The Trustee for Moonee Parklands Trust

Moonee Parklands Residential Development

Biodiversity Offsets Strategy

March 2017

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1. Biodiversity offsets strategy

1.1 Introduction

The trustee for Moonee Parklands Trust (the client) is seeking approval for the proposed Moonee Parklands residential subdivision MP 09_0067 (the Project). The site is shown in Figure 1.

This report presents the draft Biodiversity Offset Strategy (BOS)which outlines how the proponent will be required to offset the impacts of the Project. The strategy has been prepared giving consideration to the NSW Biodiversity Offsets Policy for Major Projects (2014). This policy is supported by the Framework for Biodiversity Assessment (2014) (FBA). The FBA sets out the assessment methodology that has been adopted by the Major Projects Policy to quantify the biodiversity impacts and determine the offset requirement of a Major Project. Major projects include State significant development (SSD) and State significant infrastructure (SSI) projects.

The proposed Moonee Parklands residential subdivision was lodged before the Major Projects Policy had been adopted by the NSW government. As such, the original application was submitted with a supporting Ecological Assessment prepared by PEA Consulting (2013). Since this time the NSW Department of Planning and Environment (DPE) and the NSW Office of Environment and Heritage (OEH) have determined that the project is required to deliver biodiversity offsets to compensate for residual impacts to biodiversity. Consultation between the applicant and both the DPE and OEH have agreed that the biodiversity offsets are to be provided in accordance with the Major Projects Policy and the FBA.

It should be noted however that both DPE and OEH have agreed that the project is not required to complete a Biodiversity Assessment Report (BAR) in accordance with the requirements of the FBA as it has been acknowledged the PEA Report (2013) has adequately considered the site's biodiversity values. The agreement with DPE and OEH is to prepare a BOS, giving consideration to the requirements and application of the FBA in relation to biodiversity offsets, only.

The BioBanking Assessment Methodology (BBAM) was used to determine the number and type of biodiversity credits required to offset impacts of the Project. A copy of the biodiversity credit report is included inAppendix A. The BOS also sets out the requirements and trading rules that the project will need to apply to secure the necessary biodiversity credits before a Construction Certificate (CC) can be issued for the project.

This report was prepared with consideration of the following legislation, reports and policies:

- NSW Biodiversity Offsets Policy for Major Projects (OEH, 2014c)
- Framework for Biodiversity Assessment (OEH, 2014b)
- Ecological Assessment (PEA Consulting, 2013)
- *Environment Protection and Biodiversity Conservation Act 1999*
- *Threatened Species Conservation Act 1995*

2. Methods

2.1 Approach

Biodiversity credits were calculated at the Project according to the methodology presented in the *BioBanking Assessment Methodology* (OEH 2014a) and the *Operational Manual for using the BioBanking Credit Calculator v4.1* (OEH 2016a). The credit calculator is the software version of the methodology. Data was entered into the credit calculator (version 4.1) based on information collected in the desktop assessment, site surveys and from using GIS mapping software.

The methodology establishes two classes of biodiversity credits that may be created:

- Ecosystem credits – these are created or required for all impacts on biodiversity values, including threatened species that can be reliably predicted by habitat surrogates.
- Species credits – these are created or required for impacts on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Threatened species that require species credits are identified in the Threatened Species Profile Database (OEH, 2015a).

This BOS has been prepared to support an application for the Moonee Parklands residential subdivision. The following methods were utilised in the approach:

- A literature and database review to describe the existing environment of the Project site and to obtain the necessary data to perform BioBanking credit calculations.
- Geographic information system (GIS) assessment to map the Project site and calculate the landscape value.
- Field survey of the Project site, including the BioBanking plot/transect methodology to calculate the site value.
- Credit calculations using the credit calculator v 4.1 to determine the ecosystems credits that will be required to offset the Projects biodiversity impacts.

The credit calculator produces a number of reports, including the threatened species predicted to occur, survey effort required at the site and the biodiversity credit profile, which are appended to this BOS.

The purpose of this BOS assessment is to assess the number of credits that are required by the Project and to outline the requirements and the trading rules for securing the credits.

2.2 Desktop assessment

2.2.1 Literature and database review

The following resources were reviewed to assist in describing the existing environment of the Project site and to obtain some of the necessary data to perform Offset credit calculations:

- Coffs Harbour City Council (2012) Fine Scale Vegetation Mapping for the Coffs Harbour LGA
- OEH (2014d) Vegetation Types Database
- OEH (2016d) Vegetation Information System: Classification
- OEH (2016c) NSW BioNet Search
- PEA Consulting (2013), Ecological Assessment Lot 1 DP 1097743 and Lot 6

- DECCW (2010) NSW Interim Vegetation Extent remote sensing imagery
- Aerial photographs and satellite imagery of the site.

2.2.2 Geographical Information System (GIS) analysis

GIS analysis is an integral part of the BBAM. GIS was used to plot the Project site on a high resolution aerial photo base and to map vegetation types and biodiversity values across the site. GIS analysis was used to calculate the extent of native vegetation to be managed within the Project site, which was entered into the credit calculator.

GIS analysis was used to accurately determine the relevant Catchment Management Authority (CMA)CMA Sub-region and Mitchell Landscape for the site.

Additional GIS analysis was used to plot the assessment circles surrounding the site in which landscape scores are calculated. Native vegetation cover, extent and connectivity were assessed using aerial photography and NSW Interim Vegetation Extent remote sensing imagery (DECCW 2010). Air photo interpretation was used to identify and record distinct vegetation patches, determine the broad condition state of vegetation types and the location and extent of vegetated habitat corridors. The assessment circles and GIS area calculations were used to enter information about landscape value and to determine the change in Landscape Value score by assessing the impact of the Project on native vegetation cover and connectivity as well as the size of adjacent remnant area.

2.3 Site survey

2.3.1 Survey effort

Staged field surveys of the Project site were conducted with reference to the BBAM. Surveys involved broad vegetation surveys and vegetation mapping followed by BioBanking plot-transect surveys and additional opportunistic fauna and threatened flora surveys.

Survey effort that has contributed to this report is summarised in and described below.

Table 2-1 Survey effort

Stage	Date	Survey technique
Biobanking Surveys	29 – 30 September 2016	Vegetation composition of the site was ground truthed and any incidental fauna or threatened fauna sightings recorded. Nine 20 m x 50 m BioBanking plots / transects and nine 20 m x 20 m floristic plant species richness plots conducted.
Ecological Assessment conducted by Pacific Environmental Associates Pty Ltd (PEA) Consulting	March 2013	As per Ecological Assessment Report (EAR).

2.3.2 Vegetation mapping

Vegetation mapping as gathered from Coffs Harbour LGA Detailed Vegetation Mapping (2012) was ground-truthed in the field by GHD via walking the boundary of vegetation types. Field ecologists checked mapped vegetation polygons with a hand-held Trimble GPS unit loaded with aerial photography and the Coffs Harbour LGA vegetation mapping. Necessary adjustments were made by hand on aerial photographs of the site and by capturing waypoints at vegetation type boundaries. The site was divided into relatively homogenous or discrete zones for assessment. Each zone represented a distinct vegetation type according to the Vegetation Information System (VIS) (OEH 2016d) and broad condition state. Five vegetation zones were identified in the site, three in the development area and two in the conservation area as shown on Figure 2.

2.3.3 Plots /Transects

Plot and transect surveys were conducted on site in accordance with the BioBanking Assessment Methodology (BBAM) to obtain data for the calculation of biodiversity credits. The site value was determined by assessing 10 site condition attributes against benchmark values. Benchmarks are quantitative measures of the range of variability in condition in vegetation with relatively little evidence of alteration, disturbance or modification by humans since European settlement (DECC, 2009). Species were identified according to the nomenclature of the Royal Botanic Gardens and Domain Trust (2016). Cover abundance data was also collected for each species within the 20 metre x 20 metre portion of each plot/transect.

Plots were distributed between vegetation zones (i.e. NSW vegetation types and condition classes identified in the preliminary survey) according to the minimum number of plots required by the BBAM. A total of 9 plots were sampled within the site as shown on Figure 2.

The overall condition of vegetation was assessed through general observation and comparison against the BioBanking condition benchmark data as well as using parameters such as species diversity, history of disturbance, weed invasion and canopy health. Vegetation types all fell within the 'Moderate/good' condition class according to the BBAM.

Moderate/good condition vegetation was further split into three sub-classes with reference to BioBanking benchmark data (OEH, 2015d) as follows:

- Condition category 'high':
  - Vegetation still retains the species complement and structural characteristics of the pre-European equivalent. Such vegetation has usually changed very little over time and displays resilience to weed invasion due to intact groundcover, shrub and canopy layers. Native species diversity is relatively high. Weeds may exist in this vegetation type but are not dominant in any vegetation layer (native groundcover is greater than 50%).
- Condition category 'medium':
  - Vegetation has retained a native canopy (greater than or equal to 25% of the Lower benchmark value) but with a moderate to severe weed infestation in the midstorey and understorey. The understorey is still predominantly native. Native shrubs and were generally sparse and all stratum had Low species richness.

- Condition category ‘poor’:
  - Vegetation has a native canopy with predominantly exotic midstorey and understorey (native groundcover and shrub layer is less than 50%), or
  - Vegetation has lost most of the native canopy cover and is significantly modified structurally but has a predominantly native understorey and/or midstorey. All stratum have a very low diversity and abundance of native species.

Opportunistic and incidental observations of fauna species were recorded at all times during field surveys. Casual fauna observations were made in suitable areas of habitat throughout the course of the flora survey and while incidentally traversing the site. This included visual inspection of nests, creek lines, overhangs and woody debris, active searches for small fauna and opportunistic observation of scats, tracks, burrows or other traces.

Opportunistic observations of fauna and threatened plants were recorded throughout the survey. The locations of any threatened species identified within the site were captured with a handheld GPS.

Targeted flora surveys

No targeted flora surveys were conducted at the site. Previous surveys completed for the PEA Assessment (2013) were considered adequate by the OEH.

Targeted fauna surveys

No targeted fauna surveys were conducted at the site. Previous surveys completed for the PEA Assessment (2013) were considered adequate by the OEH.

Opportunistic and incidental observations of fauna species were recorded by GHD during this field survey. Casual fauna observations were made in suitable areas of habitat throughout the course of the flora survey and while incidentally traversing the site. This included visual inspection of fallen logs, overhangs and woody debris, and opportunistic observation of scats, tracks, burrows or other traces.

2.4 BioBanking assessment

The BioBanking credit calculations were completed by Dan Williams (accredited assessor 0082) using credit calculator Version 4.1. Field survey results, GIS calculations and this assessment report have been peer reviewed by Shaun Lawer (see Table 2-2). The credit calculations will be submitted to OEH and the biodiversity credit report is included as Appendix A.

2.5 Staff qualifications

This report, including all BioBanking credit calculations, was prepared by Dan Williams based on field surveys conducted by GHD ecologists Jessica Sharp and Ben Harrington. The assessment was peer reviewed by Shaun Lawer. Staff qualifications are presented in Table 2-2.

Table 2-2 Staff qualifications

Name	Position / Project role	Qualifications	Relevant experience
Daniel Williams	Principal Environmental Consultant / Reporting, management actions, TFD, consultation and planning	B. App. Sc. BioBanking Assessor Accreditation 1	15+ years
Jessica Sharp	Graduate ecologist / site surveys, reporting	BEnvSci	2 years
Ben Harrington	Principal Ecologist / site surveys, reporting	BSc MSc (Physical Geography) BioBanking Assessor Accreditation 1	10+ years
Shaun Lawer	Peer review	B. Urban and Regional Planning, M. Business Administration	20 years
1 Refer to OEH (2016b) list of accredited assessors.			

3. Existing environment

3.1 Site context

3.1.1 Location and land uses

The proposed site is located 30 km north of Coffs Harbour within the Coffs Harbour Local Government Area (LGA) as shown on Figure 1. It falls within the Coffs Harbour and Escarpment subregion of Northern Rivers Catchment Management Authority (CMA), and within the North Coast Bioregion.

The Project is contained within Lot 1 DP 1097743, off the Pacific Highway, Moonee Beach NSW. The site borders rural properties to the north and south and is bounded by Moonee Creek in the east and the Pacific Highway to the west.

The entire site is currently identified as DM (Deferred Matter) under the Coffs Harbour Local Environmental Plan (LEP) 2013. The site is zoned partly 2A Low Density Residential and Environmental Protection 7A Habitat and Catchment under Coffs Harbour LEP 2000.

A portion of the site in the east is excluded from the development footprint and proposed as conservation land. This includes vegetation directly adjacent to Moonee Creek.

3.1.2 Climate

The site has a subtropical, maritime climate. Based on data from the Coffs Harbour MO weather station, the site has a mean annual rainfall of 1,481 mm, mean daily maximum temperature of 24.3 degrees Celsius and mean daily minimum temperature of 11.9 degrees Celsius (BOM 2017).

3.1.3 Hydrology

Moonee Creek and an associated small tributary borders the eastern boundary of the site. The site itself does not include any drainage lines however, the site generally drains from west to east

LEGEND

- Study area
- Development site
- Conservation area
- Contour
- Cadastre

Paper Size A4

0 30 60 120

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Moonee Parklands Trust
Moonee Parklands Development
BioBanking Assessment

Job Number 22-18610
Revision B
Date 28 Feb 2017

Study area

Figure 1

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au

G:\22\18610\GIS\Maps\Deliverables\BiobankingAssessment\2218610_BA001_StudyArea_B.mxd

Data source: LPI: DCDB/DTDB, 2012/2015 Created by: kpsroba

3.2 Vegetation and habitat resources

3.2.1 Overview

Field surveys confirmed the presence of four NSW vegetation types within the site. Of these, two are located within the development footprint and two are located within the proposed conservation lands in the east of the site.

All of these vegetation types are in moderate/good condition (according to the BBAM), with one (NR161) occurring in moderate/good - medium condition and moderate/good – poor condition. The list of vegetation types in the development area includes:

- NR117: Blackbutt - Pink Bloodwood shrubby open forest dry grassy open forest of the central parts North Coast
- NR161: Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the North Coast

The list of vegetation types in the proposed conservation area includes:

- NR220: Pink Bloodwood open forest of the coastal lowlands
- NR217: Paperbark swamp forest

The vegetation zones are shown on Figure 2 and summarised in Table 3-1.

The credit calculator indicates one vegetation type, Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the North Coast (NR161), is listed as part of the endangered ecological community (EEC) Sub-tropical Coastal Floodplain Forest of the NSW North Coast bioregion under the TSC Act.

The distribution of vegetation zones in the site is closely tied to elevation, soil type, fire regime, underlying geology and geomorphic position. The site has also been previously cleared in parts and this disturbance has influenced the condition of vegetation communities within the site. Areas of higher elevation in the west contain Blackbutt - Pink Bloodwood shrubby open forest dry grassy open forest of the central parts North Coast (NR117). To the east, in areas of lower elevation, lies Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the North Coast (NR161).

The majority of vegetation within the western portion of the site is in good condition with few weeds however, scattered individuals including Lantana (*Lantana camara*) were identified as described by PEA (2013). Vegetation within the central and eastern portions of the site includes significant areas of largely cleared lands and includes introduced pastures.

Table 3-1 Vegetation zones within the development area

Vegetation type (OEH, 2016d)	Veg Type ID	Condition	Area (ha)	Conservation significance
Blackbutt - Pink Bloodwood shrubby open forest dry grassy open forest of the central parts North Coast	(NR117)	Moderate/good – high	6.23	Not listed as an EEC
Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the North Coast	(NR161)	Moderate/good – medium	1.48	Listed as part of the EEC Sub-tropical Coastal Floodplain Forest of the NSW North Coast bioregion

Vegetation type (OEH, 2016d)	Veg Type ID	Condition	Area (ha)	Conservation significance
Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the North Coast	(NR161)	Moderate/good – poor	3.60	Listed as part of the EEC Sub-tropical Coastal Floodplain Forest of the NSW North Coast bioregion
		Total area	**11.31**	

LEGEND

- Plot/transect
- Study area
- Development site
- Conservation area
- Cadastre
- Blackbutt - Pink Bloodwood shrubby open forest (NR117, Moderate/good - medium)
- Pink Bloodwood open forest of the coastal lowlands (NR220, Moderate/good)
- Forest Red Gum - Swamp Box forest (NR161, Moderate/good - medium)
- Forest Red Gum - Swamp Box forest (NR161, Moderate/good-poor)
- Paperbark swamp forest (NR217, Moderate/good)

Paper Size A4

0 30 60 90 120

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Vegetation Zones

Figure 2

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G:\22\18610\GIS\Maps\Deliverables\BiobankingAssessment\2218610_BA002_VegetationZones_C.mxd

Data source: LPI: DCDB/DTDB/Aerial, 2012/2015 Created by: kpsroba, fmackay

3.3 Conservation significance

3.3.1 Threatened flora species

No threatened flora species were identified during the biobank plot transect surveys completed by GHD. Threatened flora surveys were previously completed by PEA Consulting, the results of which are shown in the 2013 assessment.

3.3.2 Threatened fauna species

There is the potential for a number of threatened fauna species to occur within the site, given the presence of suitable habitat and previous records within the locality. GHD to date have not included targeted surveys for threatened fauna as part of this assessment.

The PEA (2013) assessment included targeted surveys for threatened fauna, the results of which are detailed in this report.

3.3.3 Threatened ecological communities

The credit calculator indicates one vegetation type, Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the North Coast (NR161), is listed as part of the EEC Sub-tropical Coastal Floodplain Forest of the NSW North Coast bioregion under the TSC Act.

4. BioBanking credit calculations

4.1 Approach

The BioBanking credit calculations were performed by Dan Williams (accredited assessor) using credit calculator Version 4.1. The credit calculations have been submitted to OEH for review and the biodiversity credit report is included as Appendix A.

The data and assumptions used to perform the BioBanking credit calculations are summarised below.

4.2 Project location

The site is located in the 'Northern Rivers CMA region; the 'Coffs Harbour and Escarpment' sub-region; and 'Manning – Macleay Coastal Alluvial Plain' is the most appropriate Mitchell Landscape for the assessment (DECC, 2008a; 2008b).

4.3 Project landscape value

4.3.1 Landscape assessment

The landscape assessment for the biobank is shown on Figure 3 and summarised in

Table 4-1. The approach to the landscape assessment is described below.

The BBAM uses 100 hectare and 1,000 hectare assessment circles to estimate the extent and connectivity of native vegetation and habitat surrounding the site. Vegetation cover and connectivity was estimated based on the current situation and after the management of the site using GIS measurement of foliage projective cover within the assessment circles. The assessment circles were placed so as to capture the greatest change in vegetation cover as a result of the management of the Project. The percentage change in native vegetation cover was estimated by adding the area of cleared land and exotic vegetation within the Project site (i.e. the area that would regenerate into native vegetation cover) to the total area of native vegetation within the assessment circles. There is approximately 49 hectares of vegetation within the 100 hectare circle and 687 hectares of vegetation within the 1000 hectare circle. This would be reduced by approximately 7.76 hectares after the establishment of the Project (see Table 5-1).

According to the criteria for assessing patch size in Appendix 4 of the BBAM 2014, the Project falls within 'extra large' patch size class (greater than 200 hectares).

The BBAM 2014 also requires an assessment of whether the Project is within or partly within a 'strategic location' such as the riparian corridor of a third order or higher stream or a recognised biodiversity corridor. A strategic location as defined by the BBAM 2014 includes:

a. An area of land identified by the assessor as being part of a state significant biodiversity link and in a plan approved by the Chief Executive OEH, or

b. An area of land identified by the assessor as being part of a regionally significant biodiversity link and in a plan approved by the Chief Executive OEH, or

c. The riparian buffer area of a 3rd order stream or higher, an important wetland or an estuarine area.

The site is not located within a strategic location as defined by the BBAM.

Table 4-1 Landscape assessment values summary

Landscape Attribute	Before Project	After Project
% Native vegetation cover in 1000 ha assessment circle	56-60% (687 ha)	56-60% (679 ha)
% Native vegetation cover in 100 ha assessment circle	81-85% (49 ha)	81-85% (41.2 ha)
Strategic location	N/A	N/A
Patch size score	Extra large (>200 ha)	Extra large (>200 ha)

LEGEND

- Study area
- Cadastre
- 100 ha landscape assessment circle
- 1000 ha landscape assessment circle
- Native vegetation

Paper Size A4

0 200 400 600 800

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

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Landscape assessment circles

Figure 3

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G:\22\18610\GIS\Maps\Deliverables\BiobankingAssessment\2218610_BA003_LandscapeAssessment_B.mxd

Data source: LPI: DCDB/DTDB/Aerial, 2012/2015 Created by: kpsroba, fmackay, tmorton

4.4 Project site value

One vegetation zone was created for each native vegetation type and broad condition state at the site. The area of each zone was calculated using GIS. Vegetation zones within the development area are summarised below in Table 4-2.

Site value data was collected using the BioBanking plot/transect methodology and was entered for each plot/transect field in each vegetation zone.

Table 4-2 Vegetation zones

Zone ID	Vegetation type	Veg Type ID	Condition	Patch size	Area	Plot / transects required	Plot / transects completed
1	Blackbutt - Pink Bloodwood shrubby open forest	(NR117)	Moderate/good	201 ha	6.23	3	3
2	Forest Red Gum - Swamp Box forest	(NR161)	Moderate/good - medium	201 ha	1.48	1	2
3	Forest Red Gum - Swamp Box forest	(NR161)	Moderate/good - low	201 ha	3.60	2	2
				Total	**11.31**		

Note: The eastern section of the site has been excluded from the development area to be reserved as a conservation area, therefore it has not been included in the area calculations associated with vegetation and management zones.

4.5 Threatened species assessment

4.5.1 Predicted ecosystem species

The BioBanking credit calculator reports the suite of threatened fauna species that are predicted to be associated with ecosystem credits required for the Project. The suite of threatened species associated with ecosystem credits for the Project is shown in Table 4-3.

Table 4-3 Predicted threatened species (ecosystem species)

Common name	Scientific name	Ts offset multiplier	On site
Barking Owl	*Ninox connivens*	3.0	Yes
Barred Cuckoo-shrike	*Coracina lineata*	1.5	Yes
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus subsp. victoriae*	2.0	Yes
Bush Stone-curlew	*Burhinus grallarius*	2.6	Yes
Diamond Firetail	*Stagonopleura guttata*	1.3	Yes
Eastern Freetail-bat	*Mormopterus norfolkensis*	2.2	Yes
Flame Robin	*Petroica phoenicea*	1.3	Yes
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	1.8	Yes
Golden-tipped Bat	*Kerivoula papuensis*	1.3	Yes
Greater Broad-nosed Bat	*Scoteanax rueppellii*	2.2	Yes
Grey-crowned Babbler (eastern subspecies)	*Pomatostomus temporalis subsp. temporalis*	1.3	Yes
Hoary Wattled Bat	*Chalinolobus nigrogriseus*	2.1	Yes
Little Eagle	*Hieraaetus morphnoides*	1.4	Yes
Little Lorikeet	*Glossopsitta pusilla*	1.8	Yes
Long-nosed Potoroo	*Potorous tridactylus*	1.3	Yes
Masked Owl	*Tyto novaehollandiae*	3.0	Yes
New Holland Mouse	*Pseudomys novaehollandiae*	2.6	Yes
Powerful Owl	*Ninox strenua*	3.0	Yes
Red-legged Pademelon	*Thylogale stigmatica*	2.6	Yes
Scarlet Robin	*Petroica boodang*	1.3	Yes
Sooty Owl	*Tyto tenebricosa*	3.0	Yes
Spotted-tailed Quoll	*Dasyurus maculatus*	2.6	Yes
Square-tailed Kite	*Lophoictinia isura*	1.4	Yes
Swift Parrot	*Lathamus discolor*	1.3	Yes
Varied Sittella	*Daphoenositta chrysoptera*	1.3	Yes
Wompoo Fruit-dove	*Ptilinopus magnificus*	1.3	Yes
Yellow-bellied Glider	*Petaurus australis*	2.3	Yes
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	2.2	Yes

Notes:

- The TS offset multiplier is an index of the likely response of a threatened species to improvement in habitat condition at a biobank site.
- The site contains habitat resources for the threatened species and the species may occur at the site from time to time or in the future.

4.5.2 Species credits

Overview

The BBAM references geographic, vegetation and habitat data for the Project site to generate a list of the species credit-type threatened species predicted to occur at the site and requiring targeted survey.

No targeted, seasonal surveys for threatened species were conducted. Species credits may be generated at the site at a later date after completion of further targeted surveys. The appropriate time for targeted surveys for each threatened species is listed below. It has been agreed with OEH that surveys completed by PEA (2013) were adequate regarding targeted surveys for species credit matters. GHD used the results of the PEA (2013) to complete the species credit calculations for the Project.

Table 4-4 Species credit species

Common name	Scientific name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Brush-tailed Phascogale	*Phascogale tapoatafa*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Common Planigale	*Planigale maculata*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dwarf Heath Casuarina	*Allocasuarina defungens*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Eastern Chestnut Mouse	*Pseudomys gracilicaudatus*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Eastern Pygmy-possum	*Cercartetus nanus*												
Emu population, NSW North Coast Bioregion and Port Stephens Local Government Area	*Dromaius novaehollandiae* - endangered population	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Giant Barred Frog	*Mixophyes iteratus*	Yes	Yes	Yes	Yes						Yes	Yes	Yes
Green-thighed Frog	*Litoria brevipalmata*	Yes	Yes	Yes							Yes	Yes	Yes
Koala	*Phascolarctos cinereus*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lady Tankervilles Swamp Orchid	*Phaius tancarvilleae*									Yes	Yes		
Milky Silkpod	*Parsonsia dorrigoensis*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Moonee Quassia	*Quassia* sp. Mooney Creek	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Native Milkwort	*Polygala linariifolia*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Needle-leaf Fern	*Belvisia mucronata*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Newry Golden Wattle	*Acacia chrysotricha*								Yes	Yes	Yes	Yes	
Pale-vented Bush-hen	*Amaurornis moluccana*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Parma Wallaby	*Macropus parma*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rainforest Cassia	*Senna acclinis*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Red Boppel Nut	*Hicksbeachia pinnatifolia*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Red Goshawk	*Erythrotriorchis radiatus*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Common name	Scientific name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Regent Honeyeater	*Anthochaera phrygia*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rufous Bettong	*Aepyprymnus rufescens*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rusty Plum, Plum Boxwood	*Niemeyera whitei*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Scant Pomaderris	*Pomaderris queenslandica*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Slender Marsdenia	*Marsdenia longiloba*	Yes	Yes										Yes
Slender Screw Fern	*Lindsaea incisa*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Southern Swamp Orchid	*Phaius australis*									Yes	Yes		
Spider orchid	*Dendrobium melaleucaphilum*							Yes	Yes	Yes	Yes		
Squirrel Glider	*Petaurus norfolcensis*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Stephens' Banded Snake	*Hoplocephalus stephensii*												
Trailing Woodruff	*Asperula asthenes*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
White-crowned Snake	*Cacophis harriettae*	Yes	Yes	Yes						Yes	Yes	Yes	Yes
White-eared Monarch	*Carterornis leucotis*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yellow-flowered King of the Fairies	*Oberonia complanata*	Yes	Yes							Yes	Yes	Yes	Yes

5. Biodiversity credits

This Section of the report summarises the results of credit calculations completed for the Project.

The data from the field survey, GIS mapping and BioBanking assessment were entered into the credit calculator Version 4.1 to determine the number and type of biodiversity credits that would be required for the Project. The BioBanking Credit Report is included in Appendix A and summarised below.

5.1 Ecosystem credits

A total of 462 ecosystem credits would be required for the Project. A summary of the number and type of ecosystem credits required as outlined in the credit profile is provided in Table 5-1.

Table 5-1 Ecosystem credits required for the development area

Veg Code	Vegetation Type	Area	Ecosystem credits required
(NR117)	Blackbutt - Pink Bloodwood shrubby open forest	6.23	291
(NR161)	Forest Red Gum - Swamp Box forest	5.08	170
		11.31	**461**

5.2 Species credits

Species credits are required for one fauna species, the Squirrel glider, as this species was detected during the PEA (2013) Assessment The number of credits required to offset the project is provided in Table 5-2.

Table 5-2 Species credits required for the Project

Species	Species credits required
Squirrel Glider (*Petaurus norfolcensis*)	170
	170

The credits listed in Table 5-1 and Table 5-2 would need to be secured and retired before a Construction Certificate is issued for the Project.

6. Biodiversity offsets approach

The BOS outlines the credit requirements for the Project as well as the obligations associated with securing the credits. This BOS has been developed giving consideration to the Major Projects Policy and the FBA.Requirement to offset

This BOS documents the process for identifying and evaluating offset options that will be required for the Project. It sets out the pathways forward and trading rules associated with securing the biodiversity credits. These credits would need to be secured and retired before a Construction Certificate can be issued for the Project. The credit requirement for the project is summarised below.

Table 6-1 Offset requirements for the Project

Plant Community Type (PCT)	Veg Type Code	Number of credits required
Ecosystem credits		
Blackbutt - Pink Bloodwood shrubby open forest	(NR117)	291
Forest Red Gum - Swamp Box forest	(NR161)	170
Species credits		
Squirrel Glider (Petaurus norfolcensis)		170

6.1 Offset options

Under the Major Projects policy for SSD projects, ecosystem and species credit requirements identified for the Project can be offset in a number of ways, including:

- Purchasing and retiring credits from existing biobank sites.
- Purchasing a suitable site and establishing it as a biobank site. Suitable credits would then be generated at the site and retired according to the number and type of credits required by the project.
- Supplementary measures (the use of supplementary measures is not proposed as part of the offsets for the Project).

6.1.1 Securing credits

Section 10.5 of the FBA sets out the detailed trading rules associated with securing suitable credits to offset a project's impacts. This rule set will apply whether the project seeks to purchase credits from an existing biobank site and/or purchases land and establishes it as a biobank site. A summary of the rule set is outlined below:

Ecosystem credits

- The vegetation type must match the vegetation type being impacted or be included in the list of vegetation types included as offset options as detailed in the credit report (Appendix A).
- The ecosystem credits must be located within the Coffs Coast and Escarpment IBRA subregion and/or any adjoining IBRA subregions.

Species credits

- The species credit must be a direct match for the species being impacted
- The species credits can be sourced from any biobank site in NSW that has matching species credits

6.1.2 Variations to the trading rules

Where possible, the Project will aim to match ecosystem and species credits on a 'like for like' basis according to the trading rules listed above through the retirement of biodiversity credits and in accordance with the credit profiles provided in the Project credit report (refer to Appendix A). Where this is not possible, the credit trading rules associated with major projects can be used to source suitable credits as outlined in Section 10.5.4.2 and 10.5.7.2 of the FBA. Any variations to the trading rules requires approval from the consent authority.

Before the consent authority can approve a variation to the trading rules the Project is required to show that all reasonable steps have been taken to source matching credits. The following information summarises the list of reasonable steps.

- Check the BioBanking public register and place an expression of interest for credits wanted on it for at least six months
- Liaise with an OEH office and relevant local councils to obtain a list of potential sites that meet the requirements for offsetting
- Consider properties for sale in the required area
- Provide evidence of why offset sites are not feasible; suitable evidence may include: the unwillingness of a landowner to sell or establish a biobank site

If insufficient credits are found after completing all 'reasonable steps', the Project may be able to apply to the consent authority to use the following variation rules in accordance with the FBA:

a. *A variation of the offset rules for matching ecosystem credits by allowing ecosystem credits created for a PCT for the same vegetation formation as the PCT to which the required ecosystem credit relates to be proposed as an offset, or*

b. *A variation of the offset rules for matching specie credits by allowing a different species to that impacted by the proposed development to be used to meet the offset requirement*

6.2 Summary of the BioBanking covenant and management actions

6.2.1 Approach

Entering into a BioBanking agreement places a conservation covenant over the land, regardless of zoning. This covenant is the strongest conservation covenant available on private lands and extinguishes all land uses other than conservation. The following describes the actions that would be required for ongoing management of an offset site. A Management Actions Plan (MAP) (prepared in accordance with the BioBanking Methodology), detailing rehabilitation activities and an associated management program, would be prepared and included in the final BioBanking agreement. The MAP forms the basis of the funds required to be placed in the BioBanking Trust when purchasing the credits. The BioBanking Trust then funds the biobank site owner to implement the MAP.

Biobank sites may have two types of management actions applied:

- Standard Management Actions

- Site Specific Management Actions

Standard management actions are those actions required on an offset site to improve vegetation condition when entering into a BioBanking agreement. The standard management actions for all BioBanking properties are:

- Management of grazing for conservation
- Weed control
- Management of fire for conservation
- Management of human disturbance
- Retention of regrowth and remnant native vegetation
- Replanting or supplementary planting where natural regeneration would not be sufficient (note: it is anticipated that natural regeneration would be sufficient for the proposed biobank sites and hence supplementary plantings are not required)
- Retention of dead timber
- Erosion control
- Retention of rocks

Based on the habitat resources within the site and the suite of threatened species which are predicted to occur, the credit calculator nominates management actions that would be required to alleviate site-specific threats. Undertaking these actions is over and above the minimal requirements for a biobank site. Additional management actions that are likely to be required at the preferred biobank sites are summarised below:

- Feral animal control (pigs, horses)
- Exclude miscellaneous feral species
- Control of feral and/or overabundant native herbivores (e.g. rabbit, goats, deer etc.)
- Maintain or reintroduce flow regimes (aquatic flora)

The MAP will identify site specific vegetation rehabilitation and management actions appropriate for the proposed offset site which would be completed during the preparation of the BioBanking agreement.

6.2.2 Monitoring of the offset site

The purchase of credits includes two components:

- Part A being the cost of rehabilitation and management
- Part B being the 'profit' to the relevant landowner

The Part A funds are the equivalent of all costs associated with the rehabilitation, management and monitoring of the biobank site/s in perpetuity.

The BioBanking methodology includes preparation of a MAP for each biobank site. The methodology also includes a credit pricing tool which places a commercial value for completing each of the actions listed in the MAP. These funds are held by the BioBanking Trust and managed by OEH. The funds are provided to the land owner on an annual basis for the amount equivalent to works required in that year. The biobank owner is then required to submit standard reports, outlining the works completed, their success and monitoring results. OEH then review the reports and, if works have been completed satisfactorily, provide the next payment for the following years work. The OEH also include site visits as part of their auditing process.

7. Conclusion

The proposed Moonee Parklands residential development is a SSD project requiring approval from the DPE as the consent authority. The DPE has been in consultation with OEH and it has been determined that the project is required to provide biodiversity offsets to mitigate residual impacts to biodiversity associated with the project. Consultation between the DPE and OEH indicated the NSW Biodiversity Offsets for Major Projects and the FBA was the preferred approach to assessing the projects biodiversity impacts and determining suitable offsets. These policies require the applicant to quantify a projects biodiversity impacts using the BBAM to determine the biodiversity credits required to offset the project. The number and type of credits required include:

- 291 ecosystem credits of Blackbutt - Pink Bloodwood shrubby open forest (NR117)
- 170 ecosystem credits of Forest Red Gum - Swamp Box forest (NR161)
- 170 species credits for the Squirrel Glider (*Petaurus norfolcensis*)

These credits would need to be secured and retired in accordance with the approach described in section 6.2 of this report before a Construction Certificate can be issued for the project.

8. References

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9. Disclaimer

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Appendices

Appendix A – Credit report

Biodiversity credit report

This report identifies the number and type of biodiversity credits required for a major project.

Date of report: 27/02/2017 Time: 2:50:55PM Calculator version: v4.0

Major Project details

Proposal ID:	082/2016/3989MP
Proposal name:	Moonee Parklands
Proposal address:	Pacific Highway Moonee Beach NSW 2450
Proponent name:	Moonee Parklands Trust
Proponent address:	PO Box 479 Coffs Harbour NSW 2450
Proponent phone:	02 6652 1202
Assessor name:	Daniel Williams
Assessor address:	Level 1, 62 Clarence Street Port Macquarie NSW 2444
Assessor phone:	6586 8714
Assessor accreditation:	082

Summary of ecosystem credits required

Plant Community type	Area (ha)	Credits created
Blackbutt - Pink Bloodwood shrubby open forest of the coastal lowlands of the NSW North Coast Bioregion	6.23	291.00
Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion	5.08	170.22
Total	11.31	461

Credit profiles

1. Blackbutt - Pink Bloodwood shrubby open forest of the coastal lowlands of the NSW North Coast Bioregion, (NR117)

Number of ecosystem credits created	291
IBRA sub-region	Coffs Coast & Escarpment

Offset options - Plant Community types	Offset options - IBRA sub-regions
Blackbutt - Pink Bloodwood shrubby open forest of the coastal lowlands of the NSW North Coast Bioregion, (NR117) Flooded Gum - Brush Box moist forest of the coastal ranges of the North Coast, (NR159) Flooded Gum - Tallowwood - Brush Box moist open forest of the coastal ranges of the North Coast, (NR160) Pink Bloodwood - Tallowwood moist open forest of the far northern ranges of the NSW North Coast Bioregion, (NR219) Spotted Gum - Brush Box moist forest of ranges of the southern Clarence Valley of the NSW North Coast Bioregion, (NR243) Spotted Gum - Grey Ironbark shrubby open forest of the Richmond Range of the NSW North Coast, (NR248) Sydney Blue Gum open forest on coastal foothills and escarpment of the North Coast, (NR258) Tallowwood - Brush Box moist open forest of the coastal ranges of the central NSW North Coast, (NR260) Tallowwood - Narrow-leaved White Mahogany - Spotted Gum moist open forest in the Washpool area of the NSW North Coast, (NR261) Turpentine moist open forest of the coastal hills and ranges of the NSW North Coast Bioregion, (NR274)	Coffs Coast & Escarpment and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

2. Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion, (NR161)

Number of ecosystem credits created	170
IBRA sub-region	Coffs Coast & Escarpment

Offset options - Plant Community types	Offset options - IBRA sub-regions
Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion, (NR161) Cabbage Gum - Broad-leaved Apple open forest of the eastern escarpment, NSW North Coast Bioregion and South Eastern Queensland Bioregion, (NR145) Cabbage Gum open forest or woodland on flats of the North Coast, (NR286)	Coffs Coast & Escarpment and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

Summary of species credits required

Common name	Scientific name	Extent of impact Ha or individuals	Number of species credits created
Squirrel Glider	Petaurus norfolcensis	7.71	170

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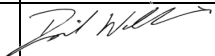
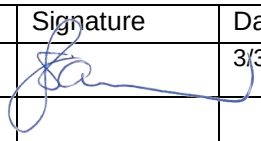
Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	J. Sharp	D. Williams		S. Lawer		3/3/2017

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