRHOEACEAE	*Xanthorrhoea fulva*	Northern Swamp Grass-tree	
	XYRIDACEAE	*Xyris complanata*	Flat Yellow-eye	
	XYRIDACEAE	*Xyris gracilis ?*	Slender Yellow-eye	

Appendix D. Opportunistic list of fauna on the property

Key to habitat codes used in Appendix D
SG – Spotted Gum dominated forests
SF– dry sandy forest
FF = floodplain forest
OG – open grassland / cleared

FAMILY					
Scientific Name	**Common Name**	**SG**	**SF**	**FF**	**OG**
BIRDS					
ANATIDAE					
Chenonetta jubata	Australian Wood Duck			■	
CHARADRIIDAE					
Vanellus miles	Masked Lapwing				■
COLUMBIDAE					
Phaps chalcoptera	Common Bronzewing	■			
Ocyphaps lophotes	Crested Pigeon	■			
Geopelia striata	Peaceful Dove	■	■		
CACATUIDAE					
Calyptorhynchus funereus	Yellow-tailed Black Cockatoo	■			
Cacatua roseicapilla	Galah		■		
Cacatua galerita	Sulphur-crested Cockatoo	■			
PSITTACIDAE					
Trichoglossus haematodus	Rainbow Lorikeet	■			
Trichoglossus chlorolepidotus	Scaly-breasted Lorikeet	■			
Glossopsitta concinna	Musk Lorikeet		■		
[t] *Glossopsitta pusilla*	[t] Little Lorikeet	■			
Platycerus eximius	Eastern Rosella	■			
CUCULIDAE					
Cacomantis flabelliformis	Fan-tailed Cuckoo	■			
Chrysococcyx lucidus	Shining Bronze-Cuckoo		■		
STRIGIDAE					
[t] *Ninox strenua*	[t] Powerful Owl			■	
HALCYONIDAE					
Dacelo novaeguineae	Laughing Kookaburra	■			
Todiramphus sancta	Sacred Kingfisher			■	
CLIMACTERIDAE					
[t] *Climacteris picumnus*	[t] Brown Treecreeper	■			
MALURIDAE					
Malurus cyaneus	Superb Fairy-wren	■	■		
Malurus melanocephalus	Red-backed Fairy Wren			■	
MONARCHIDAE					

FAMILY					
Scientific Name	**Common Name**	**SG**	**SF**	**FF**	**OG**
[m] *Myiagra cyanoleuca*	[m] Satin Flycatcher	■	■		
PARDALOTIDAE					
Pardalotus punctatus	Spotted Pardalote	■	■		
Pardalotus striatus	Striated Pardalote		■		
Gerygone olivacea	White-throated Gerygone	■			
Acanthiza pusilla	Brown Thornbill	■			
Acanthiza lineata	Striated Thornbill	■			
MELIPHAGIDAE					
Anthochaera carunculata	Red Wattlebird	■	■		
Anthochaera chrysoptera	Little Wattlebird		■		
Entomyzon cyanotis	Blue-faced Honeyeater	■	■		
Philemon corniculatus	Noisy Friarbird	■			
Manorina melanocephala	Noisy Miner	■			
Meliphaga lewinii	Lewin's Honeyeater				
Lichenostomus chrysops	Yellow-faced Honeyeater	■			
Lichenostomus fuscus	Fuscous Honeyeater	■			
Lichenostomus penicillatus	White-plumed Honeyeater	■			
[t] *Melithreptus gularis*	[t] Black-chinned Honeyeater				
Acanthorhynchus tenuirostris	Eastern Spinebill		■		
Myzomela sanguinolenta	Scarlet Honeyeater		■		
PETROICIDAE					
Microeca fascinans	Jacky Winter				■
Eopsaltria australis	Eastern Yellow Robin	■		■	
PACHYCEPHALIDAE					
Pachycephala pectoralis	Golden Whistler	■			
Pachycephala rufiventris	Rufous Whistler	■			
Colluricincla harmonica	Grey Shrike-thrush	■			
PODARGIDAE					
Podargus strigoides	Tawny Frogmouth	■			
DICRURIDAE					
Myiagra rubecula	Leaden Flycatcher		■		
Grallina cyanoleuca	Magpie-Lark	■			
Rhipidura fuliginosa	Grey Fantail	■			
Rhipidura leucophrys	Willie Wagtail	■			
CAMPEPHAGIDAE					
Coracina novaehollandiae	Black-faced Cuckoo-shrike	■	■		
ORIOLIDAE					

FAMILY					
Scientific Name	**Common Name**	**SG**	**SF**	**FF**	**OG**
Oriolus sagittatus	Olive-backed Oriole	■			
ARTAMIDAE					
Cracticus torquatus	Grey Butcherbird	■	■		■
Gymnorhina tibicen	Australian Magpie	■	■		■
Strepera graculina	Pied Currawong	■	■		■
CORVIDAE					
Corvus coronoides	Australian Raven	■			
Corvus orru	Toressian Crow	■	■		■
CORCORACIDAE					
Corcorax melanorhamphos	White-winged Chough		■		
PASSERIDAE					
Taeniophygia bichenovii	Double-barred Finch				■
Neochmia temporalis	Red-browed Firetail	■	■		
POMATOSTOMIDAE					
[t] *Pomatostomus temporalis*	[t] Grey-crowned babbler	■			
DICAEIDAE					
Dicaeum hirundinaceum	Mistletoebird	■	■		
HIRUNDINIDAE					
Hirundo neoxena	Welcome Swallow	■	■		
Hirundo nigricans	Tree Martin	■			
MAMMALS					
DASYUIRIDAE					
Antechinus flavipes	Yellow-footed Antechinus	■	■		
PERAMELIDAE					
Perameles nasuta	Long-nosed Bandicoot	■	■		
PHALANGERIDAE					
Trichosurus vulpecula	Common Brushtail Possum	■	■		
MACROPODIDAE					
Macropus giganteus	Eastern Grey Kangaroo	■			■
Macropus rufogriseus	Red-necked Wallaby	■	■		
Wallabia bicolor	Swamp Wallaby	■	■		
POTOROIDAE					
Aepyprymnus rufescens	[t] Rufous Bettong	■			■
CANIDAE					
* *Canis lupus familiaris*	* Dog				
* *Vulpes*	* Fox	■			■
CAPRINAE					

FAMILY					
Scientific Name	**Common Name**	**SG**	**SF**	**FF**	**OG**
* *Capra aegagrus hircus*	* Goat			■	
LEPORIDAE					
* *Oryctolagus cuniculus*	* Rabbit				
EQUIDAE					
* *Equus caballus*	* Horse				■
BOVIDAE					
* *Bos taurus*	* Cattle	■			■
REPTILES					
AGAMIDAE					
Amphibolurus muricatus	Jacky Lizard		■		
Pogona barbata	Bearded Dragon		■		
VARANIDAE					
Varanus varius	Lace Monitor		■		
SCINCIDAE					
Carlia folorium	A Rainbow-skink	■			
Eulamprus quoyii	Eastern Water Skink			■	
Lygisaurus foliorum	Tree-base Litter-skink	■			
ELAPIDAE					
Demansia psammophis	Yellow-faced Whip Snake			■	■
Hemiaspis signata	Marsh Snake			■	
Pseudechis porphyriacus	Red-bellied Black Snake			■	
PYTHONIDAE					
Morelia spilota	Diamond Python	■			
AMPHIBIANS					
MYOBATRACHIDAE					
Crinia parinsignifera	Eastern sign-bearing Frog			■	
Crinia signifera	Common Eastern Froglet			■	
HYLIDAE					
Litoria brevipalmata	Green-thighed Frog			■	
Litoria fallax	Eastern Dwarf Tree Frog			■	
Litoria lesueuri	Lesueur's Frog			■	
Litoria nasuta	Rocket Frog			■	

Appendix E. Research into the extent, population, genetics and the success of regeneration of habitat for the Square-fruited Ironbark

Methodology

Program1: Population, extent and genetics

There is currently limited information regarding the ecology, genetics, distribution and abundance of Square-fruited Ironbark. Building on current knowledge from studies conducted for the Glenugie upgrade the knowledge base for this species can be significantly increased with further research and analysis.

The current knowledge regarding the distribution and abundance of Square-fruited Ironbark has been obtained from the previous studies for the Glenugie upgrade. This includes data collected from numerous state forest and national parks surrounding Glenugie and Grafton.

In 2017, to satisfy MCoA 3(f), Roads and Maritime commissioned Royal Botanic Gardens and Domain Trust and John O'Donnell to expand on this existing data by investigating the extent and genetics of the species in other state forests and national parks, as well as private property where the species is known to occur.

The program included a range of tasks as described in the following sections.

Program 1: Tasks

Program 1 was divided into six key tasks. The tasks comprised:

- Task 1 – Literature review and experimental design
- Task 2 – Mapping the extent of the species
- Task 3 – Collection of genetic material and voucher specimens
- Task 4 – Genetic analysis
- Task 5 – Reporting and mapping of results

Task 1 – Literature review and experimental design	
Purpose+	A literature review of relevant information was undertaken including but not limited to technical papers, GIS data layers, consultant reports and government reports. From this information a robust experimental design was developed.
Inputs	▪ Relevant literature ▪ GIS data layers ▪ GIS software (ArcGIS)
Description	The purpose of this task was to understand the content of the existing information regarding the distribution, genetics and preferred habitat of *Eucalyptus tetrapleura,* and the experimental design which is most suitable for this study. Some of the information that was reviewed comprised: ▪ Technical papers regarding research into the genetic composition of Eucalyptus species ▪ Technical papers regarding research into the distribution and habitat preferences of closely related taxa ▪ GIS data layers including records of NSW BioNet and the Atlas of NSW Wildlife Databases ▪ Records published in scientific journals, reports and general flora distribution texts ▪ Results of local environmental studies, including studies prepared by consultants, local government authorities, biological organisations, universities and other sources. ▪ Discussions with personnel from NSW government departments including OEH and DPI (Forests NSW) and Coffs Harbour and Clarence Valley local councils ▪ Anecdotal reports from authorities and local ecologists / naturalists and local landowners From the literature review an experimental design was developed including: ▪ The hypothesis ▪ Aims and objectives

	▪ Stratification of the study area ▪ Areas to be targeted by the preliminary fieldwork ▪ Potential target populations for genetic analysis ▪ Other closely related Eucalyptus species (Ironbarks) to be included in the genetic analysis ▪ Any other relevant attributes
Outputs	▪ A good understanding of the existing information available and the experimental design of similar previous studies ▪ An outline of areas to be targeted by the preliminary fieldwork ▪ Confirmed timing, logistics and arrangements to conduct field surveys

Task 2 – Mapping the extent of the species	
Purpose	To assess and ground truth the extent of the Square-fruited Ironbark and the range of habitats including vegetation types, landscape position and soil types in which it occurs. From this field work a secondary aim was to identify potential candidate populations for genetic analysis, comprising populations occurring in different habitat and landscape positions, isolated populations and/or populations with unique morphological attributes.
Inputs	▪ Outputs from Task 1 ▪ Relevant GIS data layers and maps for fieldwork
Description	Field surveys were undertaken to ground truth existing spatial data for Square-fruited Ironbark. Modelled areas with potential suitable habitat attributes (soil landscapes) were surveyed for the species where possible. Where populations were identified a range of variables were recorded so they could be fed into the overall study including the genetic analysis. Additional to the habitat data collected rapid assessments of the population size and structure were undertaken using. This data provided an indication of the population sizes present which could be correlated to genetic data. Following field surveys preliminary maps and habitat descriptions were developed to be referred to in Task 3 to identify populations which are potentially genetically distinct.
Outputs	▪ Spatial data showing the extent of Square-fruited Ironbark across its distributional range ▪ A description of the habitats Square-fruited Ironbark occurs in ▪ Photographic records of habitats and populations ▪ A list of candidate populations for genetic analysis

Task 3 – Collection of genetic material and voucher specimens	
Purpose	To collect genetic material for analysis across the distributional range and habitat types that Square-fruited Ironbark occurs. Collect and preserve voucher specimens for assessment and comparison following the results of the genetic analysis.
Inputs	▪ Outputs from Task 1 and 2 ▪ Field survey equipment (GPS receivers, Trimble Yuma handheld GPS with Arpad software) ▪ A survey plan based on candidate populations identified in Task 2 ▪ Royal Botanic Gardens and Domain Trust herbarium facilities
Description	A total of 28 sites were sampled across the geographic range of the species, with up to 10 trees in each population being sampled. A minimum number of samples were also collected from closely related and co-occurring Ironbark species to provide some context with regard to the genetic analysis and relationships in the phylogeny group. Collection of genetic material is a relatively straight forward process comprising the collection of leaf material and placing into accurately labelled zip-lock bags. Collected samples were stored in the fridge until used in the laboratory for the genetic analysis. From each population voucher specimens were collected so these could be used as a reference following the results from the genetic analysis. The Royal Botanic Gardens and Domain Trust has an herbarium where the voucher specimens were correctly stored. Voucher specimens can be examined long after a study has been completed, enabling identifications to be reassessed particularly if there are taxonomic changes. A study design such as this one with potential taxonomic changes that is not documented by voucher specimens is of questionable validity. Best practice guidelines were followed for the collection and preservation of voucher specimens. Field data was collected using specifically designed proforma sheets to ensure all required environmental variables are recorded for the analysis.

Outputs	▪ Genetic samples (up to 200) ▪ Spatial data of locations where genetic samples were collected ▪ Voucher specimens of each population assessed ▪ Photographic records

Task 4 – Genetic analysis	
Purpose	To analyse the samples collected in Task 3 and determine any genetic variation between and within the populations assessed. Samples collected from Square-fruited Ironbark were also be compared with genetic samples taken from co-occurring and closely related Ironbark species
Inputs	▪ Outputs from Task 1, 2 and 3. ▪ Royal Botanic Gardens and Domain Trust facilities ▪ Analytical software
Description	The genetic analysis was undertaken by Diversity Arrays Technology Ltd Pty. The genetic analysis aimed to identify 'genetic markers' to be used in the main genetic analysis component. A genetic fingerprint of Square-fruited Ironbark was established and compared to other Ironbark taxa to assess potential phylogeny relationships. The genetic analysis assessed any potential differences between different populations of Square-fruited Ironbark as well as the degree of genetic variation within populations.
Outputs	Results of the genetic analysis including an assessment of the degree of variation between and within populations of Square-fruited Ironbark, and any relationships to other Ironbark species.

Task 5 – Reporting and mapping of results	
Purpose	Reports were developed to identify the background, methods, results and discussion of the project. Several maps were included in the report of various attributes related to the study.
Inputs	▪ Outputs from Task 1, 2, 3, 4 and 5 ▪ GIS software
Description	The reports were developed to summarise the background of the project, literature review, the methodologies employed during the study, the results of the population extent and genetics, detailed discussion of the results and a reference list and relevant raw data etc provided as appendices to the report. Detailed discussion of the results was provided including: ▪ Phylogeny relationships with other Ironbark species ▪ Genetic exchange between populations and likely pollination vectors ▪ Potential population size and distribution ▪ Conservation status ▪ Habitat requirements ▪ Potential threats. Maps were provided in the reports, including: ▪ The regional distribution of Square-fruited Ironbark ▪ Known populations and estimated sizes ▪ Habitat types ▪ The results of any significant revelations in the genetic analysis (i.e. potential subspecies, genetic exchange between populations) ▪ Photographs of selected populations and the range of habitats where Square-fruited Ironbark occurs
Outputs	▪ Two separate reports detailing the findings of habitat and population extent field surveys and genetic analysis.

Program 2: Habitat regeneration for Square-fruited Ironbark

Experimental design for habitat rehabilitation trials are well documented in the scientific literature. The objective of this part of the program was to assess revegetation trials across the Glenugie offset property where 70 hectares of habitat for Square-fruited Ironbark of equal or greater condition is to be rehabilitated.

Program 2: Tasks

The project has been divided into four key tasks. The tasks comprise:

- Task 1 – Literature review
- Task 2 – Site reconnaissance
- Task 3 – Treatment trials
- Task 4 – Monitoring, data collection, analysis and reporting

Task 1 – Literature Review	
Purpose	A review of available scientific literature was undertaken to refine the proposed approach to the treatment trials. This included determining the most effective approach to maximising the rehabilitation potential of the site while minimising site disturbance associated with rehabilitation.
Inputs	▪ Scientific literature ▪ OEH Bio Banking Assessment Methodology (DECC 2008) as potential monitoring protocol for assessing trends in site value condition. ▪ Background information
Description	A review of available scientific literature was undertaken to refine the proposed approach to the treatment trials.
Outputs	A methodology for undertaking the treatment trial and monitoring of rehabilitation effectiveness.

Task 2 - Site reconnaissance	
Purpose	To determine prior to treatment: ▪ The distribution of existing natural regeneration of square-fruited Ironbark for consideration in revegetation methods ▪ The distribution of other threatened flora species ▪ The condition of existing actual and potential Square-fruited Ironbark habitat.
Inputs	Background information ▪ Field survey equipment (Trimble Yuma handheld GPS with Arpad software) ▪ OEH Bio Banking Assessment Methodology (DECC 2008) as potential monitoring protocol for assessing trends in site value condition.
Description	Field surveys were undertaken by Jacobs to provide more detailed mapping of management units to identify and rank habitats in terms of their presumed potential for Square-fruited Ironbark rehabilitation. This was based on stratification of different habitats that support the species (i.e. slope habitats and floodplain habitats), mapping of the extent of natural regeneration at the site (including Square-fruited Ironbark and other canopy and mid-storey species). Management/rehabilitation zones were identified and mapped during these initial field surveys so that appropriate trial sites could be determined. Relevant GIS data layers and other information were uploaded onto field survey equipment (Trimble Yuma and/or Lexica handheld GPS with Arpad software) for reference and data capture during the field surveys. Proposed treatment trial sites were identified in the field, and their suitability confirmed. Treatment trial sites were delineated in the field as permanent one-hectare trial sites. Within each site a permanent monitoring plot of 50 x 20 metres was established and a baseline survey was undertaken to determine the site value condition. The methodology for the baseline survey followed the NSW Biobanking Assessment Methodology (2008) for comparison with established benchmarks for the relevant Biometric vegetation types in the study area. Ongoing monitoring of trial sites has and will be compared against the baseline survey to demonstrate habitat improvement.
Outputs	Preliminary mapping of: ▪ Baseline vegetation/habitat condition ▪ Potential rehabilitation zones/treatment zones ▪ Natural regeneration of Square-fruited Ironbark ▪ Trial sites for monitoring regeneration success

Task 3 Trial	
Purpose	To implement the treatment trials
Inputs	▪ Background information including maps of trial sites ▪ Inputs from literature review

Description	Treatment trial The scope of treatment trial and numbers of trial sites was refined based on the findings of the site investigations. To date, treatment trials have focused on assisted natural regeneration. This has included stock exclusion from regeneration areas and targeted weed control. As part of the Woolgoolga to Ballina Pacific Highway Upgrade program, seedlings have been planted in regeneration areas and will be managed and monitored through that project's conditions of approval and through the BSA which will cover the combined areas used as offsets for each individual project.
	An adaptive management approach has been applied based on treatments including the removal of weeds and, where required, light soil disturbance to trigger natural regeneration from the soil seed bank and natural expansion of the existing vegetation.
Outputs	▪ Establishment of treatment trial

Task 4 –Monitoring, data collection, analysis and reporting	
Purpose	To monitor and analyse Square-fruited Ironbark treatment trial plots to determine rehabilitation effectiveness
Inputs	▪ OEH Bio Banking Assessment Methodology (DECC 2008) as potential monitoring protocol for assessing trends in site value condition. ▪ Background information ▪ Field survey equipment (Trimble Yuma handheld GPS with Arpad software) ▪ Established scope for treatment trials
Description	Data collection and analysis Sites will be monitored periodically to determine habitat condition of treatment and control plots. Monitoring will include site value assessments following the NSW Biobanking Assessment Methodology (DECC 2008) in accordance with the BioBanking Operational Manual. To date, monitoring events have occurred in 2014, 2016 and 2017. Monitoring will continue for at least a further 2 years. Ongoing monitoring will be undertaken through the BSA within monitoring plots established as part of this trial. Landholders will be required to report annually including submission of a report that includes photographs and qualitative assessment of the regenerating habitat. Site value assessments The following parameters has and will be recorded at the treatment and control sites: ▪ Native plant species richness ▪ Native over-storey cover ▪ Native mid-storey cover ▪ Native ground cover attributes ▪ Number of trees with hollows ▪ Total length of fallen logs ▪ Exotic plant cover ▪ Over-storey regeneration The site value assessment has been recorded using BioBanking field data sheets (proforma) using the recommended BioBanking plot layout which consists of a 20 x 20 metre plot (0.04 ha) and a 50 metre line transect as shown in diagram below. Native canopy and mid-storey cover were visually estimated at 10 points along the 50-metre line transect and divided by 10 to provide an estimated project foliage cover for the plot. The projected foliage cover (%) of ground covers (native grasses, shrubs, other and exotic species), was calculated by recording their presence/absence at 50 points along the 50 metre line transect and dividing the total number of hits by 50. Data analysis The site value assessments have and will determine condition of treatment and control sites against recognised benchmarks in the DECC (2008) database using the Biobanking condition assessment methodology (Seidel and Briggs 2008). The plot data for each site attribute will be compared against the relevant benchmark for the dominant vegetation types, scored and then ranked. Over the first three years, monitoring has demonstrated an upward trend in site value toward the benchmark value. Monitoring period A minimum of three years of monitoring of treatment plots is recommended prior to any other active rehabilitation taking place across the broader 70-hectare Square-fruited Ironbark rehabilitation zone of the Glenugie offset site.

	The first year of treatments has been monitored approximately annually. Further surveys will be undertaken over the following two years. A final report outlining the full five-year monitoring period will be produced.
Outputs	▪ Map of trial sites. ▪ Monitoring reports outlining results of monitoring trials, details of any adaptive management actions and recommended actions for the following years. ▪ Final report after five years of monitoring outlining full results of treatment trials with recommended rehabilitation method for the Glenugie offset site.

Appendix F. Agency reviews and comments addressed

document review/comments sheet.

EPBC: 2009/5002 File Number: 2012/10281

Proponent: Roads and Maritime Services

Project/s: Upgrade of Pacific Highway between Franklins Road and Eight Mile Lane at Glenugie

Officer Reviewing: Manel Samarakoon Date Received: 28/8/12

Date comments provided: 19/9/12

Name of document reviewed: Pacific Highway Upgrade Glenugie, Biodiversity Offset Strategy, DRAFT May 2012.

Section/Heading/Page Reference	DSEWPaC Comment	Proponent Response
Page 2 section 1.1	Identifies the location of the offset site relative to the action site and states that this satisfies the approval condition requirements 3(e) and 3(h). It would be useful to provide a brief outline of how the offset site satisfies the requirements under approval condition 3(a), 3(b) and 3(g) in this paragraph.	The suggested information relating to how the offset site satisfies the requirements under approval condition 3(a), 3(b) and 3(g) will be added to this paragraph. The information relating to the 3(a), 3(b) and 3(g) is detailed in Section 1.3 and also in Sections 3.6.1 and Section 4, whereas condition requirements 3(e) and 3(h) are satisfied merely by the location of the offset site rather than being related to biological factors.

Page 6 Section 2.1	States that detailed field assessments were undertaken during 12-16 March 2012. Please provide the results of these surveys as an attachment to the report with a reference included in this paragraph. Appendices C and D to the report are titled opportunistic list of flora on the offset site and opportunistic fauna on the offset site. Are these the results of the preliminary field survey of the offset site conducted from 29 March to 1 April 2010? Or the general flora and fauna survey referred to under section 2.3 dot point 1 on page 6?	A sentence will be added to the paragraph above Section 2.1 to include: "The results of the field surveys are presented in Section 3." Results of field surveys are provided in section 3 of the strategy including vegetation mapping, vegetation condition, mapping of Square-fruited Ironbark and other threatened species. Opportunistic lists were obtained from both field trips in 2010 and 2012 and include the results of both of these combined into a single table each for flora and fauna.
Page 14, Section 3.3 and	States that the Square-fruited Ironbark (Eucalyptus tetrapleura) is found in the understorey of a 52ha Sub –tropical Coastal Floodplain Forest (SCFF) ecological community within the offset site. This ecological community does not form one of the Biometric vegetation types and is not shown in any of the figures. Additionally, none of the Biometric Vegetation types as listed in Table 3-1 appears to contain E. tetrapleura either as dominant or main associated species. If this is the case, how does the offset site satisfy the approval condition 3(a)?	This section is describing the threatened ecological communities (TEC) on the site, of which there is only one identified, which is the Sub-tropical Coastal Floodplain Forest of the NSW North Coast Bioregion (SCFF). This threatened community is state listed. The biometric types (which are used throughout the report and maps) have been identified based on the categories provided in the NSW OEH biometric database. There are two biometric vegetation types which have the species composition and distribution to meet the requirements for the listed TEC. These biometric vegetation types comprise the Narrow-leaved Red Gum woodlands of the lowlands of the North

		Coast; and Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the North Coast. The locations of these two biometric types (which comprise the single state listed threatened ecological community) are displayed in Figure 3-2. Reference to this figure explaining this will be added. The second paragraph in this section states that the dominant canopy species for the SCFF (state-listed TEC) varies throughout the study area. It explains that the Square-fruited Ironbark (Eucalyptus tetrapleura) is in areas as a dominant canopy species and often occurs with a dense Paperbark (Melaleuca spp.) understorey within these two biometric types located in the study area. These are observations from the field investigation in the study area of the dominant species in these 2 biometric vegetation types. This has been reworded in the report to make it clearer. Table 3-1 describes the biometric types according to the biometric database and reference to title which has been added to make it clear. The dominant and understorey species have been taken directly from the database. No

		biometric type in the entire Northern Rivers CMA region has been identified as supporting Square-fruited Ironbark (Eucalyptus tetrapleura) in the biometric database, yet its distribution exists on the study site.
Page 48, Figure 4-4	Figure 4-1 identifies an area of 110 ha as the E. tetrapleura offset area. Majority of this area, according to Figure 3-2 consists of Spotted Gum-Grey Box- Grey Ironbark forest of the Clarence Valley lowlands of the North Coast. The report does not provide sufficient information to justify this area to contain 110 ha of E. tetrapleura habitat which is equal or greater quality to that removed for the Pacific Highway Upgrade and Glenugie although Tables 4-2 & 4-4 identify the area as of high condition. Table 4-1 refers to E. tetrapleura area as 112ha? Should this be 110ha?	E.tetrapleura is distributed throughout several vegetation communities on the offset site as stated in Section 3.4 and 3.6 and as confirmed from the field observation has been identified as not associated with one specific vegetation/habitat type. The location of the 110 ha of E.tetrapleura depicted in Figure 4-1 is occupied by E.tetrapleura as evidenced by field surveys and mirrors the distribution in Figure 3-3. The strategy has been updated to include additional information regarding vegetation condition of the offset site and impact site according to condition ratings for the biobanking methodology. Both sites are generally in high condition with higher condition scores recorded on the offset site in areas of intact vegetation. Although this area of 110 ha of E.tetrapleura does support several small areas of moderate condition vegetation it is expected that the average condition score

		is likely to be similar or greater than the vegetation condition scores recorded at the impact site. Updated information on Eucalyptus tetrapleura is shown in Table 3-3 and includes 236 ha of high condition occupied habitat and 54 ha of low condition occupied habitat. This equates to a total of 290 ha of habitat containing Eucalyptus tetrapleura over the entire property, from this, and suitable cleared land,180 ha has been identified as the offset, accounting for 110 ha offset and 70 ha revegetation area.
Table 3-3 Figure 3-4. Figure 3-5 Figure 3-7.	Figure 4-1 identifies 70 ha as E. tetrapleura rehabilitation area. This area is identified in Figure 3-2 as comprising of low-cleared areas with scattered trees comprising of the Spotted Gum – Grey Ironbark-Pink Bloodwood open forest. However comparison of this information with condition information in Table 3-3 suggests that there is only about 58 ha of the Spotted Gum –Grey Ironbark- Pink Bloodwood open forest identified as in low condition and 18 ha in moderate condition. How does this satisfy the approval condition 3 (b)?	E.tetrapleura is not confined to one vegetation type and was recorded in all the biometric types located on the offset site. The biometric types do not provide an indication of the potential habitat for E.tetrapleura which needs to be considered in the context of all vegetation types containing this species. The distribution of Eucalyptus tetrapleura on the property is shown on Figure 3-4. The areas on the Roads and Maritime property identified as occupied low condition habitat for Eucalyptus tetrapleura comprise 54 hectares where individuals were recorded in partially cleared land and 101 hectares of unoccupied low condition

		habitat where much of this area is considered to previously have supported Eucalyptus tetrapleura prior to be being cleared. From this, an area of 70 hectares, comprising 54 ha of occupied and 16 ha of unoccupied low condition habitat was identified, as shown on Figure 4-1 which is regarded as being highly suitable for revegetation of Eucalyptus tetrapleura and therefore included in the offset area. Low condition vegetation has been identified for the rehabilitation area which is also shown in Figure 3-4, with the existing extent of E.tetrapleura overlaid.
Page 23, Table 3-5	The information provided in this table is ambiguous in relation to distribution of E. tetrapleura. It appears to assume that E. tetrapleura is distributed throughout the offset site rather than it is limited or associated with the Spotted Gum – Grey Ironbark-Pink Bloodwood open forest as suggested by information elsewhere in the report. Further information needs to be provided to clarify the distribution of E. tetrapleura within the offset site.	The ground-truthed distribution of E.tetrapleura is provided in Figure 3-4. E.tetrapleura was observed in various densities in the polygon areas in Figure 3-4, including high, mod and low (partially cleared) condition vegetation. E. tetrapleura is not limited to, or only associated with the Spotted Gum – Grey Ironbark-Pink Bloodwood open forest; it is distributed throughout the offset site, as described in Table 3-4 and shown on Figure 3-6.
Page 29	Information refers to Dry Sandy Forest and unspecified Spotted Gum Ironbark Forests, as	These are descriptions of habitat types for fauna species and have combined

	supporting E. tetrapleura within the Offset site. Sandy Forest is not one of the Biometric vegetation types identified previously in the report. It is also confusing the reference to the two Spotted Gum Ironbark Forests as a single unit supporting E. tetrapleura.	biometric types with similar fauna habitat attributes so these can be described more easily. Table 3-6 also identifies the relevant biometric types which are included in each fauna habitat type. E.tetrapleura occurs throughout all biometric types and hence all fauna habitat types as well.
Pages 31-32	Information suggests that the presence of none of the 3 fauna species identified under approval condition 3 (g) were confirmed. Have any surveys been undertaken to determine the presence of these species?	The potential presence of the fauna species identified under approval condition 3(g) have been determined from known and documented preferred habitat requirements for each species and known distribution of each species. This was a similar approach taken for the Glenugie upgrade impact assessment. Only the Grey-headed Flying-fox was confirmed from the impact area whilst the other 3 species were assumed to occur. The field surveys identifies that the offset site supports the same biometric vegetation types and habitat types as the impact area and are in a higher condition according to the biobanking scores.
Pages 27 & 28	States that the offset area consists of 112 ha of E. tetrapleura equivalent ecological attributes. It is	Updated information on Eucalyptus tetrapleura is shown in Table 3-3 and

	unclear how the 112 ha calculation was arrived at. Similarly the values provided in Table 4-2 under 3(a) needs clarification. Is 112 ha correct? Or should this be 110ha?	includes 236 ha of high condition habitat and 54 ha of low condition habitat. This equates to a total of 290 ha of habitat containing Eucalyptus tetrapleura over the entire property, from this 180 ha has been identified as the offset, accounting for 110 ha offset and 70 ha revegetation area.
Page 39	3(i) is incomplete	To ensure in perpetuity conservation of the site, Roads and Maritime propose to protect the offset area via a BSA under the BC Act. Current and future landholders will be required to manage the site in accordance with the BSA in perpetuity and OEH will be responsible for ensuring compliance with the agreement.
Page 39	3 (j) and 3 (k) are also incomplete. The approval requires the Offset Strategy to include commitments to ongoing management of the offset site and key milestones, performance indicators and timeframes.	Section 5 of the report outlines the proposed management framework for the offset area. Key milestones, performance indicators, corrective actions and timeframes are outlined in this strategy (refer to Section 4.7). Further details regarding rehabilitation and management work on the property would be detailed in a Management Action Plan once the proposed management and covenant configuration of the Roads and Maritime property has been established.

Page 47	Of the 640 ha site identified for the offset, only 300ha have been identified as offset to satisfy the requirements for this project. Section 5 refers to a Property Management Plan for the entire property. This document is not included as part of the Biodiversity Offset Strategy submitted except for a broad outline of its proposed content. In the absence of details it is unclear how the overall property will be managed and in particular the relationship between the offset areas and residual areas, in particular any potential issues on offset areas as a result of forest management practices within the residual area. In general, the section on Offset site Management Plan does not satisfactorily address the requirements of approval condition 3(a), 3(j) and 3(k).	Section 5 provides an outline of management framework for the site. This section include details on all the issues to consider for the site, i.e. management of the offset area in association with cattle, fire management, weeds, feral animals, etc. Section 6 also includes specific management actions for Eucalyptus tetrapleura. In addition to this a Management Action Plan has been prepared as a separate document to support the application to set up the site as a Biodiversity Stewardship Agreement site. The commitments to ongoing management required under 3(j) and the milestones, timeframes and actions for all actions identified in the strategy required under 3(k) are included in Section 5 and 6 and also the separate management action plan.
Page 59- section 7.2	This paragraph states that the residual area could effectively contribute to compensate for other Pacific Highway projects including Woolgoolga to Ballina upgrade. In the absence of ecological information in relation to the impacted area by this future project and the residual area within the offset site, this statement appears to be unsubstantiated.	The statement regarding the potential for the residual area to be used to contribute to an offset for W2B has been confirmed and compared with the impact areas of the project. The site only provides a portion of the offsets required of W2B

		The intent is to identify that the property contains residual area with threatened species and may meet offset requirements for other Pacific Highway projects. The strategy includes ecological information for the residual area which is detailed in section 3, including threatened species distribution, vegetation types and vegetation condition, TECs etc. The information contained in the strategy can readily be used to assess the suitability of the area to contribute towards an offset for W2B, including any rehabilitation requirements in low condition areas.
Pages 54-59	Approval condition 3(f) does not appear to have been addressed in the report.	Refer Section 7 and Appendix E which adequately addresses condition 3(f).
Page 57	Table 6-1 only refers to the 70 ha site for restoration. This table does not adequately address the requirements under approval condition 3(k)	Section 6 is only about the 70 ha of land to be rehabilitated. Condition 3(k) is addressed in Section 4.7.
Pages 41- 59	Information suggests that the offset site will be managed by State Forest. If this is so, evidence will need to be provided to confirm that the offset area has been handed over to State Forest and their agreement for the long term management of the site. This must include the overall site (640ha) and address the management of the residual areas.	Roads and Maritime propose to establish an in-perpetuity BSA conservation covenant over the offset site under the BC Act. The agreement will be accompanied by a property specific Management Action Plan which documents the condition of the natural heritage values, provides management goals and recommendations,

	Please note that the varied approval condition 3 required the submission of the Biodiversity Offset Strategy by 13/3/2011. It is now overdue by 18 months. If the above information cannot be provided to the satisfaction of the department within a reasonable timeframe (4 weeks), we suggest that an alternate arrangement to ensure protection of the offset area, such as a covenant mechanism under a suitable NSW government legislation will need to be pursued. We understand that transfer of land into the reserve system into the adjoining national park has been rejected by the NSW authorities. Other available mechanisms may include Biodiversity Banking Agreements under the Threatened Species Conservation Act 1974 (NSW) or Trust agreements under the Nature Conservation Trust Act 2001 (NSW).	and is developed based on the principles of adaptive management. The Square-fruited Ironbark Revegetation Plan for 70 hectares of the site would be included as an annexure to the property management plan. Roads and Maritime will be responsible for implementing the revegetation plan whilst the property remains in Roads and Maritime ownership. The Roads and Maritime intends to on-sell the property at which point in time the future landholder will be responsible for permitting the continued implementation of the plan. It is likely that this will involve the landholder being required to permit Roads and Maritime and third-party contractors to access the site for the purposes of implementation, maintenance and monitoring of the revegetation plan. The BSA will include terms to permit the continued implementation of the revegetation plan to continue to be implemented.

DEWHA Comment (from Sylvana Maas)	
1. We need a clear map indicating which parts of the property will form part of the offset to be delivered against this project and which areas are being held for other projects or uses. It is worth noting that the area required to offset threatened fauna species is 120 ha (the document indicates 200 ha) and that it is additional to the area provided to offset impacts on the Ironbark. Attached is a copy of the approval decision letter and an attachment to it. The attachment (Response Summary) outlines this expectation. Could the map break up the offset area into three bits showing the 110 ha Ironbark offset, the 70ha rehab area and the 120 ha threatened fauna offset area? That way, if we go through another assessment where this property is used as an offset, we know which areas are already protected through this process.	1. Figure 4-1 provide a map of the areas of the site used as an offset for the Glenugie Upgrade, and residual portions of the site used to offset other projects
2. In terms of how the property is eventually protected our strong preference is obviously within a property managed by NSW National Parks. The second preference is within the State Forest estate.	2. Roads and Maritime propose to establish an in-perpetuity BSA conservation covenant over the offset site under the BC Act.
3. In terms of plans to revegetate the offset areas, ongoing management and conduct research we would like a commitment in this strategy that the plans developed to do this come back to the Minister (through us) for approval. The information you have provided in the document all sounds very positive but is not sufficiently developed to be approved at this stage. In taking this approach it will allow us to approve this strategy knowing that we will still have an opportunity to influence the content of these plans.	3. Section 6 of the strategy outlines the commitment to revegetation of the areas of habitat for the Square-fruited Ironbark. This commitment will be formalised in the formation of the BSA for this property, and funded under the agreement and total fund deposit set up by Roads and Maritime.
4. The strategy needs to include a table that commits to the delivery of the various aspects of the plan. This must include deadlines for the acquisition of the offset land, the transfer of the offset land to its eventual owner/manager and the submission of the various plans.	4. The key milestones for delivery of the BSA and site management actions is outlined in Section 4-7 (Table 4-4)

Department of the Environment and Energy	
EPBC Number	2009/5002
Project	Proposed Upgrade of the Pacific Highway between Franklins Road and Eight Mile Lane, Glenugie, NSW
Approval Holder	Roads and Maritime Services NSW
Name of document under review	Glenugie Upgrade Biodiversity Offset Strategy, Revision 5 dated 15 May 2019
Officer(s) reviewing	Zac Neulinger Katrina Cousins
Date issued to approval holder	July 2019

Condition	DOEE Review	Response by approval holder to comments/issues
Relevant Approval Conditions		
c. Details of revegetation work required to achieve requirements of condition 3(b). The works must be consistent with advice from a suitably qualified expert;	Section 6 of the BOS details a plan to achieve the regeneration of Square-fruited Ironbark for the 70 ha area required under Condition 3(b). It notes that, while the area has been cleared and appears to have had pasture grasses sown at some time in the past, a moderate diversity of native species remains, and the soil is in good condition, making the area a suitable location for revegetation. The site also appears to be undergoing a limited degree of natural regeneration, again increasing confidence in achieving appropriate outcomes via assisted natural regeneration.	Section 6 has been updated to amend any non-binding language and to reinforce commitments. To address the metrics of successful regeneration, further survey was conducted to quantify the natural density of Square-fruited Ironbark. The methods and results of this approach have been added as Appendix G. Essentially a plot-based survey was conducted that targeted the natural occurrence of Eucalyptus tetrapleura on the property. The aim of the survey was to determine the average density of the species across a range

Condition	DOEE Review	Response by approval holder to comments/issues
	The revegetation plan is written in non-binding language, using 'should' and 'would' in place of 'will' and 'must'. It also does not specify the metrics that will demonstrate appropriate vegetation quality has been achieved. Instead, possible methods are canvassed, with their levels of suitability for the site discussed, but the plan does not establish which methods will be used at what points to achieve which goals. The document also needs to demonstrate that it was prepared consistently with the advice of a suitably qualified expert. As the site will be subject to a BSA, the Department recognises that an enforceable management plan will be attached to the site and overseen by the NSW Government. However, the degree of revegetation required by those plans, and the quality metrics that must be achieved, vary significantly between sites, depending on the number of credits being generated from the site. Therefore, the Department considers it is reasonable to allow detailed prescriptions of actions to be left to the BSA management plan, but the BOS must still establish the key metrics and outcomes that will be achieved through management under	of topographic variation to identify natural density of the species. the intent was to use this data as a benchmark to measure the performance of natural regeneration of the species in revegetation areas. The Square-fruited Ironbark Revegetation Plan has been developed by suitably qualified experts, Peter Richards and Craig Harre of North Coast Aerial Mapping (NCAM) and Jacobs personnel (refer to Appendix G) in consultation with Roads and Maritime Services

Condition	DOEE Review	Response by approval holder to comments/issues
	the BSA arrangements, and include those metrics/outcomes as binding obligations. ACTION: Resubmit the plan with all objectives expressed as firm, measurable, and enforceable commitments, and all commitments using language such as 'must' and 'will' instead of 'should'. All commitments need associated timeframes for achievement, and must provide details of how achievement will be measured. Provide details in the resubmitted plan of the identity, qualifications, and experience of the suitably qualified expert whose advice was used in preparing the revegetation plan.	
i. The land referred to in condition 3(a), 3(b) and 3(g) must be protected by a legal instrument under relevant nature conservation legislation, that ensures the land is conserved in perpetuity;	As noted in Section 4.6 of the BOS, the majority of the >600 ha offset site will be placed under a Biodiversity Stewardship Agreement (BSA) under the Biodiversity Conservation Act 2016 (NSW). Figure 3.4 shows the areas that will be subject to the BSA, and those areas that will be excluded from it. 300 ha of the area under the BSA will be used to provide the offset for this project, with the remaining 270 ha to be used for a second RMS project, but managed under the same BSA.	Section 4.4 of the BOS has been updated to identify the commitment to establishing a BSA and enforceable management framework on the property. The management framework under a BSA is audited by the state Government (BCT). All ecosystem credits generated on the site will be retired by Roads and Maritime Services and will not be on-sold to avoid 'double-dipping'. The management action plan produced under the BSA outlines a clear timeframe for implementation over a 20-year management cycle. Further details on the management program are not outlined in

Condition	DOEE Review	Response by approval holder to comments/issues
	BSAs generate biodiversity credits that may be used to offset impacts from other projects, raising a risk of 'double-dipping'. The approval holder has committed to retire all credits from the offset site themselves as offset for this project and one other (already identified) project, which will use the offset provided by the remainder of this offset site. The Department is satisfied that a) using the remainder of the site to offset another identified project is potentially appropriate; and b) the commitment to retire credits without on-selling is sufficient to avoid 'double-dipping'. The Department is satisfied that a BSA is an extremely secure conservation instrument, and notes the instrument includes guaranteed funding arrangements and enforceable management standards. As noted regarding sub-conditions 3(c) and 3(k), the BOS does not currently provide sufficient commitments regarding the conservation outcomes that will be achieved, and the language is generally non-binding. This also applies to the BSA commitment. An enforceable timeline is needed for the establishment of the BSA. <u>ACTION:</u>	the BOS, but rather are referred to in the agreed management action plan.

Condition	DOEE Review	Response by approval holder to comments/issues
	Resubmit the BOS with enforceable commitments to establish the BSA, retire all credits, and implement the BSA, with clear, enforceable timeframes.	
k. The strategy must include key milestones, performance indicators, corrective actions and timeframes for the completion of all actions outlined in the strategy; and	As per comments against Condition 3(c), the Department considers binding commitments regarding outcomes are needed within the Revegetation Plan (Section 6). Those commitments will need to include timeframes to achieve the relevant outcomes. ACTION: Resubmit the BOS with clear, binding, enforceable commitments to achieve defined environmental outcomes. Those outcomes must have enforceable timeframes for achievement, and must specify how those achievements will be measured. Given the commitment to establish a BSA site, the Department is willing to consider a comparatively high degree of flexibility regarding the specific management actions to be taken, provided the outcomes are appropriately specified.	Table 6-1 on page 66 has been added to the BOS. This tables reflects the management action plan prepared and enforced under the BSA and summarises the proposed management actions, performance measures and corrective actions and timeframes for implementation.

Department of the Environment and Energy Review (February 2020)

EPBC Number	2009/5002
Project	Proposed Upgrade of the Pacific Highway between Franklins Road and Eight Mile Lane, Glenugie, NSW
Approval Holder	Roads and Maritime Services NSW
Name of document under review	Glenugie Upgrade Biodiversity Offset Strategy, Revision 7 dated 10 December 2019
Officer(s) reviewing	Hannah McFarlane Zac Neulinger Katrina Cousins
Date issued to approval holder	February 2020

Condition	DOEE Review	Response by approval holder to comments/issues
General comments	The Department is aware that efforts to secure this site as an offset have been on-going for a substantial period (since September 2010), with the security mechanism being one of the primary concerns. The Department considers that the proposed use of a Biodiversity Stewardship Agreement (BSA) is an appropriate security mechanism. However, some additional information and minor revisions are still required for the Biodiversity Offset Strategy (BOS) to meet conditions of approval, and to ensure that compliance with EPBC conditions will be verifiable and auditable (noting that the BSA will be subject to its own NSW audit processes).	
Relevant Approval Conditions		
3. The person taking the action must submit a Biodiversity Offset Strategy to the Minister for approval. The strategy must address the following requirements:	Met. Revision 5 of the BOS is to address previous Departmental comments, in particular to address concerns about the security of the proposed offset site.	
a. The acquisition and conservation of land containing a minimum of 110 ha of habitat for the Square-fruited Ironbark that is equal or greater quality to that removed for the Pacific Highway Upgrade at Glenugie;	Met. Section 3.6 and Table 3-9 demonstrate the offset site is dominated by extremely high quality native vegetation, greater than that removed, and containing substantial Square-fruited Ironbark. 110 ha of this vegetation will be used to satisfy condition 3(a) (the site is approximately 600 ha with 430 ha being 9/10 or 10/10 quality score).	

Condition	DOEE Review	Response by approval holder to comments/issues
b. The acquisition and conservation of land containing a minimum of 70 ha that will be revegetated to provide habitat for the Square-fruited Ironbark that is equal or greater quality to that removed for the Pacific Highway Upgrade at Glenugie;	Met. Section 3.10 notes that the offset site includes 54 ha of partially cleared land containing Square-fruited Ironbark, and 101 ha of fully-cleared former vegetated areas that likely would have contained Square-fruited Ironbark. Section 3.10 commits to revegetate 70 ha compromising parts of both the partially and fully cleared areas, so that they achieve the same or higher condition thresholds as at the impact site. The revegetation area is shown in Figure 3.4. The Department notes that the revegetation area abuts the BSA Exclusion Zone (where the landowner will be permitted to develop, construct a house, and/or work the land, as long as those actions do not impact the BSA area). The Department considers this is likely acceptable, provided that the BOS establishes clear, enforceable, and time-bound outcomes for the revegetation area (see comments on sub-conditions 3[c] and 3[k]).	
c. Details of revegetation work required to achieve requirements of condition 3(b). The works must be consistent with advice from a suitably qualified expert;	Not yet met. Section 6 of the BOS details a plan to achieve the regeneration of Square-fruited Ironbark for the 70 ha area required under Condition 3(b). It notes that, while the area has been cleared and appears to have had pasture grasses sown at some time in the past, a moderate diversity of native species remains, and the soil is in good condition, making the area a suitable location for revegetation. The site also appears to be undergoing a limited degree of natural regeneration,	

Condition	DOEE Review	Response by approval holder to comments/issues
	again increasing confidence in achieving appropriate outcomes via assisted natural regeneration. The revegetation plan has been written in binding language and specifies the metrics that will demonstrate appropriate vegetation quality has been achieved. The document demonstrates that it was prepared by a suitably qualified expert. As the site will be subject to a BSA, the Department recognises that an enforceable management plan will be attached to the site and overseen by the NSW Government. However, the degree of revegetation required by those plans, and the quality metrics that must be achieved, vary significantly between sites, depending on the number of credits being generated from the site. Therefore, the Department considers it is reasonable to allow detailed prescriptions of actions to be left to the BSA management plan, but the BOS must still establish the key metrics and outcomes that will be achieved through management under the BSA arrangements, and include those metrics/outcomes as binding obligations. <u>ACTION:</u> Thank you for providing the CVs of the team of suitably qualified experts whose advice was taken in preparation of this offset management plan. However, please do not append to the final – The Department is satisfied with the information, no further content needs to be added/replaced after the removal of the CVs (Appendix H). If you would like to add the names	Appendix H, which includes CVs of the ecologists will be removed from the final offset strategy.

Condition	DOEE Review	Response by approval holder to comments/issues
	of the team working on the project, a list of contributors on the page following the document's title page would be acceptable.	
d. The land referred to in condition 3(a) and 3(b) must provide linage between existing stands of Square-fruited Ironbark and/or be adjacent to existing stands of Square-fruited Ironbark;	Met. The Department has reviewed mapping both provided by the approval holder and available through Government databases. The maps confirm the proposed offset site is adjacent to the Glenugie State Forest, in a heavily vegetated area, and the Department understands that the surrounding vegetation contains Square-fruited Ironbark.	
e. The land referred to in condition 3(a) and 3(b) must be located within 100 km of the Pacific Highway Upgrade at Glenugie;	Met. Table 4-3 in Section 4.5 of the BOS notes that the offset site is approximately 2 km from the Highway Upgrade site.	
f. Research into the extent, population genetics and the success of regeneration of habitat for the Square-fruited Ironbark;	Met. Details of the research undertaken are provided in Section 7. The Department considers that the research staff and institute were appropriately qualified, and the research question was meaningful.	
g. The acquisition and conservation of land containing a minimum of 120 ha of habitat for the Large-eared Pied Bat, Grey-headed Flying-fox, Regent Honeyeater and Swift Parrot;	Met. Section 3.8 notes surveys observed a high diversity of native fauna species at the offset site. The surveys did not observe Grey-headed Flying-foxes, Large-eared Pied Bats, Regent Honeyeaters, or Swift Parrots on site, but confirmed that appropriate habitat was present, such that those species have a high potential to occur at the site. As those species are known to be	

Condition	DOEE Review	Response by approval holder to comments/issues
	highly mobile, the Department considers the presence of appropriate vegetation is sufficient to demonstrate foraging habitat, without requiring sightings of those species. Importantly, surveys found a high number of Large-leaved Spotted Gums (Corymbia henryi) and Forest Red Gum (Eucalyptus tereticornis). These are known preferred feed species for the fauna species and the high presence of them near to water sources (within 2 km) means the offset areas are likely to constitute habitat critical to the survival of the fauna species (with the possible exception of Large-eared Pied Bat, as there do not appear to be nearby sandstone cliffs). Regarding quantity, Table 4-2 confirms 120.6 ha of fauna habitat will be protected on the offset site for this project. There are additional areas of habitat present at the site, which the approval holder has indicated may be used to offset other projects, but the Department is satisfied the areas have been appropriately identified to ensure that no 'double dipping' occurs.	
h. The land referred to in condition 3(g) must be located within 50 km of Grafton and is in addition to that provided under condition 3(a).	Met. Section 1.3 of the BOS notes that the offset site is approximately 16 km from Grafton. This is also illustrated in Figure 1.1. While a single site will be used to provide the offsets required under both 3(a) and 3(g), that site contains over 600 ha of land of which 300 ha will be used to offset impacts from this project to ensure that the areas of offset required by	

Condition	DOEE Review	Response by approval holder to comments/issues
	this approval are cumulative, rather than overlapping.	
i. The land referred to in condition 3(a), 3(b) and 3(g) must be protected by a legal instrument under relevant nature conservation legislation, that ensures the land is conserved in perpetuity;	Not yet met. As noted in Section 4.6 of the BOS, the majority of the >600 ha offset site will be placed under a Biodiversity Stewardship Agreement (BSA) under the Biodiversity Conservation Act 2016 (NSW). Figure 3.4 shows the areas that will be subject to the BSA, and those areas that will be excluded from it. 300 ha of the area under the BSA will be used to provide the offset for this project, with the remaining 270 ha to be used for a second RMS project, but managed under the same BSA. BSAs generate biodiversity credits that may be used to offset impacts from other projects, raising a risk of 'double-dipping'. The approval holder has committed to retire all credits from the offset site themselves as offset for this project and one other (already identified) project, which will use the offset provided by the remainder of this offset site. The Department is satisfied that a) using the remainder of the site to offset another identified project is potentially appropriate; and b) the commitment to retire credits without on-selling is sufficient to avoid 'double-dipping'. The Department is satisfied that a BSA is an extremely secure conservation instrument, and notes the instrument includes guaranteed funding arrangements and enforceable management standards.	Report has been updated to address comments

Condition	DOEE Review	Response by approval holder to comments/issues
	In table 4-4 proposed dates are given for key milestone for strategy delivery. The wording of 'Proposed date' is generally non-binding. The dates shown in table 4-4 for milestones 2 and 5 are unclear. '12/24' could mean either '12 to 24' or '12 or 24'. In either case, such framing is not sufficiently binding. The Department needs timeframes for deliverables to be expressed in unambiguous language. For example, 'the approval holder must complete [X] by no later than [DATE]' or 'the approval holder must commence [Y] by no later than [Z] months after [MILESTONE]'. As noted regarding sub-conditions 3(c) and 3(k), the BOS does not currently provide sufficient commitments regarding the conservation outcomes that will be achieved, and the language is generally non-binding. This also applies to the BSA commitment. An enforceable timeline is needed for the establishment of the BSA. <u>ACTION:</u> Resubmit the BOS with enforceable commitments to establish the BSA, retire all credits, and implement the BSA, with clear, enforceable timeframes. An acceptable commitment may be stated as 'All credits generated by the establishment of BSAs will be retired by Roads and Maritime Services, and not on-sold. That credit retirement will be used exclusively as an offset for this project, and not counted towards any offset obligations that may apply under either a New South Wales or Commonwealth approval	

Condition	DOEE Review	Response by approval holder to comments/issues
	(including a strategic assessment) for any project, or a statement of a similar nature. Amend the wording in table 4-4 to replace the title 'proposed date' with 'date to be achieved' or similar. Specify completion dates for key milestones (No.s 2 and 5) in table 4-4. AND Include a bind commitment regarding the timeframe for security of the offset. An example may be: 'The approval holder must submit all paperwork for the establishment of the BSA to the NSW Biodiversity Conservation Trust by no later than [DATE]' or similar. Include the following text in either section 4.6 or 4.7: 'All credits will be retired as soon as possible, and in any case within six months of the credits being generated and recorded in the credit register maintained by the NSW Biodiversity Conservation Trust.	'Proposed date' will be changed to 'Date to be achieved'. The timeframes for milestones 2 and 5 will be amended to be 'Within 12 months from approval of the Offset Strategy' The following commitment has been included into Table 4.4: 'TfNSW will submit the BSA application to the NSW Biodiversity Conservation Trust within 3 months of the approval of this strategy.' The following commitment has been included in Table 4.4: 'All ecosystem credits generated from the 300 ha Glenugie offset area will be retired within three months of the credits being generated and recorded in the credit register maintained by the NSW Biodiversity Conservation Trust.'

Condition	DOEE Review	Response by approval holder to comments/issues
j. The strategy must include commitments to ongoing management of the land referred to in condition 3(a), (b) and (g) in perpetuity;	Met. The Department is satisfied that BSAs provide appropriate protections and enforceable on-going management obligations.	
k. The strategy must include key milestones, performance indicators, corrective actions and timeframes for the completion of all actions outlined in the strategy; and	Met. As per comments against Condition 3(c), the Department considers binding commitments regarding outcomes are needed within the Revegetation Plan (Section 6). Those commitments will need to include timeframes to achieve the relevant outcomes. Table 6-1 outlines commitments to achieve defined environmental outcomes, with enforceable timeframes for achievement and specified measures for these achievements. Given the commitment to establish a BSA site, the Department is willing to consider a comparatively high degree of flexibility regarding the specific management actions to be taken, provided the outcomes are appropriately specified.	
l. The strategy must be developed in consultation with the Department.	Met. There is an extensive record of consultation between the approval holder and the Department to develop an appropriate offset management plan, particularly on ensuring that adequate 'protection in perpetuity' would be provided by the security mechanism.	

Condition	DOEE Review	Response by approval holder to comments/issues
The strategy must be submitted for approval by the Minister within eight months of the date of this approval.	Met. The first version of the BOS was submitted in September 2010, within the eight month deadline.	
The strategy must satisfy the Minister.	Not yet provided to the Minister. The BOS needs to be meet conditions of approval. This assessment table outlines the approval conditions that have not been met.	
The approved strategy must be implemented.	A strategy has not yet been approved.	
Additional content	Nil.	

Appendix G. Square-fruited Ironbark Monitoring 2019

RMS Biodiversity Offset Property, Sunnyside Road, Glenugie, NSW

Part 1: Monitoring regeneration of native vegetation and Square-fruited Ironbark Eucalyptus tetrapleura.

Part 2: Methods, outcomes and timeframes for ongoing monitoring of regeneration of native vegetation and Square-fruited Ironbark.

Report prepared for NSW Roads and Maritime Services
North Coast Aerial Mapping
Peter Richards and Craig Harré
September 2019

Contents

Title Page Images

Top: View of part of regeneration area on RMS offset property looking south towards Glenugie Peak (background). 17th September 2019. Photo by D. Brown.

Bottom: Regenerating native vegetation, including trees of Square-fruited Ironbark, at monitoring plot G7 on RMS offset property. 16th September 2019. Photo by P. Richards.

Figures

Tables

Acknowledgements

Thanks to Kylie Wells and Matt Stephens (RMS) for initiating this project and providing relevant information.

Introduction

Eucalyptus tetrapleura (Square-fruited Ironbark) is a medium to tall tree which occurs in lowland wet and dry sclerophyll forests, usually in areas of impeded drainage on Jurassic sandstones, between Kungala and Whiporie, with its main centre of distribution lying south of the Clarence River (OEH 2017; BioNet 2019) on the NSW north coast. Square-fruited Ironbark is listed as Vulnerable under the NSW BC Act and the Commonwealth EPBC Act.

As part of the process of offsetting biodiversity impacts resulting from construction of the Glenugie section of the Pacific Highway Upgrade, including impacts upon Square-fruited Ironbark and its habitat, NSW Roads and Maritime Services (RMS) purchased a property adjoining the eastern boundary of Glenugie State Forest and south of Sunnyside Road at Glenugie, south-east of Grafton (the study area, Figure 1).

In its Biodiversity Offset Strategy (BOS) for the study area, Jacobs (2019) describes the establishment and measurement of monitoring plots in the study area in 2014, in accordance with approval conditions issued by the Australian Department of Environment and Energy (DoEE). Those plots (labelled G1 to G8, Figure 1) were installed in previously cleared areas where recruitment of Square-fruited Ironbark and regeneration of native vegetation has been occurring since those parts of the property were de-stocked. NCAM (2017) describes the re-measurement of the monitoring plots and discusses the recorded changes in vegetation condition and diversity, including recruitment of Square-fruited Ironbark plants, since 2014.

NCAM has again been engaged by RMS to re-measure the plots to monitor the natural regeneration of native vegetation and recruitment of Square-fruited Ironbark in comparison to the previous survey undertaken in October 2017. This task is described in Part 1 of this report.

RMS has also requested that NCAM provide specific, expert advice regarding DoEE requirements for meeting conditions 3c and 3k of its approval. This task is described in detail and addressed in Part 2 of this report.

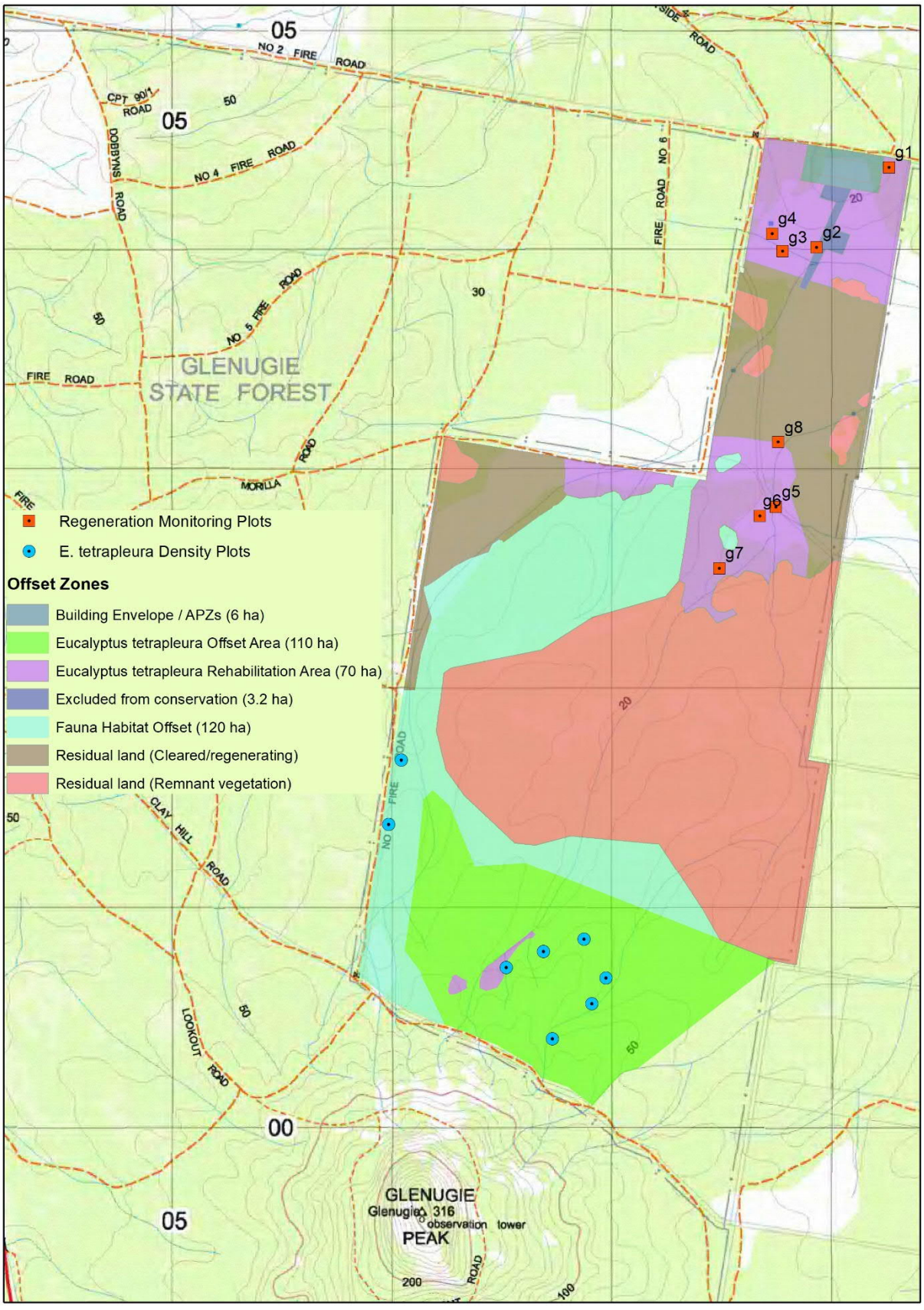


Figure 1: The Glenugie offset property showing the location of regeneration monitoring plots and Eucalyptus tetrapleura density plots.

Part 1 – Monitoring native vegetation and Square-fruited Ironbark regeneration

Methods

Plot layout

Coordinates and maps of the location of monitoring plots were provided by RMS. Hand-held GPS and photographs were used to navigate to, and orient, the plots. Methodology followed that described in Jacobs (2019). Briefly, a 50m transect was run out from the start point. A 20m by 20m quadrat was established from the start point, with the 50m transect running through its centre. Floristic diversity and regeneration was assessed within the 20m by 20m quadrat, and native/exotic percentage groundcover was assessed along the 50m transect.

Limitations

Plot markers had been removed after the plots were originally established, and only start point coordinates were obtained for the plots. It is probable, therefore, that some of the plots were not perfectly aligned with their original placement (photographs taken during initial plot installation and the 2017 surveys greatly assisted in transect orientation). In addition to discrepancies due to plot misalignment, the floristic diversity and cover scores are highly likely to vary in response to seasonal factors. For instance, the 2017 survey and the present survey were carried out after extremely dry and warm winters, although some rain had fallen prior to the 2017 work. Many groundcover species, particularly those favouring moist conditions, were absent in the present survey and many grasses had either failed to flower or had died back, making positive identification difficult in some cases.

Results

Appendix 1 provides the full results of the current survey, along with the results obtained by Jacobs in 2014 and NCAM in 2017. Photographs of the monitoring plots (from 2017 and the present survey) are provided in

Natural Regeneration

Figure 2 below provides a graphical representation of the mean comparative scores achieved for each regeneration feature measured during the 2014, 2017 and present surveys. Overall, the scores recorded during the current survey are comparable to those recorded previously, apart from a significant decline in the mean percentage cover of exotic species recorded in the present study.

Square-fruited Ironbark

The mean number of Square-fruited Ironbark plants per plot (30 plants) remained the same as the previous survey (Figure 2) although this species was recorded for the first time in plot G1 (Figure 3). Square-fruited Ironbark increased in numbers in five plots, including a substantial increase in plot G4, and decreased in numbers in three plots, with a significant decrease in plot G3 (Figure 3).

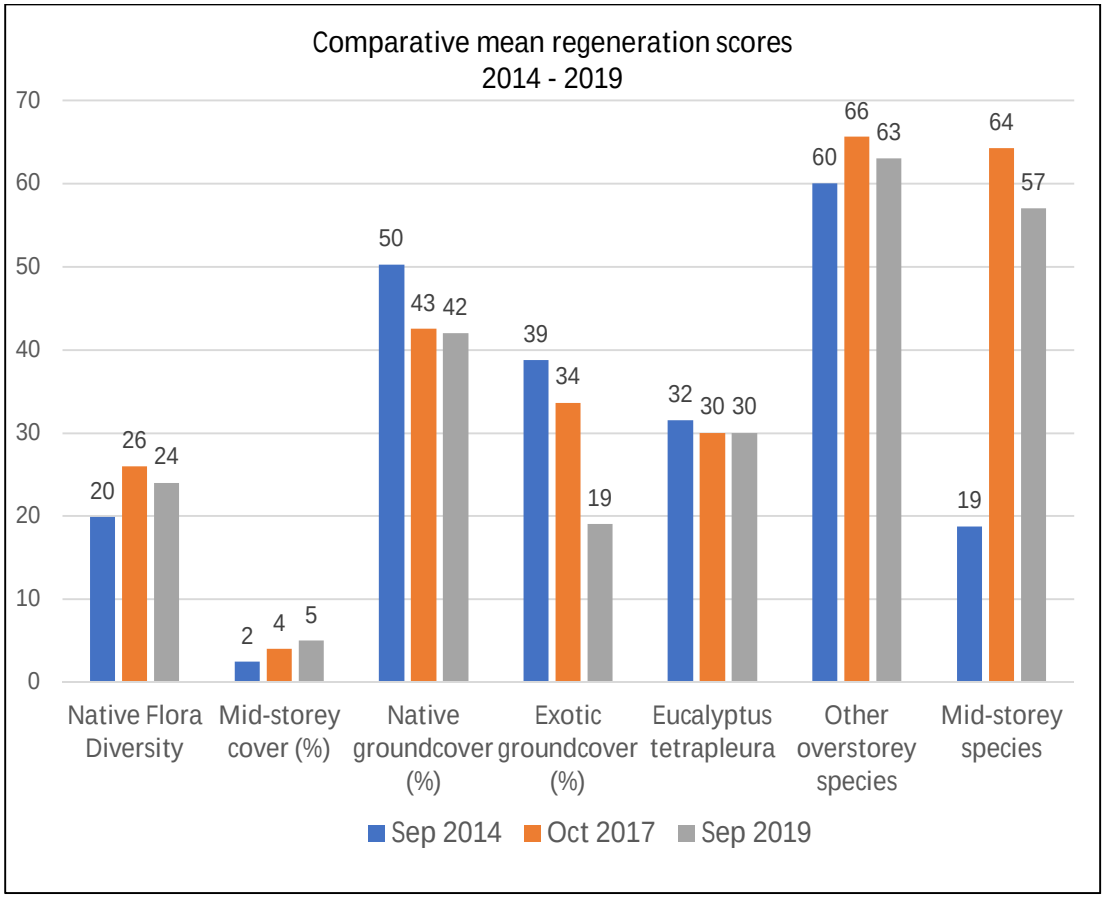


Figure 2: Bar-chart representation of comparative mean regeneration scores for 2014, 2017 and 2019 surveys.

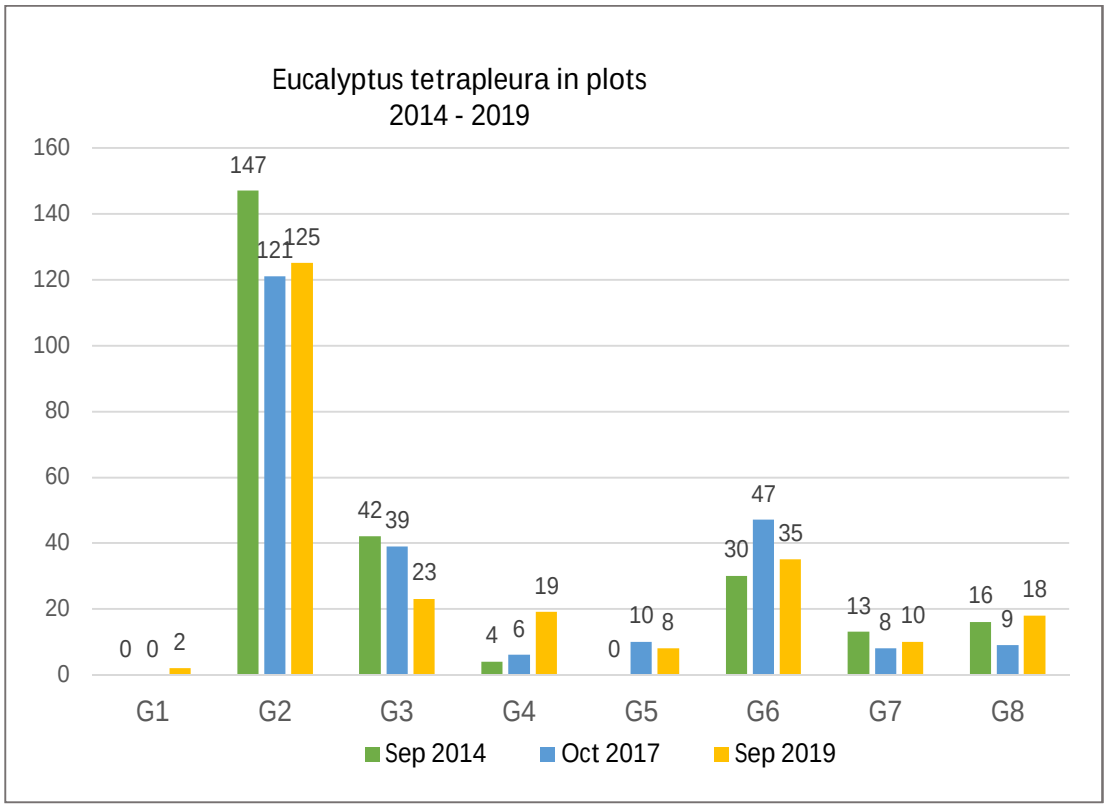


Figure 3: Comparison of Square-fruited Ironbark counts in plots for 2014, 2017 and 2019.

Discussion

It is of interest to note that mean native floristic diversity, although slightly lower than in 2017, still exceeds the mean diversity recorded in the initial survey in 2014. This, along with a recorded decline in percentage cover of exotic groundcover, indicates that, despite the exceedingly dry conditions experienced in recent years, natural regeneration is progressing in the previously cleared areas. The current mean native flora diversity of 24 species represents 80% of the benchmark diversity for the equivalent native vegetation type in good condition (DoPIE 2019). As discussed in the previous report (NCAM 2017), the exclusion of cattle from rehabilitation areas is probably responsible, in part, for an increase in both the diversity of the ground layer and the number and percentage cover of mid-storey species in plots (Figure 2).

Regeneration results for the present study would most likely have been better than recorded but for the presence of numerous feral horses in the southern rehabilitation area where plots G5, G6 and G7 are located (Figure 1). Native groundcover was lower at these plots than that recorded at other plots, apart from G8 which is cattle-affected (Appendix 1). Observations during the present survey suggest that the horses are frequently on this part of the property and are being periodically rounded up for sale by a local landholder. This situation requires rectification if satisfactory regeneration of native vegetation in the southern rehabilitation area is to be achieved. Exclusion fencing along the boundaries of all rehabilitation areas should be installed or repaired, and feral horses and stray livestock excluded from those areas.

Part 2 – Methods, outcomes and timeframes for ongoing monitoring of regeneration of native vegetation and Square-fruited Ironbark

Background

As mentioned above, NCAM has been engaged by RMS to provide specific, expert advice regarding DoEE requirements for meeting conditions 3c and 3k of its approval (Figure 4).

3(b)	*The acquisition and conservation of land containing a minimum of 70 hectares that will be revegetated to provide habitat for the Square-fruited Ironbark that is equal or greater quality to that removed for the Pacific Highway Upgrade at Glenugie*
3(c)	*Details of revegetation work required to achieve the requirements of conditions 3(b). The works must be consistent with advice from a suitably qualified expert;*
3(k)	*The strategy must include key milestones, performance indicators, corrective actions and timeframes for the completion of all actions outlined in the strategy.*

Figure 4: DoEE approval conditions 3(c) and 3(k) provided to RMS (condition 3(b) included for context).

In its review of the Glenugie BOS (Jacobs 2019), DoEE specified that RMS must:

1. '[Provide to DoEE] details of the identity, qualifications and experience of the suitably qualified expert/s whose advice was used in preparing the revegetation plan', and

2. 'Recommend firm, measurable and enforceable commitments aimed at achieving defined environmental outcomes [in this case, successful regeneration of native vegetation and Square-Fruited Ironbark]. Those outcomes must have enforceable timeframes for achievement and must specify how those achievements will be measured.'

To address requirement 1, the identity, qualifications and experience of the experts providing advice to RMS are provided in Appendix 3 of this report. The Methods section below describes how DoEE requirement 2 has been addressed.

Methods

Review of Glenugie BOS

To address DoEE requirement 2, NCAM reviewed the Glenugie BOS (Jacobs 2019), focussing on proposed revegetation and monitoring methodologies, key milestones, and timeframes in the Square-fruited Ironbark Revegetation Plan described in Chapter 6.

Square-fruited Ironbark Stocking Rate

One benchmark measure missing from the current BOS monitoring methodology was a mean stocking rate, or density, of Square-fruited Ironbark in good condition native vegetation (see results section below). This information would provide a benchmark against which the regeneration of Square-fruited Ironbark in the rehabilitation areas could be assessed over time. To obtain these data, NCAM traversed the southern, forested section of the Glenugie property and measured, in eight standard 400m^2 plots, the number of Square-fruited Ironbark plants in 3 age/size classes (juvenile <5cm dbh; sapling >5cm <15cm dbh; adult >15cm dbh). The density plots (Figure 1) were located within the Square-fruited Ironbark Offset Area (six plots) or in good condition Spotted Gum – Grey Ironbark – Pink Bloodwood open forest (two plots).

Results

Review of Glenugie BOS

Review of the Glenugie BOS, coupled with the authors' field knowledge of the current status of regeneration in the rehabilitation areas (NCAM 2017, Part 1 of this report), has resulted in a set of recommendations aimed at addressing DoEE conditions with regard to environmental objectives, metrics for measurement of progress, and timeframes for achievement of objectives. These recommendations are provided below in the Discussion and Recommendations section of this report.

Square-fruited Ironbark Stocking Rate

Stem density plots in good condition native vegetation ranged from 4 to 22 (mean = 14) stems of Square-fruited Ironbark per 400m^2 plot, with stem numbers tending to decline with age (dbh) (Table 1, Figure 5Error! Reference source not found.). Juvenile plant numbers varied from zero to 12 per plot, saplings from 1 to 7 plants and adults from 1 to 5 plants.

Table 1: Data collected at Square-fruited Ironbark stem density plots.

Plot	Easting	Northing	Juveniles (< 5cm dbh)	Saplings (>5cm <15cm dbh)	Adults (> 15cm dbh)	Total no. stems per quadrat	Total no. stems per hectare
1	506042	6701673	0	3	1	4	100
2	505985	6701380	12	7	3	22	550
3	506730	6700403	8	7	4	19	475
4	506909	6700561	5	1	3	9	225
5	506973	6700679	9	2	3	14	350
6	506875	6700855	6	7	5	18	450
7	506688	6700798	9	2	3	14	350
8	506519	6700727	3	2	4	9	225
		Mean	7	4	3	14	341

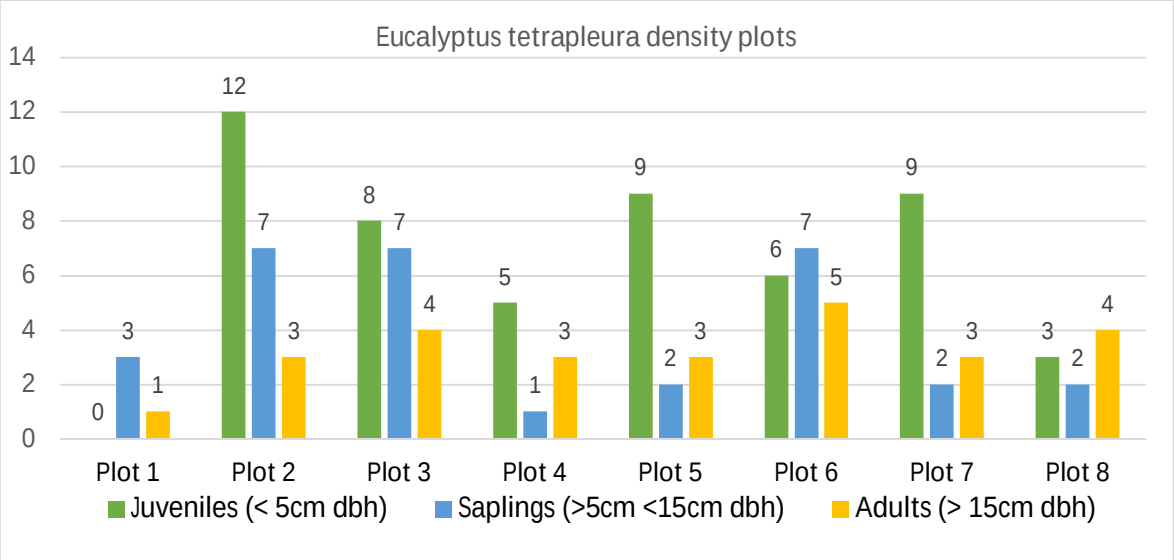


Figure 5: Results for Square-fruited Ironbark Density Plots by age (dbh) class.

These results reveal a considerable difference in stocking density between forested areas and previously cleared parts of the property. The mean number of Square-fruited Ironbark stems in the

regeneration plots (30 in the present study, Figure 2, Figure 3) is more than double the number recorded in natural areas, with a range of 2 to 125 plants per plot.

By calculating the sample standard deviation of the tallies for each age/size class in the density plots, a proposed benchmark stocking rate / density can be derived for Square-fruited Ironbark, as shown below (Table 2).

Table 2: Proposed benchmark stocking rate / density for Square-fruited Ironbark.

Age/size class	Juveniles (< 5cm dbh)	Saplings (>5cm <15cm dbh)	Adults (> 15cm dbh)	Total no. stems per quadrat (all classes)
Proposed Benchmark (± 1 SD)	3 to 11	1 to 7	1 to 5	7 to 21

Discussion and Recommendations

It is obvious at this stage that the native regeneration / Square-fruited Ironbark rehabilitation areas in previously cleared paddocks will remain in 'low' condition relative to some vegetation condition benchmarks (DoPIE 2019) for some time. For instance, scores for ground logs and number of hollow-bearing trees will remain below benchmark in the short to medium term (a conservative estimate is 50 years). However, it remains possible to compare current condition data with benchmark data for 'good' condition vegetation types in which Square-fruited Ironbark occurs on the property with the other BBAM condition metrics such as native flora diversity, native groundcover, exotic groundcover, etc and use them as indicators to track achievement of regeneration objectives and inform ongoing adaptive management actions within specified timeframes.

NCAM provides the following recommendations to RMS to satisfy DoEE requirements for approval conditions 3c and k:

1. Because the assessments of the Pacific Highway Glenugie Upgrade threatened species and native vegetation impacts, and subsequent offset requirements, were made under the original, TSC Act-based Bio Banking Assessment Method (BBAM), it is recommended that RMS continue to apply the BBAM condition assessment methodology to the ongoing Eucalyptus tetrapleura / native vegetation regeneration monitoring program. This would ensure consistency in data collection and analysis and provides baseline data starting from 2014.

2. The revegetation methodology described in the BOS as 'assisted natural regeneration' is recommended as the preferred method for ongoing rehabilitation within the study area. For clarity, 'assisted natural regeneration' here refers to the regeneration of previously cleared areas through natural recruitment of native species, assisted solely by the exclusion of livestock and feral herbivores and the minimisation of soil disturbance.

3. Assisted natural regeneration of the rehabilitation areas should continue to be monitored, using the current methodology and the 8 existing monitoring plots, twice over the next 5 years. Should monitoring results reveal a decline in native flora diversity AND an increase in exotic groundcover in the rehabilitation areas over successive surveys, then a controlled burn in the relevant parts of the rehabilitation areas should be undertaken as an adaptive management

action designed to promote the recruitment of native species and reduce competition from exotic groundcover species. The controlled burn should be implemented in accordance with a property fire management plan. Monitoring should recur within 3 and 6 months after the burn to ensure that recruitment of native species is not hindered by competition from exotic species.

4. The derivation of a benchmark for natural mean stocking rate of Square-fruited Ironbark within good condition vegetation will improve the monitoring of that species in relation to the regenerating native vegetation type in which it occurs. Future monitoring of regeneration areas should count Square-fruited Ironbark stems in 3 age/size classes as described in this report. The proposed benchmark stocking rates for Square-fruited Ironbark should be used to monitor the progress of regeneration of this species. It should be noted that stocking rates of Square-fruited Ironbark in regeneration areas will most likely remain well above benchmark for the short to medium term (10 – 15 years) after which time it is expected that natural thinning of overstorey species and competition from mid-stratum recruitment will result in stocking rates approaching benchmark for each age class.

5. The Glenugie BOS Square-fruited Ironbark Revegetation Plan should be incorporated into, and implemented as part of, any Biodiversity Stewardship Agreement (BSA) proposed for the property. This will ensure that ongoing monitoring and management of the rehabilitation areas will be undertaken by the property owner and funded through the BSA over its 20-year term.

Table of objectives, methods, milestones, timeframes.

Monitoring Task	Methods	Milestone	Adaptive Management Trigger where milestone not met)	Adaptive Management Actions	Timeframe
Regeneration of Eucalyptus tetrapleura in 'low' condition offset areas	Assessment of existing monitoring plots, including counts of E. tetrapleura stems by age/size class. Comparison of stem tallies with derived benchmark stocking rate for E. tetrapleura.	Stocking rates are trending towards benchmark densities	Stocking rates fall below or remain above benchmarks	Controlled burn	5 years monitoring, ongoing monitoring under BSA management plan (20 years)
Vegetation condition in 'low' condition offset areas.	Condition assessment of existing monitoring plots within regeneration areas. BBAM (2008) assessment methodology will be used to maintain consistency since inception of program.	Native flora diversity, native groundcover, and mid-storey and overstorey are trending towards benchmark.	Native flora diversity declines AND exotic groundcover increases over successive monitoring events	Controlled burn in relevant parts of rehabilitation areas.	Two monitoring events over next 5 years. Ongoing monitoring under BSA management plan (20 years)

References

BioNet 2019. Atlas of NSW Wildlife search tool. Available online at https://www.environment.nsw.gov.au/atlaspublicapp/UI_Modules/ATLAS_/atlasreport.aspx

DoPIE 2019. BioMetric Vegetation Type Condition Benchmarks. NSW Department of Planning, Industry & Environment. Archived data available at https://www.environment.nsw.gov.au/projects/biometric-dataset.htm. Accessed Sep 2019.

Jacobs 2019. Pacific Highway Upgrade: Glenugie Upgrade - Biodiversity Offset Strategy Version 6. Report prepared for NSW Roads & Maritime Services.

NCAM 2017 Monitoring recruitment of Square-fruited Ironbark (Eucalyptus tetrapleura) at Sunnyside Road, Glenugie, NSW. Report prepared for NSW Roads and Maritime Services by North Coast Aerial Mapping. Peter Richards and Craig Harré, November 2017.

OEH 2017. Square-fruited Ironbark Eucalyptus tetrapleura threatened species profile. Accessed online at http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10319

Appendix 1

Comparative plot data 2014-2019

Summary of condition assessment plots in regenerating vegetation – comparison of Sep 2014 (Jacobs 2019), Oct 2017 (NCAM 2017) and Sep 2019 (current survey) results.

Plot	Native Flora Diversity			Mid-storey cover (%)			Native groundcover (%)			Exotic groundcover (%)			Number of regenerating trees (saplings/seedlings)						Mid-storey species			Notes
													Eucalyptus tetrapleura			Other overstorey species						
	Sep-14	Oct-17	Sep-19	Sep-14	Oct-17	Sep-19	Sep-14	Oct-17	Sep-19	Sep-14	Oct-17	Sep-19	Sep-14	Oct-17	Sep-19	Sep-14	Oct-17	Sep-19	Sep-14	Oct-17	Sep-19	
G1	26	30	33	3.5	2	1	88	82	71	12	9	2	0	0	2	30	14	9	13	34	40	
G2	14	26	24	2.5	1	0	56	52	57	36	39	23	147	121	125	0	0	1	0	4	5	
G3	21	28	22	3	1	0	20	45	68	34	45	11	42	39	23	137	141	170	2	6	6	
G4	24	27	29	0.5	1	1	90	64	63	10	27	5	4	6	19	88	176	191	2	16	14	
G5	21	21	16	0	1	0	18	10	7	72	59	40	0	10	8	74	77	44	39	26	27	Feral horses present
G6	16	25	17	3	9	17	40	28	38	46	26	5	30	47	35	74	69	39	73	104	143	Feral horses present
G7	19	24	24	6	16	16	60	35	19	36	20	10	13	8	10	63	17	22	8	316	218	Feral horses present
G8	18	25	23	1	1	1	30	24	12	64	44	55	16	9	18	14	31	29	13	8	4	Cattle grazing current
Mean	20	26	24	2	4	5	50	43	42	39	34	19	32	30	30	60	66	63	19	64	57	

Appendix 2

Condition Assessment Plot Images Oct 2017 and Sep 2019

Plot G1 Oct 2017

Plot G2 Oct 2017

Plot G1 Sep 2019

Plot G2 Sep 2019

Plot G3 Oct 2017

Plot G3 Sep 2019

Plot G4 Oct 2017

Plot G4 Sep 2019

Plot G5 Oct 2017

Plot G5 Sep 2019

Plot G6 Oct 2017

Plot G6 Sep 2019

Plot G7 Oct 2017

Plot G7 Sep 2019

Plot G8 Oct 2017

Plot G8 Sep 2019

no image available

Appendix H. Draft Site Management Action Plan

Attachment 4: Management Plan

Instructions for completing the Biodiversity Stewardship Site Management Plan template

This Biodiversity Stewardship Site Management Plan template is to be filled in by the assessor, reviewed by the Owner and included in the Biodiversity Stewardship Site Assessment Report submitted to the BCT as part of an application to establish a Biodiversity Stewardship Site. The standard words and format provided in this template must be used for the management actions.

The BCT will review the management plan and make any necessary amendments in consultation with the Owner. The management plan will be incorporated into the Biodiversity Stewardship Agreement.

There are seven sections to this template:

- Section 1: Management Actions
- Section 2: Fire for Conservation Management Plan
- Section 3: Native Vegetation Management Plan
- Section 4: Threatened Species Habitat Management Plan
- Section 5: Integrated Feral Pest Management Plan
- Section 6: Integrated Weed Management Plan
- Section 7: Monitoring Plan

Orange boxes like this one provide instructions and examples and will be deleted by the BCT before the Biodiversity Stewardship Agreement is processed.

Yellow highlighted fields need to be customised by the Owner. Usually the Owner needs to provide the information required; sometimes the Owner will need to delete or retain provided options. It is important to ensure that, especially where fields are customised, that the management actions are certain, clear and specific so that it is clear what the requirements of the actions are.

The format and wording of standard and additional management actions must not be changed. Enter site specific information into the yellow highlighted fields as required.

Management actions are divided into 'required management actions' and 'active restoration management actions' in accordance with Subsections 13.3.2 and 13.3.3 of the BAM. Required management actions are those management actions that must be implemented on the biodiversity stewardship site to achieve the predicted management gain. Active restoration management actions are those management actions in addition to the required management actions that may be used to create biodiversity credits at a biodiversity stewardship site in addition to the biodiversity credits created for the required management actions.

Both required management actions and active restoration management actions, when included in this management plan for a biodiversity stewardship site, must be undertaken in accordance with the management plan.

Definitions

In this Management Plan, unless a contrary intention appears, a capitalised word or words has the meaning given in the corresponding row in the table below.

Other terms are defined in the Dictionary.

Word/s	Meaning
Biodiversity Stewardship Site Assessment Report	The document described in Item H
Biodiversity Stewardship Site Management Actions Map	The map showing Management Zones, management features (e.g. firetrails) and the location of Management Actions in the Biodiversity Stewardship Site
Ecological Burn	Burning of Native Vegetation undertaken to help stimulate Native Plant regeneration, control weeds and enhance Biodiversity
Ecological Burn Map	The map included in the Fire for Conservation Management Plan identifying the areas of the Biodiversity Stewardship Site to be burnt, based on broad habitat zones, during each Ecological Burn
Ecological Burn Unit	An area within the Biodiversity Stewardship Site comprised of one or more Management Zones over which the same regime of ecological burning is applied
Ecosystem Credit	The meaning given in the Biodiversity Assessment Method Note: This definition may change from time to time, with changes in the Biodiversity Assessment Method, but on the Agreement Date the meaning was: "a measurement of the value of threatened ecological communities, threatened species habitat for species that can be reliably predicted to occur within a PCT, and PCTs generally. Ecosystem credits measure the loss in biodiversity values at a development site and the gain in biodiversity values at a biodiversity stewardship site"
Feral Pest	Pest animal species not native to Australia including fox, cat, pig, goat, horse, avian pests and other miscellaneous species
Fertiliser	The meaning given in the *Biosecurity Act 2015* (NSW) Note: This definition may change from time to time with changes in Law, but on the Agreement Date this meaning was: "(a) a substance that consists of or contains nitrogen, phosphorus or potassium (or any combination of nitrogen, phosphorus or potassium) and is manufactured, represented, sold or used as a means for directly or indirectly supplying nutriment for the purpose of enhancing the development, productivity, quality or reproductive capacity of vegetation, other than a substance excluded from this definition by the regulations, or (b) any other substance prescribed by the regulations to be a fertiliser"
Fire for Conservation Management Plan	The plan titled "Fire for Conservation Management Plan" included in Section 2 of this Management Plan
High Threat Exotic Plant Cover	The meaning given to it in the Biodiversity Assessment Method Note: The definition may change from time to time, with changes in the Biodiversity Assessment Method, but on the Agreement Date this meaning was "plant cover composed of vascular plants not native to Australia that if not controlled will invade and outcompete native plant species"
High Threat Exotic Species	A vascular plant not native to Australia that if not controlled will invade and outcompete Native Plant species. Also referred to in this Attachment as High Threat Weed Species

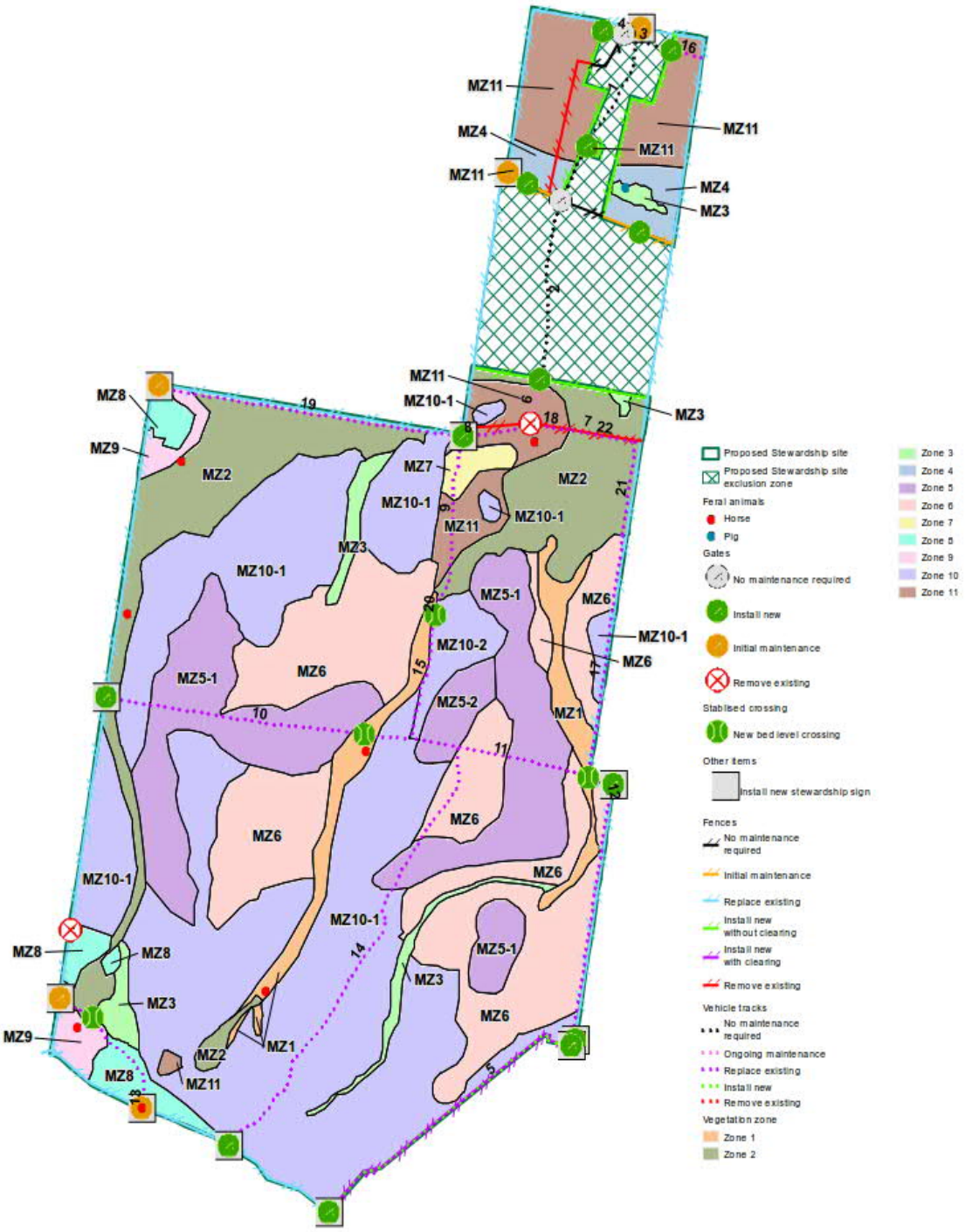
Word/s	Meaning
Hollow-dependent Threatened Species	Threatened Species for which tree hollows (sometimes of a particular size or with particular characteristics) are a key component of their habitat and are critical for the persistence of that species in the landscape
Integrated Feral Pest Management Plan	The plan titled "Integrated Feral Pest Management Plan" included in Section 5 of this Management Plan
Integrated Weed Management Plan	The plan titled "Integrated Weed Management Plan" included in Section 6 of this Management Plan
Large Woody Debris	Large, fallen dead tree branches and trunks
Living Ground Cover	All living vegetation below 1m in height including native and non-native ground cover species
Local Land Services	The statutory corporation established under the *Local Land Services Act 2013* (NSW).
Monitoring Plan	The plan titled "Monitoring Plan" included in Section 7 of this Management Plan
Native Vegetation Management Plan	The plan titled "Native Vegetation Management Plan" included in Section 3 of this Management Plan
Other Weed Species	A plant not native to Australia and not otherwise identified as a High Threat Weed Species
PCT	Plant Community Type
Pesticide	The meaning given in Section 5 of the *Pesticides Act 1999* (NSW) Note: This definition may change from time to time with changes in Law, but on the Agreement Date this meaning was: "(a) an agricultural chemical product (within the meaning of the Agvet Code), or (b) a veterinary chemical product (within the meaning of the Agvet Code) that: (i) is represented as being suitable for, or is manufactured, supplied or used for, the external control of ectoparasites of animals, and (ii) is concentrated and requires dilution or mixing in water before use, and (iii) is not prescribed under the Stock Medicines Act 1989 as a low-risk veterinary chemical product. …a pesticide continues to be regarded as a pesticide even when it is mixed with some other substance (whether or not the other substance is a pesticide). However, a pesticide does not include a prescribed mixture or a mixture of a prescribed class or description"
Photo Point	A location within the Biodiversity Stewardship Site and identified in Part 9.2 of Section 1 of this Management Plan at which a series of photographs is taken in all directions (360°) for the purpose of monitoring change in vegetation condition over time
Rubbish	Any anthropogenic waste material other than that identified in this Management Plan as being used to achieve a specific biodiversity management purpose
Sediment Trap	A temporary or permanent structure used to collect, trap and store sediment to prevent entry of sediment to a waterway

Word/s	Meaning
Species Credits	The meaning given in the Biodiversity Assessment Method. Note: This definition may change from time to time with changes in the Biodiversity Assessment Method, but on the Agreement Date the meaning was "the class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Biodiversity Data Collection"
Species Polygon	An identification of the area or count and location of the suitable habitat for a Species Credit species on the Biodiversity Stewardship Site, prepared as part of the Biodiversity Stewardship Site Assessment Report
Stock	The meaning given in the *Local Land Services Act 2013* (NSW), and including any animal declared to be stock under the *Local Land Services Regulation 2014* (NSW) Note: This definition may change from time to time with changes in Law, but on the Agreement Date the meaning was: "cattle, horses, sheep, goats, camels, alpacas, llamas, pigs, deer, ostriches, emus or, in relation to any specified provision or provisions of this Act, any other kind of animal declared by the regulations to be stock for the purposes of that provision or those provisions"
Targeted Supplementary Planting	Planting of locally indigenous native plants in one or more areas of the Biodiversity Stewardship Site to: a) increase Native Plant species richness and foliage cover of a vegetation zone above the level determined for management gain, and/or b) restore or enhance the native plant species composition and structure of recognisable PCTs, and/or c) improve habitat suitability for specific Threatened Species
Threatened Biodiversity Data Collection	The meaning given to it in the Biodiversity Assessment Method Note: This definition may change from time to time with changes in the Biodiversity Assessment Method but on the Agreement Date the meaning was "part of the BioNet database, published by OEH and accessible from the BioNet website at www.bionet.nsw.gov.au"
Threatened Species Habitat Management Plan	The plan titled "Threatened Species Habitat Management Plan" included in Section 4 of this Management Plan
Threatened Species Habitat map	The map of Threatened Species locations and Species Polygons within the Biodiversity Stewardship Site
Vegetation Integrity Survey Plot	The meaning given to 'plot' in the Biodiversity Assessment Method and described in Section 5.3.4 of the Biodiversity Assessment Method Note: This definition may change from time to time with changes in the Biodiversity Assessment Method, but on the Agreement Date the meaning was "an area within a vegetation zone in which site attributes are assessed"
Vegetation Zone	The meaning given in the Biodiversity Assessment Method Note: This definition may change from time to time with changes in the Biodiversity Assessment Method, but on the Agreement Date the meaning was "a relatively homogenous area of native vegetation on a development site, land to be biodiversity certified or a biodiversity stewardship site that is the same PCT and broad condition state"

Section 1: Management Actions

Management Actions

Biodiversity Stewardship Site Management Actions Map



The Biodiversity Stewardship Site Management Actions Map is to be produced so that the following features can be clearly identified:

(a) Vegetation Zones
(b) Management Zones
(c) Management features (e.g. artificial structures on waterways, erosion, rubbish, fencing, gates, firetrails, access tracks, infrastructure and built assets to be retained).
(d) Location of Management Actions in the Biodiversity Stewardship Site.

Part 1	Fire management	Timing
1.1 (Required management action)	The Owner must implement and comply with the Fire for Conservation Management Plan.	Ongoing from First Payment Date

Management Actions		
Part 2	**Grazing Management**	**Timing**
2.1 (Required management action)	(a) The Owner must not graze Stock on the Biodiversity Stewardship Site. If no grazing is to be allowed, replace the above part with: "The Owner must not graze Stock on the Biodiversity Stewardship Site." Then delete the words in part 2.2 (but keep the numbering) and replace with: "This part is not applicable."	Ongoing from First Payment Date
2.2 (Required management action)	This part is not applicable	Ongoing from First Payment Date
	Delete (b) and/or (c) if not relevant. Soil disturbance may be required (and is permitted) to encourage regeneration of native vegetation in conjunction with management of grazing for conservation.	
Management Actions		
2.3	If, at any time, the Owner observes Stock in any area of the Biodiversity Stewardship Site, other than an area where grazing is permitted, the Owner must take necessary measures to remove the Stock from the area immediately.	Ongoing from Agreement Date
Part 3	**Native Vegetation management**	**Timing**
3.1 (Required management action)	Native Vegetation on the Biodiversity Stewardship Site must not be cut down, felled, thinned, logged, killed, destroyed, poisoned, ringbarked, uprooted, burnt or otherwise removed, except: (a) in accordance with Part 3.6.4 of this section; (b) it is specifically permitted or required as part of a Management Action; or (c) it is essential to a carry out an action permitted under clause 6 of this Deed.	Ongoing from Agreement Date
3.2 (Required management action)	Where Part 3.1 of this section permits Native Vegetation on the Biodiversity Stewardship Site to be burnt, it may only occur in accordance with the Fire for Conservation Management Plan.	Ongoing from Agreement Date
3.3 (Required management action)	Native Vegetation must be managed on the Biodiversity Stewardship Site to improve Threatened Species habitat if required as part of a Management Action for Threatened Species on the Biodiversity Stewardship Site under this Deed.	Ongoing from First Payment Date.

3.4 (Required management action)	(a) Except as permitted by Part 3.4(b), and to as far an extent practicable, the Owner must prevent nutrients from Fertilisers and other sources (other than those that would occur as a result of natural ecosystem function) from entering the Biodiversity Stewardship Site, including waterways within the Biodiversity Stewardship Site. (b) Fertilisers and Pesticides must not be applied on the Biodiversity Stewardship Site, except where permitted or required as part of a Management Action specified in the Native Vegetation Management Plan. Use of Fertilisers for establishing Native Vegetation through planting or seeding, use of herbicides for controlling weeds or use of Pesticides for controlling feral pests may be undertaken in accordance with best practice management when required to undertake Management Actions specified in the Native Vegetation Management Plan.	Ongoing from Agreement Date
3.5 (Active restoration action)	This Part 3.5 is not applicable, no targeted supplementary planting is proposed If no native vegetation and habitat management and augmentation active restoration activities are proposed, replace the above part with: "This Part 3.5 is not applicable." and delete Part 3.6 (including sub-parts 3.6.1 to 3.6.5) and Part 3.7.	Ongoing from First Payment Date.
3.6 (Active restoration action)	This Part 3.6 is not applicable	Ongoing from First Payment Date.

Management Actions		
	If no Targeted Supplementary Planting is proposed, replace the above part with: “This Part 3.6 is not applicable.” and delete Parts 3.6.1 to 3.6.5.	
3.7 (Active restoration action)	Hydrology management must be implemented in accordance with the Native Vegetation Management Plan to aid the restoration of Native Vegetation in instances where the hydrology of the Biodiversity Stewardship Site has been disrupted or altered.	Ongoing from First Payment Date.
	If no changes to hydrology are proposed as an active restoration action, replace the above part with: “This Part is not applicable.”	
Part 4	**Threatened Species habitat management and enhancement**	**Timing**
4.1 (Required management action)	The Owner must protect breeding habitat features and sites for all Threatened Species for which Species Credits or Ecosystem Credits have been created. Known breeding sites of Threatened Species on the Biodiversity Stewardship Site are shown on the Threatened Species Habitat map.	Ongoing from Agreement Date
4.2 (Required management action)	The Owner must undertake all Management Actions described in the Threatened Species Habitat Management Plan. The Threatened Species Management Plan is to include all practical and relevant management actions identified in the Threatened Biodiversity Data Collection for a Threatened Species for which Species Credits or Ecosystem Credits have been created.	Ongoing from First Payment Date
4.3 (Active restoration action)	This part is not applicable.	Ongoing from First Payment Date
	If no habitat enhancement active restoration activities areproposed, replace the above part with: “This Part is not applicable.” and delete Parts 4.3.1 – 4.3.4.	

Management Actions		
Part 5	**Hydrology Management**	
5.1 (Active restoration action)	Hydrology management activities must be implemented as set out in the *Native Vegetation Management Plan* to aid the protection and restoration of Threatened Species habitat and/or PCTs in instances where the hydrology of the Biodiversity Stewardship Site has been disrupted or altered.	Ongoing from First Payment Date.
	If hydrology management activities will only be set out in either the Threatened Species Habitat Management Plan or Native Vegetation Management Plan, delete reference to the other plan in the highlighted section of the above part. If hydrology management activities are to be set out in both plans, replace 'and/or' with 'and' in the highlighted section of the above part. If no hydrology management is proposed as an active restoration action, replace the above part with "This part is not applicable" and delete Parts 5.2 – 5.5.	
5.2 (Active Restoration Action)	Artificial structures on waterways within the Biodiversity Stewardship Site must be managed in accordance with measures described in the *Native Vegetation Management Plan*. (a) All artificial structures on waterways or waterbodies on the Biodiversity Stewardship Site are identified in the Biodiversity Stewardship Site Management Actions Map. (b) Where such artificial structures require filling or removal in order to restore the natural flows, the Owner must take such action in accordance with best practice management at the time. (c) In filling or removing such artificial structures, the Owner must meet the requirements set out in the relevant Threatened Species Management Plan or Native Vegetation Management Plan. (d) Where artificial structures are removed, the Owner must undertake rehabilitation of the waterway or waterbody as identified in the Threatened Species Management Plan or Native Vegetation Management Plan. The Owner must not construct artificial structures such as dams or levee banks that impede the existing flow regimes on the Biodiversity Stewardship Site unless such structures are to be constructed for the purpose of restoring natural flows and the construction is described in the Threatened Species Management Plan or Native Vegetation Management Plan. This part is not applicable	Ongoing from First Payment Date
Part 6	**Integrated Feral Pest Control**	**Timing**
6.1 (Required management action)	The Owner must implement and comply with the Integrated Feral Pest Management Plan.	Ongoing from First Payment Date
Part 7	**Integrated weed management and control of High Threat Exotic Plants**	**Timing**
7.1 (Required management action)	The Owner must implement the Integrated Weed Management Plan. The Integrated Weed Management Plan must include measures to: (a) control the spread of High Threat Exotic Species and other weed species within the Biodiversity Stewardship Site. (b) undertake fine-scale intensive removal of High Threat Exotic and other exotic vegetation.	Ongoing from First Payment Date

7.2 (Active restoration action)	This part is not applicable	Ongoing from First Payment Date
	If removal or reduction in cover of high threat weeds is not proposed as an active restoration management action within the Biodiversity Stewardship Site, replace the above part with: "This Part is not applicable."	

Management Actions		
Part 8	**Management of human disturbance**	**Timing**
8.1 (Required management action)	(a) Dead timber (whether standing or fallen and including branches and leaf litter) must not be removed from or moved within the Biodiversity Stewardship Site except for the personal (non-commercial) use by the Owner for firewood for one dwelling only or for repair of fencing (not for construction of fencing). (b) The Owner must document in writing any dead timber used for firewood or for fencing repair and keep such records in accordance with the record keeping requirements described in Part 1 Attachment 3 of the Deed and the Monitoring Plan. The Owner must record the approximate amount of dead timber collected from the Biodiversity Stewardship Site for use as firewood or for fencing (in lineal metres), the location from which the dead timber was collected and the date it was collected (month, year). (c) Vegetation and timber within the 6 m wide track maintenance envelope throughout the Biodiversity Stewardship Site is not subject to this provision.	Ongoing from Agreement Date
8.2 (Required management action)	(a) The Owner must take all reasonable steps to prevent, control and remedy erosion on the Biodiversity Stewardship Site. (b) Soil management for preventing and controlling erosion must be undertaken using best practice soil management techniques applied as relevant for the Biodiversity Stewardship Site. (c) The Owner must manage existing erosion on the Biodiversity Stewardship Site, identified on the Biodiversity Stewardship Site Management Actions Map, by conducting: • *There are four locations where existing tracks cross drainage /creek crossings (Tracks 1, 12, 13, 19). These require a gravel bed level crossing to be constructed to avoid downstream sedimentation and creek erosion over long-term.* • *Rock base over creek crossings and low-lying areas to prevent erosion and sedimentation of waterways. The construction of four 25-metre long by 3-metre wide by 100-millmetre thick gravel on creek crossings (Tracks 10, 11, 13, 20) and three locations of low-lying areas (Tracks 19, 21, 22) with 50 metre long by 3-metre wide by 100-millmetre thick gravel. Track 19 will require a 100 metre long by 3-metre wide by 100-millmetre thick gravel. This will create all weather tracks internally and on boundary track easements that is needed for access for weed and pest control, fence maintenance and fire management. Track grading of 'all-weather tracks' is then proposed on a five yearly basis* • *Eleven existing internal 'seasonal tracks' (Tracks 8-18) are to be maintained by slashing. In addition, one internal 'seasonal track' (Track 5) is proposed to be constructed to 3 metres wide for dry weather access on south eastern boundary to assist with weed, pest control and fire management activities. This track would be sensitively designed to avoid large trees and hollow-bearing trees and only involve removal of small trees, shrubs and groundcovers. It is proposed to maintain the seasonal tracks by regular slashing or mulching.* *Total new 'seasonal tracks' = 1,194 metres* *Total existing 'seasonal tracks' to maintain = 8,014 metres* *Total existing tracks to be upgraded to all weather = 2452 metres* *Total rock base to install = 350 metres* Clean rock, chemical soil and surface stabilisers or other fill material is to be used as substrate where required. Proper track maintenance will	Ongoing from First Payment Date

	prevent erosion in these areas of the Stewardship site. Rock substrate imported for track construction and maintenance is not subject to the provisions of Item 8.3. If there is no existing erosion, delete the last paragraph.	
8.3 (Required management action)	The Owner must not: (a) remove, or cause or permit to be removed, rocks from the Biodiversity Stewardship Site; or (b) move, or cause or permit to be moved, rocks within the Biodiversity Stewardship Site.	Ongoing from Agreement Date
8.4 (Required management action)	This part is not applicable (a) If there is no rubbish within the Biodiversity Stewardship Site delete the words of this part (but retain the numbering) and replace with: 'This part is not applicable.'	Ongoing from First Payment Date
8.5 (Required management action)	The Owner must take all reasonable steps to remove Rubbish deposited by others on the Biodiversity Stewardship Site, or which is otherwise present on the Biodiversity Stewardship Site.	Ongoing from First Payment Date
8.6 (Required management action)	The Owner must not store, dispose of, or cause or permit to be disposed of, any Rubbish on the Biodiversity Stewardship Site.	Ongoing from Agreement Date

Management Actions		
8.7 (Required management action)	• The Owner must install and maintain *fencing and/or signage* to deter human disturbance including Rubbish dumping. Signage must be obtained from the NSW BCT. • When installing and maintaining *fencing and/or signage*, the Owner must meet the following requirements: *Fencing and signage will be installed and maintained around the stewardship site as illustrated in Figure 5.2 – Biodiversity Stewardship Site Management Actions Map (BSSAR). This map shows where the current existing boundary fencing will receive initial maintenance work and new proposed fencing surround the exclusion zones to exclude cattle from the stewardship site. Figure 5.2 also shows the location of existing and proposed gates and which gates will require maintenance or replacement. Thirteen gates used at the Stewardship site will be new or 'as new'. Five gates require initial maintenance.* *Total new standard fence = 3,665 metres* *Total initial fence repair = 505 metres* *Total fence removal = 1,240 metres.* *Proposed performance standards for all upgrade works to existing fencing and installation of new fencing at the Biodiversity Stewardship Site are as follows:* • *As there is potential for stock to access the stewardship site area from the adjoining excluded areas, all fencing must be repaired, installed and maintained at a standard sufficient to control and prevent stock accessing the site using materials and construction techniques fit for this purpose.* • *Where barbed wire is used, the top and bottom wire must be plain to avoid injuring wildlife and fences are to be installed in a manner that would not preclude native fauna movement within the Stewardship site or between the Stewardship site and surrounding lands.* • *There is high potential for wild horses to access the Stewardship site from adjoining land. Therefore, all fencing will be repaired, installed and maintained at a standard sufficient to control and prevent feral horses and stock accessing the Stewardship site using materials and construction techniques fit for this purpose. .* • *It is intended to install a further thirteen new gates or 'as new' which will all be located within and along the boundary of property. Of this, six new gates will allow internal access between the exclusion zone and Stewardship site and allow for release of any unwanted livestock or wild horses from Stewardship site.* • *Thirteen boundary gates (new and existing) will have a stewardship site sign installed.* • *A fence line maintenance vegetation suppression zone to around 4 metres is proposed around the boundary of the Stewardship site. Boundary tracks will form part of this suppression zone.* • *A new fence and track is proposed (Track 5) in south eastern corner of property. A maximum width of 4 metres is proposed. This is necessary for access to manage weeds, pests and fire. Clearing will avoid taller, mature trees and any trees with hollows located within the 3 metre zone will be retained.* Signage will be erected in strategic locations around the Stewardship site (i.e. on access gates). The required signage will be installed within 2	Signage must be installed within 2 months of the First Payment Date All other requirements in Part 8.7 are ongoing from First Payment Date

	months of the first payment date. If only fencing or signage are to be installed and maintained delete reference to the other in the highlighted section of the above part. If both fencing and signage are to be installed and maintained, replace 'and/or' with 'and' in the highlighted section of the above part. Signage should be located at points of access and other practical locations interfacing with adjoining properties. For Biodiversity Stewardship Sites that may be located fully within private landholdings, there should be at least one Biodiversity Stewardship Site sign to be placed at the main access gate to the site.	
8.8 (Required management action)	The locations of existing and proposed man-made structures (where permitted or required by a Management Action) on the Biodiversity Stewardship Site, including fencing, gates, firetrails and access tracks are identified on the Biodiversity Stewardship Site Management Actions Map.	On Agreement Date
8.9 (Required management action)	(a) Existing firetrails and access tracks within the Biodiversity Stewardship Site (identified on the Biodiversity Stewardship Site Management Actions Map), where retained, must be maintained to permit the carrying out of Management Actions. (b) All existing firetrails and access tracks within the Biodiversity Stewardship Site must be maintained to control and minimise erosion. • *Ongoing maintenance will be required after the construction of four 25-metre long by 3-metre wide by 100-millmetre thick gravel on creek crossings (Tracks 10, 11, 13, 20) and three locations of low-lying areas (Tracks 19, 21, 22) with 50 metre long by 3-metre wide by 100-millmetre thick gravel. Track 19 will require a 100 metre long by 3-metre wide by 100-millmetre thick gravel.* • *Eleven existing internal 'seasonal tracks' (Tracks 8-18) are to be maintained by slashing. In addition, one new 'seasonal track' (Track 5) is proposed to 3 metres wide for dry weather access to assist with weed, pest control and fire management activities. These tracks would be sensitively designed to avoid large trees and hollow-bearing trees and only involve removal of small trees, shrubs and groundcovers. It is proposed to maintain the seasonal tracks by regular slashing or mulching.*	Ongoing from Agreement Date
Part 9	**Monitoring**	**Timing**
9.1 (Required Management action)	The Owner must undertake monitoring in accordance with the Monitoring Plan.	Ongoing as specified in Section 7 – Monitoring Plan
9.2 (Required management action)	The Owner must establish permanent Photo Points at locations within the Biodiversity Stewardship Site as described in the Monitoring Plan	Ongoing from Agreement Date
9.3 (Required management action)	The Owner must conduct, or arrange for the conduct of, an inspection of the Biodiversity Stewardship Site at the times, and having regard to the purpose, set out in the Monitoring Plan.	Ongoing as specified in Section 7 – Monitoring Plan

9.4 (Required management action)	(a) The Owner must establish permanent Vegetation Integrity Survey Plots within 12 months after the Agreement Date with the purpose of providing a baseline for assessing Biodiversity outcomes in the future. (b) The Vegetation Integrity Survey Plots must be permanently marked and labelled using steel posts (i.e. star picket or equivalent durable post). (c) The Owner must record the location and label of each of the Vegetation Integrity Survey Plots in the Monitoring Plan using the format described therein.	Within 12 months of the Agreement Date and ongoing thereafter
9.5 (Required management action)	(a) The Owner must monitor the Biodiversity Stewardship Site for evidence of plant disease or dieback within the Native Vegetation present on the site. (b) The Owner must report any evidence of plant or animal disease on the site to the NSW BCT as soon as practicable.	Ongoing as specified in Section 7 – Monitoring Plan
9.6 (Active restoration action)	This part is not applicable If active restoration management actions are not proposed within the Biodiversity Stewardship Site, replace the above part with: "This part is not applicable."	Ongoing as specified in Section 7 – Monitoring Plan

Section 2: Fire for Conservation Management Plan

Completing the fire for conservation management plan

A table is provided below for the fire conservation management plan. Add additional sections to the table if required. The plan must include, but is not limited to:

- a map identifying the areas to be burnt during each Ecological Burn (the Ecological Burn Map). Areas to be burnt are to be based on broad habitat zones across the Biodiversity Stewardship Site.
- the year the last fire went through, the type of fire and the extent of the fire and location, where known
- frequency of natural fires in the area of the Biodiversity Stewardship Site, where known
- a description of locations and Management Zones where Ecological Burns will be conducted and areas that will not be burnt
- the methods that will be used for Ecological Burns
- the fire frequency intervals recommended for the vegetation types and Threatened Species present, including any required adjustment to the schedule in the event of a wildfire or activities undertaken under the Rural Fires Act 1997 (NSW) to ensure minimum frequency between Ecological Burns
- the fire intensity for the recommended vegetation types
- the time of year suitable for Ecological Burns
- clear, measurable objectives and performance indicators to demonstrate how the management action will achieve gain on the Biodiversity Stewardship Site.

Requirements for monitoring the performance of the Fire for Conservation Management Plan are set out in Section 7 – Monitoring Plan and include:

- methods for monitoring the outcomes of Ecological Burns
- reporting and assessing the results from monitoring
- the diary for recording actions taken in accordance with the Fire for Conservation Management Plan

1. Previous known fire events affecting the land that is the Biodiversity Stewardship Site are described in the table in this plan titled 'Fire history for previous 20 years (or longer if known)' to provide an indication of local fire conditions including intensity and frequency.
2. The Owner must carry out Ecological Burns for each Management Zone according to the following:
   (a) the method and frequency described in the table in this plan titled 'Ecological Burning actions';
   (b) the areas to be burnt identified in the Ecological Burn Map;
   (c) the requirements for each vegetation type or Threatened Species as described in the table in this plan titled 'Fire requirements for vegetation types and threatened species'.
   (d) the following NSW Rural Fire Service publications:
      (i) 'Rules and Notes for implementation of the Threatened Species Hazard Reduction List for the Bush Fire Environmental Assessment Code';
      (ii) 'Threatened Species Hazard Reduction List – Part 1 – Plants';
      (iii) 'Threatened Species Hazard Reduction List – Part 2 – Animals'; and
      (iv) Threatened Species Hazard Reduction List – Part 3 – Threatened Ecological Communities'; and
   (e) establish a mosaic-pattern of different burn ages (i.e. time since fire) across Ecological Burn Units (as displayed on the Ecological Burn Map) to ensure the Biodiversity Stewardship Site retains refuge areas for native fauna at all times.
3. The Owner must take the fire frequencies recommended in BioNet or other published sources of any Threatened Species on the Biodiversity Stewardship Site into consideration when determining the frequency of Ecological Burns.
4. The Owner must avoid areas containing Threatened Species when constructing fire containment lines.
5. The Owner must implement the activities (if any) described in the table in this plan titled 'Other fire management activities'.

6. The Owner must meet the performance measures described in the table in this plan titled 'Fire Management Performance Measures'.
7. The Owner must implement the monitoring and inspections of fires as described in the Monitoring Plan.

Where Species Credits are generated on the Biodiversity Stewardship Site the Species Polygon must be displayed on the Map of areas to be burnt during each Ecological Burn. Where the fire regime of the species credit species differs from that of the surrounding vegetation the management plan must demonstrate how the species polygon will be treated or excluded to ensure inappropriate fire regimes do not adversely impact the species;

Fire history for previous 20 years (or longer if known)

Year of fire	**Hazard reduction, wildfire burn or Ecological Burn and extent of fire**	**Management Zone/s**
Unknown. Last estimated c.2013 in regenerating areas of MZ11	While the fire history is unknown, there were signs of fire damage in 2013, such as loss of mature trees, and a very dense regrowth of early colonisers such as Acacia and Melaleuca spp. The remainder of the site has no records of fire history. While the fire history is unknown, there are signs of fire across the central portions of the property, particularly in PCT1062 estimated between 3-10 years.	All zones

Fire requirements for vegetation types and Threatened Species

Vegetation type and/or Threatened Species	**Fire frequency required**	**Time of year for burning**	**Fire intensity required**	**Adjustment required due to wildfires or activities undertaken under the *Rural Fires Act 1997* (NSW)**
PCT1211 Spotted Gum-Grey Ironbark-Pink Bloodwood open forest. (Dry sclerophyll forests (shrub/grass sub-formation)	Fire interval Min 5 years Max 50 years	Spring through early autumn (avoid during mid-May to July when Brush-tailed Phascogale, Emu and Squirrel Glider are breeding)	Avoid hot fires that consume canopy and frequent fires over large areas/ this habitat is occupied by hollow-dependent fauna including Squirrel Glider and Brush-tailed Phascogale. Further maturity is required to develop hollows for these species, which are currently below benchmark for this PCT	Yes
PCT 1209 Spotted Gum – Grey Box – Grey Ironbark dry open forest of the Clarence Valley lowlands of the North Coast. (shrub/grass sub-formation)	Fire interval Min 5 years Max 50 years	Late winter through early spring (avoid during mid-May to July when Brush-tailed Phascogale, Emu and Squirrel Glider are breeding) Avoid December to April during breeding season of Green-thighed Frog	Avoid hot fires that consume canopy and frequent fires over large areas/ this habitat is occupied by hollow-dependent fauna including Squirrel Glider and Brush-tailed Phascogale. Further maturity is required to develop hollows for these species,	Yes

			which are currently below benchmark for this PCT	
PCT1062 Orange Gum (Eucalyptus bancroftii) open forest of the North Coast (Dry sclerophyll forests shrub/grass sub-formation)	Fire interval Min 5 years Max 50 years	Spring through early autumn (avoid during mid-May to July when Brush-tailed Phascogale, Emu and Squirrel Glider are breeding)	Avoid hot fires that consume canopy and frequent fires over large areas/ this habitat is occupied by hollow-dependent fauna including Squirrel Glider and Brush-tailed Phascogale. Further maturity is required to develop hollows for these species, which are currently below benchmark for this PCT	Yes
PCT1136 Scribbly Gum – Red Bloodwood heathy open forest of the coastal lowlands of the North Coast (Dry sclerophyll forests, shrubby sub-formation	Fire interval Min 7 years Max 30 years	Spring through early autumn (avoid during mid-May to July when Brush-tailed Phascogale, Emu and Squirrel Glider are breeding)	Mosaic burning approach. Variable intensity - high intensity surface fires separated by patches of lower intensity fire and unburnt patches. Avoid hot fires that consume canopy and frequent fires over large areas/ this habitat is occupied by hollow-dependent fauna including Squirrel Glider and Brush-tailed Phascogale. Further maturity is required to develop hollows for these species.	Yes
PCT971 Narrow-leaved Red Gum woodlands of the lowlands of the North Coast (Coastal Valley Grassy Woodlands)	Fire interval Min 5 year Max 40 years	Spring through early autumn (avoid during mid-May to July when Phascogale, Emu and Squirrel Glider are breeding)	Avoid hot fires that consume canopy and frequent fires over large areas/ this habitat is occupied by hollow-dependent fauna including Squirrel Glider and Brush-tailed Phascogale. Further maturity is	Yes

			required to develop hollows for these species	
Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion (PCT 837)	Fire interval Min 7 years Max 35 years	Late winter through spring (avoid during mid-May to July when Brush-tailed Phascogale, emu and Squirrel Glider are breeding) Avoid December to April during breeding season of Green-thighed Frog	Avoid hot fires that consume canopy and frequent fires over large areas/ this habitat is likely occupied by hollow-dependent fauna including Squirrel Glider and Brush-tailed Phascogale. Further maturity is required to develop hollows for these species, which are currently below benchmark for this PCT	Yes
Eucalyptus tetrapleura (Square-fruited Ironbark)	No fire more than once every 25 years	Late summer to autumn	Mosaic burning approach. Variable intensity - high intensity surface fires separated by patches of lower intensity fire and unburnt patches. Crown fires should be avoided. No slashing, trittering or tree removal	Yes Eucalyptus tetrapleura occurs in very high abundance across a large proportion of the proposed stewardship site including all. The abundance of individuals is relatively constant across the property.
Melaleuca irbyana (Weeping Paperbark)	Restrict bush fire. No fire more than once every 25 years. No fire before trees reach maturity.	Late summer to autumn	Mosaic burning approach. Crown fires should be avoided. No slashing, trittering or tree removal	Yes. This species occurs in moderate abundance at a single location within MZ8. It has also been recorded in high abundance within state forest along the western boundary of the stewardship site
Centranthera cochinchinensis (Swamp Fox-glove)	Fire is to be restricted from the habitat. If needed, no fire more than once every 10 years	Fire is to be restricted from the habitat. If needed, low intensity fire during late winter to early spring.	Fire is to be excluded from the habitat. No slashing, trittering or tree removal	Yes. This species occurs in moderate to high abundance at two locations in centre of property within MZ1 and MZ2.
Maundia triglochinoides	Fire is to be excluded from the habitat.	Fire is to be excluded from the habitat.	Fire is to be excluded from the habitat.	Do not burn. This species occurs in moderate abundance at two locations along same drainage line in centre and

				eastern boundary of property (MZ1 and MZ2)

Ecological Burning actions				
Fire Management Zone/s	**Actions**	**Supervision & extinguishing techniques**	**Time of year for Ecological Burn**	**Frequency (years)**
Fire management zones: 5.5 5.6 5.9 6.1 6.2 6.7 6.8 6.9 See the Sunnyside Road, Calamia Ecological Burn Map.	Fire management actions for conservation will be implemented in portions of Scribbly Gum – Red Bloodwood heathy open forest of the coastal lowlands of the North Coast (PCT 1136) and Orange Gum (Eucalyptus bancroftii) open forest of the North Coast (PCT1062) which have been burnt for < 10 years. FMZ 5.5 and 5.6 have patches of dense *Allocasuarina* spp. Controlled surface fires will be used to control weeds and promote regeneration of native species where necessary. High intensity crown fires can and should occur towards the higher end of the fire interval range as high intensity fire is required to stimulate seed germination. Small patches of dense regrowth that require fire to supress midstorey and improve diversity of groundcovers	Burn to be conducted and/or supervised by the RFS NSW Fire and Rescue or qualified and experienced fire management specialist	Year 5 Spring through early autumn (avoid during mid-May to July when Phascogale, Emu and Squirrel Glider are breeding)	No burn to occur until the year 2024. The acceptable fire interval for shrubby dry sclerophyll forest is 7 to 30 years. Some intervals greater than 25 years are desirable. Monitor fire recover plant species diversity and abundance to inform fire interval. Do not exceed min and max interval periods described
Fire management zones: 5.1 5.2 5.3 5.4 5.7 5.8 6.1 6.3 6.4 6.5 6.6 7.1 7.2 9.2 10.4 See the Sunnyside Road, Calamia Ecological Burn Map.	Fire management actions for conservation will be implemented in portions of Scribbly Gum – Red Bloodwood heathy open forest of the coastal lowlands of the North Coast (PCT 1136) and Orange Gum (Eucalyptus bancroftii) open forest of the North Coast (PCT1062) which have been burnt for > 10 years. Currently plant species diversity and abundance is considered well developed and close to benchmark. Monitor diversity and abundance to inform future ecological burn requirements at next review stage. Controlled surface fires will be used to control weeds and promote regeneration of native species where necessary in MZ 7.	Burn to be conducted and/or supervised by the RFS NSW Fire and Rescue or qualified and experienced fire management consultant	Year 10 Spring through early autumn (avoid during mid-May to July when Phascogale and Squirrel Glider are breeding)	No burn to occur until the year 2029. The acceptable fire interval for shrubby dry sclerophyll forest is 7 to 30 years. Some intervals greater than 25 years are desirable. Monitor fire recover plant species diversity and abundance to inform fire interval. Do not exceed min and max interval periods described
Fire management zones: 8.1 8.2	Fire management actions for conservation will be implemented in portions of Spotted Gum – Grey Box – Grey Ironbark dry open forest of the	Burn to be conducted and/or supervised by the	Year 15 Late winter through spring	No burn to occur until the year 2034.

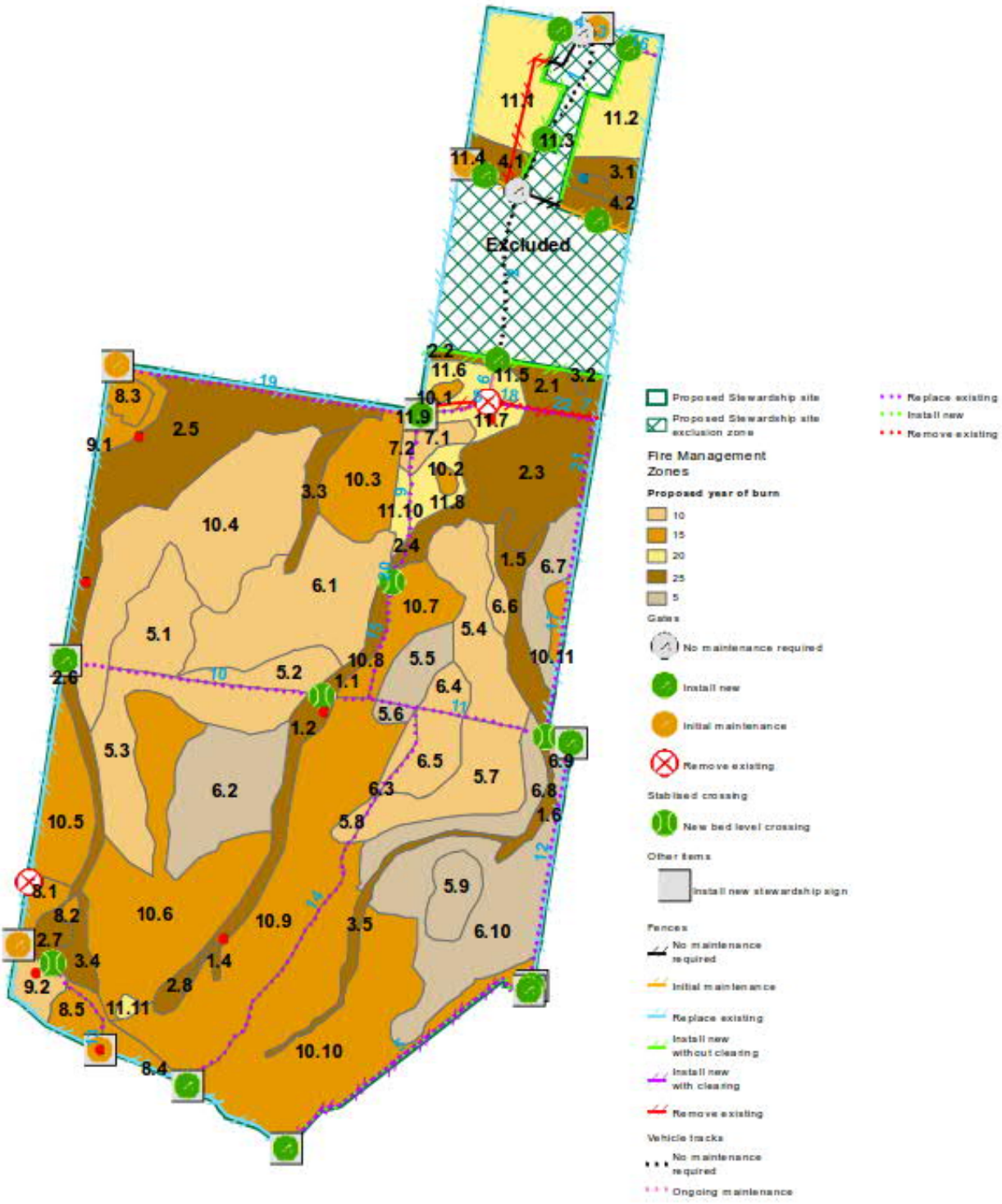
8.3 8.4 8.5 9.1 10.1 10.11 10.2 10.3 10.5 10.6 10.7 10.8 10.9 See the Sunnyside Road, Calamia Ecological Burn Map.	Clarence Valley lowlands of the North Coast (PCT 1209) and Spotted Gum – Grey Ironbark – Pink Bloodwood open forest of the Clarence Valley lowlands of the North Coast (PCT 1211) which is estimated to have no burn for >10 years. Currently plant species diversity and abundance is considered well developed and close to benchmark. Monitor diversity and abundance to inform future ecological burn requirements at next review stage.	RFS NSW Fire and Rescue.	(avoid during mid-May to July when Phascogale and Squirrel Glider are breeding) Avoid December to April when Green-thighed Frog are breeding	The acceptable fire interval for shrubby dry sclerophyll forest is 7 to 30 years. Some intervals greater than 25 years are desirable. Monitor fire recover plant species diversity and abundance to inform fire interval. Do not exceed min and max interval periods described
Fire management zones: 11.1 11.11 11.12 11.2 11.3 11.4 11.5 11.6 11.7 11.8 11.9 See the Sunnyside Road, Calamia Ecological Burn Map.	Fire management actions for conservation will be implemented in portions of regrowth Spotted Gum – Grey Ironbark – Pink Bloodwood open forest of the Clarence Valley lowlands of the North Coast (PCT 1211) which is estimated to have no burn between 3-10 years. Controlled surface fires will be used to control weeds and promote regeneration of native species where necessary in all zones.	Burn to be conducted and/or supervised by the RFS NSW Fire and Rescue.	Year 20 Spring through early autumn (avoid during mid-May to July when Phascogale and Squirrel Glider are breeding)	No burn to occur until the year 2044. The acceptable fire interval for shrubby dry sclerophyll forest is 7 to 30 years. Some intervals greater than 25 years are desirable. Monitor fire recover plant species diversity and abundance to inform fire interval. Do not exceed min and max interval periods described
Fire management zones: 1.1 1.2 1.3 1.4 1.5 1.6 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 3.1 3.2 3.3	Fire management actions for conservation will be implemented in portions of Forest Red Gum – Swamp Box of the Clarence Valley lowlands of the North Coast (PCT 837) and Narrow-leaved Red Gum woodlands of the lowlands of the North Coast (PCT 971) which is estimated to have no burn > 10 years. Currently plant species diversity and abundance is considered well developed and close to benchmark. Monitor diversity and abundance to inform future ecological burn requirements at next review stage. Controlled surface fires will be used to control weeds and promote regeneration of native species where necessary MZ2 and MZ4.	Burn to be conducted and/or supervised by the RFS NSW Fire and Rescue.	Year 25 Late winter through s (avoid during mid-May to July when Phascogale and Squirrel Glider are breeding Avoid December to April when Green-thighed Frog are breeding	No burn to occur until the year 2034. The acceptable fire interval for shrubby dry sclerophyll forest is 7 to 30 years. Some intervals greater than 25 years are desirable. Monitor fire recover plant species diversity and abundance to inform fire interval. Do not exceed min and max interval periods described

3.4 3.5 4.1 4.2 See the Sunnyside Road, Calamia Ecological Burn Map.				

Other fire management activities (where required)
Annual track slashing and five yearly track grading is proposed to keep tracks open and navigable. The track network has been designed to assist with fire management. Surrounding residents and Forestry Corporation should be notified at least 1 month prior to an ecological burn occurring. All existing access tracks should be maintained for ecological burns. Containment lines may be installed where necessary for fire containment during ecological burns and will be left to regenerate during the post burn period. .

Ecological Burn Map

(Shows numbered fire management zones discussed above as well as access tracks / fire trails)



Fire Management Performance Measures	
Fire Management Zone/s	**Performance indicator (e.g. % Management Zone burnt)**
Fire Management Zones: 2, 4, 5.5, 5.6, 7, 9 and 11	Aim for 100% burn of these smaller patches. Monitor plant diversity and tree density as measure of performance. Monitor fire recovery on plant species diversity and abundance to inform fire interval. Do not exceed min and max interval periods described.
Fire Management Zones: 1, 3, 5, 6, 8, 10	Aim for minimum 50% of zone. Monitor fire recovery on plant species diversity and abundance to inform fire interval. Do not exceed min and max interval periods described.

Section 3: Native Vegetation Management Plan

Completing the Native Vegetation Management Plan

A table is provided below for completing the Native Vegetation Management Plan. Add additional fields to the table as required.

The description and location (Management Zones) of native vegetation management actions to be undertaken by the Owner are listed in the Native Vegetation Management Plan.

This plan includes some management actions listed as required Native Vegetation Management actions in Section 13.3.2 of the BAM (2016) ("Required management actions"). It may also include actions to manage and augment threatened Native Vegetation and Threatened Species habitat where approved as active restoration management actions (Section 13.3.3 of the BAM). Active restoration management actions may be approved where it can be demonstrated that management and/or augmentation is feasible for the target Plant Community Type or Threatened Species of the proposed active restoration activity.

The Native Vegetation Management Plan must:

(i) identify the target PCTs for which management and augmentation will be undertaken and Management Zones where actions will be undertaken;
(ii) specify the requirements for the ongoing management and maintenance within the Biodiversity Stewardship Site; and
(iii) detail ongoing monitoring requirements for the relevant PCTs and include measures of success and contingencies in the event of failure.

Where hydrology management activities are proposed, the Native Vegetation Management Plan must:

(i) identify the PCT for which hydrology management will be undertaken;
(ii) specify the requirements for the ongoing management and maintenance of hydrology within the Biodiversity Stewardship Site; and
(iii) detail ongoing monitoring requirements for the relevant PCT and include measures of success and contingencies in the event of failure.

The locations and extent of areas proposed for Native Vegetation Management must be clearly identified and mapped.

Where Targeted Supplementary Planting is proposed as an active restoration management action to manage and/or augment Native Vegetation or Threatened Species habitat, the Native Vegetation Management Plan must include detailed prescriptions for planting schedules, including:

- species list per Management Zone
- planting method – specify whether plants are to be tubestock, direct seeding or another method
- number of plants per area – for tubestock, the number of plants should be rounded to the nearest 100 if there are more than 1,000 plants or to the nearest 10 if there are 1,000 plants or fewer;
- timing – described as the number of months (or Year if relevant) for completion of planting after First Payment Date.
- Management of supplementary planting includes watering, slashing, scalping, spraying of weeds, and plant replacement.

Appropriate site treatment (e.g. weed control) of each area of planting or seeding identified in the planting schedule must be identified in the Native Vegetation Management Plan and undertaken prior to such planting.

The Native Vegetation Management Plan must set out the period following planting or seeding over which grazing must be excluded from areas of Targeted Supplementary Planting. The period may be expressed as a date following planting or seeding, or as a minimum height that must be obtained by all planted or seeded plants before grazing is permitted.

The Native Vegetation Management Plan must contain clear, measurable objectives and performance indicators to demonstrate how the Management Action will achieve gain on the Biodiversity Stewardship site.

Requirements for monitoring the performance of the Native Vegetation Management Plan are set out in Section 7 – Monitoring Plan and include:

- methods for monitoring the outcomes of Native Vegetation Management
- reporting and assessing the results from monitoring
- the diary for recording actions taken in accordance with the Fire for Conservation Management Plan

1. The Owner must carry out Native Vegetation Management for each Management Zone according to the method and frequency described in the table in this plan titled 'Native Vegetation Management Actions';
2. The Owner must undertake Targeted Supplementary Planting in accordance with the table in this plan titled 'Targeted Supplementary Planting Schedule at the Biodiversity Stewardship Site'.
3. The Owner must meet the performance measures described in the table in this plan titled 'Native Vegetation Management Performance Measures'.
4. The Owner must implement the monitoring of Native Vegetation management as described in the Monitoring Plan.

Native Vegetation Management Actions

Management Zone	**Description of Vegetation Management action**	**Frequency and timing**	**Management Action Type** (Required or Active)
Fire Mgt Zones 5-5, 5-6	*Patches of dense regrowth of Allocasuarina were noted in Management Zone 5-5, and 5-6. These dense patches occur as pioneer regrowth following historical clearing and fire (or lack of fire) and lead to suppression of tree, shrub and groundcover vegetation. Thinning may be beneficial in assisting natural regeneration of shrub and ground covers and improve diversity. This could occur in conjunction with fire management.*	Planned to occur once around Year 4. This is due to focus on tracks and fences being developed in years 1 to 3.	Active

Targeted Supplementary Planting Schedule at the Biodiversity Stewardship Site

Species' common name	**Species scientific name**	**Management Zone/s of planting**	**Number of plants per area**	**Planting method**	**Timing** (months or Year)
	NOT PROPOSED				

Native Vegetation Management Performance Measures			
Manage-ment Zone/s	**Manage-ment Action**	**Performance indicator (e.g. % of Management Zone treated per year, % survival rate of plantings, species abundance).**	**Timing**
Fire Mgt Zones 5.5 and 5.6	Thinning of *Allocasuarina* trees	100% of zone treated in Year 4, monitor seedling recruitment annually through placement of a single 20 x 20 m plot in each of the two small areas of this zone.	Year 3

Section 4: Threatened Species Habitat Management Plan

Completing the Threatened Species Habitat Management Plan

A table is provided below for completing the Threatened Species Habitat Management Plan. Add additional fields to the table as required.

The description and location (Management Zones) of threatened species habitat management actions to be undertaken by the Owner are listed in the Threatened Species Habitat Management Plan.

This plan includes some management actions listed as required management actions in Section 13.3.2 of the BAM (2016) ("Required management actions"). It may also include actions to enhance and augment threatened species habitat where approved as active restoration management actions (Section 13.3.3 of the BAM).

Active restoration management actions relating to Threatened Species Habitat Management may be approved where it can be demonstrated that restoration of habitat is feasible for the target species of the proposed active restoration activity.

The Threatened Species Habitat Management Plan must:

(i) identify the target Threatened Species for which habitat enhancement will be undertaken and the species polygon in which habitat enhancement actions will be implemented;
(ii) specify the requirements for the ongoing management and maintenance of habitat enhancement within the Biodiversity Stewardship Site; and
(iii) detail ongoing monitoring requirements for the relevant species and include measures of success and contingencies in the event of failure.

Where hydrology management activities are proposed, the Threatened Species Habitat Management Plan must:

(i) identify the Threatened Species and their species polygon for which hydrology management will be undertaken;
(ii) specify the requirements for the ongoing management and maintenance of hydrology within the Biodiversity Stewardship Site; and
(iii) detail ongoing monitoring requirements for the relevant species and include measures of success and contingencies in the event of failure.

The locations and extent of areas proposed for threatened species habitat management must be clearly identified and mapped on the Threatened Species Habitat Map. Breeding sites identified on the Biodiversity Stewardship Site must also be mapped on the Threatened Species Habitat Map and protected from disturbance.

Where Targeted Supplementary Planting is proposed as an active restoration management action to improve habitat suitability for specific Threatened Species, this should be identified in the Threatened Species Management Plan with reference made to relevant activities in the Native Vegetation Management Plan.

Habitat enhancement measures may include the installation of artificial nesting boxes, breeding ponds, relocation of fallen logs, relocation and securing of dead hollow bearing stags and/or the relocation of rocks. The Threatened Species Habitat Management Plan must include detailed prescriptions for the ongoing management, replacement and maintenance of installed habitat structures.

Where habitat enhancement measures include the installation of habitat structures, the Threatened Species Habitat Management Plan must:

(i) specify the target Threatened Species, and type of habitat structures to be installed.

(ii) Specify the number and location of each type of habitat structure to be installed.

(iii) provide for ongoing management, replacement and maintenance of the installed habitat structures.

(iv) detail the ongoing monitoring requirements for the installed habitat structures and include measures of success and contingency actions in the event of failure of the habitat structures to improve roosting and breeding habitat for target Threatened Species; and

(v) provides reference material to support evidence of the target Threatened Species' use of the habitat structures.

The Threatened Species Habitat Management Plan must contain clear, measurable objectives and performance indicators to demonstrate how the Management Action will achieve gain on the Biodiversity Stewardship site.

Requirements for monitoring the performance of the Threatened Species Habitat Management Plan are set out in Section 7 – Monitoring Plan and include:

- methods for monitoring the outcomes of Threatened Species Habitat Management
- reporting and assessing the results from monitoring
- the diary for recording actions taken in accordance with the Threatened Species Habitat Management Plan

1. The Owner must carry out the Management Actions for each Management Zone according to the method and frequency described in the table in this plan titled 'Threatened Species Habitat Management Actions';
2. The Owner must meet the performance measures described in the table in this plan titled 'Threatened Species Habitat Management Performance Measures'.
3. The Owner must implement the monitoring of Threatened Species habitat management as described in the Monitoring Plan.

Threatened Species Habitat map

Threatened Species Habitat Management Actions				
Name of Threatened Species	**Description of habitat management action**	**Manage-ment Zone/s**	**Frequency and timing**	**Management Action Type** (Required or Active)
Green-thighed Frog	Exclude clearing activities within the species habitat polygon except for those listed as permissible in the biodiversity stewardship agreement	1,2,3,4,8,9	ongoing	Required
Green-thighed Frog	Avoid burning of moist grassy habitats between December and April	1,2,3,4,8,9	ongoing	Active
Green-thighed Frog	Fence off suitable habitat to protect it from grazing	1,2,3,4,8,9	From first payment date	Active
Green-thighed Frog	Maintain vegetation and leaf litter around ponds, drainage lines and other moist areas. Restrict clearing along the western boundary in Management Zone 2 in location of known breeding ponds	1,2,3,4,8,9	ongoing	Required and Active

Threatened Species Habitat Management Performance Measures			
Manage-ment Zone/s	**Manage-ment Action**	**Performance indicator (e.g. % of Management Zone treated per year, % survival rate of plantings, species abundance, number of nestboxes occupied).**	**Timing**
		NOT PROPOSED	

Section 5: Integrated Feral Pest Management Plan

Completing the compulsory Integrated Feral Pest Management Plan

A table is provided below for the integrated feral pest management plan. Add additional fields to the table if required. The plan must include, but is not limited to:

- a description of the target fauna species e.g foxes, cats, pigs, goats, avian pests, horses, other miscellaneous species as relevant
- consideration of relevant current OEH and other pest management programs
- the methods of feral pest control in each Management Zone determined in accordance with best management practice
- the frequency and timing of pest control actions in each Management Zone
- clear, measurable objectives and performance indicators to demonstrate how the management action will achieve gain on the Biodiversity Stewardship site.

All pest species identified as requiring management on a Biodiversity Stewardship site must be included in the integrated feral pest management plan.

Separate management plans may be developed for each pest species.

When the management plan is reviewed, control activities may be amended, deleted or added to take into account pest species found on the site at that time.

Details of monitoring to assess the effectiveness of Integrated Feral Pest Management activities are to be described in Section 7 – Monitoring Plan and are to include:

- methods for monitoring the success of pest animal control actions
- reporting and assessing the results from monitoring
- a timetable and measures for inspections to identify new pest species that may negatively impact on Threatened Species on the Biodiversity Stewardship site
- a diary for recording actions taken in accordance with the integrated feral pest management plan

1. Feral Pests existing on the Biodiversity Stewardship Site, and their extent or severity of impact, as at the Agreement Date are listed in the table below titled “Feral pests”.
2. The table below titled “Methods considered” lists possible methods of control of Feral Pests and the suitability of such methods to the Biodiversity Stewardship Site.
3. The Owner must control Feral Pests for each Management Zone according to the method and frequency described in the table below titled “Methods of control”. The methods of control will apply to the Feral Pests listed in the ‘Feral pests’ table.
4. The Owner should seek advice from Local Land Services on how to effectively and legally implement Feral Pest control prior to commencing any control methods on the Biodiversity Stewardship Site. If any methods advised or recommended by Local Land Services differ from those identified in this Integrated Feral Pest Management Plan, the Owner must advise the NSW BCT in writing prior to commencing control activities.
5. The Owner must carry out such activities as are specified (if any) in the table below titled “Other Management Activities”.
6. The Owner must implement monitoring of existing and new Feral Pests on the Biodiversity Stewardship Site, as described in the Monitoring Plan and with reference to the performance measures specified in the table below titled “Integrated Feral Pest Management Performance Measures”.
7. The Owner must complete the templates in the Monitoring Plan titled “Diary template for Feral Pest management” and “Template for reporting of monitoring activities – Feral Pest management” to record implementation of this Integrated Feral Pest Management Plan and monitoring activities.

Feral Pests

Pest	Name of Feral Pest (e.g. foxes, cats, pigs, goats, avian pests, horses, other miscellaneous species)	Description of extent/severity of impact	Management Zone/s

A	Horses	There is a long-standing history in the surrounding Glenugie to Pillar Valley area relating to breeding herds of wild horses being 'loosely' bred and maintained by successive generations of a particular local family. These horses are allowed to reside in Glenugie State Forest and also access several private properties surrounding the state forest. There is evidence of horses accessing all parts of the proposed stewardship site, and likely have been present for decades.	Horses
B	Pig	Likely to be residents of the site.	All management zones. Possibility throughout the site, although specific locations unknown
C	Fox	Likely to be residents of the site.	All management zones. Possibility throughout the site, although specific locations unknown
D	Dog	Extent not known but likely to be visitors to the site. The Stewardship site may be part of a home range or dogs may be residents of the site. Known to be present in the adjacent Mororo State Forest Wild dogs are a 'declared pest animal' under the Local Land Services Act 2013 and are defined as: 'any dog, including a dingo, that is, or has become wild.	All management zones. Possibility throughout the site, although specific locations unknown
E	Cat	The total extent of cat occupancy is not known but cats are likely to be visitors to the site. The Stewardship site may be part of a home range or cats may be residents of the site.	All management zones. Possibility throughout the site, although specific locations unknown

Methods considered

Pest type	Name and description of program or method	Describe suitability
A	Monitored and removed as necessary, this is considered the most effective method given the relatively small area The proposed method to be adopted will be the installation of new boundary fencing around entire property to exclude wild horses from accessing and damaging the site. Horses will then be mustered and removed and ongoing monitoring and inspection and maintenance of the fence will be conducted. The landowners are then responsible for informing the neighbour if horses are observed on the property after being removed	Fencing (physical exclusion from the site) and mustering is considered the most suitable method in this case. This is because of the small numbers of horses and relatively small site and willingness of neighbour to catch and remove. Fencing is to be installed as a management measures to

		exclude neighbouring stock from the Stewardship site and so will also serve to exclude feral horses.
B	Management of feral pigs can include population reduction by using a number of control techniques. Initial control via a method that will remove a high proportion of the population is important. This will be followed by secondary control methods designed to reduce the population and feral pig impacts further and prevent it building back up. Primary control methods can consist of: Ground baiting (1080 or PigOut®, Warfarin, HogGone®, etc). Aerial baiting (1080 or PigOut®, Warfarin, HogGone®, etc). Secondary control methods can include: Shooting Trapping Other best management practices developed over the life of the agreement	Baiting can be effective as initial control of pig numbers if undertaken in a methodical manner. It is particularly effective if green feed and other food sources are scarce. Shooting feral pigs from the ground is an effective method to opportunistically to follow up and maintain numbers after an initial knockdown program has occurred.
C	Monitored and controlled in accordance with strategies outlined in the OEH Best-practice guidelines for fox control contained within the Predation by the red fox - threat abatement plan. Primary control methods can consist of: Ground baiting (1080) Aerial baiting (1080) Canid Pest Ejectors (a spring-loaded toxin delivery device buried in the ground with an attractant attached). Secondary control methods can include: Shooting Trapping Other best management practices developed over the life of the agreement	1080 baits are suitable for use at the site in accordance with the relevant legislation and guidelines but may result in off target kill. Canid Pest Ejectors are suitable as the target specificity associated with the pull strength required to trigger the ejector; and the placement of toxin in a stable capsule environment rather than in a bait substrate where degradation in toxin potency may occur over time. Shooting has benefits being suitable for multiple feral species, is species specific and humane. A multi-species approach is likely to be the most cost effective means to control feral animals

		at the Stewardship site.
D	No single control technique will solve a persistent wild dog predation problem. A combination of methods, such as ground or aerial baiting, trapping, shooting and fencing should be applied if the impacts of these pest animals are to be successfully managed. Primary control methods can consist of: Ground baiting (1080) Aerial baiting (1080) Canid Pest Ejectors (a spring-loaded toxin delivery device buried in the ground with an attractant attached). Secondary control methods can include: Shooting Trapping Other best management practices developed over the life of the agreement	1080 baits are suitable for use at the site in accordance with the relevant legislation and guidelines but may result in off target kill. Canid Pest Ejectors are suitable as the target specificity associated with the pull strength required to trigger the ejector; and the placement of toxin in a stable capsule environment rather than in a bait substrate where degradation in toxin potency may occur over time. Shooting has benefits being suitable for multiple feral species, is species specific and humane. A multi-species approach is likely to be the most cost effective means to control feral animals at the Stewardship site.
E	Control of feral cats is difficult as they are found in very low densities over large home ranges. Cats are very difficult to locate. The current control methods of shooting and trapping feral cats are quite difficult, expensive and time consuming and require skilled staff. The most effective form of feral cat control over large areas is poison baiting. A combination of methods, such as ground baiting and trapping, and shooting should be applied or other best management practices developed over the life of the agreement	Poison baits are suitable for use at the site in accordance with the relevant legislation and guidelines but may result in off target kill. Shooting is one of the main methods of control currently used but it is labour intensive and not considered an effective broad-scale control method. Shooting has benefits being suitable for multiple feral species, is species specific and humane. A multi-species approach is likely to be the most cost effective means to control feral

			animals at the Stewardship site.

Methods of control

Management Zone/s	Feral Pest type	Method of control	Frequency and timing (Year refers to years following the first payment)
All management zones	A	A combination of new boundary fencing (physical exclusion from the site) and mustering and removal of horses will be applied.	New boundary fencing is proposed in Year 1-2 following track work. Horses will be removed at the end of Year 2 and start of Year 3. This will require regular follow up action by owner until confident that all horses have been removed and in the event that horses are observed in subsequent years. The management costs include annual maintenance and repair of fences to continually exclude horses and other neighbouring stock.
	B	As identified by NSW Primary Industries the following methods are suggested. Primary control method – ground baiting. Bait stations are constructed by enclosing an area, normally about 1000 m2, with fencing that will not allow non target species in, but can allow pigs to enter by pushing underneath. Bait material is placed in a furrowed area or on the ground within the fenced area. After the baiting program all remaining poisoned bait must be removed and, where possible, carcasses of poisoned pigs should be collected and buried to prevent poisoning of non-target wildlife. Secondary control method – shooting program. Shooting feral pigs from the ground is normally used to follow up and maintain numbers after an initial knockdown program (i.e. baiting) has occurred. Often ground shooting is conducted using dogs to locate pigs. Ground shooting should not be conducted prior to, or during, any other program of control, as it disrupts normal feral pig activity and may cause feral pigs to temporarily disperse to other areas.	Where, through initial monitoring it is identified that there is a pest presence on the Stewardship site, ground baiting to start in the first year and continue as required throughout the agreement period. The period of free feeding may take up to 2 weeks or more and must be a minimum of 3 nights. Poisoned bait material of the correct volume can then be provided for a maximum of 3 consecutive nights. Ground shooting to occur as necessary after the baiting program has finished. Starting year 2.

			Funding has been provided every 2 years. It is expected that this will cover the 2 year period and allow for an adaptive, proactive and / or reactive approach when undertaking pest control works. It is expected that funding would cover the intensive control methods to be applied in year every second year with follow up survey and control conducting between intensive events
	C	As identified by NSW Primary Industries the following methods are suggested. Primary control method – ground baiting and/or Canid Pest Ejectors. Baiting will be used to control foxes should they be identified to be using the site. The correct type and method of baiting will need to consider the presence of native fauna and their feeding habits. Secondary control method – shooting program. Shooting foxes from the ground is normally used to follow up and maintain numbers after an initial knockdown program (i.e. baiting) has occurred.	Where, through initial monitoring it is identified that there is a pest presence on the Stewardship site, ground baiting and/or Canid Pest Ejectors to start in the first year. Ground shooting to occur as necessary after the baiting program has finished. Starting year 2. Funding has been provided every 2 years. It is expected that this will cover the 2 year period and allow for an adaptive, proactive and / or reactive approach when undertaking pest control works.
	D and E	As identified by NSW Primary Industries the following methods are suggested. Primary control method – ground baiting and/or Canid Pest Ejectors. Bait stations may be set up using meat or manufactured 1080 baits. The baits are lightly covered by raked sand or soil or placed on the surface and soil mounded on top. The soil around the bait or mound is raked to form a square about 1 m2. This allows for the identification of animals that visit the mound through tracks and scat observation. Free feeding using non-poisonous baits in bait stations may be carried out to identify visitation by non-target species such as	Where, through initial monitoring it is identified that there is a pest presence on the Stewardship site, ground baiting and/or Canid Pest Ejectors to start in the first year. Ground shooting to occur as necessary

		quolls. Bait stations visited by non-target species are discontinued. The remaining bait stations may then poisoned with a single 1080 poisoned bait and regularly checked. Baiting should continue until wild dogs stop taking baits. Individual bait stations may then be stopped if non-target animals are taking poison bait. Secondary control method – shooting program. Shooting may be effective in situations where wild dogs are known to be in the area. Most shooting however is opportunistic. Shooting can play an important role in controlling wild dogs, but usually does not have as significant an impact on a regional basis as poisoning. Electronic callers, predator calls and trail/game cameras can be used to increase the numbers of dogs shot.	after the baiting program has finished. Starting year 2. Funding has been provided every 2 years. It is expected that this will cover the 2 year period and allow for an adaptive, proactive and / or reactive approach when undertaking pest control works.

Other management activities

Records will be kept of other pest animal sightings, and if required control programs will be implemented.

Integrated Feral Pest Performance Measures

Feral Pest species	**Performance indicator (e.g. numbers treated/year, level of threat abatement to be achieved, total area to be treated (in hectares)).**
Horses (A)	Fencing completed by end of Year 2 and horses removed in first half of Year 3. Follow-up monitoring and reporting annually. The monitoring is to comprise, 1. a walk over of the site annually to observe horses and dung and level of impact 2. camera trapping as part of the vertebrate pest management monitoring work 3. Ad hoc / opportunistic observation of horses and their signs whilst undertaking other management tasks and general presence on site. Monitoring will be documented and include date, number of animals and location of observation, and this information will be used to inform control. The current level of impact will also be reported at this time.
B (Pigs), C (Fox) and D (Dog)	The monitoring is to comprise an initial survey with trail cameras to measure level of pest activity and hotspots for setting appropriate control effort. Monitoring will include an annual nocturnal survey using trail cameras annually and an estimate of the level of fox, dog, cat and pig activity. The level of impact is to be recorded as negligible, minimal, moderate or high. The monitoring is to also include recording the date, number and location of any tracks, traces scats or sightings. This information is to be used to inform where control effort should be conducted.

Section 6 - Integrated Weed Management Plan

Completing the compulsory Integrated Weed Management Plan

A table is provided below for the Integrated Weed Management Plan. Add additional sections to the table if required.

The plan must include, but is not limited to:

- a description of the high threat weeds and other weeds present on the Biodiversity Stewardship Site and their locations, linked to each Management Zone where weeds are present
- the method/s of weed control in each Management Zone
- the frequency of weed control activities at the site, taking into account management practices where weeds are providing habitat for native species
- the timing of any planting of native plant species required in each Management Zone to provide alternative habitat for native species affected by weed control activities

When the management plan is reviewed, weed control activities may be amended, deleted or added to take into account the weed species on the site at the time of the review.

The Integrated Weed Management Plan must contain clear, measurable objectives and performance indicators to demonstrate how the weed management actions will achieve gain on the Biodiversity Stewardship Site.

Details of monitoring to assess the effectiveness of Integrated Weed Management activities are to be described in Section 7 – Monitoring Plan and are to include:

- methods for monitoring the success of integrated weed management
- reporting and assessing the results from monitoring
- a timetable/measures for inspections to identify new weed species
- a diary for recording actions taken in accordance with the Integrated Weed Management Plan

1. The weeds present, and their locations, on the Biodiversity Stewardship Site as at the Agreement Date are listed in the table below titled "Weed Species present". Also refer to *Figure 5.2 – Biodiversity Stewardship Site Management Actions Map (BSSAR).*
2. The permitted methods of control of weeds on the Biodiversity Stewardship Site for each weed type are listed in the table below titled "Methods of Weed control".
3. Other Management Actions to control weeds (if any) are specified in the table below titled "Other Weed management activities".
4. The Owner must implement the monitoring and inspection of existing and new weeds on the Biodiversity Stewardship Site as described in the Monitoring Plan and with reference to the performance measures listed in the table below titled "Integrated Weed Management Performance Measures".

Weed species present

	Common name of Weed	**Scientific name of Weed**	**High Threat Weed Species (Y/N)**	**Description of infestation (e.g. intensity [% Projected Foliage Cover (PFC)] & location within zone)**	**Management Zone/s**
A	Balloon cotton Bush	*Gomphocarpus physocarpus*	N	Varying densities in disturbed areas both in north and south of site – locally abundant in SW and NE	8, 9
B	Redhead cotton bush	*Asclepias curassavica*	N	Located in SE of site around disturbed areas in low densities	8, 9
C	Whiskey Grass	*Andropogon virginicus*	Y	<1% on tracks and varying densities in open disturbed areas. Locally abundant & up to >50% in north of property	4, 8, 9, 10

D	Lantana	*Lantana camara*	Y	Range from isolated occurrence <1% to heavier patches of 6-50% along drainage lines in south of site	10
E	Camphor Laurel	*Cinnamomum camphora*	Y	Mature individual previously controlled on central southern drainage line, individual seedlings present	7
F	Broad-leaved Carpet Grass	*Axonopus compressus*	N	Open areas and tracks heavy in open areas, tracks in south of property light	2, 4
G	Narrow-leaved Carpet Grass	*Axonopus fissifolius,*	Y	Open areas on floodplain	1, 2, 3, 4
H	Groundsel Bush	*Baccharis halimifolia*	Y	Open areas, along creek lines.	1, 4
I	Cudweed	*Gnaphalium sp*	N	Along central drainage line in south of site	9, 11
J	Smooth Senna	*Senna septemtrionalis*	N	Small patch on top drainage line in south of site, sparse	11
K	Purple Top	*Verbena bonariensis*	N	Located in the south where lantana had been previously controlled, sparse	1, 2, 8
L	White Passion Flower	*Passiflora subpeltata*	N	Located in open disturbed areas in low densities	N/A
M	Fleabane	*Conyza bonariensis*	N	Located in open pasture	8, 9
N	Parramatta Grass	*Sporobolus fertilis*	Y	Located in open disturbed areas in low densities	2, 4, 9
O	Farmers Friends	*Bidens pilosa*	Y	Individual located on southern drainage line	8, 9
P	Ink weed	*Phytolacca octandra*	N	In open disturbed areas	N/A
Q	Fireweed	*Scenecio madagascariensis*	Y	In open disturbed areas	8, 9
R	Paddy's Lucerne	*Sida rhombifolia*	N	In open disturbed areas	8, 9
S	Thistle	*Cirsium vulgare*	N	Varying densities in disturbed areas both in north and south of site – locally abundant in SW and NE	8, 9
T	Broad-leaved Paspalum	*Paspalum dilatatum*	Y	Located in open pasture	2, 8, 9
U	Pigeon Grass	*Setaria parviflora*	N	Located in open pasture	2
V	Rhodes Grass	*Chloris gayana*	Y	Open areas on floodplain	4
W	Wild Aster	*Aster subulatus*	N	In open disturbed areas	9

X	Gomphrena Weed	*Gomphrena celosioides*	N	In open disturbed areas	8, 9
Y		*Richardia stellaris*	N	In open disturbed areas	9

Methods of Weed control			
Management Zone/s	**Weeds**	**Method of Weed control**	**Frequency and timing**
	Exotic Grasses	Careful spot spraying with non-selective herbicide such as Roundup Biactive® at 1:100 + adjuvant Should be undertaken where adjacent native species will not be killed or where risk of killing native species is low Avoid the risk of vehicles/ machinery spreading seed through site	Year 1 Commence annually. Control in warmer seasons, generally spring to summer
	Lantana	Manual control such as hand pulling or, lopper cut scrape and paint base Glyphosate 1:1.5 isolated individual plants. Ensure cut stems are elevated off the ground to avoid reshooting	Primary weed control & follow up for the first year, working systematically
	Camphor Laurel	Seedlings/saplings: hand pull or spot spray with glyphosate & water at 1:50 (20ml/L) + adjuvant Cut scrape and paint small plants 1:1.5 Stem inject 1:1.5 larger trees	Years 2 – 5 follow up weed control
	Blue Billy Goat Weed	Spray glyphosate 1:100 + adjuvant, or metsulfuron methyl at 1.5g/10L + adjuvant Hand pull and hang up	Year 6 -20 Annual maintenance. Best targeted before seeds are produced (for daisies before flowers develop September to December but may vary between species
	Balloon cotton Bush	Spray glyphosate 1:100 + adjuvant, or metsulfuron methyl at 1.5g/10L + adjuvant Hand pull and hang up	
	Redhead cotton bush	Spray glyphosate 1:100 + adjuvant, or metsulfuron methyl at 1.5g/10L + adjuvant Hand pull and hang up	
	Groundsel Bush	Spray glyphosate 1:100 + adjuvant Hand pull and hang up	
	Cudweed	Spray glyphosate 1:100 + adjuvant, or metsulfuron methyl at 1.5g/10L + adjuvant	
	Smooth Senna	Seedlings/saplings: hand pull or spot spray with glyphosate & water at 1:50 (20ml/L) + adjuvant Cut scrape and paint small plants 1:1.5 Stem inject 1:1.5 larger trees	
	Purple Top	Spray glyphosate 1:100 + adjuvant, or metsulfuron methyl at 1.5g/10L + adjuvant	
	White Passion Flower	Seedlings/saplings: hand pull or spot spray with glyphosate & water at 1:50 (20ml/L) + adjuvant Cut scrape and paint small plants 1:1.5	
	Fleabane	Metsulfuron methyl at 1.5g/10L + adjuvant Hand pull and hang up	
	Farmers Friends	Spray glyphosate 1:100 + adjuvant, or metsulfuron methyl at 1.5g/10L + adjuvant	

	Ink weed	Spray glyphosate 1:100 + adjuvant, or metsulfuron methyl at 1.5g/10L + adjuvant	
	Fireweed	Spray glyphosate 1:100 + adjuvant, or metsulfuron methyl at 1.5g/10L + adjuvant	
	Paddy's Lucerne	Spray glyphosate 1:100 + adjuvant, or metsulfuron methyl at 1.5g/10L + adjuvant	
	Thistle	Spray glyphosate 1:100 + adjuvant, or metsulfuron methyl at 1.5g/10L + adjuvant	
	Wild Aster	Spray glyphosate 1:100 + adjuvant, or metsulfuron methyl at 1.5g/10L + adjuvant	
	Gomphrena Weed	Spray glyphosate 1:100 + adjuvant, or metsulfuron methyl at 1.5g/10L + adjuvant	

Other Weed Management Actions

Management Zone/s	Weeds	Management Action	Frequency and timing
All management zones Consideration of the fire management plan should be made and that weed control efforts should be concentrated in areas that will not be burnt during the burn proposed in year 5. Then say commence weed monitoring and control efforts in areas burnt in year 5 following burn	All weed species	An appropriately trained person will identify areas of weed infestation proposed to be controlled and to update the Weed Management Plan where required until all management zones achieve maintenance weed levels. A monitoring and evaluation program to address weed regrowth and control measures will be undertaken annually by the landholder through the set-up of fixed photo-points across all restoration zones. Photos should be taken by digital camera and recorded in the project file by date and discrete photo-point number at the plot locations. Photo-point locations should be clearly marked on site and/or recorded using a GPS. The photo-point monitoring will be augmented by completion of a weed management log (included below) describing actions and observations. During weed control activities a site walkover will be conducted to determine the location of any new weed infestations and to record the extent of existing occurrences and control. For each management zone, the following information will be reported: A summary of weed control works undertaken for the previous 12 months in the zone and a review of their success or otherwise. A description of the current condition of the zone (i.e. presence/absence of canopy, shrub and/or ground-layer regeneration and any evidence of dieback, etc.). Brief descriptions of the type and locations of any significant new or remaining weed infestations. Recommendations, if required, of any adaptations to the weed control techniques previously applied. Any recommended changes to weed management where wildfire or controlled burns occur.	Year 1 – 10 annually Year 12 Year 18

All management zones	All weed species	Slashing equipment that is used on the stewardship site must enter the site clean of vegetation and soil that may contain weed seeds and be cleaned down after leaving areas of high weed density and entering areas of low weed density.	
All management zones	All weed species	Where required, brush matting using prunings from site of native plant species, may be used to assist regeneration in areas where weed control activity has reduced the level of surface cover and / or may result in increased erosion potential.	

Integrated Weed Management Performance Measures		
Management Zone/s	**Weeds**	**Performance indicator (e.g. % of Management Zone treated per year, weed PFC/abundance remaining per Management Zone).**
All management zones	All weed species	An appropriately trained person will identify areas of weed infestation proposed to be controlled and to update the Weed Management Plan where required until all management zones achieve maintenance weed levels. A monitoring and evaluation program to address weed regrowth and control measures will be undertaken annually by the landholder through the set-up of fixed photo-points across all restoration zones. Photos will be taken by digital camera and recorded in the project file by date and discrete photo-point number at the locations determined for weed control monitoring at the beginning of weed control works. Photo-point locations will be clearly marked on site and recorded using a GPS. The photo-point monitoring will be augmented by completion of a weed management log (included below) describing actions and observations. During weed control activities a site walkover will be conducted to determine the location of any new weed infestations and to record the extent of existing occurrences and control. For each management zone, some or all of the following information will be reported: • A summary of weed control works undertaken for the previous 12 months in the zone and a review of their success or otherwise. • A description of the current condition of the zone (i.e. presence/absence of canopy, shrub and/or ground-layer regeneration and any evidence of dieback, etc.). • Brief descriptions of the type, age class, and locations of any significant new or remaining weed infestations. • Percent foliage weed cover in photo point plots. • Recommendations, if required, of any adaptations to the weed control techniques previously applied. • Any recommended changes to weed management where wildfire or controlled burns occur. Weed monitoring frequency: • Year 1-10 (annually) • Year 12 • Year 18 Weed management plan review: • Year 7 • Year 13 • Year 19 **Performance indicators/goals** • All management zones to contain a 20% reduction in weed cover or reduced to maintenance level at photo point locations by Year 10. A reduction to weed maintenance level across whole site by Year 10.

Section 7 - Monitoring Plan

1. The Owner must implement monitoring as described in Section 7A.
2. The Owner must complete the diary templates and reports of monitoring activities contained in the more recent of:
   a) the templates contained in section 7B or;
   b) the templates published from time to time on the BCT website.

   The completed diary templates and reports of monitoring activities relating to a Reporting Period must be submitted with the Annual Report.

Section 7A – Monitoring methods and frequency

7A.1- Photo Points	(a) The Owner must establish permanent Photo Points at locations specified below within the Biodiversity Stewardship Site and ensure that photographs are taken from each point within 12 months of the Agreement Date and then at least every 12 months thereafter. (b) The Owner must take photographs according to the specifications below and at the locations listed below.			
	Locations of Photo Points Projected coordinate system: [GDA94 and Zone56]			
	Photo Point reference number	**Easting**	**Northing**	
	2	505945	6700684	
	8	507627	6702768	
	13	506399	6700971	
	17	506682	6702965	
	24	506341	6702367	
	25	506556	6702026	
	27	506274	6702850	
	34	507879	6704394	
	37	507450	6702812	
	38	507519	6702865	
	43	507780	6704072	
	The photographs must: (i) be taken in all directions (360°) from the Photo Point. (ii) be taken at the same location, with the same starting direction for the commencement and direction of the sweep, with the camera held at the same location, height and angle; (iii) show exactly the same field of view each monitoring event, to enable comparison across years; (iv) be clear and of suitable resolution to show detail, and taken at appropriate light conditions to display optimal contrast. (v) be dated, and labelled with the corresponding Photo Point reference number. (vi) retained by the Owner for the duration of the Deed.			
7A.2 - Biodiversity Stewardship Site inspections	Inspection of the Biodiversity Stewardship Site must be undertaken by a suitably qualified person at the times, and having regard to the purpose, set out below:			

	Site inspection		
	A. Purpose	**B. Interval (starting from the Agreement Date)**	
	To determine the percentage of Living Ground Cover present on the Biodiversity Stewardship Site for the purposes of grazing Stock in accordance with part 2.1 of section 1 of the Management Plan (if applicable).	Every 12 months	NA - No stock will be grazed on the Site
	To determine the number of Stock and date/s when Stock have entered the Management Zones on the Biodiversity Stewardship Site	Every 3 months	NA – No stock will be grazed on the site
	To determine the physical condition of fencing and gates and whether they are maintained to a standard that can: — control the movement of Stock if required under Part 2.2 of Section 1 of the Management Plan — control human disturbance if required under Part 8 in Section 1 of the Management Plan — control the movement of Feral Pests if required under Part 6.1 of Section 1 of the Management Plan	Every 12 months	
	To determine any human disturbance on the Biodiversity Stewardship Site Note: Part 8 of section 1 of the Management Plan and clause 4 of this Deed place restrictions on human activities on the Biodiversity Stewardship Site	Every 6 months	
	To determine the physical condition of existing firetrails and access tracks within the Biodiversity Stewardship Site, their navigability and evidence of erosion. The Owner must also document any evidence of erosion within other areas of the Biodiversity Stewardship Site. Note: Parts 8.2 and 8.9 of Section 1 of the Management Plan contain requirements for erosion control	Every 6 months	
	To determine the presence of Rubbish on the Biodiversity Stewardship Site Note: Part 8.3 and 8.6 of Section 1 of the Management Plan contains requirements for storing and disposing of Rubbish on the Biodiversity Stewardship Site	Every 6 months	
	Biodiversity monitoring	Every 5 years	
	Biodiversity monitoring would be in the form of monitoring vegetation integrity against the baseline data provided in the BSSAR. A selection of plots is detailed below, and these have been chosen to target areas where the greatest change from management activity is expected.		

	To assess the effectiveness of Threatened Species habitat management actions	Every 12 months or as specified in the Threatened Species Habitat Management Plan	N/A
	The dedicated Eucalyptus tetrapleura regeneration area has been monitored since 2014. Regrowth has been successful to date and based on these results this habitat is expected to continue to regenerate with assisted weed works and fire management, as per the scope of this MAP. The final monitoring of tree stem density is planned in Year 5. Following this, tree density monitoring will be replaced with the vegetation integrity monitoring on a 5-yearly basis to inform adaptive management. From the selection of plots below, a subset of these has been placed in the revegetation area for this purpose.		
7A.3 - Baseline biodiversity monitoring – Vegetation Integrity Survey Plots	Vegetation Integrity Survey Plots must be established with the purpose of providing a baseline for assessing Biodiversity outcomes in the future at the locations specified below.		

Locations of Vegetation Integrity Survey Plots
Projected coordinate system: [GDA94 and Zone56]

PCT	Plot reference	Easting	Northing	Direction of plot (magnetic degrees)
837	8	507627	6702768	85
837	13	506399	6700971	72
837	17	506682	6702965	270
971	30	506107	6700808	273
971	41	508065	6703819	280
1062	15	506790	6701849	69
1062	21	507334	6701897	162
1062	22	507741	6701787	343
1136	25	506556	6702026	192
1136	37	507450	6702812	312
1136	38	507519	6702865	97
1209	4	506278	6700638	290
1209	31	506224	6700541	105
1209	27	506274	6702850	77
1211	24	506341	6702367	170

1211	26	506171	6702103	138
1211	34	507879	6704394	273
1211	35	508285	6704303	185
1211	43	507780	6704072	49
1211	42	507790	6703868	293
1211	44	507632	6703946	146

7A.4 - Monitoring	The Owner must carry out monitoring against the performance measures using the methods and frequency specified below.			
	Monitoring Fire for conservation management			
	Performance Measure	**Management Zone/s**	**Method of monitoring**	**Timing**
	Aim for minimum 100% of all zones. Monitor fire recovery on plant species diversity and abundance to inform fire interval. Do not exceed min and max interval periods described	2, 4, 5.5, 5.6, 7, 9 and 11	Data on species diversity and cover of different strata is collected as part of the vegetation integrity survey and should be compared with benchmark data for each PCT. Monitor plant diversity (cover and abundance) as measure of performance. Data collected every 5 years as part of the integrity monitoring program and used to inform the need for fire in line with the fire management intervals, or the recovery of the community post fire	Every 5 years
	Aim for minimum 50% of zone Monitor fire recovery on plant species diversity and abundance to inform fire interval. Do not exceed min and max interval periods described	1, 3, 5, 6, 8, 10	Data on species diversity and cover of different species and strata is collected as part of the vegetation integrity survey and should be compared with benchmark data for each PCT. Monitor plant diversity (cover and abundance) as measure of performance. Data collected every 5 years as part of the integrity monitoring program	Every 5 years
	Monitoring Native Vegetation Management			
	Performance indicator	**Management zone(s)**	**Method of monitoring**	**Timing**
		N/A		
	Monitoring Threatened Species Habitat Management			
	Performance indicator	**Management Zone/s**	**Method of monitoring**	**Timing**

	N/A		

Monitoring Integrated Feral Pests Management			
Performance indicator Reduction in activity since baseline	**Management Zone/s** All zones	**Method of monitoring** Site walkover the observe fresh signs of feral animals and record location of high activity	**Timing** Every 2 years
Reduction in activity since baseline	All zones	Camera monitoring	Every 6 years
Reduction in activity since baseline	All zones	Scat and tracks monitoring	Every 6 years

Monitoring Integrated Weed Management			
Performance indicator	**Management Zone/s**	**Method of monitoring**	**Timing**

More than 70% reduction from baseline by year 6 and then 100% reduction by Year 12	Zones: 2, 4, 7, 8 9, 10, 11	Photo points	Every 5 years
Maintain a 50% reduction from baseline	All zones	Photo points	Every 5 years

Section 7B - Templates for reporting monitoring activities

Diary template for fire management

The Owner must complete this template following any fire event (including prescribed ecological burns, wildfire and arson) within the Biodiversity Stewardship Site.

Completed templates must be submitted with the next Annual Report.

Completed by:
Date of fire:
Cause of fire:
Management Zone/s affected:
Area burnt (hectares) (attach map):
Canopy scorched (%):
Leaf litter remaining (%):
Intensity of fire:
Other comments/observations:

Template for the reporting of monitoring activities – Integrated Fire management

The Owner must complete this template for each Management Zone. The template must be completed each year and submitted with the Annual Report.

It is required to be completed by a suitably qualified ecologist or bush regenerator.

Completed by:	
Date:	

Management Zone/s:	
Date of fires on the Biodiversity Stewardship Site:	
General description of the vegetation structure and species composition at time of reporting	
Observations of the health of threatened flora and its response to previous fires	
Interpretation of other ecological outcomes of previous fires	
Assessment of results of management actions (refer to performance measures)	
Recommendation on the timing and location for future planned fires within the Management Zone(s)	

Diary template for Native Vegetation management

The Owner must complete this template to record the details of any Native Vegetation Management Actions implemented on the Biodiversity Stewardship site.

Completed templates are to be submitted with the next Annual Report.

Completed by:

Date of activity:

Management Zone/s:

Description and type of action undertaken Include details of the Targeted Supplementary Planting, site treatment and other actions.

Assessment of results of management actions (refer to performance measures). Include details of the results of the action and how it could be improved in future

Minor variations from management plan (if any) (Include details and reasons)

Template for reporting of monitoring activities – Native Vegetation management

The Owner must complete this template to record the outcomes of Native Vegetation Management Actions implemented on the Biodiversity Stewardship site.

The template must be completed each year and submitted with the Annual Report.

Manage-ment Zone/s	Date	Observations and assessment of monitoring against performance measures

Diary Template for the reporting of monitoring activities - threatened species habitat management
The Owner must complete this template to record the details of any Threatened Species Habitat Management Actions implemented on the Biodiversity Stewardship site. Completed templates are to be submitted with the next Annual Report.
Completed by:
Date of activity:
Management zone/s:
Description and type of management undertaken Include details of the target species and the management activity used.
Assessment of effectiveness of threatened species habitat management action (refer to performance measures). Include details of the results of the management activity implemented and how it could be improved in future
Minor variations from management plan (if any) (Include details and reasons)

Template for reporting of monitoring activities – Threatened Species Habitat Management

The Owner must complete this template to record the outcomes of Threatened Species Habitat Management Actions implemented on the Biodiversity Stewardship site.

The template must be completed each year and submitted with the Annual Report.

Manage-ment Zone/s	Date	Observations and assessment of monitoring against performance measures

Diary template for Feral Pest management

The Owner must complete this template to record the details of any Feral Pest management control actions implemented on the Biodiversity Stewardship site.

Completed templates are to be submitted with the next Annual Report.

Completed by:

Date of activity:

Management zone/s:

Description and type of control undertaken Include details of the target species and the control technique used.

Assessment of results of control technique action (refer to performance measures). Include details of the results of the control technique and how it could be improved in future

Minor variations from management plan (if any) (Include details and reasons)

Template for reporting of monitoring activities – Feral Pest management

The Owner must complete this template to record the outcomes of Feral Pest management control actions implemented on the Biodiversity Stewardship site.

The completed template must be submitted with the next Annual Report.

Manage-ment Zone/s	Date	Current level of impact on vegetation or threatened fauna species This column must record impact as Negligible, Minimal, Moderate or High	Observations and assessment of monitoring against performance measures

Diary Template Integrated Weed management

This template must be completed to record the details of any Integrated Weed Management actions implemented on the Biodiversity Stewardship site. The template must be completed by a suitably qualified bush regenerator or ecologist on behalf of the Owner.

Completed templates are to be submitted with the next Annual Report.

Completed by:

Date of activity:

Management Zone:

Description and type of control undertaken

Provide a summary of all weed control activities undertaken within the previous 12 months. As a minimum, this should include number of person hours worked, methods used, type and quantity of chemical used, approximate area (ha) of primary weed treatment and follow-up weed treatment, and the main weeds that were treated. Attach a map of locations worked.

Assessment of results of control technique action (refer to performance measures). Include details of the results of weed control activities and how they could be improved in future. Assess effectiveness through evaluation against the relevant performance measures for the management zone.
Minor variations from management plan (if any) (Include details and reasons)

Template for the reporting of monitoring activities – integrated weed management	
This template must be completed annually for each Management Zone by a suitably qualified bush regenerator or ecologist. The completed template must be submitted with the next Annual Report.	
Management Zone:	
Completed by:	**Date:**
Weed control summary	
Provide a summary and review of all weed control activities undertaken within the previous 12 months and their effectiveness through evaluation against the relevant performance measures for the management zone. As a minimum, this should include number of person hours worked, methods used, type and quantity of chemical used, approximate area (ha) of primary weed treatment and follow-up weed treatment, and the main weeds that were treated. Attach a map of locations worked.	

Description and recommendations for remaining weed infestations

Provide a summary of the type and density of the main weeds that remain in the Management Zone, their location (mark on a map if necessary), and describe the recommended techniques for controlling these weeds.

Condition

Record each of the following condition measures as either absent, occasional, moderate or frequent when assessed across the part of the management zone where active integrated weed management has commenced

	Absent	Occasional	Moderate	Frequent
Regeneration of native canopy species				
Regeneration of native shrubs				
Regeneration of native groundcovers				
Dieback of native species				
Erosion				

Comments on condition

Provide any additional comments on the condition of the Management Zone, including reference to areas where supplementary planting or erosion control is required or has occurred (mark on a map where necessary).

Annual Reporting Template

Biodiversity Stewardship Site Annual Report					
Location details Biodiversity Stewardship Agreement ID: Reporting period:			Name of Owner/s: Property address:		
Management action	**Required completion time and frequency**	**Action completed (Yes/No)**	**Actual completion date/s**	**Description of actions undertaken** (including where undertaken (including reference to Management Zones), any variations and the reasons for variation)	**Visual observations and other comments** (including reasons for non-completion)
1 Management of fire for conservation					
2 Management of grazing for conservation					
3 Native vegetation management					
4 Threatened species habitat management					
5 Hydrology management					
6 Integrated feral pest management					
7 Integrated weed management					
8 Management of human disturbance					
9 Monitoring					

Records submitted with this report	
☐ Photographs taken at the Photo Point locations specified in the Management Plan in the Biodiversity Stewardship Agreement	
☐ Results of any monitoring, inspections or surveys required to be conducted under the Biodiversity Stewardship Agreement. This should include all completed diary templates and completed templates for the reporting of monitoring activities.	
Signature and certification	
I hereby declare that the information supplied in this report is accurate and complies with the reporting requirements under the Biodiversity Stewardship Agreement Note: If the land that forms the Biodiversity Stewardship Site is owned by multiple persons, each Owner must sign this Annual Report	
Signed: Date:	Signed: Date:

Attachment 5: Dictionary

In this Deed, unless a contrary intention appears, a capitalised word or words has the meaning given in the corresponding row in the table below:

Note: Definitions used only within the Management Plan are defined within the Management Plan and are not defined in this Dictionary

Word/s	Meaning
Aboriginal Objects	The same meaning that "Aboriginal objects" has in the NPW Act *Note: This definition may change from time to time with changes in Law, but on the Agreement Date this meaning was "Aboriginal object means any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises New South Wales, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains"*
Aboriginal Places	The same meaning that "Aboriginal places" has in the NPW Act *Note: This definition may change from time to time with changes in Law, but on the Agreement Date this meaning was "Aboriginal place means any place declared to be an Aboriginal place under section 84" of the NPW Act*
Accredited Person	The meaning given to it in section 1.6 of the Biodiversity Conservation Act *Note: This definition may change from time to time with changes in Law, but on the Agreement Date this meant a person accredited to prepare biodiversity assessment reports in accordance with the Biodiversity Assessment Method, under the scheme for the accreditation that is prepared in draft by the Environment Agency Head and published by the Minister on the NSW legislation website*
Agreement Date	The date on which the last party executes the Deed, being the date set out in Item A
Annual Contribution	The annual contribution payable in relation to the Biodiversity Stewardship Site, determined in accordance with clause 6.27 of the Biodiversity Conservation Regulations
Annual Report	An annual report for each Reporting Period in the form of, and attaching the information and documents required by, the Annual Reporting Template
Annual Reporting Template	The form entitled "Annual Reporting Template" which has been available to the Owner by whichever is the most recent of the following: — as attached to this Deed in Attachment 4 — on the NSW BCT website — as supplied to the Owner by the Minister's Representative from time to time
Assessment Date	The date on which the assessment for the preparation of the Site Assessment Report commenced
Attachment	A numbered attachment at the end of this Deed
Authorised Entrant	Any one or more of the following: — the Minister — the Minister's Representative — the Environment Agency Head — an officer of OEH or the NSW BCT — any other person that the Minister, the Environment Agency Head or an officer of OEH or the NSW BCT requests the Owner to allow onto the Land to carry out Research and/or Monitoring where the Owner has consented to such request (such consent not to be unreasonably withheld or delayed)
Authorised Officer	A person who is appointed as an authorised officer under Part 12 of the Biodiversity Conservation Act *Note: This definition may change from time to time with changes in Law, but on the Agreement Date, the Environment Agency Head may appoint any person (including a class of persons) as an authorised officer*
Authority	Any federal, state or local government authority, body or department having jurisdiction in relation to the Premises or this Deed and includes any governmental or semi-governmental or local governmental authority, administrative or judicial body or tribunal, department, commission, public authority, agency, minister, statutory corporation or instrumentality

Word/s	Meaning
Biodiversity	The meaning given to it in section 1.5 of the Biodiversity Conservation Act *Note: This definition may change from time to time with changes in Law, but on the Agreement Date this meaning was "the variety of living animal and plant life from all sources, and includes diversity within and between species and diversity of ecosystems"*
Biodiversity Assessment Method	The method established under section 6.7 of the Biodiversity Conservation Act
Biodiversity Conservation Act	The *Biodiversity Conservation Act 2016* (NSW) and any regulations from time to time in force under that Act
Biodiversity Conservation Regulations	The *Biodiversity Conservation Regulation 2017* (NSW)
Biodiversity Credit	A biodiversity credit created under this Deed
Biodiversity Stewardship Payments Fund	The fund established under Part 6 of the Biodiversity Conservation Act to hold funds from the transfer or retirement of Biodiversity Credits, and other funds
Biodiversity Stewardship Site	The area described in Item F beside the words "Biodiversity Stewardship Site"

Word/s	Meaning
Biodiversity Values	The meaning given to it in section 1.5 of the Biodiversity Conservation Act *Note: This definition may change from time to time with changes in Law, but on the Agreement Date this meaning was:* *"- vegetation integrity—being the degree to which the composition, structure and function of vegetation at a particular site and the surrounding landscape has been altered from a near natural state,* *- habitat suitability—being the degree to which the habitat needs of threatened species are present at a particular site,* *- threatened species abundance—being the occurrence and abundance of threatened species or threatened ecological communities, or their habitat, at a particular site,* *- vegetation abundance—being the occurrence and abundance of vegetation at a particular site,* *- habitat connectivity—being the degree to which a particular site connects different areas of habitat of threatened species to facilitate the movement of those species across their range,* *- threatened species movement—being the degree to which a particular site contributes to the movement of threatened species to maintain their lifecycle,* *- flight path integrity—being the degree to which the flight paths of protected animals over a particular site are free from interference,* *- water sustainability—being the degree to which water quality, water bodies and hydrological processes sustain threatened species and threatened ecological communities at a particular site"*
Business Day	A day that is not: — a Saturday, Sunday, public holiday or bank holiday in Sydney, Australia; or — 24, 27, 28, 29, 30 or 31 of December
Claim	Any claim, damage, demand, liability, Cost, loss, suit, proceeding (whether actual or potential), right of action and claim for compensation
Cost	Any cost, expense, charge, payment, outgoing, loss or other expenditure of any nature whether direct, indirect or consequential and whether accrued or paid and includes legal costs and expenses on whichever is the higher of a full indemnity basis or solicitor and own client basis

Word/s	Meaning
CPI	The Consumer Price Index All Groups number relating to Sydney published from time to time by the Australian Bureau of Statistics (or if that index ceases to be published then such other index which is, in the reasonable opinion of the Minister, a similar index which reflects changes in the cost of living in Sydney at the relevant time)
Deed	This deed and includes any attachments, annexures or schedules attached to this deed
Development	The meaning given to it in section 1.6 of the Biodiversity Conservation Act *Note: This definition may change from time to time with changes in Law, but on the Agreement Date this meaning was:* *"(a) the use of land, and* *(b) the subdivision of land, and* *(c) the erection of a building, and* *(d) the carrying out of a work, and* *(e) the demolition of a building or work, and* *(f) any other act, matter or thing referred to in section 26 of the Environmental Planning and Assessment Act 1979 (NSW) that is controlled by an environmental planning instrument,* *but does not include the demolition of a temporary structure"*
Dictionary	This Attachment 5 and includes any replacement or updated component of such Attachment from time to time
Disclosure Information	The information contained in this Deed, including a copy of the Deed and details of the location of the Land and Management Actions and Management Payments under this Deed
Dispute	A dispute, difference or claim in connection with this Deed (but excluding any dispute, difference or claim in connection with clause 29)
Dispute Notice	A notice setting out: — the nature, or subject matter, of the Dispute, including a summary of any efforts made to resolve other than in accordance with the Dispute Resolution Process; — the identity of any other person centrally involved in the Dispute; — the intent to invoke the Dispute Resolution Process; and — (if practicable) the outcomes which the notifying party wishes to achieve
Dispute Resolution Process	The process set out in clauses 24(a) and 24(b)

Word/s	Meaning
Environment Agency Head	The meaning given to it in section 1.6 of the Biodiversity Conservation Act *Note: This definition may change from time to time with changes in Law, but on the Agreement Date this meaning was "the Chief Executive of the Office of Environment and Heritage"*
First Payment Date	The date of the first occasion when the balance in the Relevant Account is equal to or greater than 80% of the Total Fund Deposit
Force Majeure Event	An event that is beyond the reasonable control of the Owner, including any natural disaster, fire, flood, accident, war, riot, act of terrorism, biohazard, a serious epidemic, or a change in legislation, but only to the extent that such events were beyond the Owner's reasonable control. A force majeure event does not however include any obligation to pay money, a labour dispute or shortage of materials or labour
Formal Review	A review conducted by an Accredited Person or by an appropriately qualified person to consider the efficacy of the Management Plan, including the Management Actions, and any amendments to the Management Plan that the reviewer considers appropriate to ensure the conservation of Biodiversity and of Biodiversity Values on the Biodiversity Stewardship Site and a written report summarising the findings of that review
Fund Manager	The person appointed from time to time under Part 6 of the Biodiversity Conservation Act as the "fund manager" in respect of the Biodiversity Stewardship Payments Fund, and who, as at the Agreement Date, is the person listed in Item E
Funding Acknowledgement Guidelines	The Funding Acknowledgement Guidelines for recipients of NSW Government infrastructure grants published by the NSW Government and as updated from time to time
GST Act	*A New Tax System (Goods and Services Tax) Act 1999 (Cth).* The expressions "GST", "Input Tax Credit", "Recipient", "Supply", "Tax Invoice" and "Taxable Supply" have the meanings given to those expressions in the GST Act and "Supplier" means the party who made the Taxable Supply

Word/s	Meaning
Identified Legal Requirements	Any one or more of the requirements listed below: — under the *Biosecurity Act 2015* (NSW): + an emergency order under section 44; + a control order under section 62; + a requirement to assist an authorised officer under section 103; or + a biosecurity direction under section 128; + a weed control notice issued under and prior to the repeal of the *Noxious Weeds Act 1993* (NSW)*;* — under the *Local Land Services Act 2013* (NSW): + a pest control order under section 130, + an eradication order under section 144, + a requirement for destruction of pests under section 152, or + a requirement to assist an authorised officer under section 179 + a direction under section 37A of the *State Emergency and Rescue Management Act 198*9 (NSW) in relation to a state of emergency or a direction under section 22A of that Act, — under the Rural Fires Act 1997 (NSW): + any notified steps under section 63, + a direction under section 45 for the prevention, control or suppression of any bush fire, + a bush fire hazard reduction notice under section 66, + an emergency fire fighting act within the meaning of that Act, + emergency bush fire hazard reduction work within the meaning of that Act, + otherwise as part of any managed bushfire hazard reduction work that is carried out in accordance with a current bushfire hazard reduction certificate that applies to the work or the provisions of any bushfire code applying to the land specified in the certificate
Item	A numbered item in the terms schedule at the beginning of this Deed
Land	The land described in Item F beside the word "Land"
Law	The common law, any requirement of any rule, statute, proclamation, regulation, ordinance or by-law, present or future, and whether state, federal or otherwise and the requirements of any Authority
Management Action	An obligation to act or an obligation to refrain from doing something set out in section 1-7 of the Management Plan

Word/s	Meaning
Management Payments	A payment to be made to the Owner in accordance with clause 11.1(a)
Management Plan	The management plan attached to this Deed in Attachment 4 and includes any replacement or updated component of such Attachment from time to time
Management Zone	An area of a given vegetation zone within the Biodiversity Stewardship Site subject to the same regime of management identified as a management zone on the map immediately below the words "Property Management Actions" included in the Management Plan
Minister's Representative	The person nominated by the Minister to be his or her representative from time to time and who, as at the Agreement Date, is the person set out in Item D
Monitoring	Observing and making records (in any form) of any one or more of the following: — the status of and changes to Biodiversity and Biodiversity Values — the success of the Management Plan in improving Biodiversity — compliance by the Owner with this Deed and the Biodiversity Conservation Act
Native Plant	The meaning given to it in section 5 of the NPW Act *Note: This definition may change from time to time with changes in Law, but on the Agreement Date this meaning was "native plant means any tree, shrub, fern, creeper, vine, palm or plant that is native to Australia, and includes the flower and any other part thereof"*
Native Vegetation	The meaning given to it in section 1.6 of the Biodiversity Act *Note: This definition may change from time to time with changes in Law, but on the Agreement Date this meant any plants (including trees, saplings, shrubs, scrub, groundcover) native to New South Wales (ie established in New South Wales before European settlement)*
New Owner	Any transferee, assignee or novatee of part or all of the Owner's interest under this Deed, including by way of a sale of the Land, or any part of the Land
Nominated Bank Account	The bank account nominated by the Owner in accordance with clause 11.5(a) or as updated from time to time in accordance with clause 11.5(b)
Note	Any indented or italicised text in this point 8 font and prefaced by the word "Note:"

Word/s	Meaning
Notice Address	The address set out in Item B, Item C, Item D or Item E beside the words "Address for service of notices" for the party to whom the notice is to be given
Notified Occupant	Any Occupant that the Minister is aware of because the Owner has provided the notification required under clause 9.1(a)
NPW Act	The *National Parks and Wildlife Act 1974* (NSW) and any regulations from time to time in force under that Act
NSW BCT	The Biodiversity Conservation Trust of New South Wales established under the Biodiversity Conservation Act
Occupancy Agreement	Any lease or licence or other agreement which permits entry to or occupancy of any part of the Land (including the Biodiversity Stewardship Site)
Occupant	Any person who occupies any part of the Land pursuant to an Occupancy Agreement (but does not include an Owner)
OEH	The Office of Environment and Heritage
Ongoing	In relation to the timing of carrying out a Management Action means commencing on the Agreement Date or First Payment Date (as indicated) and continuing in perpetuity, unless specified otherwise
Operational Deficit	The meaning given to it in the Biodiversity Conservation Regulations *Note: This definition may change from time to time with changes in Law, but on the Agreement Date this meant the balance of the biodiversity stewardship site account is less than the total present value of all scheduled management payments in respect of the biodiversity stewardship site for the period starting from the most recent anniversary of the date on which the biodiversity stewardship agreement was entered into and extending to perpetuity.*
Operational Deficit Threshold	The meaning given to it in the Biodiversity Conservation Regulations *Note: This definition may change from time to time with changes in Law, but on the Agreement Date this meant:* *(a) 20% of the total present value of all scheduled management payments in respect of the biodiversity stewardship site for the period starting from the most recent anniversary of the date on which the biodiversity stewardship agreement was entered into and extending to perpetuity, or* *(b) such other amount as the Minister determines, having regard to the advice of the Fund Manager*
Owner	The person described as "Owner" at Part A at the beginning of this Deed, any successor or assign under clause 31.1(h) and any person who is an "owner" within the meaning given to that term in section 1.6 of the Biodiversity Conservation Act *Note: This definition may change from time to time with changes in Law, but on the Agreement Date this meaning was that owner of land includes:* *(a) every person who, either at law or in equity:* *(i) is entitled to the land for any estate of freehold in possession, or* *(ii) is a person to whom the Crown has lawfully contracted to sell the land under the Crown Lands Act 1989 (NSW) or any other Act relating to the alienation of lands of the Crown, or* *(iii) is entitled to receive, or is in receipt of, or if the land were let to a tenant would be entitled to receive, the rents and profits in respect of the land, whether as beneficial owner, trustee, mortgagee in possession or otherwise, and* *(b) a person who leases land under the Crown Lands Act 1989, the Crown Lands (Continued Tenures) Act 1989 (NSW) or the Western Lands Act 1901 (NSW), and* *(c) any other person who, under the regulations, is taken to be the owner of the land,* *but (unless the regulations otherwise provide) does not include a beneficiary of a trust relating to the land*
Owner Associate	Any representative, servant, contractor, consultant, agent, lessee, licensee or invitee of the Owner

Word/s	Meaning
Ownership Change Date	The date that the Minister's Representative is notified of a change in Owner of the Land
Payment Amount	Each amount set out in, or calculated in accordance with, the Payment Tables for a Payment Year, increased in accordance with the method set out in clause 11.2(a)
Payment Tables	The tables in Item L and Item M
Payment Year	Each 12 month period: — commencing on the First Payment Date; and — each yearly anniversary of the First Payment Date
Permitted Exception	An activity specified in the table in Item I, provided it is carried out in accordance with the requirements within that table, and only in the Management Zones for which the activity is permitted
Protected Animal	The same meaning that it has in section 1.6 of the Biodiversity Conservation Act *Note: This definition may change from time to time with changes in Law, but on the Agreement Date this meaning was "an animal of a species listed or referred to in Schedule 5 of the Biodiversity Conservation Act" and "animal means any animal, whether vertebrate or invertebrate and in any stage of biological development, but does not include:* *(a) humans, or* *(b) fish within the meaning of the Fisheries Management Act 1994 (NSW)"*
Protected Person	Each and all of the following: — the Minister — the Minister's Representative — the Environment Agency Head — the employees or officers of the OEH — the NSW BCT — the members and committees of the Board of the NSW BCT — the employees and officers of the NSW BCT — any other person acting under the delegation, direction or control of the Minister, the Minister's Representative, the Environment Agency Head or the NSW BCT for any purpose — the Crown in right of the State of New South Wales

Word/s	Meaning
Registration	Registration of this Deed, or the variation or termination of this Deed, in the Register kept under the *Real Property Act 1900* (NSW) and includes, where the context allows, an application to register this Deed and "Register" has a corresponding meaning
Registration Date	The date on which the Minister receives notification from the Registrar-General that this Deed has been registered under Section 5.12 of the Biodiversity Conservation Act
Relevant Account	The biodiversity stewardship site account within the Biodiversity Stewardship Payments Fund kept by the Fund Manager in accordance with the Biodiversity Conservation Regulations
Reporting Obligations	The reporting and record keeping requirements as set out in Attachment 3
Reporting Period	Each of the following: — prior to the First Payment Date: + the 12 month period commencing on the Agreement Date; and + each subsequent 12 month period commencing on each anniversary of the Agreement Date — on and from the First Payment Date: + the 12 month period commencing on such First Payment Date; and + each subsequent 12 month period commencing on each anniversary of the First Payment Date
Research	The investigation into and study of facts relating to Biodiversity and Biodiversity Values, and the conservation of Biodiversity and Biodiversity Values
Review Date	— Until the first Ownership Change Date, each 5th anniversary of the Agreement Date — On and after the Ownership Change Date, on the Ownership Change Date and each 5th anniversary of the Ownership Change Date
Sell	To sell, transfer, gift, assign or otherwise dispose of and "Sale" has a corresponding meaning
Site Assessment Report	The report described in Item H
Site Sketch Plan	A plan in registrable form which is part of this Deed showing the boundaries of the Biodiversity Stewardship Site, but not a deposited plan or subdivision plan which is separate to this Deed

Word/s	Meaning
Site Splitting	A gifting or transfer of part only of the Land, including a Subdivision in preparation for such a gift or transfer *Note: For example, if the Owner wanted the Owner's children to each own part of the Land*
Special Conditions	The terms and conditions set out in Item J
Standard Provisions	Clauses 1 to 31 of this Deed, and this Dictionary
Subdivide	To physically or legally (or both) split or separate the Land into portions or to make any application to an Authority for such a split or separation
Templates	The Templates available on the NSW BCT website
Threatened Ecological Community	Vegetation communities that are: — known to occur within the Conservation Area and specified as a threatened ecological community in the Site Values Report; or — listed in Schedule 2 to the Biodiversity Conservation Act; or — listed in accordance with the *Environment Protection and Biodiversity Conservation Act 1999* (Cth)
Threatened Species	The same meaning as in section 1.6 of the Biodiversity Conservation Act *Note: This definition may change from time to time with changes in Law, but on the Agreement Date a list of threatened species was available at https://www.legislation.nsw.gov.au/#/view/act/2016/63/sch1*

Word/s	Meaning
Total Fund Deposit	The meaning given to it in section 6.21(7) of the Biodiversity Conservation Act and for this Biodiversity Stewardship Site is the amount specified in Item K *Note: This definition may change from time to time with changes in Law, but on the Agreement Date this meant, for a site, an amount determined (subject to the regulations) by the Environment Agency Head as the present value of the total of all scheduled management payments in respect of the site (under the biodiversity stewardship agreement) during the life of the agreement. The present value is to be determined by applying the discount rate determined and published by the Environment Agency Head from time to time.*
Waste	The meaning given to it in the *Protection of the Environment Operations Act 1997* (NSW) *Note: This definition may change from time to time with changes in Law, but on the Agreement Date this meaning included:* *(a) any substance (whether solid, liquid or gaseous) that is discharged, emitted or deposited in the environment in such volume, constituency or manner as to cause an alteration in the environment, or* *(b) any discarded, rejected, unwanted, surplus or abandoned substance, or* *(c) any otherwise discarded, rejected, unwanted, surplus or abandoned substance intended for sale or for recycling, processing, recovery or purification by a separate operation from that which produced the substance, or* *(d) any processed, recycled, re-used or recovered substance produced wholly or partly from waste that is applied to land, or used as fuel, but only in the circumstances prescribed by the regulations, or* *(e) any substance prescribed by the regulations to be waste.* *A substance is not precluded from being waste merely because it is or may be processed, recycled, re-used or recovered*

x
NSW BCT delegate

x
Owner