

Oxley Highway to Kempsey & Kempsey to Eungai Pacific Highway Upgrades

Biodiversity Offset Package


July 2017



View from the north over the Yerbury property at Clybucca, April 2017 (Matthew Stephens)

About this release

Title	Oxley Highway to Kempsey & Kempsey to Eungai Pacific Highway Upgrades – Biodiversity Offset Package
--------------	--

Approval and authorisation		Sign	Effective date
Prepared by	Kylie Wells		11/7/2017
Reviewed by	Aleesha Doolan	via email	19/7/2017
Reviewed by	Scott Lawrence	via email	31/7/2017
Approved by	Bob Higgins	Approval memo	31/7/2017

Document status	Date
Final	23/8/2017

Version	Date	Revision Description
Draft	21/12/2016	Draft version 1
Draft	4/4/2017	Draft version 2
Draft	11/7/2017	Draft for internal review
Draft	31/7/2017	Draft for approval
Final	23/8/2017	Final

Contents

1	Introduction.....	6
1.1	Background.....	6
1.2	Purpose of this report.....	6
1.3	Consultation.....	8
2	Updated project impacts.....	8
3	Management of Biodiversity Impacts.....	10
3.1	Biodiversity Mitigation Measures.....	10
3.1.1	Fauna Crossing Measures.....	10
3.1.2	Fauna fencing.....	10
3.1.3	Revegetation Measures.....	11
3.1.4	Installation of Nest Boxes and Microbat Roost Boxes.....	11
3.1.5	Widened Median.....	12
3.1.6	Other Fauna Mitigation Measures.....	12
3.1.7	Biodiversity Monitoring Measures.....	12
4	Biodiversity Offsets.....	12
4.1	Options for Biodiversity Offsets.....	12
4.2	Summary of proposed offset measures.....	13
4.3	Offset properties in detail.....	17
4.3.1	Norton.....	17
4.3.2	Cairncross State Forest.....	21
4.3.3	Lallemand.....	26
4.3.4	Blair.....	29
4.3.5	Whalen.....	33
4.3.6	Yerbury.....	38
4.3.7	McAlister/Latham.....	42
4.3.8	Priority 1 properties.....	47
4.4	Protection mechanisms to be used.....	50
4.4.1	BioBanking Agreement.....	50
4.4.2	Transfer to NPWS.....	52
4.4.3	Flora Reserve.....	52
4.5	Proposed management actions.....	53
4.6	Monitoring.....	53
4.7	Timing and responsibility for implementation of package.....	54
5	Summary of offsets provided by package.....	56
6	Conclusions.....	61
7	References.....	63
	Appendix A – Oxley Highway to Kempsey Approved Biodiversity Offset Strategy.....	64
	Appendix B – Approved Kempsey to Eungai Biodiversity Offset Strategy.....	65

Appendix C – Stakeholder Consultation.....66

Appendix D – Norton BioBanking Assessment Report, GHD, 2016.....67

Appendix E – Assessment of the Caincross State Forest and Lallemand sites, extracted from Niche (in prep).....68

Appendix F – Assessment of the Blair and Whalen sites, Lewis 2012.....69

Appendix G – Assessment of the Yerbury site, Lewis and Richards 2012.....70

Appendix H – Assessment of the McAlister/Latham site, Lewis 2013.....71

1 Introduction

1.1 Background

The NSW Roads and Maritime Service (Roads and Maritime) is currently upgrading a 37 kilometre section of the Pacific Highway, from approximately 700m north of the Oxley Highway Interchange to tie in with the Kempsey to Eungai Pacific Highway Upgrade (see below). Two main sections of the Project would deviate from the existing Pacific Highway. These are in the vicinity of the Hastings River and the Wilson River.

A new grade separated interchange is planned in the area of Blackmans Point Road south of Telegraph Point and a half interchange is proposed in the area of Haydons Wharf Road, north of Telegraph Point. These would both provide access into Telegraph Point which would be bypassed as part of the Project. The design of the carriageway arrangement would allow for a six-lane divided carriageway in the future.

Roads and Maritime has also upgraded a 40.8 kilometre section of the Pacific Highway, from south of Kempsey to Eungai on the Mid- North Coast of New South Wales. The upgrade diverges in a north-easterly direction from the existing Pacific Highway south of Kempsey, passing over the Macleay River floodplain and crossing the Macleay River north-east of Frederickton. From Frederickton, it passes to the west of the existing Pacific Highway through Collombatti and the edge of the Tambar State Forest, and north through Barraganyatti to join the existing highway south of Eungai Rail. The northern end of the proposed upgrade involved the upgrade and duplication of the existing highway.

New grade separated interchanges at south Kempsey, Frederickton and Stuarts Point Road, allow easy access to and from the existing Pacific Highway, Kempsey, Frederickton, Barraganyatti, Stuarts Point and Eungai Rail.

The design of the carriageway arrangement allows for a six-lane divided carriageway in the future.

The upgrade was constructed in two stages, with the Kempsey Bypass section (Stage 1) completed in March 2013, and the Frederickton to Eungai section (Stage 2) completed in May 2016.

Both upgrades form part of the Pacific Highway Upgrade Program, a joint commitment by the NSW State Government and the Federal Government to upgrade the Pacific Highway between Hexham and the Queensland border.

1.2 Purpose of this report

The Oxley Highway to Kempsey (OH2K) and Kempsey to Eungai (K2E) upgrades were approved under Part 3A of the NSW *Environmental Planning and Assessment Act 1979*. The conditions of approval for both projects required the development of a Biodiversity Offset Strategy and Package. This report has been prepared to satisfy the Minister's Conditions of Approvals for both projects as outlined below.

Table 1.1: Ministers conditions of approval and relevant sections of report or stand-alone reports.

MCoA – OH2K	Section of this report
MCoA B9: Within two years of the date of approval of the Biodiversity Offset Strategy, unless otherwise agreed by the Director General,	

the Proponent shall prepare and submit a Biodiversity Offset Package for the approval of the Director General. The package shall be developed in consultation with the EPA and DPI (Fishing and Aquaculture), and shall include, but not necessarily be limited to:	
(a) Details of the final suite of the biodiversity offset measures to be implemented for the project demonstrating how it achieves the requirements of the Biodiversity Offset Strategy (including specified offset ratios);	Sections 4.3 and 5
(b) The final selected means of securing the biodiversity values of the Package in-perpetuity, including ongoing management, maintenance and monitoring requirements; and	Sections 4.4, 4.5 and 4.6
(c) Timing and responsibilities for the implementation of the provisions of the package over time.	Section 4.7
The requirements of the Package shall be implemented by the responsible parties according to the timeframes set out in the Package, unless otherwise agreed by the Director General.	
MCoA – K2E	
MCoA 2.9c): The Proponent shall, in consultation with DECCW: c) consider including appropriate compensatory habitat for the <i>Maundia triglochoides</i> in the Biodiversity Offsets Package referred to in Condition 2.11 should the information obtained during the investigation referred to in Condition 2.9 a) find that translocation is not reasonable and feasible.	Sections 4.3.4, 4.3.5, 4.3.6 and 5
MCoA 2.11 Within 12 months of the approval of the Biodiversity Offset Strategy, or as otherwise agreed by the Director-General, the Proponent shall submit the Biodiversity Offset Package for the approval of the Director-General. The Package shall be developed in consultation with the DECC and:	
(a) shall detail the final suite of biodiversity offset measures selected in accordance with the Strategy; and	Sections 4.3 and 5
(b) include a program (timeline) to achieve the implementation of the final suite of measures. Where possible, this should include purchase of land, development of agreements with identified land management authorities (e.g. DECC, local council etc.) for long term management and funding of offsets and mitigation measures, and installation of identified mitigation measures.	Sections 4.4 and 4.7
OH2K EPBC Act Elements	
CoA 5 To compensate for the loss of 240 hectares of threatened species habitat the person taking the action must prepare and submit a Biodiversity Offset Management Plan (BOMP) for the Minister's	Stand-alone reports OH2K OMP, Niche (in-prep). V1 – 16.01.15; V2 09.03.16; final expected late 2017.

written approval within 6 months of commencement of the action.	
---	--

The OH2K Biodiversity Offset Strategy was originally approved on 27 January 2014. The K2E Biodiversity Mitigation and Offset Strategy was originally approved on 14 May 2010. In 2016 both strategies were revised to seek approval to submit a single offset package covering both projects and incorporating the Collombatti-Clybucca Floodplain Remediation Project as part of the offset package. The updated offset strategies for the OH2K and K2E projects were re-approved on 4 July 2016 and 21 December 2016 respectively (Appendices A and B). The Department of Planning and Environment also agreed to a submission timeframe of 27 January 2017 for a single offset package covering both projects. An extension until 31 July 2017 was also provided to submit the final package.

1.3 Consultation

The details within this plan have been completed through ongoing consultation with the OEH/EPA, DPI (Fisheries), FCNSW and NPWS and through the Clybucca Government Working Group (CGWG) (Appendix C).

2 Updated project impacts

The biodiversity offset strategies for each project detailed the broad vegetation types that were expected to be impacted. These were updated with the latest figures available during the revision of each offset strategy during 2016 and are summarised in Table 2.1.

Table 2.1: Summary of broad vegetation types impacted by the OH2K and K2E projects and the habitat area (hectares) that will be offset.

Vegetation Type	PCT ID	EEC	Area impacted (Ha)		Offset Ratio Applied	Offset Area required (Ha)
			OH2K	K2E		
Blackbutt – Scribbly Gum Dry Sclerophyll Forest	PCT 698 & 1135	N/A		1.47	2:1(K2E)/ 4:1 (OH2K)	113.84
Tallowood – Grey Gum Dry Sclerophyll Forest	PCT 1262	N/A		35.53		
Stringybark/Ironbark/ Bloodwood Dry Sclerophyll Forest	PCT 688 or PCT 1267	N/A		4.13		
Scribbly Gum Dry Sclerophyll Forest	PCT 1135	N/A		10.99		
Mahogany Dry Sclerophyll Forest ¹	PCT 1262	N/A		4.80		
Wet Sclerophyll (Grassy), includes Blackbutt Plantation	PCT 698	N/A	31	122.51		
Wet Sclerophyll (Shrubby)	PCT 699, 1073 & 1208	N/A	170		680	

Sub-tropical Floodplain Forest (formerly River-flat Forest)	PCT 695, 827, 837, 971 & 1227	Subtropical Coastal Floodplain	14	7.17	4 :1	84.68
Swamp Sclerophyll Forest	PCT 1064 & 1230	Swamp Sclerophyll Forest	21	18.78	4:1	159.12
Swamp Oak Floodplain Forest	PCT 1235	Swamp Oak Floodplain Forest	1	23.31	4 :1	97.24
Freshwater Wetland – Wet Meadow	PCT 782	Freshwater Wetlands	3	21.03	4 :1	100.56
Freshwater Wetland – Lepironia Sedgeland	PCT 780			1.11	4:1	
TOTAL			240	250.83		1604.46

3 Management of Biodiversity Impacts

3.1 Biodiversity Mitigation Measures

Biodiversity offset and mitigation measures are outlined in detail in the Biodiversity Offset Strategy for each project and follow the Avoid, Minimise, Mitigate and Offset approach. The key biodiversity mitigation measures for the OH2K and K2E upgrades include:

- Fauna Crossing Measures;
- Fauna fencing;
- Revegetation Measures;
- Installation of Nest Boxes and Microbat Roost Boxes;
- Widening of the Median
- Other Fauna Mitigation Measures; and
- Biodiversity Monitoring Measures.

3.1.1 Fauna Crossing Measures

Construction of a range of fauna crossing measures, including fauna underpasses, combined fauna drainage/bridge structures and associated fauna fencing, rope bridges, glider poles and vegetated medians have been incorporated into Upgrades. A summary of the fauna crossing measures is provided in Table 3.1. Full detail on each measure is located in the Biodiversity Offset Strategy for each project.

Table 3.1: Summary of Fauna Crossing Point and Structures: Oxley Highway to Kempsey and Kempsey to Eungai Upgrades

Fauna crossing type	Number		TOTAL
	OH2K	K2E	
Dedicated fauna underpass	11	2	13
Combined fauna underpass	30	7	37
Bridges	16	7	23
Rope bridges	11	4	15
Glider poles (sets of)	4	6	10
TOTAL	72	26	98

All waterway crossings that involve new water crossing structure(s) or replacement of an existing structure have been designed to minimise impact on fish passage in accordance with Department of Industry guidelines (Fairfull & Witheridge 2003).

3.1.2 Fauna fencing

For the OH2K upgrade, three types of fauna fencing are being installed:

1. Standard floppy-top fencing – where the project traverses the Cairncross, Ballengarra and Maria River State Forests or a regional habitat corridor; between dual carriageway bridges and culverts where there are gaps between structures to prevent fauna accessing the median strip and on the outside of all spill containment/water quality treatment basins to prevent fauna from accessing polluted water sources.
2. Frog fencing – where the presence of Giant Barred Frogs has been confirmed, in areas of Green-thighed Frog breeding ponds and or where there is an obvious threat of frogs accessing the new carriageway.
3. Phascogale fencing – in areas on known or high potential habitat, to direct phascogales away from the highway and towards underpasses.

3.1.3 Revegetation Measures

Revegetation and rehabilitation of areas disturbed as a result of construction of the Upgrades, including ancillary areas, is progressively occurring as construction works progress.

Revegetation measures include planting a range of locally occurring native shrubs, trees and ground covers and where possible linking bushland remnants. Species selected are based on the surrounding vegetation communities that are impacted by the Upgrades.

Riparian vegetation is being restored and rehabilitated in and around watercourses affected by the project in consultation with the EPA and the Department of Primary Industries (Fisheries).

Revegetation and rehabilitation works includes measures to provide or enhance fauna habitat features for threatened species such as:

- Planting of preferred food trees for native fauna, including appropriate Eucalypt species for the Koala and Yellow-bellied Glider and Allocasuarina spp for the Glossy Black Cockatoo;
- Provide fringing vegetation around riparian zones to enhance habitat for frogs including the Giant Barred Frog and Green-thighed Frog. At some specific locations, fringing ground covers will be used to enhance constructed breeding ponds for the Green-thighed Frog;
- Incorporation of specific microhabitat features (ie in fauna underpasses) including but not limited to hollow logs and large rocks to provide refuge habitat for ground dwelling fauna including the Spotted-tail Quoll;
- Redistribution of habitat features and resources for native fauna identified by a qualified ecologist (eg hollow-bearing trees, hollow logs and bush rocks), which have been removed from construction sites, along the route of the Project. This redistribution will not occur in high condition remnant vegetation.

Weeds in areas disturbed by construction activities are managed for between one and three years after construction is completed for each major project stage.

3.1.4 Installation of Nest Boxes and Microbat Roost Boxes

Nest boxes have or are currently being installed to offset the removal of hollow-bearing trees in areas where habitat trees are in short supply (<4 suitable trees per hectare) and in consultation with adjacent property owners.

For the K2E Upgrade, a total of 346 nest boxes were installed. For the OH2K Upgrade, the Nest

Box Management Plan has identified that 723 nest boxes of various sizes are required to be installed. This project will also install 160 microbat roost boxes.

3.1.5 Widened Median

The OH2K project has retained a widened, vegetated median in the Cairncross State Forest, to provide a stepping stone opportunity for gliders, predominantly the Yellow Bellied Glider and Squirrel Glider.

3.1.6 Other Fauna Mitigation Measures

Additional commitments identified in the Biodiversity Offset Strategy for each project include:

- Clearing limits were clearly marked on site with temporary fencing prior to clearing commencing;
- Pre-clearing surveys were undertaken by qualified ecologists. Any fauna found were relocated into nearby suitable habitat;
- On detection of any additional or unexpected threatened species, the unexpected finds processes in the Construction Environmental Management Plan has been followed.
- Design and implementation of best practices erosion, sediment and water quality controls as per Managing Urban Stormwater Soils and Construction Volume 2D (2008).
- Adjoining vegetation has been maintained to limit overhang of fauna fences or other barriers.

3.1.7 Biodiversity Monitoring Measures

An Ecological Monitoring Program (EMP) was prepared for both the OH2K and K2E projects, in consultation with the EPA. The primary aim of the EMP is to measure the effectiveness of mitigation measures implemented for the project and allow for their modification via corrective actions if necessary. The EMP includes the full duration of construction and from the opening of the project to traffic until it can be demonstrated that the effectiveness of the mitigation measures has been achieved over three to five successive monitoring periods or as otherwise agreed by the Director General of the Department of Planning and Environment.

4 Biodiversity Offsets

4.1 Options for Biodiversity Offsets

For K2E, the Minister for Planning's Condition of Approval 2.10 (a) states that a minimum of 382 hectares of native vegetation must be provided to offset the direct and indirect impacts of the project. For OH2K, no specific hectare requirement is specified, rather at a ratio of 4:1 for areas of high conservation and 2:1 for the remainder of native vegetation areas.

Decision making framework

All biodiversity offsets will be located within the NSW North Coast Bioregion with the aim of offsetting according to the following framework:

1. On a like-for-like basis based on vegetation formation or EEC for the existing offset properties of Norton, Cairncross State Forest, Lallemand and the Roads and Maritime Collombatti-Clybucca floodplain cluster (Blair, Whalen, Yerbury and McAlister/Latham); and
2. Utilising the residual Freshwater Wetland, Swamp Oak and Swamp Sclerophyll EEC present on the Roads and Maritime Collombatti-Clybucca floodplain cluster; and
3. Inclusion of an additional area of Freshwater Wetland, Swamp Oak and Swamp Sclerophyll EEC on Priority 1 private owned properties, as identified in the Collombatti-Clybucca Floodplain Remediation Feasibility Study (VRL, 2015). In the event all Priority 1 lands cannot be secured by either a BioBanking Agreement or voluntary acquisition, Roads and Maritime would seek agreement to an alternative proposal.

4.2 Summary of proposed offset measures

Roads and Maritime have identified fifteen properties to offset biodiversity impacts associated with the Oxley Highway to Eungai Pacific Highway upgrades. Table 4.1 summarises the key features of each property. The location of each property in relation to the Upgrade is shown in Figure 4.1.

Table 4.1: Offset properties identified to offset biodiversity impacts associated with the Oxley Highway to Eungai Pacific Highway Upgrades.

	Norton	Cairncross State Forest	Lallemand	Blair	Whalen	Yerbury	McAlister/Latham	Priority 1 private properties (8)
Lot & DP	501//1200647 (part); 53//1162355; 301//1161894; 302//1161894; 56//1165099 (part); 11//1194544 and 21//1199597.	1//1141894 1//1142895 183//SFNO	86//755543 6//1211674 96//755543 101//755543	3//546108 11//752428 28//752428	2//1181951 3//1181951 4//1181951	1132//546042 851//546043 852//546043 91//752409 92//752409 114//752409 131//752409 159//752409 163//752409 164//752409 165//752409	851//546043 5//546108 178//752409 155//752409 1741//609394 1742//609394 93//752409	[REDACTED]
Tenure	RMS	FCNSW	RMS	RMS	RMS	RMS	RMS	Private
Property Size (ha)	508.1	491.8	106.4	585.75	73.1	394.3	200.1	438.30
OH2E Offset size (ha)	37.1	326.6	106.4	333.2	34.8	298.1	181.3	295.4
Distance from Upgrade (km)	Adjacent	Adjacent	1.2	Adjacent	Adjacent	Adjacent	1.2	<5
Protection mechanism	BioBanking Agreement	Flora Reserve	NPWS Transfer	BioBanking	BioBanking	BioBanking	BioBanking	BioBanking
Used for EPBC reqs.	Yes	Yes	No	No	No	No	No	No
Used for other projects?	Yes, majority of site (455 ha) allocated to WC2U.	No	No	No	No	No	No	No

With the exception of the Priority 1 private properties, the remainder of the proposed offset sites have been surveyed. GHD undertook a full BioBanking assessment of the Norton property (Appendix D). Niche undertook ecological surveys of Cairncross State Forest site and Lallemand, as part of the development of the Commonwealth offset package for OH2K (Appendix E). Lewis Ecological Surveys undertook ecological surveys of Blair, Whalen, Yerbury and McAlister/Latham for the Kempsey to Eungai compensatory habitat package during 2012 (Appendices F-H).

The Norton, Cairncross State Forest and Lallemand sites were selected on the basis that they:

- are located within the NSW North Coast Bioregion;
- are located within a 5 km radius of the project;
- contain the vegetation types required to be offset (refer Table 2.1);
- have been surveyed to determine the presence of suitable habitat for the threatened species impacted;
- comprise vegetation of at least moderate to good condition;
- enable connectivity between adjacent areas of vegetation; and
- are suitable for ongoing management for conservation through either a transfer to NPWS, gazettal of a new Flora Reserve or establishment of a BioBanking Agreement.

The Blair, Whalen, Yerbury, McAlister/Latham and Priority 1 private properties have been included as a variation to the like-for-like offset requirements. As outlined in the approved offset strategies for the OH2K and K2E projects, prior to the inclusion of the Priority 1 properties, preliminary offset calculations identified a deficit of sub-tropical floodplain forest EEC and wet sclerophyll forest (shrubby and grassy sub formation) when a like-for-like offsetting arrangement was applied.

In accordance with Principal 3 of the Biodiversity Offset Policy for Major Projects, wet sclerophyll forest (shrubby sub formation) will be substituted with a community at a higher conservation value. For example the deficit area of wet sclerophyll forest (shrubby and grassy sub formation) will be offset with an equal area of swamp sclerophyll forest, swamp oak floodplain forest or freshwater wetlands.

The deficit of sub-tropical floodplain forest EEC has been substituted with a community of an equal of higher conservation value that has undergone a similar or greater amount of past clearing. Table 4.2 details the estimated cleared percentage of each EEC in the region. This table identifies that swamp sclerophyll forest, swamp oak floodplain forest and freshwater wetlands have all been subject to a greater level of past clearing. As a result, the deficit of subtropical floodplain forest EEC can be substituted with any of those EECs.

Table 4.2: Extent of endangered ecological communities within the Mid-North Coast Region of NSW

Endangered Ecological Community	Extent in the Region in 1999 ¹	Cleared estimate for the region ⁶
Swamp sclerophyll forest	29,155 ha	75%
Swamp oak floodplain forest	2883 ha	75%
Subtropical coastal floodplain forest	60,018 ha	60-70%
Freshwater wetlands	24,118 ha	40-80% ²

This approach still meets the K2E MCoA 2.10 requirement to provide at least 382 hectares of native vegetation.

¹ Source: Oxley Highway to Kempsey – Upgrading the Pacific Highway Environmental Assessment Vol 2 Working Papers Sept 2010 p37

² The extent of freshwater wetlands shown may be overestimated as the NPWS Map Unit 141 includes two vegetation communities – forested wetlands and freshwater wetlands. However only the freshwater wetland community strictly corresponds to the EEC

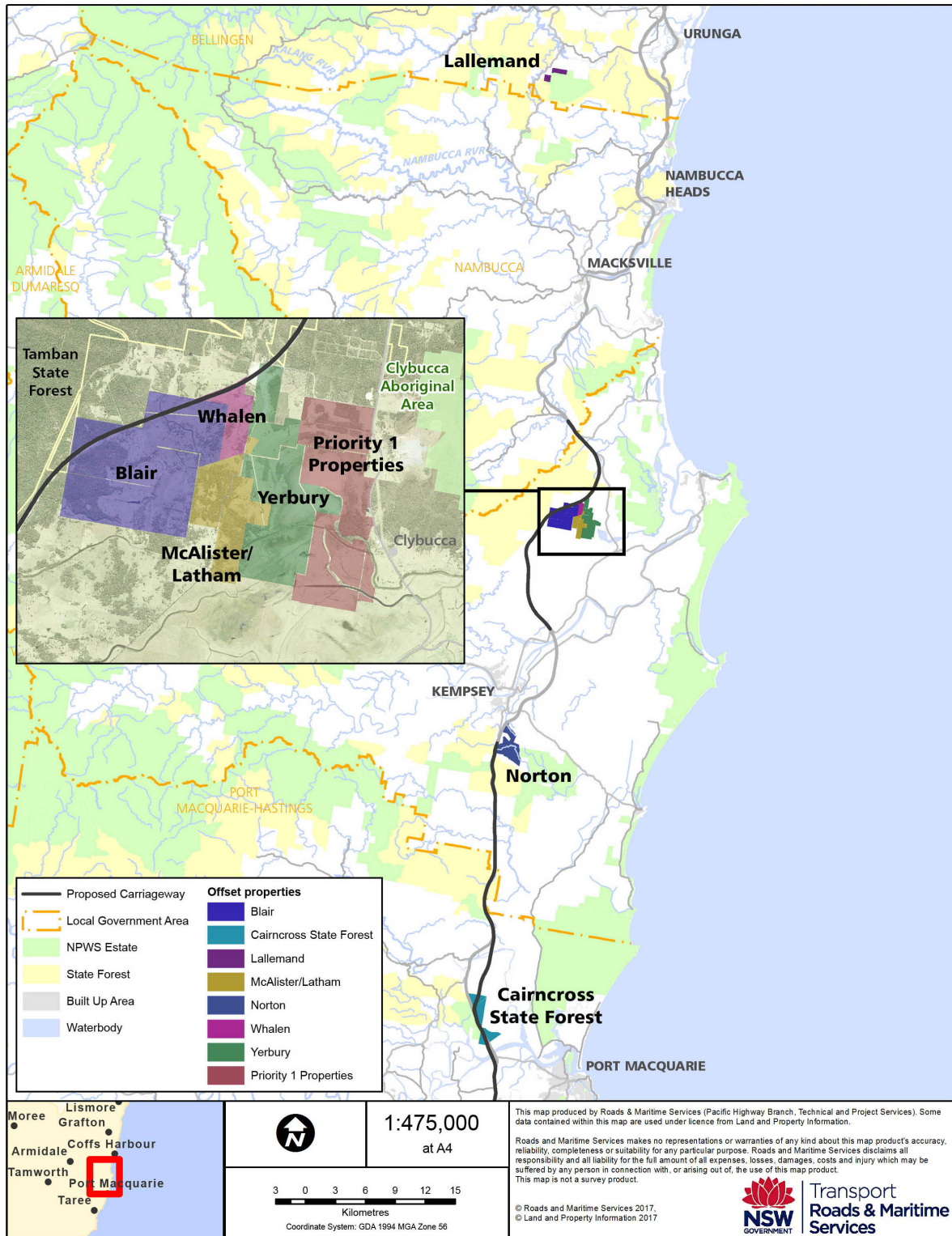


Figure 4.1: Location of the offset sites in relation to the Oxley Highway to Kempsey and Kempsey to Eungai Pacific Highway Upgrades.

4.3 Offset properties in detail

4.3.1 Norton

The Norton site is a parcel of privately owned land that was purchased by Roads and Maritime for the purpose of securing biodiversity offsets for various stages of the Pacific Highway upgrade project. It has been the subject of detailed ecological surveys to establish its suitability as a biodiversity offset as part of a preliminary assessment of candidate properties (Lewis and James, 2010), to complete a BioBanking agreement application (GHD, 2016a) and to inform the preparation of the Warrell Creek to Nambucca Heads Offset Management Plan (GHD, 2016b) and the Norton and Griffin Offset Management Plan (GHD, 2016c) for the Nambucca Heads to Urunga project.

The Norton offset site comprises a number of lots as detailed in Table 4.1. The site boundary and associated cadastre are currently being modified to accommodate the Kundabung to Kempsey Pacific Highway upgrade. The area that will be removed for the Pacific Highway upgrade has been excluded from the offset site. A portion of Lot 56 DP 1165099 is also excluded from the offset site, as this area will be maintained as a house site and home paddocks.

The Norton offset site is around 508 hectares in area and contains remnant and regenerating forest of gently undulating terrain. It is directly adjacent to the project footprint in an equivalent position on near-coastal low hills (refer Figure 4.1). The Norton offset site in its entirety includes a number of vegetation communities, however the area that has been set aside to offset the OH2E project includes one vegetation community that contributes to the projects offset requirements as well as providing suitable habitat for a number of threatened species required to be offset.

The Norton site is currently unoccupied. Previous land uses include timber harvesting, low intensity grazing and stockpiling of timber, rubbish and fill. There is a limited network of dirt access tracks across the site and some internal fences, generally in poor condition. An electricity easement runs north-south through the southwestern portion of the site and another runs along the southern boundary. These 20 m wide easements have been excluded from the offset site.

Further information on the Norton offset site can be found in Appendix D the ecological assessment prepared by GHD.

Vegetation present on Norton

37.1 hectares of the Norton property has been allocated to the Oxley Highway to Eungai Pacific Highway Upgrades. The biometric vegetation types surveyed from the site from 2014 to 2016 are detailed in Table 4.3. Figure 4.2 shows the location of the OH2E offset site within the property.

Table 4.3: Vegetation communities present on the Norton offset property (GHD, 2016a)

Vegetation Community	Biometric Vegetation Types Surveyed	Vegetation ID	Present on Norton (ha)	Allocated to OH2E
Dry Open Forest – Blackbutt (non EEC)	Blackbutt-Turpentine-Tallowwood shrubby open forest	NR122	33.4	
	Blackbutt-Pink Bloodwood shrubby open forest	NR117	53.4	
	Blackbutt-Tallowwood dry grassy open forest	NR119	44.5	
	Spotted Gum-Grey Ironbark open forest	NR247	19.5	
	Spotted Gum-Grey Ironbark-Pink Bloodwood open forest ³	NR246	135.4	35.3
Open Forest – Scribbly Gum	Scribbly Gum-Red Bloodwood heathy open forest	NR228	164.3	1.8
Moist Open Forest – White Mahogany-Grey Gum-Ironbark	Red Mahogany open forest	NR222	30.2	
Moist Open Forest – Flooded Gum (non EEC)	Flooded Gum-Tallowwood-Brush Box moist open forest	NR160	7.4	
Subtropical Coastal Floodplain Forest	Forest Red Gum-Swamp Box	NR161	3.8	
Cleared/Excluded			16.2	
TOTAL			508.1	37.1

³ Note that 4ha of this vegetation type in low condition has not been included for offsets.

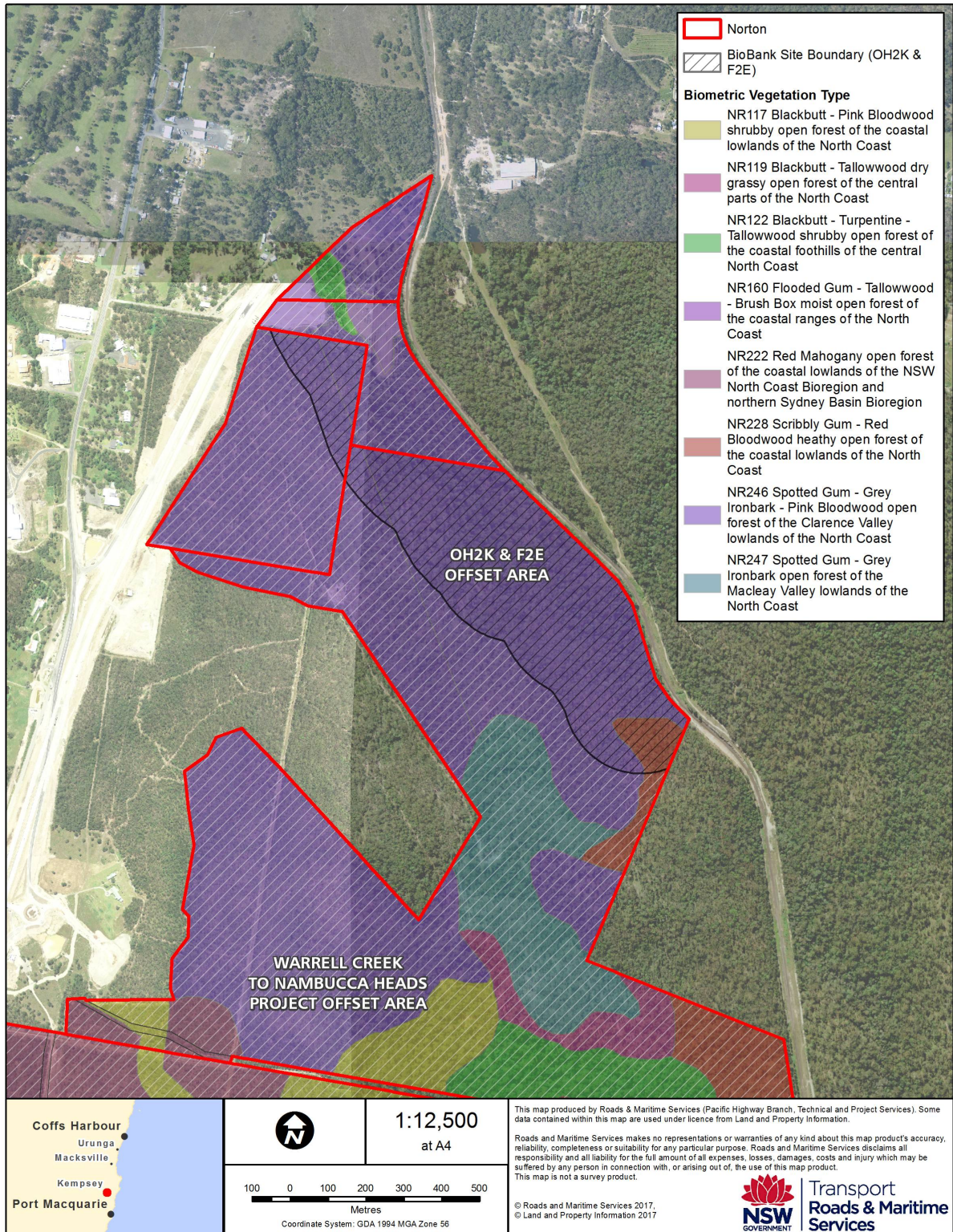


Figure 4.2: Distribution of vegetation types across the Norton property (data from GHD, 2016a) with OH2E offset area superimposed.

Species habitat present on Norton

Roads and Maritime commissioned GHD to conduct a full BioBanking assessment of the Norton property in 2016, in preparation for submitting a BioBanking Agreement application to the Office of the Environment and Heritage as soon as the boundaries are finalised. The BioBanking Assessment is included as an attachment to Appendix D. The following information regarding threatened species present and suitable habitat has been extracted from this assessment.

A total of 12 threatened fauna species have been recorded at the site as listed in Table 4.4. Ten of these species are required to be offset by the projects.

Table 4.4: Threatened species recorded at the Norton offset site (by GHD, 2016a-c unless otherwise stated)

Common name	Scientific name	TSC Act Status	Observation type	Required for project?
Giant Barred-frog	<i>Mixophyes iterates</i>	E	Heard	Yes
Glossy Black Cockatoo	<i>Calyptorhynchus lathami</i>	V	Seen	Yes
Green-thighed frog	<i>Litoria brevipalmata</i>	V	Seen (Lewis and James, 2010)	Yes
Koala	<i>Phascolarctos cinerus</i>	V	Seen, scats	Yes
Little Lorikeet	<i>Glossopsitta pusilla</i>	V	Seen (Lewis and James, 2010)	No
Varied Sittella	<i>Daphoenositta chrysoptera</i>	V	Seen	No
Brush-tailed Phascogale	<i>Phascogale tapoatafa</i>	V	Seen (Lewis and James, 2010)	Yes
Yellow-bellied Glider	<i>Petaurus australis</i>	E	Feed scar (Lewis and James, 2010)	Yes
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	V	Seen (Lewis and James, 2010)	Yes
Little Bentwing-bat	<i>Miniopterus australis</i>	V	Anabat recording (Lewis and James, 2010)	Yes
Eastern Bentwing-bat	<i>Miniopterus schreibersii oceanensis</i>	V	Anabat recording (Lewis and James, 2010)	Yes
Powerful Owl	<i>Ninox strenua</i>	V	Heard (Lewis and James, 2010)	Yes

Suitable habitat for a further 23 threatened species occurs on Norton, 8 of which are required to be offset, or are substitutes for required species, including:

- Wompoo Fruit-dove (*Ptilinopus magnificus*), as a substitute for the Rose crowned fruit dove
- Greater Broad-nosed Bat (*Scoteanax rueppellii*)
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)
- Hoary Wattled Bat (*Chalinolobus nigrogriseus*), as a substitute for the Eastern False Pipistrelle
- Eastern Freetail-bat (*Micronomus norfolkensis*)
- Masked Owl (*Tyto novaehollandiae*)
- Sooty Owl (*Tyto tenebricosa*)
- Square-tailed kite (*Lophoictinia isura*)
- Spotted-tailed quoll (*Dasyurus maculata*)

Hollow Bearing trees and logs

The OH2K Biodiversity Offset Strategy requires that the proposed offset sites should contain a commensurate number of hollow bearing trees to the impacted area (603). GHD undertook an analysis of the number of hollow bearing trees present at the Norton site and found that the NR246 vegetation type had on average 3.3 hollow bearing trees per hectare, which would provide just over 120 hollow bearing trees in the area allocated to the OH2E project.

Landscape connectivity

The Norton site is part of a near continuous patch of native vegetation and habitat of many thousands of hectares. The Pacific Highway to the west and North Coast Railway to the east comprise barriers to fauna movement and other ecological processes. Kalateenee State Forest lies to the west of the Pacific Highway and beyond that there is an extensive network of native vegetation in national parks and State Forests that stretches to the Great Dividing Range. The Norton site is partially connected to this extensive area of habitat via the riparian corridors of Boat Harbour and Stumpy Creek and associated culverts and underpasses. There are partial barriers to the south and southeast associated with partly cleared and/or fenced private land. The Maria Rivers State Forest lies to the south of this land and is continuous with the Maria River National Park and other native vegetation that stretches to the coast. East of the railway there is native vegetation in the Maria National Park and on private and Crown land that is part of the vegetated corridor to the coast (extract from BioBanking Assessment report, GHD 2016a).

4.3.2 Cairncross State Forest

The Cairncross State Forest offset site occurs in the Cairncross State Forest north of Wauchope in the Northern Rivers CMA. The offset site shares a boundary with Rawdon Creek Nature Reserve and drains largely into Rawdon Creek which flows southwards into Munns Channel, in the lower tidal reaches of the Hastings River. In its entirety the proposed new Flora Reserve is around 492 ha. Only around 326 hectares has been used in this offset package due to special protection zones already in place over the remainder of the area.

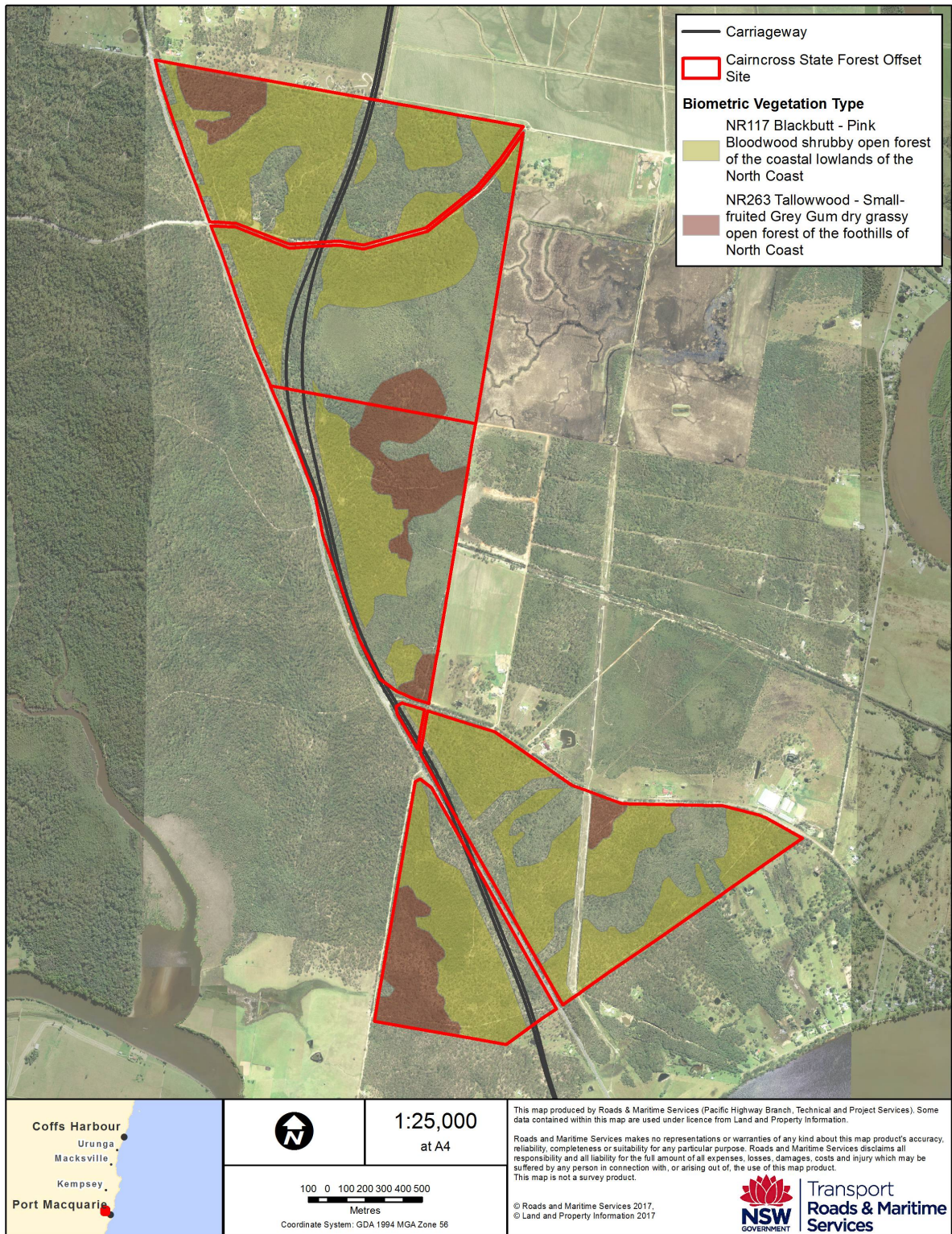
Vegetation present on Cairncross State Forest

326.6 hectares of the Cairncross site has been allocated to the OH2E Upgrade. The biometric

vegetation types surveyed from the site in 2014 are detailed in Table 4.5. Figure 4.3 shows the distribution of these vegetation communities.

Table 4.5: Vegetation communities present on the Cairncross State Forest offset property (Niche, in prep)

Broad Vegetation Community	Biometric Vegetation Types Surveyed	Vegetation ID	Present on Cairncross (ha)	Allocated to OH2E (ha)
Tallowwood-Grey Gum Dry Sclerophyll Forest	Tallowwood-Small-fruited Grey Gum dry grassy open forest of the foothills of the North Coast	NR263	65.4	65.4
Swamp Sclerophyll Forest on Coastal Floodplain (EEC)	Scribbly Gum-Broad-leaved Paperbark Swamp Sclerophyll Forest	NR217	165.2	0
Wet Sclerophyll (Shrubby)	Blackbutt-Pink Bloodwood shrubby open forest of the coastal lowlands of the North Coast	NR117	261.2	261.2
TOTAL			491.8	326.6



Published: 26/07/2017 Author: wilsoth G:\Pac-Hwy\Adam\Hoole\PHOCorporateGIS\03_Maps\01_MXD\OH2EID00202_2017053_PA_OH2EOffsetPackageMaps_Cairncross_RMS_A4P_25000_V01.mxd

Figure 4.3: Distribution of vegetation types across the Cairncross State Forest site (data from Niche, in prep).

Species habitat present on Cairncross

Roads and Maritime commissioned Niche to conduct a full ecological assessment of the Cairncross site in 2015, in order to prepare the Commonwealth offset package for the Oxley Highway to Kempsey project (Niche, in prep). The following information regarding threatened species present and suitable habitat has been extracted from this assessment.

A total of 4 threatened species have been recorded at the site as listed in Table 4.6, three of which are required to be offset.

Table 4.6: Threatened species recorded at the Cairncross offset site (by Niche, in prep unless otherwise stated)

Common name	Scientific name	TSC Act Status	Observation type	Required for project?
Koala	<i>Phascolarctos cinerus</i>	V	Motion sensing camera	Yes
Brush-tailed Phascogale	<i>Phascogale tapoatafa</i>	V	Hair trap	Yes
Green-thighed frog	<i>Litoria brevipalmata</i>	V	BioNet	Yes
Little Eagle	<i>Hieraaetus morphnoides</i>	V	BioNet	No

Suitable habitat for a further 14 threatened species occurs on Cairncross including:

- Eastern Freetail bat (*Micronomus norfolkensis*)
- Little Bentwing-bat (*Miniopterus australis*)
- Eastern Bentwing bat (*Miniopterus schreibersii oceanensis*)
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)
- Hoary Wattled Bat (*Chalinolobus nigrogriseus*)
- Glossy Black Cockatoo (*Calyptorhynchus lathami*)
- Masked Owl (*Tyto novaehollandiae*)
- Powerful Owl (*Ninox strenua*)
- Sooty Owl (*Tyto tenebricosa*)
- Square-tailed Kite (*Lophoictinia isura*)
- Wompoo Fruit Dove (*Ptilinopus magnificus*)
- Yellow-bellied Glider (*Petaurus australis*)
- Grey-headed flying fox (*Pteropus poliocephalus*)
- Spotted-tailed quoll (*Dasyurus maculata*)

Hollow Bearing Trees and logs

Niche reported very low levels of hollow bearing trees and logs presently on site, due to the harvest history so this site has not been included in the hollow bearing tree calculations.

Landscape connectivity

The offset area will also protect two areas of vegetation on the western side of the alignment, which are both contiguous with the larger Cairncross State Forest and Rawdon Creek Nature Reserve.

Six fauna connectivity structures, along with a widened median, will be built in this section of the Oxley Highway to Kundabung upgrade project, to facilitate east-west movement of fauna beneath the Pacific Highway.

4.3.3 Lallemand

The Lallemand property was previously part of a rural residential property at Brierfield. The site is adjacent to the Jaaningga Nature Reserve on the southern and eastern boundaries. The site also abuts Newry State Forest on the south-west boundary. Four lots of the original property were identified by NPWS as suitable for inclusion in the adjacent nature reserve. To the north the site is bounded by heavily vegetated private properties. To the west, one lot adjoins a heavily cleared property.

The property has been subject to previous selective timber harvesting. Further information on the Lallemand offset site can be found in Appendix E, which is taken from the EPBC Act offset management plan for the Oxley Highway to Kempsey project developed by Niche.

Vegetation present on Lallemand

The entire 106 hectares of the Lallemand property has been allocated to the OH2E upgrades. The biometric vegetation types surveyed from the site from 2015 are detailed in Table 4.7. Figure 4.4 shows the distribution of these vegetation communities.

Table 4.7: Vegetation communities present on the Lallemand offset property (Niche, in prep)

Vegetation Community	Biometric Vegetation Types Surveyed	Vegetation ID	Present on Lallemand (ha)
Dry Open Forest – Blackbutt (non EEC)	Blackbutt-Turpentine-Tallowwood shrubby open forest	NR122	2.6
Wet Sclerophyll (Shrubby)	Tallowwood-Brush Box-Sydney Blue Gum moist shrubby forest of the southern North Coast	NR259	32.9
	Turpentine moist open forest of the coastal hills and ranges of the North Coast	NR274	54.4
	Flooded Gum-Tallowwood-Brush Box moist open forest of the coastal ranges of the North Coast	NR160	12.7
Rainforest	Coachwood-Soft Corkwood-Crabapple warm temperate rainforest of the North Coast	NR147	1.8
Regenerating			2.0
TOTAL			106.4

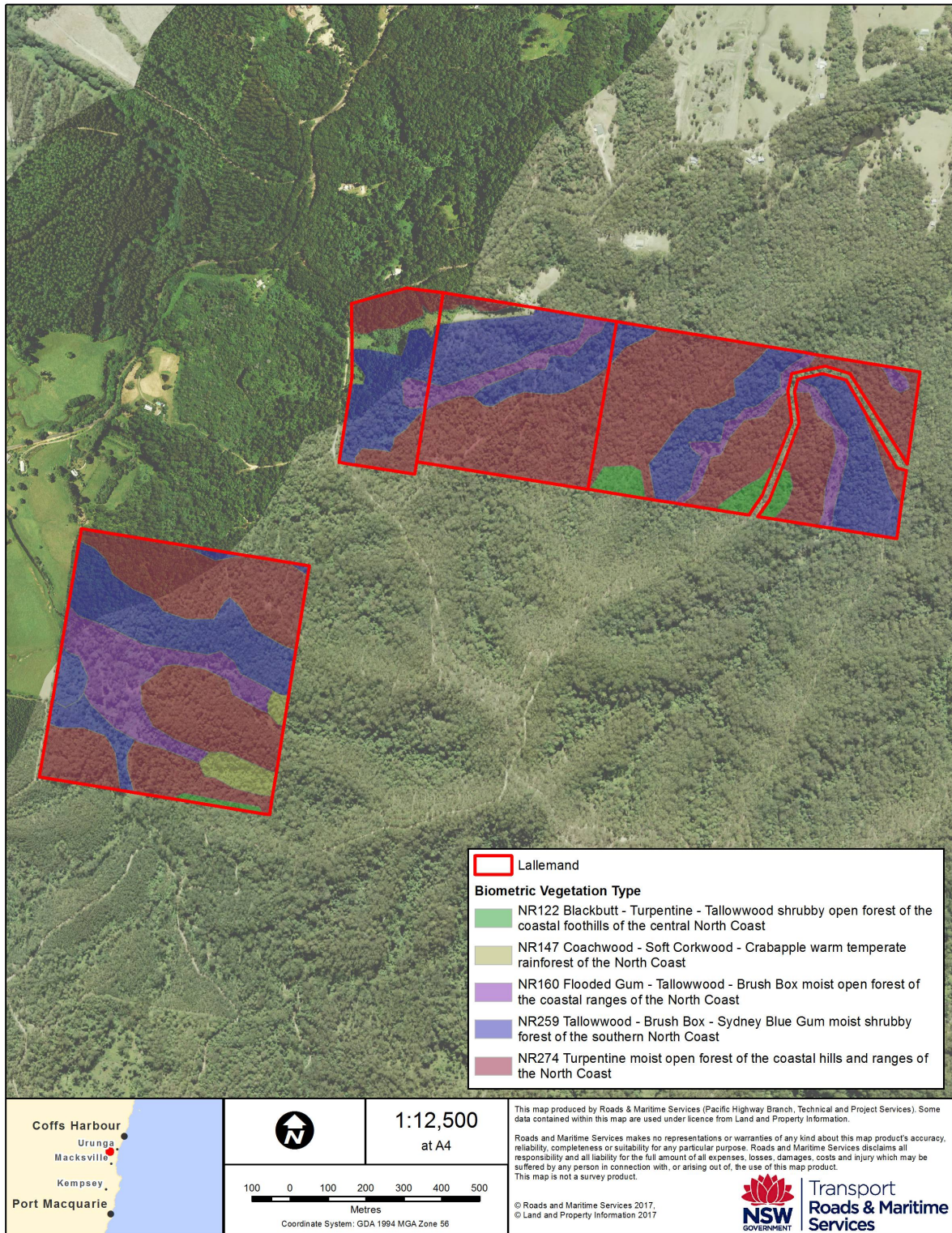


Figure 4.4: Distribution of vegetation types across the Lallemand property (data from Niche, in prep).

Species habitat present on Lallemand

Roads and Maritime commissioned Niche to conduct an ecological assessment of the Lallemand property in 2015, in preparation for submitting the Commonwealth Biodiversity Offset Package for the Oxley Highway to Kempsey project to the Department of the Environment and Energy in order to meet the Commonwealth approval conditions for this project. The following information regarding threatened species present and suitable habitat has been extracted from this assessment.

A total of 2 threatened species have been recorded at the site as listed in Table 4.8.

Table 4.8: Threatened species recorded at or near the Lallemand offset site (by Niche, in prep unless otherwise stated)

Common name	Scientific name	TSC Act Status	Observation type	Required for project?
Koala	<i>Phascolarctos cinerus</i>	V	Motion sensing camera.	Yes
Brush-tailed Phascogale	<i>Phascogale tapoatafa</i>	V	Hair trap.	Yes

Suitable habitat for a further 19 threatened species occurs on Lallemand including:

- Rose-crowned Fruit Dove (*Ptilinopus regina*)
- Wompoo Fruit Dove (*Ptilinopus magnificus*)
- Common Planigale (*Planigale maculata*)
- Eastern Bentwing bat (*Miniopterus schreibersii oceanensis*)
- Little Bentwing-bat (*Miniopterus australis*)
- Southern Myotis (*Myotis macropus*)
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)
- Eastern Freetail bat (*Micronomus norfolkensis*)
- Great Broad-nosed Bat (*Scoteanax rueppellii*)
- Glossy Black Cockatoo (*Calyptorhynchus lathami*)
- Green-thighed Frog (*Litoria brevipalmata*)
- Grey-headed flying fox (*Pteropus poliocephalus*)
- Yellow-bellied glider (*Petaurus australis*)
- Squirrel Glider (*Petaurus norfolkensis*)
- Masked Owl (*Tyto novaehollandiae*)
- Powerful Owl (*Ninox strenua*)
- Sooty Owl (*Tyto tenebricosa*)
- Square-tailed Kite (*Lophoictinia isura*)
- Spotted-tailed quoll (*Dasyurus maculata*)

Hollow bearing trees and logs

Niche (in prep) did not assess the density of hollow bearing trees on the Lallemand site. However using a conservative estimation of 3 HBTs/ha for the moist forest vegetation types present on the site, the Lallemand offset site would provide 300 hollow bearing trees.

Landscape connectivity

The Lallemand site forms part of a large vegetated corridor which spans from the coast at

Wenonah Head inland to the central ranges across a number of Nature Reserves and State Forests. The Lallemand site itself is adjacent to Newry State Forest and the Jaaningga Nature Reserve.

4.3.4 Blair

The Blair site is owned by Roads and Maritime and is located at Colombatti. The property was originally purchased as part of the compensatory habitat package for the Kempsey to Eungai Upgrade. The vegetation on the site was assessed by Lewis (2012) and Niche Environmental Management did further assessment on the site as part of the development of the Commonwealth offset package for the Oxley Highway to Kempsey project (Niche, in prep), however, it was surplus to those requirements.

The Blair offset site comprises Lot 3 of DP 546108 and Lots 11 and 28 of DP752428. As the site is proposed to be BioBanked an exclusion area has been included.

The Blair offset site is around 586 hectares, comprising 333 ha of native vegetation and 253 ha of cleared land. It is located directly adjacent to the Kempsey to Eungai upgrade project (refer Figure 4.1). The Blair offset site includes a number of vegetation communities that contribute to the projects offset requirements as well as providing occupied habitat for a number of threatened species required to be offset, including approximately 0.5 ha of *Maundia triglochinooides* across several locations (Lewis, 2012).

The Blair site is currently an unoccupied rural property. Previous land uses include timber harvesting and grazing.

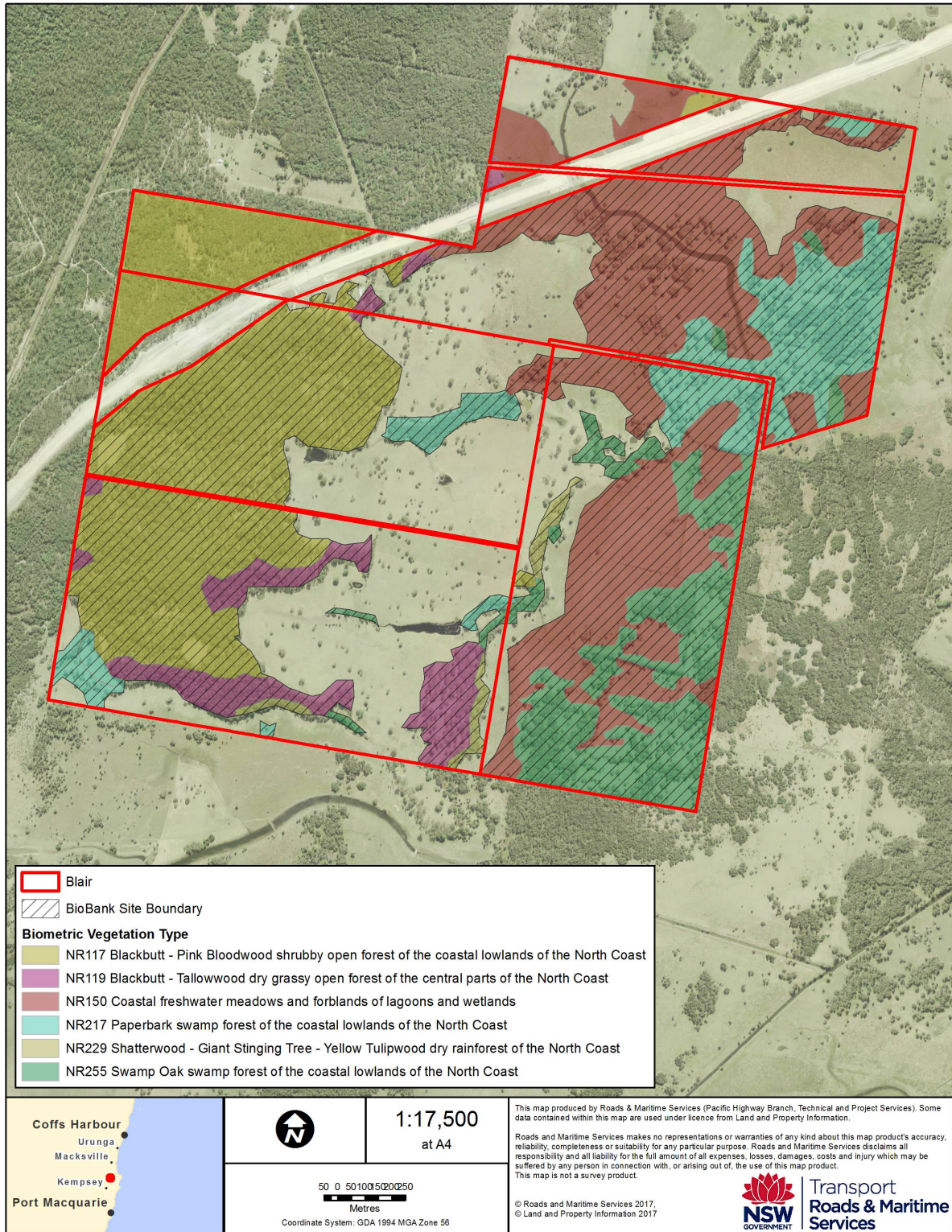
Further information on the Blair offset site can be found in Appendix F.

Vegetation present on Blair

Approximately 333 hectares of the Blair site has been allocated to the OH2E Upgrades. The biometric vegetation types surveyed from the site in 2012 are detailed in Table 4.9. Figure 4.5 shows the distribution of these vegetation communities.

Table 4.9: Vegetation communities present on the Blair offset site (updated from Lewis, 2012)

Broad Vegetation Community	Biometric Vegetation Types Surveyed	Vegetation ID	Present on Blair (ha)	Allocated to OH2E (ha)
Blackbutt Dry Sclerophyll Forest	Blackbutt-Tallowood dry grassy open forest of the central parts of the North Coast	NR119	24.4	23.8
Wet Sclerophyll (Shrubby)	Blackbutt-Pink Bloodwood shrubby open forest of the coastal lowlands of the North Coast	NR117	124.5	96.2
Swamp Oak Floodplain Forest (EEC)	Swamp Oak Swamp Forest of the coastal lowlands of the North Coast	NR255	50.5	50.5
Swamp Sclerophyll Forest on Coastal Floodplain (EEC)	Paperbark swamp forest of the coastal lowlands of the North Coast	NR217	47.3	47.3
Freshwater Wetlands on Coastal Floodplains (EEC)	Coastal freshwater meadows and forblands of lagoons and wetlands	NR150	119.6	111.2
Rainforest	Shatterwood-Giant Stinging Tree-Yellow Tulipwood dry rainforest of the North Coast	NR229	4.2	4.2
Cleared land or excluded			184.2	0
Road Reserve			31.05	0
TOTAL			585.75	333.2



Published: 26/07/2017 Author: wilsoth G:\Pac-Hwy\Adam\Hoole\PHOCorporateGIS\03_Maps\01_MXD\OH2EID00202_2017051_PA_OH2EOffsetPackageMaps_Blair_RMS_A4P_17500_V01.mxd

Figure 4.5: Distribution of vegetation types across the Blair offset site (data from Lewis, 2012).

Species habitat present on Blair

Roads and Maritime commissioned Lewis Ecological Surveys to conduct an ecological assessment of the Blair property in 2012. This assessment is included as Appendix F. The following information regarding threatened species present and suitable habitat has been extracted from this assessment.

A total of 16 threatened fauna species have been recorded at the site as listed in Table 4.10.

Table 4.10: Threatened species recorded at the Blair offset site (by Lewis, 2012 unless otherwise stated)

Common name	Scientific name	TSC Act Status	Observation type	Required for project?
Maundia	<i>Maundia triglochinoidea</i>	V	Seen	Yes
Glossy Black Cockatoo	<i>Calyptorhynchus lathami</i>	V	Seen	Yes
Square-tailed kite	<i>Lophoictinia isura</i>	V	Seen (2005 survey)	Yes
Black Bittern	<i>Ixobrychus flavicollis</i>	V	Seen	No
Powerful Owl	<i>Ninox strenua</i>	V	Seen (2004/05 route surveys)	Yes
Masked Owl	<i>Tyto novaehollandiae</i>	V	Seen (2004/05 surveys)	Yes
Little Lorikeet	<i>Glossopsitta pusilla</i>	V	Seen (2005 survey)	No
Varied Sittella	<i>Daphoenositta chrysoptera</i>	V	Seen (2005 survey)	No
Green-thighed frog	<i>Litoria brevipalmata</i>	V	Seen (Lewis and James, 2010)	Yes
Brush-tailed Phascogale	<i>Phascogale tapoatafa</i>	V	Seen (2005 survey)	Yes
Yellow-bellied Glider	<i>Petaurus australis</i>	E	Seen (2007 & 2007 surveys)	Yes
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	V	Seen (2004/05 route surveys)	Yes
Little Bentwing-bat	<i>Miniopterus australis</i>	V	Seen (2004/05 route surveys)	Yes
Eastern Bentwing-bat	<i>Miniopterus schreibersii oceanensis</i>	V	Seen (2004/05 route surveys)	Yes
Eastern Freetail-bat	<i>Micronomus norfolkensis</i>	V	Seen (2004/05 route surveys)	Yes
Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>	V	Seen (2004/05 route surveys)	Yes

Suitable habitat for a further 10 threatened species occurs on Blair including:

- Common Planigale (*Planigale maculata*)
- Koala (*Phascolarctos cinerus*)
- Black-necked Stork (*Ephippiorhynchus asiaticus*)
- Osprey (*Pandion haliaettus*)
- Rose-crowned Fruit Dove (*Ptilinopus regina*)
- Wompoo Fruit Dove (*Ptilinopus magnificus*)
- Sooty Owl (*Tyto tenebricosa*)
- Southern Myotis (*Myotis macropus*)
- Squirrel Glider (*Petaurus norfolcensis*)
- Spotted-tailed quoll (*Dasyurus maculata*)

Hollow bearing trees and logs

Lewis and Richards (2012) assessed the density of hollow bearing trees on the nearby Yerbury property. They found variable mean numbers ranging from 5.7 hollow bearing trees per hectare in the Moist Sclerophyll Forest to the absence of hollow bearing trees in the Freshwater Wetland habitat. Assuming the mean HBT density per hectare across three habitat types is consistent with that on Yerbury, Blair is expected to support approximately 370 hollow bearing trees.

Landscape connectivity

The Blair site forms an integral part of the Clybucca offset complex, which also includes Whalen, McAlister/Latham, Yerbury and the Priority 1 properties. Overall the Clybucca offset complex covers over 1,100 hectares of land to be protected under BioBanking agreements.

The Yerbury property towards the east of the complex is linked to Eungai State Forest, vacant Crown land and flood refuges and by coastal wetlands including Yerrahappinni Nature Reserve. The property also connects the Willawong, Fisherman's-Clybucca and Tamban-Clybucca regional wildlife corridors. These are reported as important for a range of threatened species including Glossy Black Cockatoo, Brush-tailed Phascogale, Powerful Owl and Square-tailed Kite (Lewis and Richards, 2012).

To the west, the Blair property is adjacent to the new Pacific Highway alignment which causes some impacts to fauna movements. A fauna underpass has been placed approximately 300 m west of the Blair property, which connects the vegetated areas on the south-west area of Blair with heavily vegetated areas to the west of the alignment which run for thousands of hectares to the inland ranges.

4.3.5 Whalen

The Whalen site is owned by Roads and Maritime and is located at Colombatti. The property was originally purchased as part of the compensatory habitat package for the Kempsey to Eungai Upgrade. The vegetation on the site was assessed by Lewis (2012) and Niche Environmental Management did further assessment on the site as part of the development of the Commonwealth offset package for the Oxley Highway to Kempsey project (Niche, in prep), however, it was surplus to those requirements.

The Whalen offset site comprises Lots 2, 3 and 4 of DP 1181951. As the site is proposed to be BioBanked an exclusion area has been included.

The Whalen offset site is around 73 hectares, comprising 35 ha of native vegetation and 27 ha of cleared land. It is located directly adjacent to the Blair property, with the north-western boundary of the property adjacent to the Kempsey to Eungai upgrade project (refer Figure 4.1). The Whalen offset site includes four vegetation communities that contribute to the projects offset requirements as well as providing occupied habitat for a number of threatened species required to be offset, including three areas of *Maundia triglochinoides* totalling approximately 0.5 ha (Lewis, 2012).

The Whalen site is currently an unoccupied rural property. Previous land uses include timber harvesting and grazing.

Further information on the Whalen offset site can be found in Appendix F.

Vegetation present on Whalen

Approximately 34.8 hectares of the Whalen site has been allocated to the OH2E Upgrades. The biometric vegetation types surveyed from the site in 2012 are detailed in Table 4.11. Figure 4.6 shows the distribution of these vegetation communities.

Table 4.11: Vegetation communities present on the Whalen offset site (adapted from Lewis, 2012)

Vegetation Community	Biometric Vegetation Types Surveyed	Vegetation ID	Present on Whalen (ha)	Allocated to OH2E
Swamp Oak Floodplain Forest (EEC)	Swamp Oak Swamp Forest of the coastal lowlands of the North Coast	NR255	5.3	5.3
Swamp Sclerophyll Forest on Coastal Floodplain (EEC)	Paperbark swamp forest of the coastal lowlands of the North Coast	NR217	13.7	13.7
Freshwater Wetlands on Coastal Floodplains (EEC)	Coastal freshwater meadows and forblands of lagoons and wetlands	NR150	15.8	15.8
Cleared land			27.2	0
Road Reserve			11.1	0
TOTAL			73.1	34.8

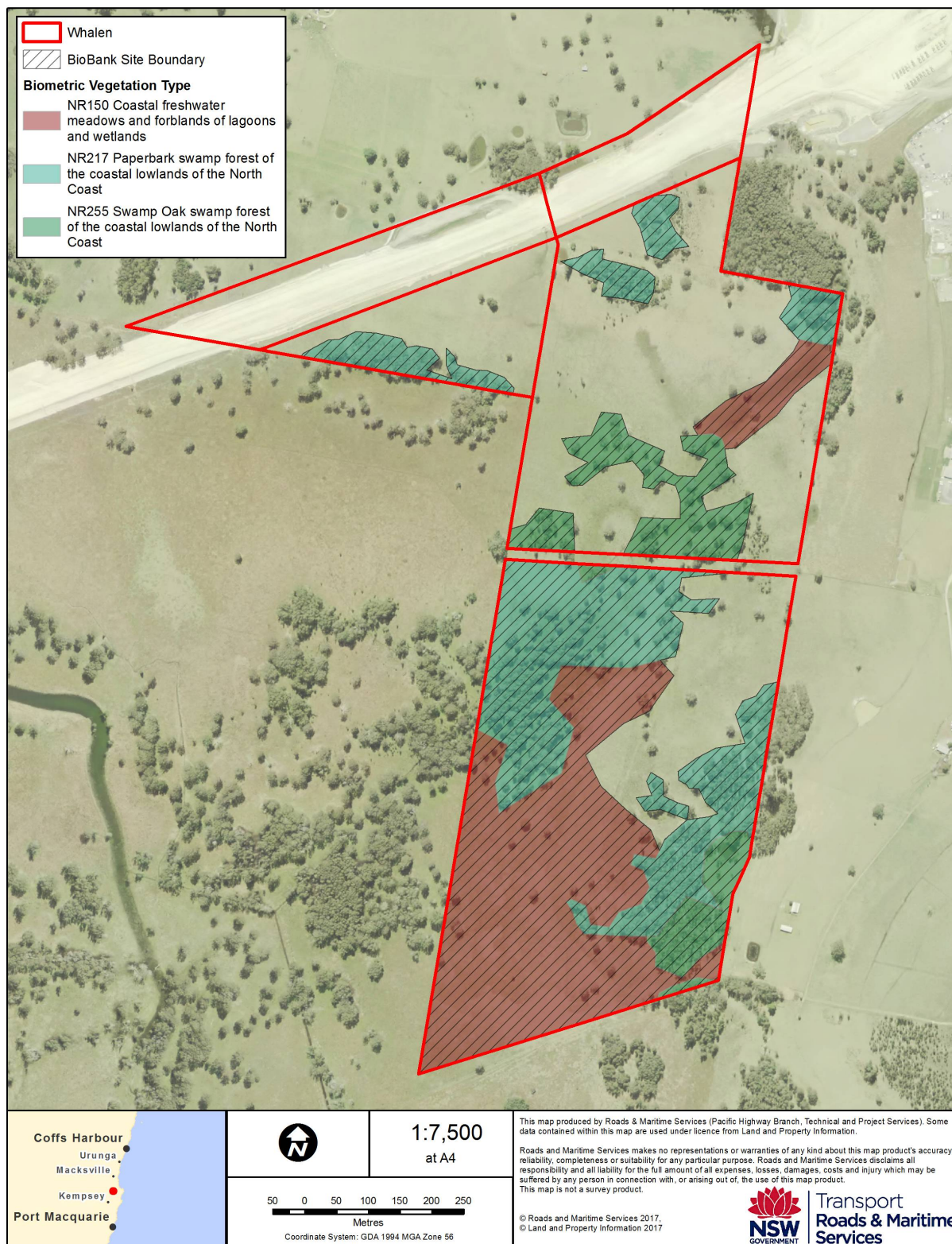


Figure 4.6: Distribution of vegetation types across the Whalen offset site (data from Lewis, 2012).

Species habitat present on Whalen

Roads and Maritime commissioned Lewis Ecological Surveys to conduct an ecological assessment of the Whalen property in 2012. This assessment is included as Appendix F. The following information regarding threatened species present and suitable habitat has been extracted from this assessment.

A total of 5 threatened fauna species have been recorded at the site as listed in Table 4.12.

Table 4.12: Threatened species recorded at the Whalen offset site (by Lewis, 2012 unless otherwise stated)

Common name	Scientific name	TSC Act Status	Observation type	Required for project?
Maundia	<i>Maundia triglochinoidea</i>	V	Seen	Yes
Square-tailed kite	<i>Lophoictinia isura</i>	V	Seen (2005 survey)	Yes
Little Lorikeet	<i>Glossopsitta pusilla</i>	V	Seen (2005 survey)	No
Varied Sittella	<i>Daphoenositta chrysoptera</i>	V	Seen (2005 survey)	No
Hoary Wattled Bat	<i>Chalinolobus nigrogriseus</i>	V	Seen (2004-05 survey)	Yes, as a substitute.

Suitable habitat for a further 17 threatened species occurs on Whalen including:

- Green-thighed frog (*Litoria brevipalmata*)
- Powerful Owl (*Ninox strenua*)
- Masked Owl (*Tyto novaehollandiae*)
- Brush-tailed Phascogale (*Phascogale tapoatafa*)
- Little Bentwing-bat (*Miniopterus australis*)
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*)
- Eastern Freetail-bat (*Micronomus norfolkensis*)
- Greater Broad-nosed Bat (*Scoteanax rueppellii*)
- Grey-headed Flying-fox (*Pteropus poliocephalus*)
- Glossy Black Cockatoo (*Calyptorhynchus lathami*)
- Black-necked Stork (*Ephippiorhynchus asiaticus*)
- Osprey (*Pandion haliaettus*)
- Southern Myotis (*Myotis macropus*)
- Yellow-bellied Glider (*Petaurus australis*)
- Squirrel Glider (*Petaurus norfolcensis*)
- Spotted-tailed quoll (*Dasyurus maculata*)
- Common Planigale (*Planigale maculata*)

Hollow bearing trees and logs

Lewis and Richards (2012) assessed the density of hollow bearing trees on the adjoining Yerbury property. They found variable mean numbers ranging from 5.7 hollow bearing trees per hectare in the Moist Sclerophyll Forest to the absence of hollow bearing trees in the Freshwater Wetland

habitat. Assuming the mean HBT density per hectare across three habitat types is consistent with that on Yerbury, Whalen is expected to support approximately 65 hollow bearing trees.

Landscape connectivity

The Whalen site forms part of the Clybucca offset complex, which also includes Blair, McAlister/Latham, Yerbury and the Priority 1 properties. Overall the Clybucca offset complex covers over 1,100 hectares of land to be protected under BioBanking agreements.

The Yerbury property towards the east of the complex is linked to Eungai State Forest, vacant Crown land and flood refuges and by coastal wetlands including Yerrahappinni Nature Reserve. The property also connects the Willawong, Fisherman's-Clybucca and Tamban-Clybucca regional wildlife corridors. These are reported as important for a range of threatened species including Glossy Black Cockatoo, Brush-tailed Phascogale, Powerful Owl and Square-tailed Kite (Lewis and Richards, 2012).

To the west, the Blair property is adjacent to the new Pacific Highway alignment which causes some impacts to fauna movements. A fauna underpass has been placed approximately 300 m west of the Blair property, which connects the vegetated areas on the south-west area of Blair with heavily vegetated areas to the west of the alignment which extend for thousands of hectares to the inland ranges.

4.3.6 Yerbury

The Yerbury site is owned by Roads and Maritime and is located at Colombatti. The property was originally purchased as part of the compensatory habitat package for the Kempsey to Eungai Upgrade. The vegetation on the site was assessed by Lewis and Richards (2012) and Niche Environmental Management did further assessment on the site as part of the development of the Commonwealth offset package for the Oxley Highway to Kempsey project (Niche, in prep), however, it was surplus to those requirements.

The Yerbury offset site comprises eleven lots as detailed in Table 4.1. As the site is proposed to be BioBanked an exclusion area has been included.

The Yerbury offset site is around 394 hectares, comprising 298 ha of native vegetation and 96 ha of cleared or excluded land. It is located directly adjacent to the Whalen and McAlister/Latham properties on the western boundary and the Priority 1 properties on the eastern boundary (refer Figure 4.1). The Yerbury offset site includes a number of vegetation communities that contribute to the projects offset requirements as well as providing occupied habitat for a number of threatened species required to be offset, including three separate areas of *Maundia triglochinooides* totalling approximately 0.19 ha (Lewis and Richards, 2012).

The Yerbury site is currently an unoccupied rural property. Previous land uses include timber harvesting and grazing.

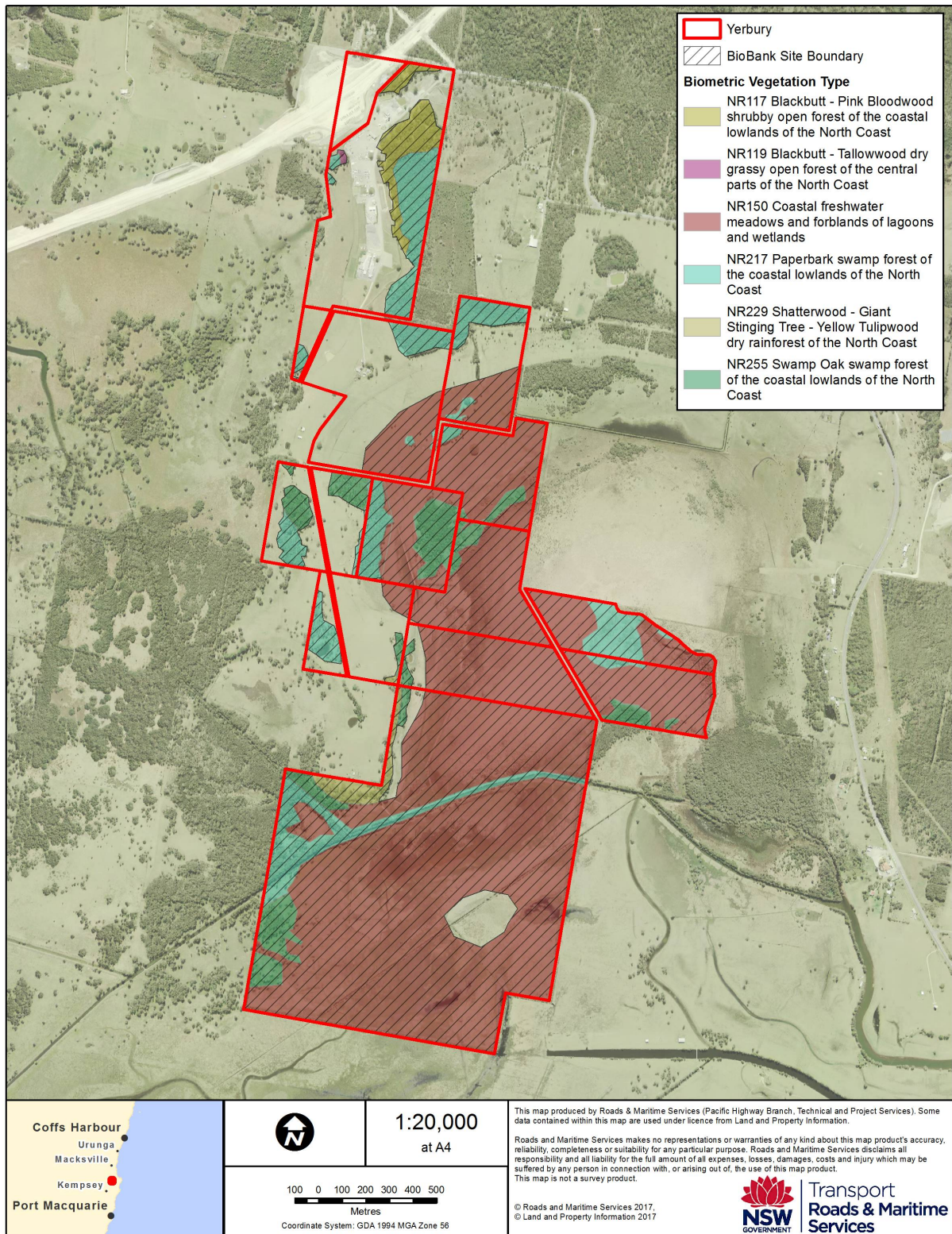
Further information on the Yerbury offset site can be found in Appendix G.

Vegetation present on Yerbury

Approximately 298 hectares of the Yerbury site has been allocated to the OH2E Upgrades. The biometric vegetation types surveyed from the site in 2012 are detailed in Table 4.13. Figure 4.7 shows the distribution of these vegetation communities.

Table 4.13: Vegetation communities present on the Yerbury offset site (updated from Lewis and Richards, 2012)

Vegetation Community	Biometric Vegetation Types Surveyed	Vegetation ID	Present on Yerbury (ha)	Allocated to OH2E
Wet Sclerophyll (Shrubby)	Blackbutt-Pink Bloodwood shrubby open forest of the coastal lowlands of the North Coast	NR117	6.8	6.8
Swamp Oak Floodplain Forest (EEC)	Swamp Oak Swamp Forest of the coastal lowlands of the North Coast	NR255	20.8	20.8
Swamp Sclerophyll Forest on Coastal Floodplain (EEC)	Paperbark swamp forest of the coastal lowlands of the North Coast	NR217	40.4	40.4
Freshwater Wetlands on Coastal Floodplains (EEC)	Coastal freshwater meadows and forblands of lagoons and wetlands	NR150	226.3	226.3
Rainforest	Shatterwood-Giant Stinging Tree-Yellow Tulipwood dry rainforest of the North Coast	NR229	3.8	3.8
Cleared land			90.2	0
Road reserve			6.0	
TOTAL			394.3	298.1



Published: 26/07/2017 Author: wilsoth G:\Pac-Hwy\AdamHoolle\PHOCorporateGIS\03_Maps\01_MXD\OH2E\D00202_2017052_PA_OH2E\OffsetPackageMaps_Yerbury_RMS_A4P_20000_V01.mxd

Figure 4.7: Distribution of vegetation types across the Yerbury offset site (data from Lewis and Richards, 2012).

Species habitat present on Yerbury

Roads and Maritime commissioned Lewis Ecological Surveys to conduct an ecological assessment of the Yerbury property in 2012. This assessment is included as Appendix G. The following information regarding threatened species present and suitable habitat has been extracted from this assessment.

A total of 9 threatened fauna species have been recorded at the site as listed in Table 4.14.

Table 4.14: Threatened species recorded at the Yerbury offset site (by Lewis and Richards, 2012 unless otherwise stated)

Common name	Scientific name	TSC Act Status	Observation type	Required for project?
Maundia	<i>Maundia triglochinosoides</i>	V	Seen	Yes
Glossy Black Cockatoo	<i>Calyptorhynchus lathami</i>	V	Seen	Yes
Square-tailed kite	<i>Lophoictinia isura</i>	V	Seen	Yes
Black-necked stork	<i>Ephippiorhynchus asiaticus</i>	E	Reported by formed landowner.	Yes
Comb-crested Jacana	<i>Irediparra gallinacea</i>	V	Seen	No
Little Lorikeet	<i>Glossopsitta pusilla</i>	V	Seen	No
Varied Sittella	<i>Daphoenositta chrysoptera</i>	V	Seen	No
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	V	Seen (2005 survey)	Yes
Golden-tipped bat	<i>Kerivoula papuensis</i>	V	Seen (2005 survey)	No

Suitable habitat for a further 19 threatened species occurs on Yerbury including:

- Green-thighed frog (*Litoria brevialmata*)
- Rose-crowned Fruit Dove (*Ptilinopus regina*)
- Wompoo Fruit-dove (*Ptilinopus magnificus*)
- Powerful Owl (*Ninox strenua*)
- Masked Owl (*Tyto novaehollandiae*)
- Sooty Owl (*Tyto tenebricosa*)
- Osprey (*Pandion haliaettus*)
- Koala (*Phascolarctos cinerus*)
- Brush-tailed Phascogale (*Phascogale tapoatafa*)
- Eastern Free-tail Bat (*Micronomus norfolkensis*)
- Southern Myotis (*Myotis macropus*)
- Little Bentwing Bat (*Miniopterus australis*)
- Eastern Bentwing Bat (*Miniopterus schreibersii oceanensis*)
- Greater Broad-nosed Bat (*Scoteanax rueppellii*)
- Hoary Wattled Bat (*Chalinolobus nigrogriseus*)

- Spotted-tailed quoll (*Dasyurus maculata*)
- Common Planigale (*Planigale maculata*)
- Yellow-bellied Glider (*Petaurus australis*)
- Squirrel Glider (*Petaurus norfolcensis*)

Hollow bearing trees and logs

Lewis and Richards (2012) assessed the density of hollow bearing trees on the Yerbury property. They found variable mean numbers ranging from 5.7 hollow bearing trees per hectare in the Moist Sclerophyll Forest to the absence of hollow bearing trees in the Freshwater Wetland habitat. Based on the mean HBT density per hectare across three habitat types, the property is expected to support approximately 350 hollow bearing trees, the majority being small limb and trunk hollows associated with Broad-leaved Paperbark, Brushbox and Blackbutt. The exception to this is was a number of large Forest Red Gum in the north eastern part of the property.

Landscape connectivity

The Yerbury site forms an integral part of the Clybucca offset complex, which also includes Blair, McAlister/Latham, Whalen and the Priority 1 properties. Overall the Clybucca offset complex covers over 1,100 hectares of land to be protected under BioBanking agreements.

The Yerbury property sits towards the east of the complex and provides linkages to Eungai State Forest, vacant Crown land and flood refuges and by coastal wetlands including Yerrahappinni Nature Reserve. The property also connects the Willawong, Fisherman's-Clybucca and Tamban-Clybucca regional wildlife corridors. These are reported as important for a range of threatened species including Glossy Black Cockatoo, Brush-tailed Phascogale, Powerful Owl and Square-tailed Kite (Lewis and Richards, 2012).

To the west of the offset complex, the Blair property is adjacent to the new Pacific Highway alignment which causes some impacts to fauna movements. A fauna underpass has been placed approximately 300 m west of the Blair property, which connects the vegetated areas on the south-west area of Blair with heavily vegetated areas to the west of the alignment which extend for thousands of hectares to the inland ranges.

4.3.7 McAlister/Latham

The McAlister/Latham site is owned by Roads and Maritime and is located at Colombatti. The property was originally purchased as part of the compensatory habitat package for the Kempsey to Eungai Upgrade. The vegetation on the site was assessed by Lewis (2013) and Niche Environmental Management did further assessment on the site as part of the development of the Commonwealth offset package for the Oxley Highway to Kempsey project (Niche, in prep), however, it was surplus to those requirements.

The McAlister/Lathan offset site comprises seven lots as detailed in Table 4.1. As the site is proposed to be BioBanked an exclusion area has been included.

The McAlister/Latham offset site is around 200 hectares, comprising 181 ha of native vegetation

and 19 ha of cleared or excluded land. It is located directly south of the Whalen property and directly west to the Yerbury property (refer Figure 4.1). The McAlister/Latham offset site includes a number of vegetation communities that contribute to the projects offset requirements as well as providing occupied habitat for a number of threatened species required to be offset (Lewis, 2013).

The McAlister/Latham site is currently an unoccupied rural property. Previous land uses include timber harvesting and grazing.

Further information on the McAlister/Latham offset site can be found in Appendix H.

Vegetation present on McAlister/Latham

Approximately 181 hectares of the McAlister/Latham site has been allocated to the OH2E Upgrades. The vegetation types surveyed from the site in 2013 are detailed in Table 4.15. Figure 4.8 shows the distribution of these vegetation communities.

Table 4.15: Vegetation communities present on the McAlister/Latham offset site (Lewis, 2013)

Vegetation Community	Biometric Vegetation Types Surveyed	Vegetation ID	Present on McAlister/Latham (ha)	Allocated to OH2E
Rainforest	Shatterwood-Giant Stinging Tree-Yellow Tulipwood dry rainforest of the North Coast	NR229	2.2	2.2
Swamp Oak Floodplain Forest (EEC)	Swamp Oak Swamp Forest of the coastal lowlands of the North Coast	NR255	85.72	85.72
Swamp Sclerophyll Forest on Coastal Floodplain (EEC)	Paperbark swamp forest of the coastal lowlands of the North Coast	NR217	51.09	51.09
Freshwater Wetlands on Coastal Floodplains (EEC)	Coastal freshwater meadows and forblands of lagoons and wetlands	NR150	42.31	42.31
Cleared land			19.13	0
TOTAL			200.45	181.32

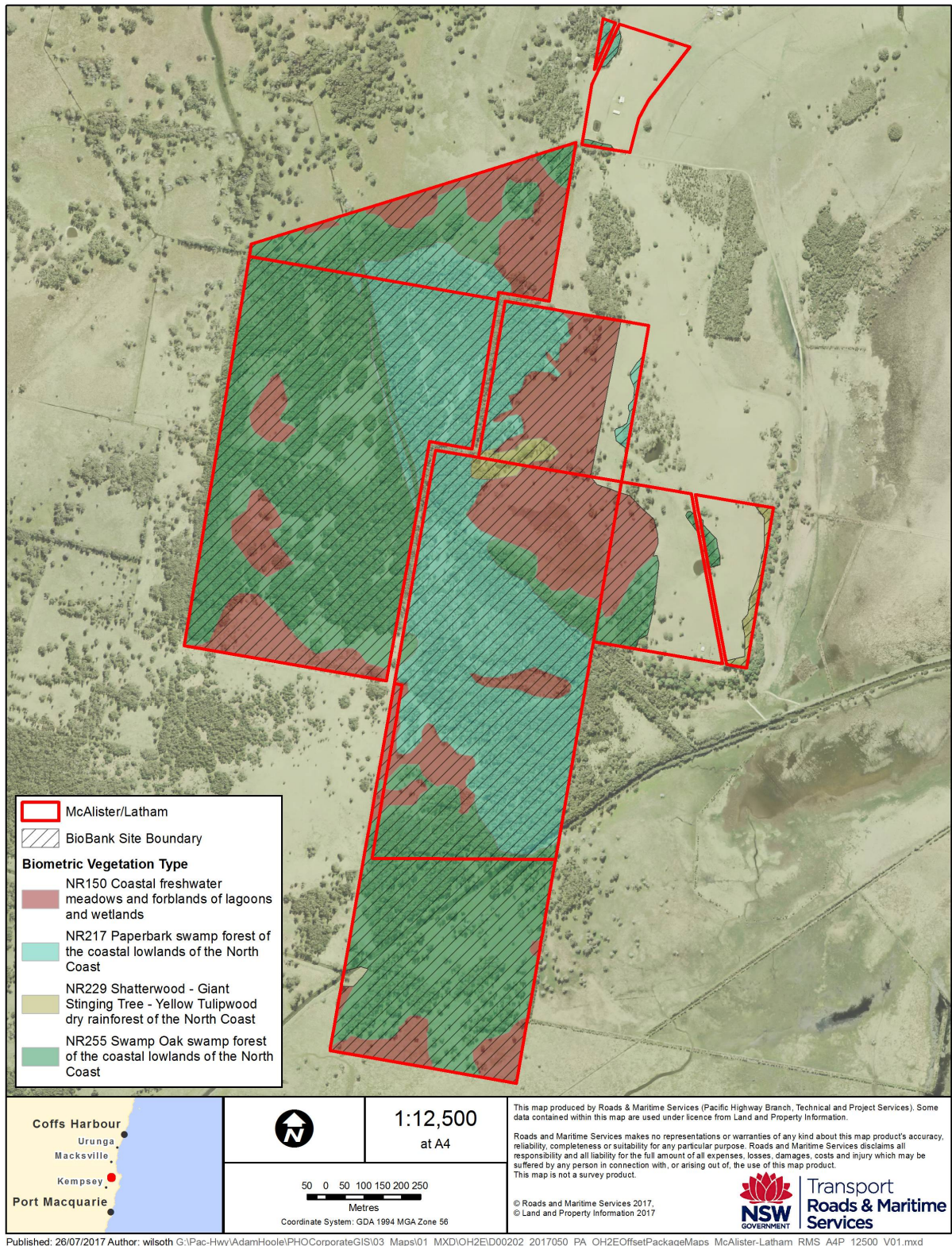


Figure 4.8: Distribution of vegetation types across the McAlister/Latham offset site (data from Lewis, 2013).

Species habitat present on McAlister/Latham

While no detailed fauna surveys were conducted on these properties as part of Lewis's 2013 vegetation survey, surveys of adjacent lands elsewhere in Doughboy Swamp and the surrounding foothills indicate a number of threatened species probably inhabit the property. These are summarised below.

In August 2012 surveys, *Maundia triglochinoidea* was recorded at a number of locations near the south-western boundary, however inspections of this area in Lewis's August 2013 surveys showed no obvious sign of its presence. Lewis notes that *Maundia* is expected to seasonally occur as small isolated patches across the western part of this property.

Suitable habitat for a number of the threatened fauna required to be offset is present on the McAlister/Latham offset site including:

- Black-necked Stork (*Ephippiorhynchus asiaticus*)
- Square-tailed Kite (*Lophoictinia isura*)
- Osprey (*Pandion haliaettus*)
- Glossy Black Cockatoo (*Calyptorhynchus lathamii*)
- Powerful Owl (*Ninox strenua*)
- Masked Owl (*Tyto novaehollandiae*)
- Sooty Owl (*Tyto tenebricosa*)
- Rose-crowned Fruit Dove (*Ptilinopus regina*)
- Brush-tailed Phascogale (*Phascogale tapoatafa*)
- Little Bentwing Bat (*Miniopterus australis*)
- Eastern Bentwing Bat (*Miniopterus schreibersii oceanensis*)
- Eastern Freetail Bat (*Micronomus norfolkensis*)
- Greater Broad-nosed Bat (*Scoteanax rueppellii*)
- Hoary Wattled Bat (*Chalinolobus nigrogriseus*)
- Southern Myotis (*Myotis macropus*)
- Common Planigale (*Planigale maculata*)
- Green-thighed Frog (*Litoria brevipalmata*)
- Yellow-bellied Glider (*Petaurus australis*)
- Squirrel Glider (*Petaurus norfolcensis*)

Hollow bearing trees and logs

Lewis (2013) did not specifically report on the hollow bearing trees present on the McAlister/Latham properties. Lewis and Richards (2012) assessed the density of hollow bearing trees on the adjoining Yerbury property, finding variable mean numbers ranging from 5.7 hollow bearing trees per hectare in the Moist Sclerophyll Forest to the absence of hollow bearing trees in the Freshwater Wetland habitat. Based on a similar mean HBT density per hectare across three habitat types, the McAlister/Latham property is expected to support approximately 200 hollow bearing trees.

Landscape connectivity

The McAlister/Latham site forms an integral part of the Clybucca offset complex, which also includes Blair, Whalen, Yerbury and the Priority 1 properties. Overall the Clybucca offset complex

covers over 1,100 hectares of land to be protected under BioBanking agreements.

The McAlister/Latham property sits towards the central-south area of the complex and completes the linkage between the Blair and Yerbury holdings. To the east, Yerbury provides linkages to Eungai State Forest, vacant Crown land and flood refuges and by coastal wetlands including Yerrahappinni Nature Reserve. The property also connects the Willawong, Fisherman's-Clybucca and Tambar-Clybucca regional wildlife corridors. These are reported as important for a range of threatened species including Glossy Black Cockatoo, Brush-tailed Phascogale, Powerful Owl and Square-tailed Kite (Lewis and Richards, 2012).

To the west of the offset complex, the Blair property is adjacent to the new Pacific Highway alignment which causes some impacts to fauna movements. A fauna underpass has been placed approximately 300 m west of the Blair property, which connects the vegetated areas on the south-west area of Blair with heavily vegetated areas to the west of the alignment which extend for thousands of hectares to the inland ranges.

4.3.8 Priority 1 properties

The Priority 1 properties complete the Clybucca offset complex, adjoining the eastern boundary of the Yerbury property. They were identified in the Colombatti-Clybucca Floodplain Remediation Feasibility Study developed of the UNSW (WRL, 2015) and were deemed necessary to complete the Mayes Swamp hydrological unit. Securing these properties will allow the commencement of hydrological works to improve the condition of the existing freshwater wetland. The UNSW have developed a range of priority on-ground actions that include in-filling of some drainage structures to reduce the speed with which water drains off the wetland.

The Priority 1 properties comprise eight separate properties with 16 lots as detailed in Table 4.1. The required areas are proposed to be acquired by Roads and Maritime and added to the Yerbury property or BioBanked with the existing landowners. As per the commitments made in the approved offset strategies for the OH2K and K2E projects, in the event any of the Priority 1 properties are unable to be secured, Roads and Maritime will seek agreement to an alternative proposal in consultation with DP&E.

The Priority 1 properties include around 295 hectares of native vegetation. They are located directly east of the Yerbury property (refer Figure 4.1). As these properties are required for hydrological purposes, no ecological study has been undertaken. Given their proximity to the other Clybucca offset properties they are likely to include a number of vegetation communities that contribute to the projects offset requirements as well as providing occupied habitat for a number of threatened species required to be offset.

The Priority 1 properties are a mixture of occupied and unoccupied rural properties. Current land uses include grazing.

Vegetation present on the Priority 1 properties

Approximately 295 hectares of the Priority 1 properties have been allocated to the OH2E Upgrades. The vegetation types present have been assessed via aerial mapping and by the vegetation surveyed from the adjoining Yerbury property and are detailed in Table 4.16. Figure 4.9 shows the distribution of these vegetation communities.

Table 4.16: Vegetation communities expected to be present on the Priority 1 properties

Vegetation Community	Biometric Vegetation Types Surveyed	Vegetation ID	Allocated to OH2E
Swamp Oak Floodplain Forest (EEC)	Swamp Oak Swamp Forest of the coastal lowlands of the North Coast	NR255	5.11
Swamp Sclerophyll Forest on Coastal Floodplain (EEC)	Paperbark swamp forest of the coastal lowlands of the North Coast	NR217	42.91
Freshwater Wetlands on Coastal Floodplains (EEC)	Coastal freshwater meadows and forblands of lagoons and wetlands	NR150	247.34
TOTAL			295.36

Species habitat, hollow bearing trees and landscape connectivity

Given the proximity of the Priority 1 properties to the Yerbury property, the species habitat, hollow bearing tree and landscape connectivity are likely to be consistent with the descriptions in the Yerbury section (4.3.6).

Lewis and Richards (2012) assessed the density of hollow bearing trees on the adjoining Yerbury property, finding variable mean numbers ranging from 5.7 hollow bearing trees per hectare in the Moist Sclerophyll Forest to the absence of hollow bearing trees in the Freshwater Wetland habitat. Based on a similar mean HBT density per hectare across three habitat types, the Priority 1 properties are expected to support approximately 60 hollow bearing trees.

MAP REMOVED FOR PRIVACY

Figure 4.9: Distribution of vegetation types across the Priority 1 properties (data from aerial mapping and Lewis and Richards, 2012).

4.4 Protection mechanisms to be used

Three different protection mechanisms will be used to provide in-perpetuity protection for the fifteen offset properties included in this offset package, including BioBanking Agreements, transfers to NPWS and creation of a Flora Reserve under the *Forestry Act 2012*. The protection mechanism proposed for each offset property is summarised in Table 4.17.

Table 4.17: Summary of protection mechanism proposed for each offset site

Offset site	Proposed protection mechanism
Norton	BioBanking Agreement
Cairncross	New Flora Reserve under the <i>Forestry Act 2012</i>
Lallemand	Transfer to NPWS
Blair	BioBanking Agreements
Whalen	
Yerbury	
McAlister/Latham	
Priority 1 private properties	

A detailed description of each of these mechanisms is included below.

4.4.1 BioBanking Agreement

The Norton offset site and all of the Clybucca properties will be conserved under BioBanking agreements under the NSW *Threatened Species Conservation Act 1995* (the TSC Act). The NSW Government established BioBanking under Part 7A of the TSC Act. The *Threatened Species Conservation (Biodiversity Banking) Regulation 2008* and the BioBanking Assessment Methodology 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 Biobanking agreement to maintain or improve their land's biodiversity values by undertaking management actions. The land is then known as a biobank 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 BioBanking Trust 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 Norton, Blair, Whalen, Yerbury and McAlister/Latham offset sites, Roads and Maritime will initiate a BioBanking agreement with the Office of Environment and Heritage (OEH), retire the required number of credits generated on the property and deposit all of the Total Fund Deposit required into the BioBanking Trust Fund prior to on-selling the properties to a third party with the BioBanking agreement in place. 100% of the ecosystem credits will be retired, as the entire site has been allocated as offsets. Surplus species credits, for any species not required

to be offset under this package will be retained.

Similarly, Roads and Maritime will assist the landowners of the Priority 1 properties to enter into a BioBanking agreement with the OEH and purchase and retire all of the biodiversity credits generated as the entire site has been allocated under this offset package. For the Norton, Blair, Whalen, Yerbury, McAlister and Priority 1 sites, this will secure the conservation covenant over the area of land and provides for the management of the site in perpetuity.

OEH assume responsibility for monitoring, compliance and enforcement of all BioBanking agreements as outlined in the BioBanking Compliance Assurance Strategy (DECC, 2008). OEH monitor compliance through annual reports submitted by owners of biobank sites, inspections and compliance audits. OEH has a range of enforcement responses at its disposal, applied on a risk basis. These include:

- Requests for remedial action, warning letters and inspections.
- Withholding annual payments from the BioBanking Trust Fund if management actions have not been carried out.
- Directing the owner of a biobank site to carry out work at their own cost to rectify a breach of a Biobanking agreement.
- Allowing OEH to enter the land to carry out necessary work where the owner has failed to comply with a Ministerial direction.
- Allowing OEH to seek an award of damages against the owner of a biobank site for breaching a Biobanking agreement.
- Applying to the Land and Environment court to have the land transferred to a more responsible land manager where a person has contravened a Biobanking agreement.

A BioBanking agreement is the strongest covenant available on private lands in NSW and extinguishes all land uses other than conservation unless the BioBanking agreement is varied or terminated by the NSW Minister for the Environment to permit alternative uses. Certain mining rights may be granted over a biobank site, and certain development can be carried out by public authorities on a biobank 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 BioBanking agreements will be developed by the OEH in consultation with Roads and Maritime and the landowners of the Priority 1 sites, 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 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 4.5 of this offset package (see draft management actions plan for Norton included with Appendix D).
- Ongoing monitoring in accordance with Section 4.6 of this offset package.

4.4.2 Transfer to NPWS

The Lallemand offset site will be transferred to National Parks & Wildlife Services (NPWS) to maintain and manage in perpetuity. Roads and Maritime currently owns the Lallemand offset site and are progressing discussions with NPWS to undertake the long-term management and conservation of the property. Roads and Maritime will transfer ownership of the property to NPWS to be included in the Jaaningga Nature Reserve.

The Lallemand offset site will be managed as native vegetation for biodiversity conservation. To ensure in-perpetuity funding will be available to manage the site, Roads and Maritime will place a BioBanking Agreement on each site prior to transferring them to NPWS. While the BioBanking Agreements will be revoked upon the sites being gazetted as a National Park, this will ensure funding is held in the Biodiversity Trust Fund for ongoing management of the sites.

The property will be managed by site specific management plans to be developed by NPWS. The broad management strategies for this site are outlined in Section 4.5 and planned monitoring in Section 4.6 of this offset package.

4.4.3 Flora Reserve

The Cairncross SF offset site will remain in the State forest estate and will be secured as a Flora Reserve and managed for conservation by FCNSW. The portion of the State forest within the Cairncross SF offset site will be set aside as a Flora Reserve under the *Forestry Act 2012* (Forestry Act). The land that is dedicated as a Flora Reserve will not be limited so as to exclude any land lying below the surface of the land pursuant to Section 16 (2) of the Forestry Act (i.e. mining will be prohibited within or below the Flora Reserve). Subject to the Forestry Act, a Flora Reserve cannot be revoked wholly or in part otherwise than by Act of Parliament. The NSW OEH recognises that Flora Reserves offer a similar level of security and protection to biodiversity as National Parks and Nature Reserves (OEH, 2011).

Conservation as a Flora Reserve meets the Commonwealth standards for inclusion within the National Reserve System which state that a reserve must be:

- Statutorily defined and resourced.
- Reserved in perpetuity.
- And that any change in management status must have Ministerial or statutory approval (NRMCC, 2010).
- A fundamental requirement of any area's eligibility for inclusion within the National Reserve System is that it must meet the IUCN definition of a 'protected area' A clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values' (NRMCC, 2010). Conservation as a Flora Reserve through Section 16 of the Forestry Act meets the definition of 'Legal means': Land is brought under control of an Act of Parliament, specialising in land conservation practices, and requires a Parliamentary process to extinguish the protected area or excise portions from it (NRMCC 2010).

The Forestry Act requires the preparation of working plans for each Flora Reserve that specifies the operations to be carried out in or in relation to the Flora Reserve with the objective of the

plan the preservation of native flora. The working plan will exclude activities such as timber harvesting, grazing and apiary that are inconsistent with the preservation of native flora and specify management measures such as weed management, fire management, track maintenance and erosion control.

Roads and Maritime will make an appropriate financial contribution to FCNSW to compensate for the loss of access to the timber resource and other economic potential within the Flora Reserve and to ensure that funds are available to manage the Flora Reserve for conservation.

4.5 Proposed management actions

The following broad management strategies and related actions are proposed to be undertaken at each of the offset sites to improve the value and extent of native vegetation and habitat for threatened fauna:

- Property maintenance, through:
 - Establishment and maintenance of appropriate fences, gates and signs.
 - Removal of rubbish.
 - Maintenance of tracks.
 - Maintenance of easements.
- Conservation and improvement of habitat, through:
 - Bush regeneration and facilitated improvement in the condition of native vegetation.
 - Natural regeneration and supplementary planting where appropriate in cleared or degraded land.
 - Weed control.
 - Exclusion of domestic stock grazing and management of human disturbance.
 - Retention of dead timber, rocks and other habitat resources.
 - Fire management.
- Pest fauna control.

Each offset site will have a detailed management plan outlining the required actions and associated timeframes. As an example, the management action plan for the Norton site is included in Appendix D. A copy of the management plan for each site will be provided to the Department of Planning and Environment when finalised.

4.6 Monitoring

BioBanking sites – Norton, Blair, Whalen, Yerbury, McAlister/Latham and Priority 1 sites

The following monitoring programs and reports will apply to these offset sites:

- Management actions performance monitoring, from the approval of the BioBanking agreement. Annual reports will be prepared by the landowner and submitted to OEH.
- A vegetation and habitat survey along with a targeted threatened species survey at year five to further confirm the presence and condition of occupied habitat for the affected threatened fauna.

- Pest fauna control monitoring, comprising annual monitoring of pest fauna populations and documenting of control activities from the approval of this offset package. Reports are to be completed by suitably qualified practitioners and maintained by the landholder.
- OEH monitoring and auditing to be completed on an ongoing basis from approval of the BioBanking agreement.

Flora Reserve – Cairncross SF

The FCNSW will monitor biodiversity values at the Cairncross SF offset site as part of their management of the State forest. Monitoring will include an annual assessment of the general extent and quality of habitat for the affected threatened flora and the effectiveness of management actions for a minimum of 20 years. The following monitoring programs and reports will apply to the Offset site:

- Vegetation and habitat monitoring, comprising a monitoring program to be completed by the FCNSW annually, for a minimum of 20 years and including preparation of annual overviews of the condition of vegetation and habitat.
- A targeted threatened species survey at year five to further confirm the presence and condition of occupied habitat for the affected threatened fauna.
- Pest fauna control monitoring, involving documenting of control activities for a minimum of 20 years.

NPWS – Lallemand

The NPWS will monitor biodiversity values at the Lallemand offset site as part of their management of the Jaaningga Nature Reserve. Monitoring will include an annual assessment of the general extent and quality of habitat for the affected threatened fauna and the effectiveness of management actions as per the BioBanking requirements. The following monitoring programs and reports will apply to the Lallemand offset site:

- Vegetation and habitat monitoring, comprising a monitoring program to be completed by the NPWS annually, and including preparation of annual overviews of the condition of vegetation and habitat.
- Pest fauna control monitoring, comprising bi-annual survey of pest fauna populations and documenting of control activities.

4.7 Timing and responsibility for implementation of package

Each offset site will require different actions and have a different timetable, depending on the protection mechanism selected. Table 4.18 details the timing and responsibility for the expected actions required to protect the sites in perpetuity and for on-going management for each offset site.

Table 4.18: Required actions, timing and responsibility for implementation of the OH2E offset package.

Protection mechanism	Offset Site	Actions required	Target timeframe	Responsibility
BioBanking Agreement	Norton	Submit BioBanking Application to OEH	July-August 2017	RMS
		Create and execute BioBanking Agreement	August – Dec 2017	OEH/RMS
		Retire credits	Dec 2017 - Jan 2018	RMS
		Implement Management Action Plan and annual monitoring	From signing of BioBanking Agreement	RMS, until re-sale to third party.
		Re-sell on open market	From Jan 2018	RMS
	Clybucca properties (RMS and Private sites)	Submit BioBanking Application to OEH	September 2017 – February 2018	RMS/Landowners
		Create and execute BioBanking Agreement	February - June 2018	OEH/RMS/Landowners
		Retire credits	June 2018	RMS
		Implement Management Action Plan and annual monitoring	From signing of BioBanking Agreement	Landowner/RMS, until re-sale to third party.
		Re-sell on open market	From June 2018	RMS
NPWS Transfer	Lallemand	Finalise management actions and funding	July - August 2017	RMS/NPWS
		Transfer title to NPWS	September 2017 – December 2017	RMS
		Include in National Parks Estate and implement management actions and annual monitoring	Upon property transfer	NPWS
Flora Reserve	Cairncross State Forest	Gazettal of new Flora Reserve	February 2017 – August 2017	FCNSW
		Implement management actions and annual monitoring	From gazettal, for a minimum of 20 years.	FCNSW

5 Summary of offsets provided by package

Vegetation

The Biodiversity Offset Strategy for the OH2K and K2E upgrades specified 12 broad vegetation types that offsets need to be provided for (Table 2.1). Roads and Maritime have allocated the Biometric Vegetation Types recorded on each offset site to these broad vegetation communities using permissible trades between vegetation communities that occur in the same vegetation formation. The results of this assessment are summarised in Table 5.1.

Table 5.1: Summary of how Biometric Vegetation Communities on the offset sites contribute to the offset requirements. Trades are indicated by the NR type used for the trade. Shaded communities are present on offset sites but not required to be offset.

Broad vegetation community	Total impacted (ha)	Offset required (ha)	Norton	Cairncross SF	Lallemand	Blair	Whalen	Yerbury	McAlister/Latham	Priority 1	Balance (ha)
Blackbutt – Scribbly Gum Dry Sclerophyll Forest	1.47	113.84									-11.34
Tallowwood – Grey Gum Dry Sclerophyll Forest	35.53			65.4							
Stringybark/Ironbark/Bloodwood Dry Sclerophyll Forest	4.13		35.3 (NR246)								
Scribbly Gum Dry Sclerophyll Forest	10.99		1.8 (NR228)								
Mahogany Dry Sclerophyll Forest ¹	4.80										
Wet Sclerophyll (Grassy), including Blackbutt Plantation	153.51	369.02				23.8 (NR119)					-345.22
Wet Sclerophyll (Shrubby)	170	680		261.2 (NR117)	102.6 (NR 122, 160, 259 & 274)	96.2 (NR117)		6.8 (NR117)			-213.2
Sub-tropical Floodplain Forest (formerly River-flat Forest)	21.17	84.68									-84.68
Swamp Sclerophyll Forest	39.78	159.12				47.3	13.7	40.4	51.09	42.91	36.28
Swamp Oak Floodplain Forest	24.31	97.24				50.5	5.3	20.8	85.72	5.11	70.19
Freshwater Wetland – Wet Meadow	24.03	100.56				111.2	15.8	226.3	42.31	247.34	542.39
Freshwater Wetland – Lepironia Sedgelands	1.11										
Rainforest - Dry	-	-				4.2		3.8	2.2		10.2
Rainforest – Northern Warm Temperate	-	-			1.8						1.8
TOTAL	490.83	1604.46	37.1	326.6	104.4	333.2	34.8	298.1	181.32	295.36	6.42

An overall surplus of 6.42 ha has been achieved over the required offsets of 1604.46 ha based on the 2:1/4:1 ratios across all of the broad vegetation communities as specified in the approved Biodiversity Offset Strategies for OH2K and K2E.

Vegetation communities in surplus include:

- Swamp Sclerophyll Forest (+36.28 ha)
- Swamp Oak Floodplain Forest (+70.19 ha)
- Swamp Sclerophyll Forest on Coastal Floodplain (+14.62 ha)
- Freshwater Wetlands on Coastal Floodplains (+542.39 ha); and
- Dry Rainforest (+10.2 ha) (this community is not required to be offset)
- Northern Warm Temperate Rainforest (+1.8 ha) (this community is not required to be offset).

Vegetation communities in deficit include:

- Dry Sclerophyll Forest (-11.34 ha)
- Wet Sclerophyll (Grassy), includes Blackbutt Plantation (-345.22)
- Wet Sclerophyll (Shrubby) (-213.2 ha)
- Subtropical Coastal Floodplain Forest (-84.68 ha)

As outlined in the approved Biodiversity Offset Strategies for the OH2K and K2E upgrades, the deficits in the four vegetation communities will be substituted with a community at an equal or higher conservation value. Table 5.2 shows the substitution used for each of the vegetation communities in deficit.

Table 5.2: Substitutes used for vegetation communities in deficit

Vegetation community in deficit	Required offset (ha)	Amount offset in package (ha)	Substitute used (ha)	Remaining deficit (ha)
Subtropical Coastal Floodplain Forest (EEC, 60-70% cleared estimate for region)	84.68	0	70.19 ha Swamp Oak EEC 14.49 Swamp Sclerophyll EEC (both 75% cleared estimate for region)	0
Dry Sclerophyll Forest	113.84	102.5	11.34 ha Swamp Sclerophyll EEC	0
Wet Sclerophyll (Grassy)	369.02	23.8	10.45 ha Swamp Sclerophyll EEC 334.77 ha Freshwater Wetland EEC	0
Wet Sclerophyll (Shrubby) (10-40% cleared estimate)	680	466.8	207.62 ha Freshwater Wetland EEC	0

for region)			5.58 ha Dry Rainforest (30% cleared estimate in region)	
-------------	--	--	---	--

Threatened species

Table 5.3 shows the known or suitable habitat areas for threatened species listed in the Biodiversity Offset Strategies for OH2K and K2E on each offset site. The fifteen offset sites provide either known or suitable habitat for all of the threatened species likely to be impacted by the project. There are deficits in the offsets provided for Maundia (3.5 ha), Eastern False Pipistrelle (8.1 ha) and Rose-crowned Fruit Dove (46.4 ha) compared to the impact areas. The latter two fauna species have been substituted with similar species at the same or higher threat level as detailed in the Biodiversity Offset Strategies for OH2K and K2E.

Table 5.3: Threatened species required to be offset by the OH2K and K2E upgrades along with amount of known or suitable habitat on each offset site. Substitute species are shaded.

Threatened species required to be offset	Impact (ha)	Norton	Cairncross SF	Lallemand	Blair	Whalen	Yerbury	McAlister/Latham	Priority 1	TOTAL AREA (ha)
Maundia (<i>Maundia triglochoides</i>)	4.71				0.5	0.5	0.2	Known		1.2
Black-necked Stork (<i>Ephippiorhynchus asiaticus</i>)	25				209	34.8	287.5	179.1	295.4	1005.8
Brush-tailed Phascogale (<i>Phascogale tapoatafa</i>)	250.1		326.6		97.8	19	61.2	136.8	48	689.4
Common Planigale (<i>Planigale maculata</i>)	240			15.3	209	34.8	287.5	179.1	295.4	1021.1
Eastern Bentwing Bat (<i>Miniopterus schreibersii</i>)	240		326.6	15.3	209	34.8	287.5	179.1	295.4	1347.7
Eastern False Pipistrelle (<i>Falsistrellus tasmaniensis</i>)	215	37.1	65.4	104.4						206.9
Hoary Wattled Bat (<i>Chalinolobus nigrogriseus</i>)	-	37.1	326.6			19.0	68.0	136.8		587.5
Eastern Freetail Bat (<i>Mormopetrus norfolkensis</i>)	240		326.6	15.3	209	34.8	287.5	179.1	295.4	1347.7
Glossy Black Cockatoo (<i>Calyptorhynchus lathamii</i>)	412	37.1	326.6	15.3	97.8	19	61.2	136.8	48	741.8
Greater Broad-nosed Bat (<i>Scoteanax rueppellii</i>)	237			15.3	97.8	19	61.2	136.8	48	378.1
Green-thighed Frog (<i>Litoria brevipalmata</i>)	498.5			15.3	209	34.8	287.5	179.1	295.4	1021.1
Giant Barred Frog (<i>Mixophyes iterates</i>)	7.7	37.1								37.1
Little Bentwing Bat (<i>Miniopterus australis</i>)	237		326.6	15.3	97.8	19	61.2	136.8	48	704.7
Masked Owl (<i>Tyto novaehollandiae</i>)	225	37.1	326.6	15.3	50.5	5.3	20.8	85.7	5.1	546.4
Osprey (<i>Pandion haliaeetus</i>)	25				209	34.8	287.5	179.1	295.4	1005.8
Powerful Owl	237	37.1	326.6	15.3	97.8	19	61.2	136.8	48	978.8

<i>(Ninox strenua)</i>										
Rose-crowned Fruit Dove <i>(Ptilinopus regina)</i>	104			47.4	4.2		3.8	2.2		57.6
Wompoo Fruit Dove <i>(Ptilinopus magnificus)</i>	-		261.2	54.4	96.2		6.8			418.6
Sooty Owl <i>(Tyto tenebricosa)</i>	184		261.2	104.4	100.4		10.6	2.2		478.8
Southern Myotis <i>(Myotis macropus)</i>	240			15.3	209	34.8	287.5	179.1	295.4	1021.1
Square-tailed Kite <i>(Lophoictinia isura)</i>	226	37.1	326.6	15.3	50.5	5.3	20.8	85.7	48	589.3
Squirrel glider <i>(Petaurus norfolcensis)</i>	177			15.3	47.3	13.7	40.4	51.1	42.9	210.7
Yellow-bellied Glider <i>(Petaurus australis)</i>	236	37.1	326.6	102.6	143.5	13.7	47.2	51.1	42.9	764.7
Koala <i>(Phascolarctos cinereus)</i>	215.4	37.1	326.6	100	96.2		6.8			566.7
Grey-headed Flying-fox <i>(Pteropus poliocephalus)</i>	232	37.1	326.6	104.5	288.8	34.8	63.4			855.2
Spotted-tailed Quoll <i>(Dasyurus maculata)</i>	215	37.1	326.6	104.5	288.8	18.5	57.17			832.65

Regarding the current Maundia deficit of 3.5 ha, Roads and Maritime intends to survey the impacted areas to assess whether any recolonisation of Maundia has occurred, which under the conditions of approval, will reduce the offset requirement of this species. In addition, updated distribution data of Maundia across the Clybucca offset properties will be gathered during the detailed BioBanking assessments that will be undertaken in late 2017 – early 2018.

When the results of these assessments are available, Roads and Maritime will report to DP&E on the status of the Maundia offset, and if necessary, our proposal to address any remaining deficit.

Hollow bearing trees

Table 5.4 summarises the hollow bearing trees estimated on each offset site. The OH2K Biodiversity Offset Strategy confirmed that the offset sites should contain a commensurate number of hollow bearing trees to the impact area. 603 hollow bearing trees have been confirmed as being impacted by the project. The offset sites contain a conservative estimate of approximately 1465 hollow bearing trees, a ratio of just over 2:1 to the number impacted.

Table 5.4: Number of hollow bearing trees estimated on each offset site.

Offset site	HBT estimation	HBTs/ha
Norton	120	3.3
Cairncross SF	-	-
Lallemand	300	3.0
Blair	370	0-5.7
Whalen	65	
Yerbury	350	
McAlister/Latham	200	
Priority 1	60	
TOTAL	1465	

6 Conclusions

The approved Biodiversity Offset Strategies for the Oxley Highway to Kempsey and Kempsey to Eungai upgrades identified biodiversity mitigation and offsetting measures to be implemented including fauna crossings, revegetation, threatened flora translocation, installation of nest boxes, widening of the median and biodiversity monitoring during the construction and operational phases as well as outlining the process to be followed for biodiversity offsetting.

The Biodiversity Offset Package provides details on the fifteen offset properties proposed for the Oxley Highway to Kempsey and Kempsey to Eungai upgrades including timeframes and responsibilities for implementation. This package has been developed in consultation with stakeholders and will deliver environmental outcomes for the vegetation communities and threatened flora and fauna impacted by the project.

The Strategy involves securing, through three in perpetuity protection mechanisms, 1,610.88 ha of native vegetation communities. Six properties will be placed under BioBanking Agreements, one property will be transferred to NPWS for inclusion in the National Parks estate and a new Flora Reserve will be created in the Cairncross State Forest. All of the sites will be managed under site specific plans of management.

The offset sites provide known or suitable habitat for the full suite of threatened species likely to be impacted by the upgrade. The habitat offset exceeds the impact area for all but three species, Maundia, Eastern False Pipistrelle and Rose-crowned Fruit Dove. Deficits for the two fauna species have been substituted with species in the same class at the same or greater threat level as specified in the OH2K Biodiversity Offset Strategy. For Maundia, populations of this species have been found across four of the Clybucca offset properties and it is likely that the distribution of this species will spread once wetland remediation commences in this area. Monitoring of the distributions of this species will continue over the coming months as outlined in Section 5. The offset sites also provide well in excess of the required number of hollow bearing trees.

Comparison with Biodiversity Offsets Strategy Objectives

A summary of how the offset properties satisfies the objectives of the Biodiversity Offset Strategy is provided in Table 6.1

Table 6.1: Compliance of the offset property with the Biodiversity Offset Strategy objectives.

Objective	Comment
An outcome that maintains or improves biodiversity values	The biodiversity values of each offset property have been assessed by an independent ecologist and management actions have been developed to ensure the ecological condition of the sites continues to improve over time.
Successfully securing the long-term (in perpetuity) protection and management of lands containing endangered ecological communities and habitat for threatened species (key habitat)	The offset properties contain 1,610.88 ha of native vegetation, including 1,005.78 ha of EEC. This vegetation provides suitable habitat for a number of threatened species affected by the upgrade.
Meeting the minimum requirements for offsets as specified in the conditions of approval.	The offset properties exceed the area of offset stipulated in the state conditions (variable ratios depending on conservation status) by 6.42 ha.
Is consistent with the principles outlined in Section 3.3 (of the Biodiversity Offset Strategy)	Section 3.3 requires the offset package be consistent with the NSW offset principles for major projects (SSI). The package has been designed to be consistent with the principles, including seeking approval to depart from the like-for-like requirements to protect higher conservation vegetation communities.
The total area of land used to offset the biodiversity impacts would exceed the direct and indirect (edge effects) impacts.	The area of land offset is 3 times greater than the direct and indirect impacts of the project.
The process for setting the scope and quantum of the biodiversity offsets is transparent and justifiable on environmental, social and economic grounds.	The offset assessment process has been fully transparent. Ongoing consultation has been undertaken with state departments during the assessment phase and post approval.

7 References

- Department of Environment and Climate Change. (2008). BioBanking Compliance Assurance Strategy. DECC 2008/346.
- Fairfull, S. and Witheridge, G. (2003). Why do fish need to cross the road? Fish Passage requirements for waterway crossings. NSW Fisheries Office of Conservation.
- GHD. (2016a). Norton Biobank BioBanking Assessment. Prepared by GHD for Roads and Maritime Services.
- GHD. (2016b). Warrell Creek to Nambucca Heads Biodiversity Offset Package. Prepared by GHD for Roads and Maritime Services.
- GHD. (2016c). Norton and Griffin Offset Management Plan. Prepared by GHD for Roads and Maritime Services.
- Lewis, B. D. (2012). Kempsey to Eungai Biodiversity Offset Strategy: Clyde Blair and Ken Whalen Candidature Sites. Prepared by Lewis Ecological Surveys for Roads and Maritime Services.
- Lewis, B. D. (2013). Kempsey to Eungai Biodiversity Offset Strategy: McAlister and Latham Candidature Sites. Prepared by Lewis Ecological Surveys for Roads and Maritime Services.
- Lewis, B. D. and Richards, P. (2012). Yerbury Candidature Site: Compensatory Habitat Package for Kempsey to Eungai Upgrade. Report prepared for Roads and Maritime Services by Lewis Ecological Surveys.
- Niche Environment and Heritage. (In prep). Oxley Highway to Kempsey Biodiversity Offset Management Plan. Prepared by Niche Environment and Heritage for Roads and Maritime Services.
- Natural Resource Management Ministerial Council (NRMMC). (2010). Australia's strategy for the National Reserve System 2009 – 2030. Department of the Environment and Heritage, Canberra.
- Office of Environment and Heritage. (2011). NSW Conservation Mechanisms. <http://environment.nsw.gov.au/bioregions/BioregionsNswoutlineConservation.htm>
- Water Research Laboratory (WRL). (2015). Collombatti-Clybucca Floodplain Remediation Feasibility Study. WRL Technical Report 2015/01.

Appendix A – Oxley Highway to Kempsey Approved Biodiversity Offset Strategy.

Appendix B – Approved Kempsey to Eungai Biodiversity Offset Strategy.

Appendix C – Stakeholder Consultation.

Appendix D – Norton BioBanking Assessment Report, GHD,
2016.

Appendix E – Assessment of the Caincross State Forest and
Lallemand sites, extracted from Niche (in prep).

Appendix F – Assessment of the Blair and Whalen sites, Lewis 2012.

Appendix G – Assessment of the Yerbury site, Lewis and Richards
2012.

Appendix H – Assessment of the McAlister/Latham site, Lewis 2013.