Great Lakes Council

Phase 1 Studies - Lots 110 and 112, DP1091944

Investigation of Flora and Fauna

April 2013

Table of contents

Table index

Figure index

Appendices

1. Introduction

1.1 Background

Great Lakes Council (Council) have engaged GHD to undertake an investigation of flora and fauna as a specialist input to the Planning Proposal for Lots 110 and 112, DP109144 at Pacific Palms, NSW (the 'subject land'). The subject land is shown on Figure 1.

The 338 hectare subject land is currently under consideration for rezoning for a variety of uses, including residential, commercial and conservation land uses. A preliminary plan of possible development and conservation areas within the subject land is presented as Figure 2. The site is subject to development constraints that require further investigation to inform the suitability and viability of undertaking a rezoning application.

The overall Planning Proposal will require a variety of investigations. Council have engaged GHD to provide a specialist ecological assessment as the 'Phase 1 Vegetation Community mapping and First Phase Viability Analysis' (Phase 1) that is presented in this report. Vegetation community mapping can be used as a surrogate for biodiversity generally to inform development/ conservation planning through consideration of ecological constraints and opportunities.

The aims of Phase 1 are to:

- Describe and map vegetation with the subject land
- Conduct an ecological constraints assessment, based on the conservation significance of the vegetation present.

The Phase 1 field surveys and ecological assessments addresses the entire subject land with the greatest focus on the potential developable lands identified as areas A, B and C in Figure 2 . Proposed conservation lands (areas F1 and F2) were also assessed to account for potential secondary impacts outside of development areas and also to determine their potential suitability as biodiversity offsets.

1.2 Purpose of this report

The purpose of this Phase 1 assessment is to describe the conservation value of the subject land, with particular emphasis on threatened ecological communities, populations and species listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and *Fisheries Management Act 1994* (FM Act), and *Matters of National Environmental Significance* (MNES) listed under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The specific objectives of this Phase 1 flora and fauna investigation are to:

- Describe and map vegetation types and condition classes across the subject land and compile a flora species inventory
- Identify areas of vegetation, species or habitat of conservation significance within the framework of the BioBanking Assessment Methodology (BBAM)
- Identify areas of disturbed or cleared land with development potential or value for rehabilitation to restore habitat linkages
- Map ecological constraints to potential development
- Provide a preliminary assessment of the suitability of conservation areas as biodiversity offsets for future development.

Field surveys and assessments were undertaken with reference to the BioBanking Assessment Methodology (BBAM). GHD's technical lead on this project, Ben Harrington, is an accredited BioBanking assessor under Part 7A of the TSC Act.

LEGEND

Subject Land

Lot

1:10,000 (at A3)

0 50 100 200 300 400

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56

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Great Lakes Council

Phase 1 Studies - Lots 110 and 112, DP1091944,
The Lakes Way, Pacific Palms
Investigation of Flora and Fauna

Subject land

Job Number 22-16518
Revision A
Date 21 Dec 2012

Figure 1

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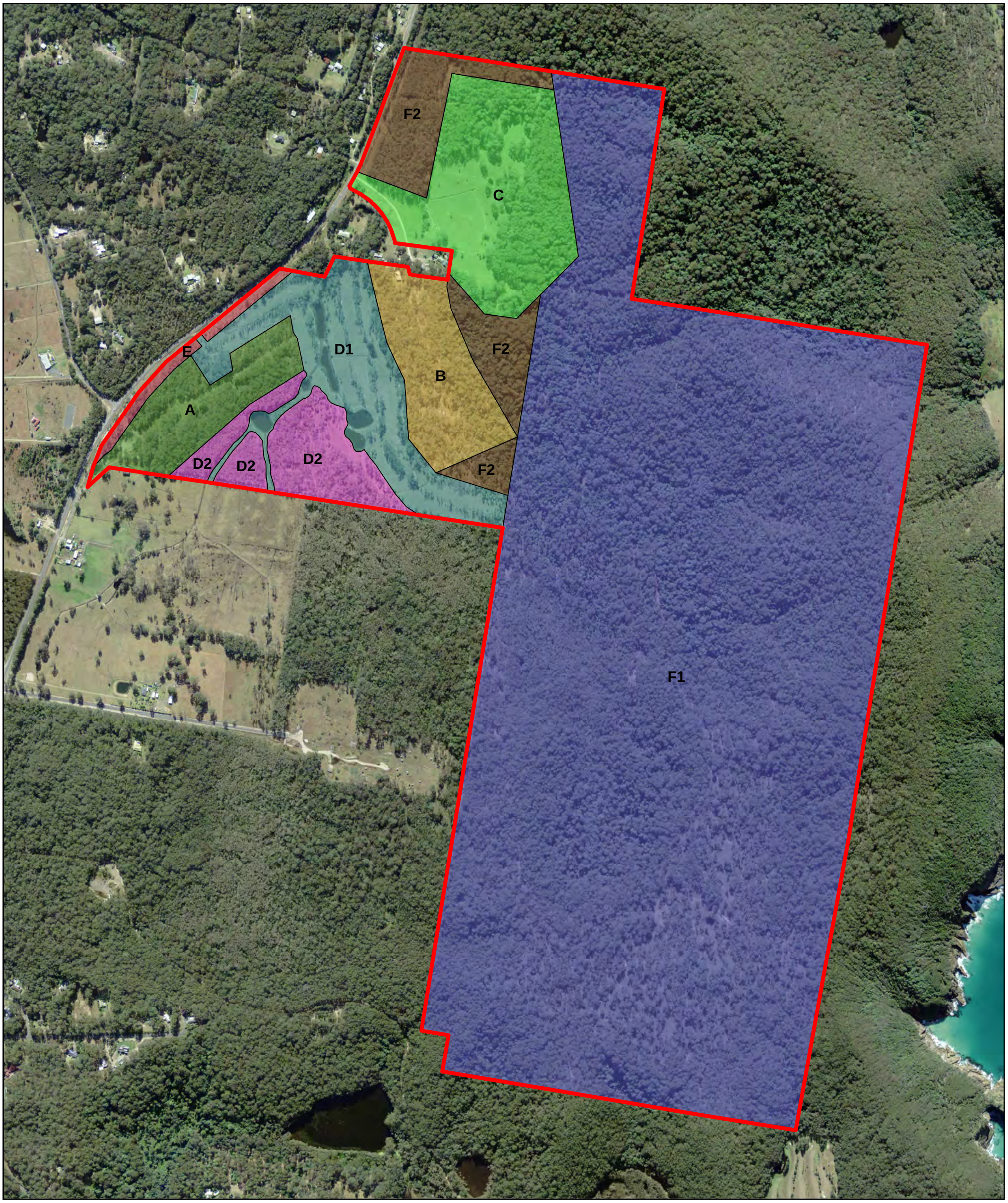
Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data Source: NSW Department of Lands: Cadastre - Jan 2012; Geoscience Australia: 250k Data - Jan 2012. Created by: qjchung



LEGEND

- Subject Land
- A, Possible Development Footprint
- B, Possible Development Footprint
- C, Possible Development Footprint
- D1, Approved Golf Course including access carparks and ponds
- D2, Recreation Development / Conservation Investigation
- E, The Lakes Way Buffer Zone
- F1, Possible Conservation Dedication
- F2, Possible Conservation (Private or Public Conservation)

1:10,000 (at A3)

0 50 100 200 300 400

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56

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Phase 1 Studies - Lots 110 and 112, DP1091944,
The Lakes Way, Pacific Palms
Investigation of Flora and Fauna

Plan of Possible Development and Conservation Areas

Figure 2

Job Number	22-16518
Revision	A
Date	21 Dec 2012

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Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data Source: NSW Department of Lands: Cadastre - Jan 2012; Geoscience Australia: 250k Data - Jan 2012. Created by: qjchung

1.3 Scope and limitations

The scope of works for this ecological assessment comprises:

- Desktop assessment, including:
  - Review of existing vegetation and environmental assessment data for the local area and region
  - Identification of threatened species, populations, ecological communities (threatened biota) and their habitats that may occur in the subject land
- Field surveys, including:
  - Validation of the type, condition and conservation significance of native vegetation using the BBAM
  - Targeted surveys for threatened species and associated habitat resources
  - Habitat assessment
  - Identification of pest plants/weed species and their distribution in the subject land
- Description of the existing environment, including:
  - Assessment of the diversity of the flora and fauna within the subject land and the type and quality of habitat resources
  - Assessment of the degree of disturbance associated with past and present land uses
  - Assessment of landscape context and habitat connectivity
  - Identification of the suite of threatened biota potentially affected by future development and the value of habitats in the subject land for these threatened biota
  - Identification of core conservation areas, including 'red flag' areas within the BBAM and key vegetated habitat corridors and linkages.
- An ecological constraints and opportunities assessment, including mapping of ecological constraint classes based on conservation significance of vegetation and habitats
- Identification of measures to avoid or mitigate impacts on ecological values and to manage conservation areas

A preliminary assessment of the suitability of conservation areas as biodiversity offsets for future development.Limitations to this ecological assessment include:

- The field survey effort and calculations presented in this report were based on a preliminary application of the BBAM since the proposed development layout of the subject land is yet to be determined. Additional plot/transects and other survey effort are likely to be required to complete a BBAM assessment of a final development layout for the subject land
- The flora and fauna survey effort, including targeted searches for threatened species, employed in this assessment was designed to determine the conservation significance of the subject land and compile a list of those threatened plants which are likely to occur as specified by the brief.. Supplementary surveys, including additional targeted searches for threatened species would be required to assess impacts within specific development footprints as part of later stages of the development of the subject land
- The GHD Proposal included the preparation of a draft plan for the subject land, including mapping potential development areas and proposed conservation areas.The Scope of Works has been amended as specified in Mathew Bell's email of 22 February 2013 to

exclude the preparation of a Preliminary Development/ Conservation Footprint. Council would formulate a revised Development/ Conservation Footprint on the basis of this ecological assessment and the results of the Flood/ Water Management Study.

1.4 Disclaimer

This report: has been prepared by GHD for Great Lakes Council and *may only be used and relied on by Great Lakes Council for the purpose agreed between GHD and the Great Lakes Council.*

GHD otherwise disclaims responsibility to any person other than Great Lakes Council arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Great Lakes Council and others who provided information to GHD (including Government authorities)], which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

1.5 Terms and definitions

biodiversity credits means ecosystem credits or species credits that are generated for conservation measures or required for the land proposed for biodiversity certification for the purpose of this methodology.

CMA area means the area of operation of a Catchment Management Authority, as described in Schedule 2 to the *Catchment Management Authorities Act 2003*.

CMA subregion means the subregions of CMA areas as set out in the Environmental Outcomes Assessment Methodology, established under the *Native Vegetation Regulation 2005*.

connectivity means a measure of the degree to which an area(s) of native vegetation is linked with other areas of native vegetation.

Director General means the Director General of the Office of Environment and Heritage (OEH)

EP&A Act means the NSW *Environmental Planning and Assessment Act 1979* (NSW).

EPBC Act means the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

expert report means a report prepared by an expert in relation to biodiversity values or a threatened species.

FM Act means the NSW *Fisheries Management Act 19***93**

MNES means matters of national environmental significance as listed under the EPBC Act

native vegetation has the same meaning as in section 6 of the *NV Act*. Native vegetation is used as a surrogate for general biodiversity values in the BBAM.

NPW Act means the NSW *National Parks & Wildlife Act 1974.*

NV Act means the NSW *Native Vegetation Act 2003*.

offset area means an area of land that is subject to a proposed conservation measure in an application for biodiversity certification to offset the impacts of the conferral of biodiversity certification on land.

offset rules means the circumstances in which ecosystem credits and species credits generated for conservation measures are allowed to offset the impacts of the conferral of biodiversity certification on land.

species credits means the class of credits for biodiversity certification that are generated for a conservation measure or are required for the land proposed for biodiversity certification. Species credits are used for offsetting the impacts of biodiversity certification on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates.

species polygon means the actual area of habitat, or number of individuals of a threatened species, impacted by conferring biodiversity certification or used as a conservation measure.

threatened ecological community (TEC) means threatened ecological communities as defined in section 4(1) of the TSC Act or threatened ecological communities listed under Part 13 of the EPBC Act.

threatened population means endangered population as defined in section 4(1) of the TSC Act.

threatened species means critically endangered, endangered or vulnerable threatened species and populations as defined in section 4(1) of the TSC Act or any additional threatened species listed under Part 13 of the EPBC Act as critically endangered, endangered or vulnerable.

TSC Act means the NSW *Threatened Species Conservation Act 1995*.

vegetation type means the finest level of classification of native vegetation used in the methodology. Vegetation types are assigned to vegetation classes, which in turn are assigned to vegetation formations. There are approximately 1600 vegetation types within NSW.

vegetation zone means a relatively homogenous area in a biodiversity certification assessment area consisting of a single vegetation type in the same broad condition state. A single zone must not contain a mix of vegetation in low condition and vegetation not in low condition. A zone may comprise one or more discontinuous areas.

2. Methods

2.1 Desktop assessment

A desktop assessment was undertaken to identify threatened flora and fauna species, populations and ecological communities listed under the TSC Act and FM Act, and MNES listed under the EPBC Act that may occur in the subject land. Database records pertaining to the subject land and locality (i.e. within a 10 km radius of the subject land) were reviewed and included:

- NSW Office of Environment and Heritage (OEH) Wildlife Atlas database for records of threatened species listed under the TSC Act (OEH 2012a; data supplied by OEH on 26 September 2012).
- OEH *NSW threatened species database* online search for threatened ecological communities listed under the TSC Act (OEH 2012b database queried on 8 November 2012).
- Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) Protected Matters Online Search Tool for MNES listed under the EPBC Act and predicted to occur in the locality (DSEWPaC 2012; database queried on 8 November 2012).

The desktop assessment and habitat assessments conducted during field surveys (see below) were used to determine the likelihood of each threatened ecological community and threatened plant species occurring within the subject land. The results of this assessment are presented in Appendix B.

2.2 Site surveys

Site surveys were undertaken with reference to the BioBanking Assessment Methodology (BBAM). GHD's technical lead, Ben Harrington, is accredited under the TSC Act to undertake and prepare surveys and assessments for applications for BioBanking agreements or statements under Part 7A of the Act.

Field survey effort and techniques used for this ecological assessment are summarised in Table 1 and described below. Survey techniques and effort were conducted with reference to the BBAM (DECC, 2009).

Table 1 Survey Effort

Survey round	Dates	Survey effort
Phase 1 (Flora) survey	13 to 16 November 2012	• 2 ecologists for 4 days • 23 x 20 m x 50 m BBAM plot/transects • Targeted searches for threatened plants, opportunistic fauna and plant observations throughout the subject land

2.2.1 Terrestrial flora survey

The flora survey involved the following techniques, which are described in detail below:

- Mapping of 'vegetation zones' based on vegetation type and broad condition classes

- Flora sampling using BBAM plot/transects, area searches and systematic traverses
- Targeted threatened flora surveys.

The locations of plot/transects sampled during the flora survey are displayed in Figure 4.

Vegetation mapping

Native vegetation within the subject land was mapped based on observed species composition and vegetation structure according to the classification of Specht (1970). Intact native vegetation communities were defined according to NSW vegetation types OEH (2012a) and broad condition classes. Exotic or planted native vegetation was defined based on structure and species composition. Fine-scale ground-truthing of previous vegetation mapping and validation of the location of threatened ecological communities and threatened species habitat was performed with reference to a Trimble hand-held GPS unit loaded with aerial photography, previous survey results and an editable vegetation mapping layer. Native vegetation types were then stratified into broad condition classes according to the BBAM to yield vegetation zones. Vegetation zones were mapped using aerial photographic interpretation within a geographical information system (GIS) as guided by the field survey results. Plant cover abundance data was collected in vegetation sampling plots and compared using PATN analysis. The PATN analysis produced a classification tree showing the level of similarity between survey plots. This PATN classification was compared with the preliminary vegetation zone polygons and the vegetation mapping adjusted accordingly.

Vegetation within the subject land was assessed against identification criteria for State and Commonwealth listed threatened ecological communities (critically endangered ecological communities (CEECs), endangered ecological communities (EECs) and vulnerable ecological communities (VECs)). Vegetation and habitats were compared with descriptions provided in DEC (2005) and DSEWPC (2012b) community profiles.

Flora sampling

Plot and transect surveys were conducted on site in accordance with the methodology provided in DECC (2009) to collect quantitative data for plant species richness, vegetation structure, weed infestation and habitat resources. A total of 23 plots were sampled within the subject land as shown in Figure 4.

Plant identifications were made according to nomenclature in RBGT (2012). All vascular plants (ie not mosses, lichens or fungi) observed were recorded on proforma field data sheets. Plant specimens that could not be identified rapidly in the field were collected and subsequently identified using standard botanical texts or PlantNet (RBGT, 2012).

Plant specimens which were difficult to identify (either insufficient sample collected or buds/fruiting bodies were not available at the time of the survey) were identified to genus level.

A flora species list was compiled for each vegetation zone and for the subject land noting the occurrence of noxious and environmental weeds, threatened species and regionally significant species.

Targeted threatened flora surveys

Targeted surveys were undertaken for threatened flora species which could potentially occur within the subject land given known distributions, previous records in the locality and habitat requirements for each species. Surveys were conducted on foot while ground-truthing vegetation mapping during the preliminary survey and then while travelling between plot/transects in the detailed survey. Not every area of potential threatened plant habitat within the subject land was systematically searched. Additional random meander transects focused in areas of potentially suitable habitat may be appropriate in later stages of the study.

2.2.2 Terrestrial fauna survey

A preliminary fauna survey was undertaken in conjunction with the flora surveys in order to target threatened fauna species, gain an appreciation of fauna species richness and assess habitat values. All observations were recorded on proforma field data sheets.

Fauna habitat assessment

General fauna habitat assessments were undertaken throughout the subject land, including active searches for potential shelter, basking, roosting, nesting and/or foraging sites. Specific habitat features and resources such as water bodies, food trees, the density of understorey vegetation, the composition of ground cover, the soil type, presence of hollow-bearing trees, leaf litter and ground debris were noted.

Indicative habitat criteria for targeted threatened species (ie those determined as having the potential to occur within the subject land following the desktop review) were identified prior to fieldwork. Habitat criteria were based on information provided in OEH and DSEWPC threatened species profiles, field guides, and the knowledge and experience of GHD field ecologists. Habitat assessments included active searches for the following:

- Habitat trees including hollow-bearing trees or those with nests or roosts.
- Rock outcrops or overhangs providing potential shelter sites for fauna.
- Burrows, dens and warrens.
- Distinctive scats or latrine sites (of particular relevance for the Spotted-tailed Quoll), owl white wash and regurgitated pellets under roost sites.
- Tracks or animal remains.
- Evidence of activity such as feeding scars, scratches and diggings.
- Specific food tree species and evidence of foraging.

The locations and quantitative descriptions of significant habitat features were captured with a handheld GPS unit and photographed where appropriate.

Opportunistic observations

Opportunistic and incidental observations of fauna species were recorded at all times during field surveys. Survey effort was concentrated on suitable areas of habitat throughout the course of the flora survey, for instance fallen timber was scanned and/or turned for reptiles and mature trees and dams were scanned for roosting birds.

2.3 Constraints Assessment

2.3.1 Approach

A constraints assessment was conducted in order to stratify the subject land into areas that are potentially suitable for development, areas that should be conserved and areas that are required for purposes such as APZs and riparian corrdors. The procedure for the constraints assessment was as follows:

- An ecological assessment was conducted through the desktop assessment and site surveys described above.
- Ecological constraints within the assessment area were defined as three classes based on conservation significance and sensitivity to impacts arising from development:
  - Low ecological constraint such as highly modified or cleared areas that would be suitable for development.
  - Medium ecological constraint such as areas of modified or regrowth, non-TEC native vegetation that have potential to realise environmental gains through active management for conservation or that may be suitable for development as part of an overall strategic balance within the subject land.
  - High ecological constraint such as high quality native vegetation and habitat resources including TECs that should be conserved.

2.4 Staff Qualifications

This report, including all BBAM credit calculations, was prepared by Ben Harrington. The assessment was peer reviewed by Jayne Tipping. Staff qualifications are presented in Table 2.

Table 2 GHD Ecology personnel and qualifications

Name	Position / Project role	Qualifications	Relevant experience
Ben Harrington	Senior Ecologist / desktop assessment, site surveys, credit calculations and reporting	BSc, MSc (Physical Geography) BBAM Assessor Accreditation*	8+ years
Elise Budden	Graduate Ecologist / site surveys, desktop assessments	BSc (Ecology)	1+ years
Jayne Tipping	Principal Ecologist/ technical review	BSc (Ecology), MEnvLaw	17+ years
* Refer to OEH (2012c) list of accredited assessors.			

2.5 Survey Limitations

Given the duration and timing of the field surveys (four days, in late spring in one year) it is likely that some species that occur in the subject land (permanently, seasonally or transiently) were

not detected during the survey. These species are likely to include: flora species that flower at other times of year as well as annual, ephemeral or cryptic species.

The desktop assessment provided a list of the native flora and fauna and especially threatened biota that could potentially occur in the subject land or be affected by the proposal (including seasonal, transient or cryptic species). The habitat assessment conducted for the site allows for identification of habitat resources for such species and an assessment of their likelihood of occurrence on the subject land on this basis. As such, the survey was not designed to detect all species, rather to provide an overall assessment of the ecological values in the subject land in order to inform the constraints assessment.

3. Existing Environment

3.1 Subject land

The subject land comprises Lots 110 and 112, DP109144 at Pacific Palms, between The Lakes Way and the Tasman Sea as shown on Figure 1. The 338 hectare subject land is dominated by native vegetation with some clearing and vegetation modification for agricultural activities in the westernmost portion. The cleared and partially cleared portions of the subject land are grazed by cattle.The south western portion of the subject land is subject to an existing conditional development consent (DA5057 of 1991) for a golf course and associated facilities. Stage 1 of the golf course, comprising nine-holes, seven ponds, an access road, 50-space car-park and a temporary club-house, has been approved and the consent has commenced. Subsequent stages of the golf course would require additional consent(s). The approximate area of the approved Stage 1 golf course development is shown on Figure 2. The Stage 1 golf course development area has been partially cleared for fairways and drainage works though construction of the facilities has not yet commenced.

The site is drained through two distinct sub-catchments separated by a ridge that runs north-west / south-east through the development investigation area (BMT WBM, 2013). A number of natural steep gullies drain runoff from the north and eastern parts of the subject land onto flatter, partially cleared land, in the west which in turn drain to a box culvert under The Lakes Way prior to discharging into Wallis Creek which flows into Wallis Lake (BMT WBM, 2013). The south eastern portion of the subject land drains via three small, unnamed drainage lines to the south which in turn drain into Smiths Lake.

The subject land is bordered by: native vegetation on Crown Land in the coastal reserve to the east; native vegetation with some limited clearing for recreational activities to the south; cleared agricultural land to the southeast; and partially vegetated low density residential land to the west and north.

The subject land forms part of a north-south vegetated corridor adjoining the coastal strip of the Tasman Sea and provides habitat linkages between Wallis Lake, Smiths Lake and the coast. As a result, large portions of the subject land have considerable ecological value, either due to their location adjacent to the coastal reserve, or as riparian linkages in the western portions.

3.2 Flora Species

A total of 274 species of flora from 88 families were recorded within the subject land, comprising 236 natives and 38 exotic species. The Poaceae (grasses, 29 species, 15 native; 14 exotic), Mytraceaee (native trees and shrubs, 23 species), Fabaceae (pea-flowered shrubs, herbs and scramblers, 20 species, 17 native, 3 exotic), Asteraceae (daisy's, 15 species, eight native; seven exotic) were the most diverse families recorded.

No threatened plants were recorded within the subject land during the current investigations.

The full list of plant species recorded is presented in Appendix A. Dominant species recorded within each of the vegetation zones occurring within the subject land are discussed below.

3.3 Vegetation Zones

3.3.1 Overview

Vegetation types were identified based on the dominant canopy species, commonly occurring mid-storey species, location and observed biophysical characteristics such as topography, aspect, vegetation structure, drainage etc. Based on vegetation types and broad condition classes, five vegetation zones were identified in the subject land. Plot/ transects were spread across these five vegetation zones.

Plant cover abundance data were transferred to PATN, in order to establish a preliminary interpretation of the relationships between each pair of variables and to attempt to organise the variables into a set of discrete groups – the discrete groups being the vegetation zones. The selected method of analysis was the Kulczynski association measure, from which a dendrogram was developed which indicated five major associations as shown in Figure 3. These five associations correlated reasonably well with the preliminary vegetetation zones identified in the feld surveys as follows:

- Plots 1, 2, 4, 5, 20, 17 and 18 are grouped and fall within the Blackbutt – Angophora forest in moderate/good condition
- Plots 6 and 23 are grouped with each other, but despite similar canopy composition and context are separate from the other Blackbutt – Angophora forest plots. This may be because of the slashing of the understorey and encroachment of exotic species in the vicinity of these two plots. These plots meet the BBAM definition of moderate/good vegetation (DECC, 2009) and based on canopy composition and context do not appear to be a separate vegetation type. Therefore they have been included in the the Blackbutt – Angophora forest in moderate/good condition
- Plots 3, 7, 8, 14, 19, 10 and 13 are grouped and fall within the Flooded Gum moist forest in moderate/good condition, despite some variation in canopy composition and localised slashing of the understorey
- Plots 9 and 11 are grouped and are associated with exotic grassland in cleared land
- Plots 12, 21, 22 and 15 are grouped and fall within the Swamp Mahogany forest in moderate/good condition
- Plot 16 is grouped with the four Swamp Mahogany forest plots listed above, but does not contain a canopy or mid storey and so has been separated as Swamp Mahogany forest in low condition. The similarity in species richness with the other Swamp Mahogany forest plots supports the separation of this vegetation zone from exotic grassland and cleared land.

The Blackbutt – Angophora forest and Flooded Gum moist forest have been split further into ‘in moderate/good – good condition’ and ‘moderate/good – medium condition’ based on observed differences in understorey vegetation.

The five vegetation zones and two sub-zones defined within the subject land are presented in Table 3 and mapped on Figure 4. Plant species and cover abundance within plots and vegetation zones are listed in Appendix A

The most extensive vegetation zone is Blackbutt Angophora Forest in good condition which occurs on vegetated upper slopes in the eastern portion of the subject land. There are some areas of regrowth vegetation and stands that have been thinned or underscrubbed though there are frequent pre-European age trees.

Figure 3 PATN Analysis Dendrogram of Vegetation Plot Data

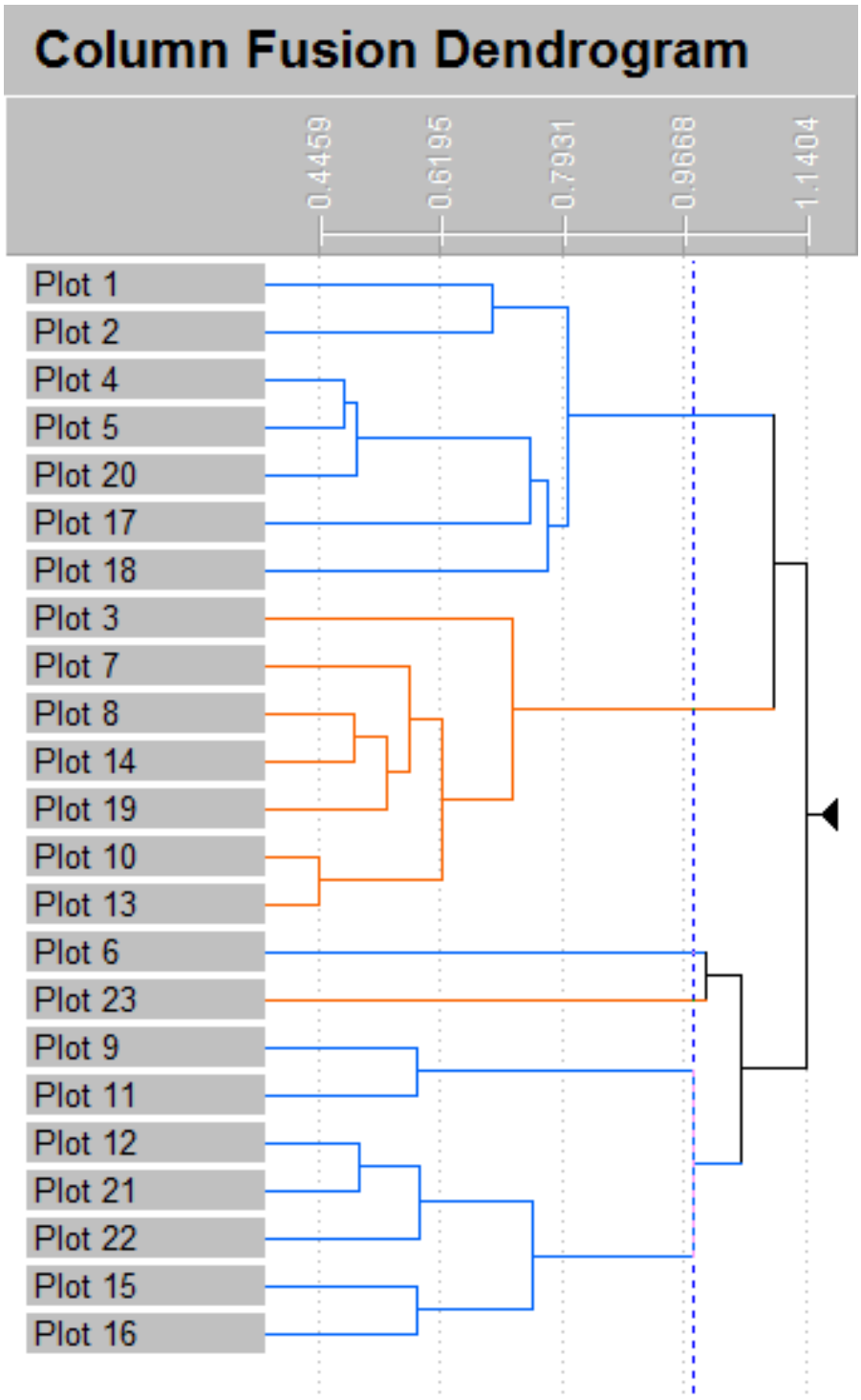
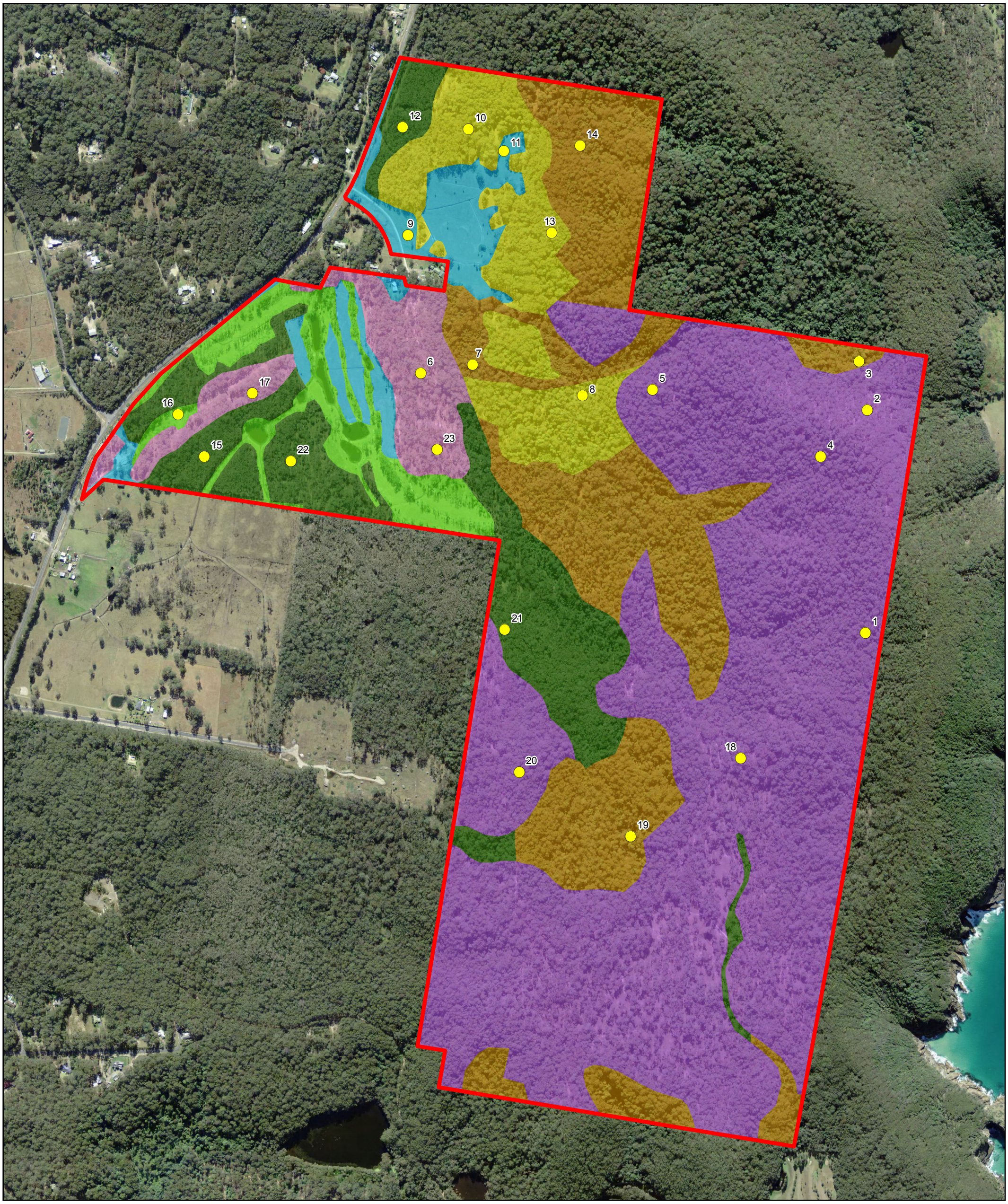


Table 3 Vegetation zones

Vegetation Zone	VegetationType	NSW Vegtation Type (OEH, 2011a)	Condition	Conservation Status	Area within Subject Land (hectares)	Plots
1a -Flooded Gum – Brushbox moist forest (good)	Flooded Gum - Brush Box moist forest of the coastal ranges of the North Coast	HU542	Moderate/good (good)	Portions located on coastal floodplain or drainage lines are Subtropical Coastal Floodplain Forest (EEC under the TSC Act)	67.56	3, 7, 14 and19
1b -Flooded Gum – Brushbox moist forest (medium)	Flooded Gum - Brush Box moist forest of the coastal ranges of the North Coast	HU542	Moderate/good (medium)	Portions located on coastal floodplain or drainage lines are Subtropical Coastal Floodplain Forest (EEC under the TSC Act)	27.92	8, 10 and 13
2a -Blackbutt – Angophora forest (good)	Sydney Peppermint - Smooth-barked Apple shrubby open forest on coastal hills and plains of the southern North Coast and northern Sydney Basin	HU641	Moderate/good (good)	Native	169.25	1, 2, 4, 5, 18 and 20

Vegetation Zone	VegetationType	NSW Vegtation Type (OEH, 2011a)	Condition	Conservation Status	Area within Subject Land (hectares)	Plots
2b -Blackbutt – Angophora forest (medium)	Sydney Peppermint - Smooth-barked Apple shrubby open forest on coastal hills and plains of the southern North Coast and northern Sydney Basin	HU641	Moderate/good (medium)	Native	16.03	6, 17 and 23
3 - Swamp Mahogany swamp forest (good)	Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	HU633	Moderate/good (good)	Swamp Sclerophyll Forest (EEC under the TSC Act)	38.49	12, 21, 22 and 15
4 -Swamp Mahogany swamp forest (low)	Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	HU633	Low	Swamp Sclerophyll Forest (EEC under the TSC Act)	16.31	16
5 - Exotic grassland and cleared land	n/a	n/a	Cleared	Cleared	14.79	9 and 11



LEGEND

Subject Land

Plot / transect

Vegetation Zone

- 1a - Flooded Gum - Brushbox moist forest (good)
- 1b - Flooded Gum - Brushbox moist forest (medium)
- 2a -Blackbutt - Angophora forest (good)
- 2b -Blackbutt - Angophora forest (medium)
- 3 - Swamp Mahogany swamp forest (good)
- 4 -Swamp Mahogany swamp forest (low)
- 5 - Exotic grassland and cleared land

1:9,950 (at A3)

0 50 100 200 300 400

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56

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Phase 1 Studies - Lots 110 and 112, DP1091944,
The Lakes Way, Pacific Palms
Investigation of Flora and Fauna

Vegetation

Job Number 22-16518
Revision A
Date 04 Apr 2013

Figure 4

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Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data Source: NSW Department of Lands: Cadastre - Jan 2012; Geoscience Australia: 250k Data - Jan 2012. Created by: qjchung

3.3.1 Flooded Gum – Brushbox moist forest (moderate/good condition)

This vegetation zone occurs as broad patches on lower slopes and flats through the centre of the subject land and as narrow, linear patches in gullies in the east. The underlying geology is fine-grained lithic sandstone and conglomerate. Soils are grey brown, organic rich sandy loams. Soils are likely to be colluvium, including material from richer, shale-derived substrates up slope. Soils may also contain alluvial material of the coastal floodplain.

This vegetation zone has a Tall Forest, Forest or Closed Forest Structure (Specht, 1970) consisting of tall emergent Flooded Gum (Eucalyptus grandis) or Small-fruited Grey Gum (*Eucalyptus propinqua*) over a *Eucalyptus* spp., Turpentine (*Syncarpia glomulifera*) and Brush Box (*Lophostemon confertus*) canopy with a dense mid storey of rainforest species.

Average canopy height is around 25m, although trees in excess of 30m are common. The canopy foliage projective cover (FPC) is generally 40% or more.

The midstorey and groundcover varies with slope position and disturbance as follows:

- Steep mid slopes and gullies feature a dense midstorey of rainforest trees and a tall, dense and variable groundcover of rainforest palms, lianes, shrubs, herbs and ferns (as mapped as ‘good condition’on Figure 4).
- Lower slopes and flats have been underscrubbed and grazed and feature a simple, low groundover of herbs, grasses and ferns (as mapped as ‘medium condition’ on Figure 4.

Notwithstanding this variation in midstorey and groudcover structure, all plots sampled within this vegetation zone featured native overstorey at bench mark levels, high native plant species richness, regeneration of canopy species and hollow-bearing trees. Therefore all patches of Flooded Gum – Brushbox moist forest meet the BBAM definiation of ‘moderate/good’ condition. Further, the underscrubbed and grazed portions had high groundcover FPC for native herbs, ferns and grasses despite the absence of shrubs and mid storey species.

The mid storey varies from six to 15 metres in height and FPC up to 60% or more. There are localised, very dense stands of Shatterwood (*Backhousia sciadophora*), Jackwood (*Cryptocarya glaucescensi)* and Cabbage Palm (*Livistona australis*). There is a highly diverse suite of other small rainforest trees throughout this vegetation type, including Brush Daphne (*Pittosporum undulatum*), Lilly Pilly (*Syzygium smithii*), Murrogun (*Cryptocarya microneura*), Veiny Wilkiea (*Wilkiea huegeliana*), Creek Sandpaper Fig (*Ficus coronata*), Port Jackson Fig (*Ficus rubiginosa*) and Whalebone Tree (*Streblus brunonianus*).

The groundcover is structurally complex and variable and includes:

- Large rainforest herbs such as Narrow-leaved Palm Lily (*Cordyline stricta*) and Native Ginger (*Alpinia caerulea*)
- Shrubs and small trees such as Orange Thorn (*Pittosporum multiflorum*), Flintwood (*Scolopia braunii*), Wild Quince (*Alectryon subcinereus*) and Native Raspberry (*Rubus parvifolius*)
- Ferns such as Trim Shield Fern (*Lastreopsis decomposita*) and Giant Maidenhair (*Adiantum formosum*)
- Sedges such as Settler’s Flax (*Gymostachys anceps*) and *Carex longebrachiata*
- Herbs such as Kidney Weed (*Dichondra repens*), Ivy-leaved Violet (*Viola hederacea*), Pastel Flower (*Pseuderanthemum variabile*) and *Tripladenia cunninghamii*
- Grasses such as Forest Hedgehog Grass (*Echinopogon ovatus*), Weeping Grass (*Microlaena stipoides*) and Basket Grass (*Oplismenus imbecillis*).

Other conspicuous features of the Flooded Gum – Brushbox moist forest include abundant:

– Epiphytes such as Tree Spider Orchid (*Dendrobium tetragonum*) and Stag Horn fern Staghorn (*Platycerium superbum*),
– Climbers such as Pearl Vine (*Sarcopetalum harveyanum*), Snake vine (*Stephania japonica*), Wonga Wonga Vine (*Pandorea pandorana*) and Water Vine (*Cissus* antartica)
– Scramblers such as Wombat Berry (*Eustrephus latifolius*) and Hairy Apple Berry (*Billardiera scandens*).

There is light infestation with exotic grasses such as Narrow-leafed Carpet Grass (*Axonopus fissifolius**), and herbaceous environmental weeds such as Fireweed (*Senecio madagascariensis**) and Fleabane (*Conyza bonariensis**) throughout and occasional, localised moderate infestations of Lantana (*Lantana camara**).

Portions of this vegetation community located on periodically inundated alluvial flats or drainage lines on the coastal floodplain comprise a local occurrence of 'Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion' (subtropical coastal floodplain forest) which is listed as an EEC under the TSC Act. A Digital Elevation Model (DEM) and flood modelling (BMT WBM, 2013) has been used to map the likely distribution of periodically inundated alluvial flats or drainage lines at the site. It is assumed that the distribution of subtropical coastal floodplain forest matches the likely distribution of periodically inundated alluvial flats or drainage lines as shown on Figure 5. On this basis there is approximately 26.83 hectares of subtropical coastal floodplain forest in the subject land.

Modified Flooded Gum - Brushbox moist forest in medium condition with an open understorey of ferns and herbs

Intact Flooded Gum - Brushbox moist forest in good condition with a dense midstorey of rainforest shrubs, palms and climbers

3.3.2 Blackbutt – Angophora forest (moderate/good condition)

Blackbutt – Angophora forest occurs in the east and south of the subject land on mid and upper slopes. The underlying geology is fine-grained lithic sandstone and conglomerate. Soils are grey or yellow sands. The soils vary from shallow, gravelly soils derived directly from bedrock in steeper parts of the landscape to deeper soil profiles enriched by colluvium on gentle slopes. These soils may also contain wind-borne coastal dune sand material.

This vegetation zone has a Forest or Open Forest Structure (Specht, 1970) with a canopy dominated by Blackbutt (*Eucalyptus pilularis*) and Smooth-barked Angophora (*Angophora costata*). Other sub-dominant canopy species include Small-fruited Grey Gum (*Eucalyptus propinqua*), Grey Ironbark (*E. siderophloia*), Sydney Peppermint (*E. piperita*) Turpentine (*Syncarpia glomulifera*) and occasional Brush Box (*Lophostemon confertus*).

This vegetation varies in the north-east of the subject site where there is an open canopy of Spotted Gum (*Corymbia maculata), E.siderophloia* and *E. pilularis* with a grassy understorey. This variation probably reflects the influence of shale-derived soils in this area. PATN analysis suggested that this vegetation, which was sampled by plots 1 and 2, was not sufficiently different enough from other plots within the Blackbutt – Angophora forest to warrant a separate vegetation zone (refer to Figure 3).

Average canopy height is around 25m, although trees in excess of 30m are common. The canopy foliage projective cover (FPC) is generally 30-40.

The mid-storey varies with slope, aspect, fire history and disturbance as follows:

- A moderately dense, variable mid storey, including small trees such as Cheese Tree (*Glochidion ferdinandi*), Allocasuarina spp., and Narrow-leaved Geebung (*Persoonia linearis*) and tall shrubs such as Straight Wattle (*Acacia stricta*), Flat Bush Pea (*Platylobium formosum* subsp. *formosum*) and Coffee Bush (*Breynia oblongifolia*)
- A dense, tall (5-10 metres) mid storey of Black She-Oak (*Allocasuarina littoralis*) or Forest Oak (*Allocasuarina torulosa*) on sheltered slopes
- A dense, low (1-2 metres) mid storey dominated by Hopbush (*Dodonea triquetra*) in patches that had been burnt recently and/or frequently
- A dense understorey of small rainforest trees such as Mutton wood (*Myrsine variabilis*), Tree Heath (*Trochocarpa laurina*), Sweet Pittosporum (*Pittosporum undulatum*) and Large Mock-olive (*Notelaea longifolia*) and climbers such as Snake Vine (*Stephania japonica*) and Large-leafed Water Vine (*Cissus hypoglauca*) on lower slopes where this vegetation zone adjoins Flooded Gum moist forest
- Mid storey sparse to absent, where the vegetation has been slashed and grazed, notably within Area B (see Figure 2).

The ground cover vegetation has been modified and degraded by slashing, exotic plants and/or grazing in many patches of this vegetation type. However this vegetation type appears to be resilient to these impacts and understorey plant species richness and native FPC are good throughout.

Ground-cover is generally dense and includes:

- Native sedges and grasses such as Mat Rush (*Lomandra longifolia*), Kangaroo Grass (*Themeda australis*), Weeping Grass (*Microlaena stipoides*), Wallaby Grass (*Austrodanthonia* spp.) and *Lepidosperma laterale*

- Small shrubs such as Pyramid Flower (*Comesperma ericinum*), Hairpin Banksia (*Banksia spinulosa*) and Coral Heath (*Epacris microphylla*) and Rough Guinea Flower (*Hibbertia aspera*)
- Herbs such as Pomax (*Pomax umbellata*), Silky Purple-Flag (*Patersonia sericea*) and *Phyllanthus similis*
- Scramblers such as Hairy Apple Berry (Billardiera scandens), Slender Tick-trefoil (Desmodium varians), Small-leaf Glycine (Glycine microphylla) and False Sarsaparilla (Hardenbergia violacea).

Intact Blackbutt – Angophora forest is mapped as 'good condition'on Figure 4.

Modified Blackbutt – Angophora forest which has been underscrubbed is mapped as 'medium condition' on Figure 4.

There is light to moderate infestation with exotic pasture grasses such as Kikuyu Grass (*Pennisetum clandestinum**) or Narrow-leafed Carpet Grass (*Axonopus fissifolius**), Lantana (*Lantana camara**) and herbaceous environmental weeds such as Clover (*Trifolium* spp.), Fireweed (*Senecio madagascariensis**) and Fleabane (*Conyza bonariensis**).

Intact Blackbutt – Angophora forest in good condition with complex vegetation structure and mature, hollow-bearing trees

Modified Blackbutt – Angophora forest in medium condition with thinned canopy, no mid storey or shrub layer and slashed understorey. These areas contain mature, hollow-bearing trees

3.3.3 Swamp Mahogany swamp forest (good condition)

This vegetation zone occurs as broad patches on flats through the west and south of the subject land and as linear patches in broad gullies in the east. Soils are grey, organic rich fine sands and loamy sands derived from alluvial material of the coastal floodplain.

This vegetation zone has a Forest or Closed Forest Structure (Specht, 1970) consisting of a canopy of Swamp Mahogany (*Eucalyptus robusta*) with occasional Smooth-barked Apple (*Angophora costata*), Broad-leaved Paperbark (*Melaleuca quinquinervia*) and Swamp Oak (*Casuarina glauca*) above a dense mid storey of *Melauleuca* spp. and Cabbage Palm (*Livistona australis*).

Canopy height is around 15-25m. The canopy foliage projective cover (FPC) is generally 60% or more.

There is a dense, diverse and variable small tree and shrub layer of species such as *Callistemon salignus,* juvenile *Eucalyptus* and *Melaleuca* spp., Cheese Tree (*Glochidion ferdinandi*), Lemon-scented Ti-tree (*Leptospermum polygalifolium*) and Ball Honey-myrtle (*Melaleuca nodosa*).

There is diverse and variable understorey, including: sedges such as Tall Saw-sedge (*Gahnia clarkei*); grasses such as Weeping Grass *(Microlaena stipoides)*, and Wiry Panic (*Entolasia stricta*); ferns such as Bracken (*Pteridium esculentum*) and Common Maidenhair (*Adiantum aethiopicum*); forbs such as Spiny-headed mat Rush (*Lomandra longifolia*) and Flax Lily (*Dianella caerulea* var. *producta*); and herbs such as (*Commelina cyanea*). There are occasional drains and flooded depressions that support moisture-loving species such as Cumbungi (*Typha orientalis*), Common Reed (*Phragmites australis*) and knotweeds (*Periscaria* spp.).

There are large numbers of climbers such as Sweet Sarsparilla (*Smilax glyciphylla*), Wonga Wonga Vine (*Pandorea pandorana*) and Common Silkpod (*Parsonsia straminea*) and scramblers such as Apple Berry (*Billardia scandens*) and Broad-leaved Glycine (*Glycine tabacina*).

As for the Blackbutt –Angophora forest, the ground cover vegetation has been modified and degraded by slashing, exotic plants and/or grazing in many patches of this vegetation type but it is resilient to these impacts and understorey plant species richness and native FPC are good throughout.

There is slight to moderate infestations of exotic plants throughout this community, including pasture grasses such Narrow-leafed Carpet Grass (*Axonopus fissifolius**), Lantana (*Lantana camara**) and herbaceous environmental weeds such as Fleabane (*Conyza bonariensis**).

This vegetation community comprises a local occurrence of ‘Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions’ (swamp sclerophyll forest) which is listed as an EEC under the TSC Act.

Intact Swamp Mahogany forest in good condition with a dense, intact understorey

Modified Swamp Mahogany forest in moderate condition with a slashed, grazed understorey

3.3.4 Swamp Mahogany swamp forest (low condition)

The low condition patches of this vegetation type occur in the south west of the subject land and are associated with clearing for a golf course (Area D1 on Figure 2).

The canopy and mid storey are absent though there are occasional regenerating juvenile Swamp Mahogany (*Eucalyptus robusta*), Broad-leaved Paperbark (*Melaleuca quinquinervia*) and Swamp Oak (*Casuarina glauca*).

There is relatively dense regrowth of juveniles of the small tree layer associated with this vegetation type throughout, especially Snow-in-Summer (*Melaleuca linarifolia*). Other regenerating species include *Callistemon salignus,* Cheese Tree (*Glochidion ferdinandi*) and Lemon-scented Ti-tree (*Leptospermum polygalifolium*).

There is diverse and variable understorey, including: localised remnant patches of sedges such as Tall Saw-sedge (*Gahnia clarkei*); grasses such as Wiry Panic (*Entolasia stricta*) and *Oplismenus aemulus*; forbs such as Spiny-headed mat Rush (*Lomandra longifolia*) and Flax Lily (*Dianella caerulea* var. *producta*); and herbs such as (*Commelina cyanea*). There are artificial wetlands and drains that support moisture-loving species such as Cumbungi (*Typha orientalis*), Common Reed (*Phragmites australis*) and Water Lilies (*Nelumbo* spp.).

There are occasional scramblers such as Apple Berry (*Billardia scandens*) and Broad-leaved Glycine (*Glycine tabacina*).

This vegetation zone has been severely modified through removal of the canopy and mid storey and ongoing slashing and grazing. There is moderate native species richness and some mid storey species and this vegetation zone qualifies as 'Low' condition rather than 'Cleared' (DECC, 2009).

The groundcover is dominated by Carpet Grass (*Axonopus fissifolius**) with moderate infestation of other exotic grasses and environmental weeds such as African Lovegrass (*Eragrostis curvula**), Quaking Grass (*Briza maxima**), Scarlet Pimpernel *(Anagallis arvensis*)* and Paddy's Lucerne (*Sida rhombifolia**). There is occasional, localised moderate infestations of Lantana (*Lantana camara**) and Blackberry (*Rubus fruticosis* spp. agg.*)

Swamp Mahogany forest in low condition with no canopy or mid storey and moderate weed infestation in the understorey. Canopy and mid storey species are regenerating.

Swamp Mahogany forest in low condition with no canopy or mid storey and moderate weed infestation in the understorey. Canopy and mid storey species are regenerating.

3.3.5 Cleared land and exotic grassland

This vegetation zone includes areas which have been cleared and will continue to remain cleared, such as easements and access tracks, as well as areas that have been cleared and are currently being exploited for agriculture. This community has a tussock grassland structure (Specht, 1970) with occasional remnant paddock trees, juvenile trees and shrubs. It is dominated by exotic species, including noxious and environmental weeds with occasional

remnant or opportunistic native plants associated with the native vegetation types described above. There is no canopy or mid storey and the native groundcover FPC is less than 50% (and typically <10%) so this vegetation zone qualifies as 'Cleared' land and is not a native vegetation type (DECC, 2009).

The dominant vegetation strata is a dense cover of the exotic grasses; Carpet Grass (*Axonopus fissifolius**) and Kikuyu (*Pennisetum clandestinum**). It is heavily grazed and/or regularly slashed.

There are occasional, isolated sub-mature native trees and shrubs, including Flooded Gum (*Eucalyptus grandis*) and Swamp Mahogany (*Eucalyptus robusta*).

The shrub layer, where present, is dominated by Lantana (*Lantana camara**). There is locally dense cover of tall forbs such as Fleabane (*Conyza bonariensis**) and Purpletop (*Verbena bonariensis**). Throughout, there is a very high cover of a diverse mix of exotic grasses, scramblers and herbs, including noxious and environmental weeds. There are occasional native shrubs, herbs and grasses associated with the native vegetation types described above, though always at low cover abundances.

The mapped extent of this community also includes gravel tracks, hardstand areas and other infrastructure with occasional plants associated with cracks or shallow soil deposits. Groundcover vegetation consists of a mixture of exotic pasture grasses, annual weeds and some of the more hardy native groundcovers.

Cleared land comprising heavily grazed exotic grassland. There are some native understorey species but no regeneration of canopy or mid storey species.

Cleared land comprising heavily grazed exotic grassland. There are some native understorey species but no regeneration of canopy or mid storey species.

3.4 Fauna and Habitats

This Phase 1 investigation focussed on vegetation. A brief summy of fauna species and habitats observed in the subject land is provided below.

During field surveys, up to 75 terrestrial fauna species (all native) were recorded. Native species comprised 66 native bird species, three terrestrial or arboreal mammal species, one reptile species and five frog species. One exotic fish species was recorded. Three threatened fauna species were recorded: the Koala (*Phascolarctos cinereus*); Little Lorikeet (*Glossopsitta pusillai);* and Glossy Black-Cockatoo (*Calyptorhynchus lathami*). All three threatened fauna species are listed as vulnerable species under the TSC Act. The Koala is also listed as a vulnerable species under the EPBC Act. The full list of fauna species recorded is presented in Appendix A along with the conservation status, observation type and habitat association of each species.

Three main habitat types were recorded during the survey: areas of native forest, wetland and aquatic habitats; and cleared areas dominated by exotic vegetation.

Native forest within the study area was generally in moderate to good condition, with varying tree age and size, patches of dense shrubs and relatively abundant of fauna habitat resources such as hollow-bearing trees, fallen timber and woody debris and fruiting or flowering trees. This vegetation has considerable habitat value for native fauna, including threatened parrots, forest owls, arboreal mammals and microbats.

Flooded Gum – Brushbox moist forest and Swamp Mahogany forest in the study area contain large numbers of food tree species including primary food trees listed under Schedule 2 of SEPP 44 and secondary feed tree species identified in the Koala Recovery Plan for the North Coast management area (DECC 2008). Exotic grassland and cleared land have limited habitat value for native fauna. These areas would provide foraging resources for opportunistic native birds and terrestrial mammals. These species would use these areas as an adjunct to the higher quality, more extensive areas of suitable habitat available outside of the study area and it is unlikely that any species or individuals of native fauna would be reliant on these habitats for their survival.

A large number of drainage lines are present in the subject land. These range from generally dry intermittent creeks on the upper slopes to more regularly flowing creeks on the lower slopes. In the upper slopes, creeks have occasional coarse-grained boulders present, with some particularly steep sections having high incidences of large coarse-grained boulders. One creek in the south flows over sandstone pavement (flat bedrock) before falling over a relatively high cliff. In other areas, creeks flow over a combination of cobbles and silt. Little water was flowing at the time of surveys with creeks in the lower sections being up to 20 cm deep, but generally around 5 cm deep, while on the upper slopes creeks were dry.

Farm dams and flooded depressions are scattered though the cleared areas of the subject land. These are also likely to be utilised by a variety of native fauna, including waterbirds, reptiles and frogs. Habitat values of dams varied depending on the level of access by livestock. Where livestock were limited in some way, dams tended to have better cover of emergent vegetation such as *Typha.* Dams provide potential habitat for few threatened fauna species. It is likely that threatened bats would forage above these dams.

Drainage lines, artificial wetlands and swamp forest may support threatened frogs of coastal wetlands and rainforest.

3.5 Conservation Signficance

The database searches identified 14 threatened flora species as having been previously recorded or predicted to occur in the locality (see Appendix B). Eight threatened ecological

communities listed under the TSC Act and/or the EPBC Act are known or predicted to occur in the locality. The site survey included survey for these threatened flora and ecological communities and their habitats. The results of the survey and assessment are described below.

The database searches also identified a number of threatened or migratory fauna species listed under the TSC Act or EPBC Act. Threatened fauna are not a subject of this assessment and so the results of the database searches are not assessed further. Those threatened fauna that were observed opportunistically during site surveys are discussed below. Threatened fauna and their habitats will be addressed in greater detail in later stages of the assessment.

3.5.1 Threatened ecological communities

There are two threatened ecological communities on the subject land:

- 'Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion' (subtropical coastal floodplain forest) which is listed as an EEC under the TSC Act. There are approximately 26.83 hectares of subtropical coastal floodplain forest in the subject land, comprising portions of of the Flooded Gum moist forest vegetation zone that occur on periodically inundated alluvial flats or drainage lines on the coastal floodplain. Periodically indundated portions of the coastal floodplain have been defined and mapped with reference to flood modelling (BMT WBM, 2013)
- 'Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions' (swamp sclerophyll forest) which is listed as an EEC under the TSC Act. The local occurrence of swamp sclerophyll forest in the subject land comprises:
  - 38.49 hectares of intact EEC vegetation and habitat in the Swamp Mahogany swamp forest (good condition) vegetation zone
  - 16.31 hectares of intact EEC vegetation and habitat in the Swamp Mahogany swamp forest (low condition) vegetation zone.

The local occurrences of these two EECs are continuous with extensive local populations outside the subject land.

The distribution of these EECs in the subject land is shown on Figure 5.

A third EEC 'Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions' immediately adjoins the western boundary of the subject land.

3.5.2 Threatened flora

No threatened flora species were observed on the subject land.

Of the 16 threatened flora species previously recorded or predicted to occur in the locality, six can be discounted as unlikely to occur on the subject land. These species are associated with specific habitat types that are not present on the subject land, as described in Appendix B. Notably there are a number of plant species associated with fore dunes or low heath on coastal dune sands. These habitats are present within the locality but do not occur in the coastal hills and floodplain habitats within the subject land. There is no chance of secondary impacts on these threatened plants or their habitats because they occur in a separate catchment and many kilometres away from the potential disturbance footprint.

The subject land contains suitable habitat for the remaining ten species. These species are summarised in Table 4 below along with a discussion of the location of suitable habitat on the subject land. Additional targeted survey of these areas would be appropriate for later stages of

the assessment, particularly where threatened plant habitat coincides with potential development areas.

Table 4 Threatened flora that may occur in the subject land

Scientific Name	Common Name	TSC/FM Act	EPBC Act	Nature of Record	Habitat assessment
Acronychia littoralis	Scented Acronychia	E	E	Predicted to occur based on habitat present.	Not detected during survey. Possible as there is suitable habitat associated with the rainforest understorey of flooded gum moist forest in the subject land.
Cryptostylis hunteriana	Leafless Tongue-orchid	-	V	Species or species habitat may occur within area (SEWPaC, 2012)	Broadly suitable habitat in Blackbutt – Angophora forest and the margins of moist forest and swamp forest in the subject land.
Cynanchum elegans	White-flowered Wax Plant	E	E	1 record within 10 km (OEH, 2012a) Species or species habitat likely to occur within area (SEWPaC, 2012)	Suitable habitat associated with the rainforest understorey of flooded gum moist forest in the subject land.
Diuris praecox	Rough Doubletail	V	V	1 record within 10 km (OEH, 2012a) Species or species habitat likely to occur within area (SEWPaC, 2012)	Broadly suitable habitat in Blackbutt – Angophora forest in the subject land.
Lindernia alsinoides	Noah's False Chickweed	E	-	1 record within 10 km (OEH, 2012a) as well as a record on immediately adjacent land owned (Bell, M., Great Lakes Council, pers. comm.)	Suitable habitat in Swamp Mahogany forest in the subject land.
Phaius australis	Lesser Swamp-orchid	E	E	Species or species habitat may occur within area (SEWPaC, 2012). Recorded at North	Not detected during survey. Possible as there is suitable habitat in

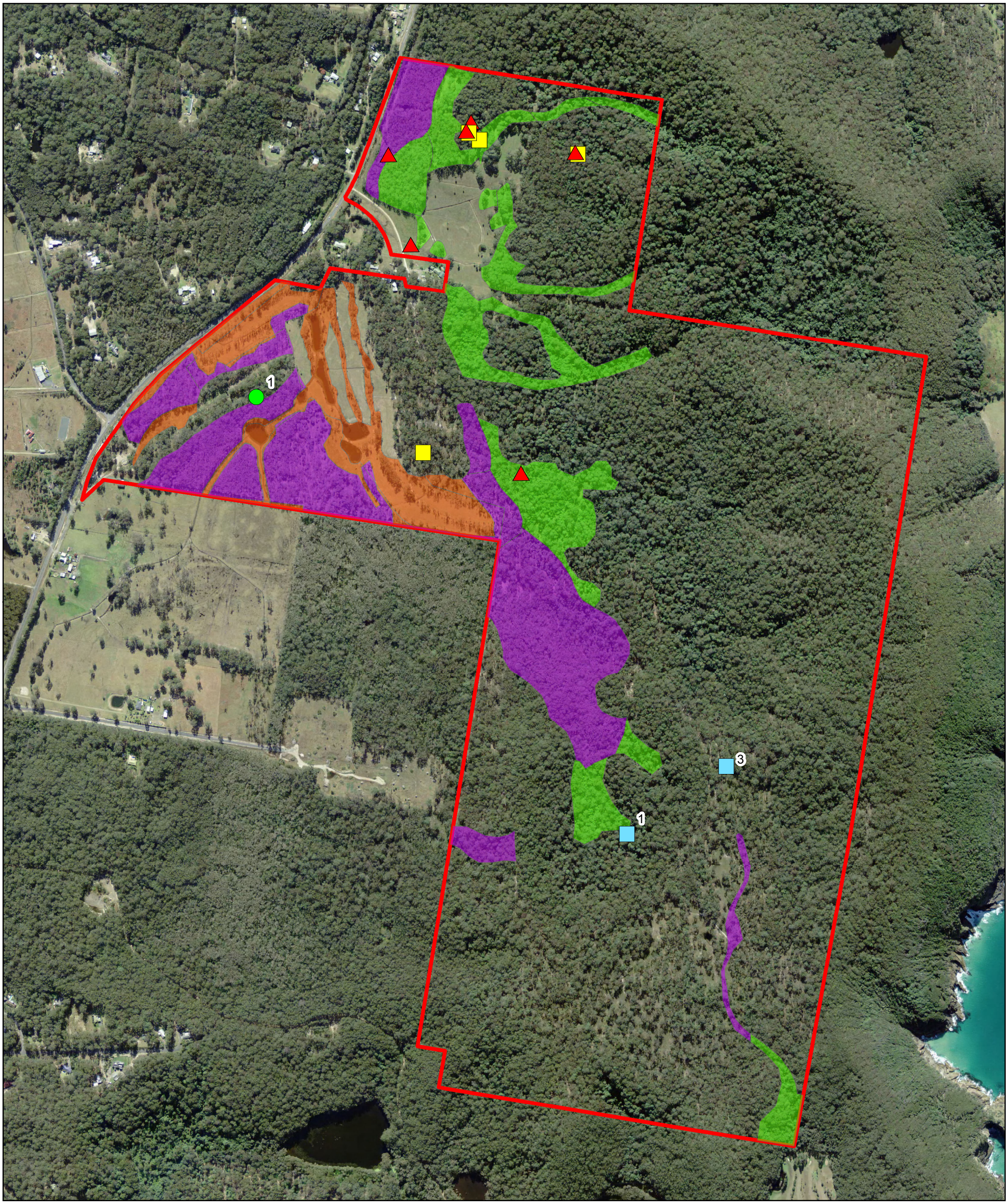
Scientific Name	Common Name	TSC/FM Act	EPBC Act	Nature of Record	Habitat assessment
				Tuncurry (Bell, M., Great Lakes Council, pers. comm.)	Swamp Mahogany forest in the subject land
Streblus pendulinus	Siah's Backbone	-	E	Species or species habitat likely to occur within area (SEWPaC, 2012)	Suitable habitat associated with the rainforest understorey of flooded gum moist forest in the subject land.
Syzygium paniculatum	Magenta Lilly Pilly	E	V	8 records within 10 km (OEH, 2012a) Species or species habitat likely to occur within area (SEWPaC, 2012)	Suitable habitat associated with the rainforest understorey of flooded gum moist forest in the subject land.
Thesium australe	Austral Toadflax	-	V	Species or species habitat likely to occur within area (SEWPaC, 2012)	Broadly suitable habitat in Blackbutt – Angophora forest and the margins of moist forest and swamp forest in the subject land.
Tylophora woollsii	Cryptic Forest Twiner	E	E	Predicted to occur based on habitat present.	Not detected during survey. Possible as there is suitable habitat associated with the rainforest understorey of flooded gum moist forest in the subject land.

3.5.3 Threatened fauna

Evidence of three threatened fauna species was observed in the subject land during site surveys as shown on Figure 5. These species are summarised in Table 5 below along with their legal status, nature of previous records in the locality, observation typeand a discussion of the location of suitable habitat on the subject land.

Table 5 Threatened fauna recorded in the subject land

Scientific Name	Common Name	TSC/FM Act	EPBC Act	Nature of Record	Presence on site
Phascolarctos cinereus	Koala	V	V	121 records within 10 km (OEH, 2012a) Species or species habitat known to occur within area (SEWPaC, 2012)	Present. Previous records in the subject land and characteristic scratches on tree trunks observed in the site survey. Preferred feed tree species present in Flooded Gum – Brushbox moist forest and Swamp Mahogany forest.
Glossopsitta pusilla	Little Lorikeet	V	-	17 records within 10 km (OEH, 2012a)	Present. Up to three individuals recorded at multiple locations in the site survey. Foraging resources and potential breeding habitat present in all forest types in the subject land.
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	-	30 records within 10 km (OEH, 2012a)	Present. An individual recorded on two occasions in the site survey. Foraging resources and potential breeding habitat present in all forest types in the subject land.



LEGEND

Note; Point labels indicated number of individuals observed.

- Subject Land
- Glossy Black-Cockatoo
- Habitat tree
- Koala scratch marks
- Little Lorikeet
- Subtropical Coastal Floodplain Forest
- Swamp Sclerophyll Forest
- Swamp Sclerophyll Forest (low condition)

1:9,958 (at A3)

0 50 100 200 300 400

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56

N

GHD

Great Lakes Council

Phase 1 Studies - Lots 110 and 112, DP1091944,
The Lakes Way, Pacific Palms
Investigation of Flora and Fauna

Job Number 22-16518
Revision A
Date 08 Apr 2013

Threatened Biota and Habitat Resources

Figure 5

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Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data Source: NSW Department of Lands: Cadastre - Jan 2012; Geoscience Australia: 250k Data - Jan 2012. Created by: qjchung

4. Ecological Constraints Assessment

4.1 Ecological Constraints

Ecological constraints within the subject land were classified into three classes based on conservation significance and sensitivity to impacts arising from development. Table 6 outlines the ecological features that have been used to define these classes and recommended land use and management.

The location of identified constraints is shown on Figure 6.

Table 6 Ecological Constraint Classes

Ecological Constraint Class	Description and Recommended Management
Low	Highly modified or cleared areas, dominated by exotic pasture grasses or environmental weeds. There are some planted exotic trees or remnant native trees that have limited habitat value. These areas have little potential to develop into areas of higher conservation significance with assisted natural regeneration. Development activities should be concentrated in these areas as far as possible. These areas may be constrained by flooding, riparian corridors or bushfire hazard. These areas may have conservation value as rehabilitation areas to increase the extent of native vegetation and restore habitat linkages.
Medium	Native vegetation that is not part of an endangered ecological community; and/or low condition vegetation that is part of an endangered ecological community. These areas have value as habitat for native flora and fauna, including threatened species and have the potential to develop into areas of high conservation significance with assisted natural regeneration. Development activities may occur in these areas subject to appropriate environmental impact assessment. These areas may be further constrained by threatened fauna and their habitats, flooding, riparian corridors or bushfire hazard. Targeted fauna surveys would be undertaken during later phases of the assessment and the constraint level reviewed accordingly. If threatened fauna or their habitats are recorded in the subject land then these areas would be a 'high' constraint. These areas have potential to realise environmental gains through active management for conservation. Consideration should be given to conserving these areas as part of an overall balance between development and conservation within the subject land.
High	Moderate/good condition vegetation that is part of an endangered ecological community. Development in these areas may result in a signficant impact on threatened biota and would comprise an impact on a red flag area within the BBAM (DECC, 2009). Development activities should be excluded from these areas as far as possible. These areas may be further constrained by riparian corridors or bushfire hazard. These areas have potential to realise environmental gains through active management for conservation. Conservation of these areas would contribute to an overall balance between development and conservation within the subject land.

LEGEND

Subject Land

Approved Golf Course including access carparks and ponds

Ecological Constraint Class

High

Medium

Low

1:10,000 (at A3)

0 50 100 200 300 400

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56

N

GHD

Great Lakes Council

Phase 1 Studies - Lots 110 and 112, DP1091944,
The Lakes Way, Pacific Palms
Investigation of Flora and Fauna

Ecological Constraints

Job Number 22-16518
Revision A
Date 04 Apr 2013

Figure 6

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Data Source: NSW Department of Lands: Cadastre - Jan 2012; Geoscience Australia: 250k Data - Jan 2012. Created by: qjchung

4.2 Planning Proposal

Council will complete a Planning Proposal for the subject land including a Development/ Conservation Footprint based on the results of the ecological constraints assessment and Flood/ Water Management Study (BMT WBM, 2013). The Planning Proposal would include:

- Potential development areas that could be assessed for development activities under relevant environmental legislation and approval pathways. Development areas are.
- Proposed conservation areas - that would be set aside and managed to improve or maintain biodiversity values, potentially including as offsets for development areas. The ecological characteristics and proposed management of these two likely components of the Planning Proposal is described below.

4.2.1 Potential development areas

The subject land contains areas of lower ecological constraint that would be suitable as development areas. Some portions of the subject land mapped as medium or high ecological constraint could also be included in a development proposal as part of an overall balance between development and conservation in the subject land and with consideration of contribution of the conservation areas as biodiversity offsets for development. Subject to the wishes of the landowner these areas could be proposed for development as part of:

- A rezoning application and development application under Part 4 of the EPA Act
- An application for a biobanking statement.

Environmental assessments would be required as part of the approval process for development in these areas. The approval authorities and assessment requirements would vary depending on the scale and nature of development and type of approval that is sought.

The subject land contains cleared land and exotic vegetation with little ecological value that would be suitable for development. Some additional areas of moderate condition native vegetation and habitats may be included in development areas in order to yield a viable development footprint for the subject land. Removal of this vegetation would also serve to reduce bushfire hazard that would otherwise constrain adjoining areas with little ecological value. Removal of native vegetation and habitat would require ecological impact assessment and biodiversity offsets.

Future development approvals would also need to consider a range of other environmental factors such as riparian corridors, flooding, traffic, cultural heritage, visual amenity, noise and community concerns.There are likely to be areas of low ecological constraint within the subject land that are constrained by other factors such as flooding or bushfire hazard. These areas would need to be treated as ‘managed open space’ and could accommodate existing dwellings, roads, utilities, sheds and garages, parks, agricultural land or drainage works. These areas could also function as asset protection zones surrounding a residential development and could contain some trees and associated habitat value but would need to be purposefully managed to reduce fuel loads through measures such as mowing and maintenance of a discontinuous canopy. Asset protection zones should be accommodated within the proposed development areas, rather than in adjoining conservation areas.

Areas of managed open space would need to be considered in the environmental assessments that would be required as part of the approval processes for proposed development areas. The type of assessment required would depend on the relevant approvals pathway and the scale and type of development. Assessment requirements may include:

- Assessment of impacts of partial vegetation removal and ongoing management as part of a rezoning application and development application under Part 4 of the EPA Act
- Assessment of impacts of partial vegetation removal according to the BioBanking assessment methodology rules for APZs as part of an application for a biobanking statement.

Future development at the subject land is likely to include areas of medium and high ecological constraint including EECs and habitat for threatened species. These areas would require assessments of significance or a red flag variation within the BBAM (DECC, 2009) and would require biodiversity offsets.

4.3 Proposed conservation areas

The draft subject land layout contains extensive areas of intact native vegetation that is unsuitable for development and that could be included in conservation areas. These areas have been proposed for conservation as part of the potential subject land layout shown on Figure 2. Subject to the wishes of the landowner these areas could be set aside for conservation through:

- 'Passive' conservation under existing land use zonings and activities
- An application for a voluntary conservation agreement, Property Vegetation Plan under the *Native Vegetation Act 2003* (NV Act) or other restriction on Title, that may be linked to a development as a biodiversity offset
- An application for a biobanking agreement
- Public dedication for biodiversity conservation.

The majority of the proposed conservation areas contain intact native vegetation in good condition, including EECs, with good landscape connectivity as part of broad vegetated corridors.

The proposed conservation areas may be set aside as biodiversity offsets for development of portions of the subject land. Biodiversity offsetting is a tool for decision makers who have to balance the relative environmental, social and economic merits of development proposals under the EPA Act. The requirement for biodiversity offsets is stated in the conditions of approval for a project and usually comprises the requirement that the project will '*improve or maintain*' biodiversity values. Figure 2 provides an indication of potential future development and conservation areas within the subject land. The proposed conservation areas contain matching 'like for like' areas of all vegetation types and EECs within potential development areas. The proposed conservation area would conserve a broad vegetetated corridor linking extensive areas of native vegetation to the north and south of the subject land and providing connectivity between coastal, floodplain, estuarine and terrestrial environments. There is scope within the subject lands to provide an appropriate balance between development and conservation lands and to deliver a biodiversity offset that would 'improve or maintain' biodiversity values.

The Commonwealth DSEWPC may also require biodiversity offsets for Matters of National Environmental Significance, determined with reference to the *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy* (DSWEPC, 2012). Additional consultation with DSEWPC and/or assessment may be required to demonstrate that the biodiversity offset package would adequately offset impacts on MNES.Further assessment and preparation of management plans would be required as part of any formal application for conservation of portions of the subject land, particularly if they are to be used as biodiversity offsets. The approval authorities and assessment requirements would vary depending on the type of Titling for conservation that is sought.

5. Conclusions

This Phase 1 flora and fauna investigation report presents the results of the GHD assessment of the subject land up to the *Critical Hold-point Task: Determination of the Preliminary Development/ Conservation Footprint* identified in the brief. GHD have completed site surveys, prepared a vegetation map and undertaken an ecological constraints assessment.

Council will complete a Planning Proposal for the subject land including a Development/ Conservation Footprint based on the results of the ecological constraints assessment and Flood/ Water Management Study (BMT WBM, 2013).The subject land contains areas of lower ecological constraint that would be suitable as development areas and some areas of higher ecological value that could be included in development areas subject to appropriate environmental impact assessment and biodiversity offsets. The draft subject land layout contains extensive areas of intact native vegetation that could be included in conservation areas. These potential conservation areas would make a valueable contribution to local and regional biodiversity conservation and would provide a suitable 'like for like' offset for development. There is scope within the subject lands to provide an appropriate balance between development and conservation lands and to deliver a biodiversity offset that would 'improve or maintain' biodiversity values.

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Appendix A – Species Lists

Flora Species list Plots 1-11

Family	Exotic	Scientific Name	Common Name	TSC Status	EPBC Status	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	Plot 10	Plot 11
Acanthaceae		*Brunoniella australis*	Blue Trumpet			1										
Acanthaceae		*Pseuderanthemum variabile*	Pastel Flower							1		1	2		2	
Adiantaceae		*Adiantum formosum*	Giant Maidenhair					2								
Adiantaceae		*Pellaea falcata*	Sickle Fern					2								
Apiaceae		*Centella asiatica*	Indian Pennywort								0					
Apiaceae		*Daucus glochidiatus*	Native Carrot								0					1
Apiaceae	*	*Hydrocotyle bonariensis*	0											2		
Apocynaceae		*Parsonsia straminea*	Common Silkpod					2	1		1	2	2		2	
Araceae		*Gymnostachys anceps*	Settler's Twine			2	1	2		1		2	2		1	
Araliaceae		*Astrotricha latifolia*	0													
Araliaceae		*Polyscias sambucifolia*	Elderberry Panax			2	2		2	2			1		2	
Arecaceae		*Livistona australis*	Cabbage Palm						1		0	4	3		2	
Aspleniaceae		*Asplenium flabellifolium*	Necklace Fern													
Asteliaceae		*Cordyline stricta*	Narrow-leaved Palm Lily									2	2		2	
Asteraceae	*	*Chrysanthemoides monilifera*	0				1									
Asteraceae	*	*Cirsium vulgare*	Spear Thistle				1									
Asteraceae	*	*Conyza bonariensis*	Flaxleaf Fleabane				1				0					2
Asteraceae		*Euchiton involucratus*	Star Cudweed								0					
Asteraceae		*Euchiton sphaericus*	Star Cudweed													1
Asteraceae	*	*Hypochaeris radicata*	Catsear													1
Asteraceae		*Lagenophora stipitata*	Common												1	

Family	Exotic	Scientific Name	Common Name	TSC Status	EPBC Status	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	Plot 10	Plot 11
			Lagenophora													
Asteraceae		*Ozothamnus diosmifolius*	White Dogwood													
Asteraceae		*Senecio linearifolius*	Fireweed Groundsel						2	2						
Asteraceae	*	*Senecio madagascariensis*	Fireweed								0			2		2
Asteraceae	*	*Senecio spp.*	Groundsel, Fireweed												1	
Asteraceae		*Senecio vagus subsp. eglandulosus*	0			2										
Asteraceae		*Solenogyne bellioides*	Solengyne				1									
Asteraceae	*	*Taraxacum officinale*	Dandelion								0				2	2
Asteraceae		*Vernonia cinerea*	0								0				1	
Bignoniaceae		*Pandorea pandorana*	Wonga Wonga Vine			1					0				1	
Blechnaceae		*Blechnum cartilagineum*	Gristle Fern									2				1
Blechnaceae		*Blechnum nudum*	Fishbone Water Fern										2			
Blechnaceae		*Doodia aspera*	Prickly Rasp Fern			2		2				2			2	
Boraginaceae		*Ehretia acuminata var. acuminata*	Koda					3								
Caryophyllaceae		*Stellaria flaccida*	0													
Caryophyllaceae	*	*Stellaria media*	Common Chickweed													
Casuarinaceae		*Allocasuarina littoralis*	Black She-Oak						4	3						
Casuarinaceae		*Allocasuarina spp.*	0				1					3				
Casuarinaceae		*Allocasuarina torulosa*	Forest Oak			3							3			
Casuarinaceae		*Casuarina glauca*	Swamp Oak													
Casuarinaceae		*Casuarina spp.*	0												1	

Family	Exotic	Scientific Name	Common Name	TSC Status	EPBC Status	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	Plot 10	Plot 11
Celastraceae		*Maytenus silvestris*	Narrow-leaved Orangebark													
Clusiaceae		*Hypericum gramineum*	Small St John's Wort													
Clusiaceae		*Hypericum japonicum*	0								1					
Commelinaceae		*Aneilema acuminatum*	0					1								
Commelinaceae		*Commelina cyanea*	Native Wandering Jew													
Convolvulaceae		*Dichondra repens*	Kidney Weed								0					2
Convolvulaceae		*Polymeria calycina*	0								0					
Cunoniaceae		*Callicoma serratifolia*	Black Wattle													
Cunoniaceae		*Schizomeria ovata*	Crabapple									2				
Cyperaceae		*Baumea teretifolia*	0													
Cyperaceae		*Carex appressa*	Tall Sedge										3	1		
Cyperaceae		*Carex longebrachiata*	0													3
Cyperaceae		*Carex spp.*	0					0							2	
Cyperaceae		*Chorizandra sphaerocephala*	Roundhead Bristle-sedge													
Cyperaceae	*	*Cyperus brevifolius*	0											1		
Cyperaceae		*Cyperus flaccidus*	Lax Flat-sedge													
Cyperaceae		*Gahnia aspera*	Rough Saw-sedge					2				2	2			
Cyperaceae		*Gahnia clarkei*	Tall Saw-sedge													
Cyperaceae		*Gahnia sieberiana*	Red-fruit Saw-sedge													
Cyperaceae		*Lepidosperma laterale*	Variable Sword-sedge			2	2			2						
Cyperaceae		*Lepidosperma spp.*	0													
Cyperaceae		*Schoenoplectus spp.*	0											2		
Dennstaedtiaceae		*Hypolepis muelleri*	Harsh Ground Fern										1			

Family	Exotic	Scientific Name	Common Name	TSC Status	EPBC Status	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	Plot 10	Plot 11
Dennstaedtiaceae		*Pteridium esculentum*	Bracken						1		0				1	3
Dicksoniaceae		*Calochlaena dubia*	Rainbow Fern									2	2		2	
Dilleniaceae		*Hibbertia aspera*	Rough Guinea Flower			1			2	2	0					
Dilleniaceae		*Hibbertia dentata*	Twining Guinea Flower			2					0		2		2	1
Dilleniaceae		*Hibbertia obtusifolia*	Hoary Guinea Flower													
Dilleniaceae		*Hibbertia scandens*	Climbing Guinea Flower						2	1	0				2	
Dilleniaceae		*Hibbertia spp.*	0													
Dryopteridaceae		*Lastreopsis decomposita*	Trim Shield Fern													
Ebenaceae		*Diospyros australis*	Black Plum					2		1			2			
Elaeocarpaceae		*Elaeocarpus reticulatus*	Blueberry Ash			1					0	2			1	
Elaeocarpaceae		*Tetratheca ericifolia*	0						2	2						
Ericaceae		*Epacris microphylla*	Coral Heath													
Ericaceae		*Leucopogon lanceolatus*	0													
Ericaceae		*Trochocarpa laurina*	Tree Heath													
Euphorbiaceae		*Homalanthus populifolius*	#N/A	#N/A												
Euphorbiaceae		*Baloghia inophylla*	Brush Bloodwood													
Fabaceae (Faboideae)		*Aotus ericoides*	0								2					
Fabaceae (Faboideae)		*Bossiaea heterophylla*	Variable Bossiaea													
Fabaceae (Faboideae)		*Desmodium rhytidophyllum*	0			2	2			1						
Fabaceae (Faboideae)		*Desmodium varians*	Slender Tick-trefoil				1		1							

Family	Exotic	Scientific Name	Common Name	TSC Status	EPBC Status	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	Plot 10	Plot 11
Fabaceae (Faboideae)		*Dillwynia acicularis*	0													
Fabaceae (Faboideae)		*Glycine microphylla*	Small-leaf Glycine			2	1		1	1	0					
Fabaceae (Faboideae)		*Gompholobium pinnatum*	Pinnate Wedge Pea													
Fabaceae (Faboideae)		*Hardenbergia violacea*	False Sarsaparilla			2	2		2		0					
Fabaceae (Faboideae)		*Kennedia rubicunda*	Dusky Coral Pea				2				0					
Fabaceae (Faboideae)	*	*Medicago minima*	Woolly Burr Medic											1		
Fabaceae (Faboideae)		*Platylobium formosum subsp. formosum*	0				2									
Fabaceae (Faboideae)		*Podolobium ilicifolium*	Prickly Shaggy Pea				2		1							
Fabaceae (Faboideae)		*Podolobium scandens*	Netted Shaggy Pea			2				1	0					
Fabaceae (Faboideae)		*Pultenaea daphnoides*	Large-leaf Bush-pea								1					
Fabaceae (Faboideae)		*Pultenaea linophylla*	0				2		1							
Fabaceae (Faboideae)		*Pultenaea spp.*	0													
Fabaceae (Faboideae)	*	*Trifolium spp.*	A Clover													
Fabaceae (Faboideae)	*	*Trifolium subterraneum*	Subterranean Clover								0			2		2
Fabaceae (Mimosoideae)		*Acacia binervata*	Two-veined Hickory				2									
Fabaceae (Mimosoideae)		*Acacia floribunda*	White Sally			2										
Fabaceae (Mimosoideae)		*Acacia irrorata*	Green Wattle													
Fabaceae		*Acacia linifolia*	White Wattle						2							

Family	Exotic	Scientific Name	Common Name	TSC Status	EPBC Status	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	Plot 10	Plot 11
(Mimosoideae)																
Fabaceae (Mimosoideae)		*Acacia longifolia subsp. longifolia*	Sydney Golden Wattle				1									
Fabaceae (Mimosoideae)		*Acacia myrtifolia*	Red-stemmed Wattle				1									
Fabaceae (Mimosoideae)		*Acacia stricta*	Straight Wattle				2			1						
Fabaceae (Mimosoideae)		*Acacia suaveolens*	Sweet Wattle													
Fabaceae (Mimosoideae)		*Acacia ulicifolia*	Prickly Moses													
Flacourtiaceae		*Scolopia braunii*	Flintwood					1								
Flagellariaceae		*Flagellaria indica*	Whip Vine									1				
Geraniaceae		*Geranium homeanum*	0								0					
Geraniaceae		*Geranium solanderi var. solanderi*	0						2							
Goodeniaceae		*Dampiera stricta*	0													
Goodeniaceae		*Goodenia hederacea*	Ivy Goodenia													
Goodeniaceae		*Goodenia heterophylla*	0				1		1	2	1					
Goodeniaceae		*Goodenia paniculata*	0													
Goodeniaceae		*Goodenia paniculata*	0													
Haloragaceae		*Gonocarpus tetragynus*	Poverty Raspwort						1		0		2		2	
Icacinaceae		*Pennantia cunninghamii*	Brown Beech									2				
Iridaceae		*Patersonia glabrata*	Leafy Purple-flag													

Family	Exotic	Scientific Name	Common Name	TSC Status	EPBC Status	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	Plot 10	Plot 11
Iridaceae		*Patersonia sericea*	Silky Purple-Flag													
Juncaceae		*Juncus continuus*	0													
Juncaceae		*Juncus usitatus*	0											2		1
Lamiaceae		*Clerodendrum tomentosum*	Hairy Clerodendrum					2					1		1	
Lauraceae		*Cryptocarya glaucescens*	Jackwood									1	2			
Lauraceae		*Cryptocarya microneura*	Murrogun										1		2	
Lindsaeaceae		*Lindsaea linearis*	Screw Fern													
Lobeliaceae		*Lobelia anceps*	0													
Lobeliaceae		*Lobelia anceps*	0													
Lobeliaceae		*Pratia purpurascens*	Whiteroot			1					0		2		2	
Lomandraceae		*Lomandra confertifolia subsp. rubiginosa*	0			2	2			1	0					
Lomandraceae		*Lomandra filiformis subsp. coriacea*	Wattle Matt-rush			1										
Lomandraceae		*Lomandra longifolia*	Spiny-headed Mat-rush			2	2	2	2	2	0		1		2	1
Lomandraceae		Lomandra multiflora subsp. multiflora	Many-flowered Mat-rush							2						
Loranthaceae		*Muellerina eucalyptoides*	0													
Luzuriagaceae		*Eustrephus latifolius*	Wombat Berry						1				1		2	
Luzuriagaceae		*Geitonoplesium cymosum*	Scrambling Lily			2		1	1	1	0	1	1		2	
Malvaceae	*	*Modiola caroliniana*	Red-flowered Mallow								0					2
Malvaceae	*	*Sida rhombifolia*	Paddy's Lucerne													1
Meliaceae		*Synoum glandulosum subsp. glandulosum*	Scentless Rosewood									2			1	
Menispermaceae		*Sarcopetalum harveyanum*	Pearl Vine			1				2					1	
Menispermaceae		*Stephania japonica*	Snake vine										2		2	

Family	Exotic	Scientific Name	Common Name	TSC Status	EPBC Status	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	Plot 10	Plot 11
Monimiaceae		*Wilkiea huegeliana*	Veiny Wilkiea										1		1	
Moraceae		*Ficus coronata*	Creek Sandpaper Fig												1	
Moraceae		*Ficus rubiginosa*	Port Jackson Fig								0					
Moraceae	*	*Ficus spp.*	0									1				
Moraceae		*Streblus brunonianus*	Whalebone Tree					2				2				
Myrsinaceae	*	*Anagallis arvensis*	Scarlet Pimpernel								2					
Myrsinaceae		*Myrsine variabilis*	0			2		1	1							
Myrtaceae		*Syzigium smithii*	Lilly Pilly									2			1	
Myrtaceae		*Angophora costata*	Sydney Red Gum						3	4	0					
Myrtaceae		*Backhousia sciadophora*	Shatterwood					5							1	
Myrtaceae		*Callistemon salignus*	Willow Bottlebrush								0					
Myrtaceae		*Corymbia maculata*	Spotted Gum			3	3		3							
Myrtaceae		*Eucalyptus acmenoides*	White Mahogany			4				2						
Myrtaceae		*Eucalyptus grandis*	Flooded Gum									3	3		4	
Myrtaceae		*Eucalyptus microcorys*	Tallowwood				3		3	3	0		3		4	
Myrtaceae		*Eucalyptus paniculata subsp. paniculata*	0				3									
Myrtaceae		*Eucalyptus pilularis*	Blackbutt			3	1		3	4	0				3	
Myrtaceae		*Eucalyptus piperita*	Sydney Peppermint								3					
Myrtaceae		*Eucalyptus propinqua*	Small-fruited Grey Gum							1					2	
Myrtaceae		*Eucalyptus punctata*	Grey Gum			3										
Myrtaceae		*Eucalyptus robusta*	Swamp Mahogany													
Myrtaceae		*Eucalyptus siderophloia*	Grey Ironbark						3							
Myrtaceae		*Eucalyptus spp.*	0													1
Myrtaceae		*Leptospermum polygalifolium*	Tantoon													
Myrtaceae		*Lophostemon confertus*	Brush Box					4		1		3	3			

Family	Exotic	Scientific Name	Common Name	TSC Status	EPBC Status	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	Plot 10	Plot 11
Myrtaceae		*Melaleuca linariifolia*	Flax-leaved Paperbark													
Myrtaceae		*Melaleuca quinquenervia*	Broad-leaved Paperbark													
Myrtaceae		*Melaleuca styphelioides*	Prickly-leaved Tea Tree													
Myrtaceae		*Rhodamnia rubescens*	Scrub Turpentine												2	
Myrtaceae		*Syncarpia glomulifera*	Turpentine						1	2		3	3		3	
Nyctaginaceae		*Pisonia umbellifera*	Birdlime Tree					2				2			2	
Ochnaceae	*	*Ochna serrulata*	Mickey Mouse Plant												2	
Oleaceae		*Notelaea longifolia*	Large Mock-olive			2							1			
Ophioglossaceae		*Ophioglossum lusitanicum*	Adder's Tongue													
Orchidaceae		*Cryptostylis subulata*	Large Tongue Orchid													
Orchidaceae		*Dendrobium tetragonum*	Tree Spider Orchid					1								
Orchidaceae		*Dipodium spp.*	0													
Orchidaceae		*Pterostylis spp.*	Greenhood					1								
Oxalidaceae		*Oxalis perennans*	0							1						
Passifloraceae		*Passiflora herbertiana*	0													
Phormiaceae		*Dianella caerulea var. producta*	0			2	2		2		0				1	
Phyllanthaceae		*Breynia oblongifolia*	Coffee Bush			1		1	1	2					2	
Phyllanthaceae		*Glochidion ferdinandi*	Cheese Tree								0		1		2	
Phyllanthaceae		*Phyllanthus similis*	0			2										
Pittosporaceae		*Billardiera scandens*	Hairy Apple Berry			1	1		2	2	0		1		2	
Pittosporaceae		*Pittosporum multiflorum*	Orange Thorn					2								

Family	Exotic	Scientific Name	Common Name	TSC Status	EPBC Status	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	Plot 10	Plot 11
Pittosporaceae		*Pittosporum revolutum*	Rough Fruit Pittosporum					1								
Pittosporaceae		*Pittosporum undulatum*	Sweet Pittosporum										1		1	
Plantaginaceae	*	*Plantago lanceolata*	Lamb's Tongues								0			2	2	2
Plantaginaceae		*Veronica plebeia*	Trailing Speedwell													
Poaceae	*	*Andropogon virginicus*	Whisky Grass								0			2		
Poaceae		*Austrodanthonia tenuior*	A Wallaby Grass													
Poaceae		*Austrostipa pubescens*	0													
Poaceae	*	*Axonopus fissifolius*	Narrow-leafed Carpet Grass								0			6		3
Poaceae	*	*Briza maxima*	Quaking Grass											2		2
Poaceae	*	*Briza minor*	Shivery Grass													
Poaceae		*Cynodon dactylon*	Common Couch								0					2
Poaceae		*Deyeuxia decipiens*	Devious Bent-grass													
Poaceae		*Echinopogon caespitosus*	Bushy Hedgehog-grass													2
Poaceae		*Echinopogon ovatus*	Forest Hedgehog Grass												2	
Poaceae		*Entolasia marginata*	Bordered Panic										2			
Poaceae		*Entolasia stricta*	Wiry Panic			2	1		2	2	0		2		2	
Poaceae		*Eragrostis brownii*	Brown's Lovegrass													
Poaceae	*	*Eragrostis curvula*	African Lovegrass													
Poaceae		*Imperata cylindrica*	Blady Grass			2	2		1	1	1					
Poaceae		*Microlaena stipoides*	Weeping Grass						2	2			3		3	2
Poaceae		*Oplismenus aemulus*	0			1										
Poaceae		*Oplismenus imbecillis*	0						2	2	0		2		2	
Poaceae	*	*Paspalum dilatatum*	Paspalum												2	
Poaceae	*	*Pennisetum clandestinum*	Kikuyu Grass											3		4

Family	Exotic	Scientific Name	Common Name	TSC Status	EPBC Status	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	Plot 10	Plot 11
Poaceae		*Poa affinis*	0			2	2		2	2	0					
Poaceae	*	*Poa spp.*	0													1
Poaceae	*	*Setaria pumila*	Pale Pigeon Grass													
Poaceae	*	*Setaria spp.*	0													1
Poaceae	*	*Setaria viridis*	Green Pigeon Grass											2		
Poaceae	*	*Sporobolus africanus*	Parramatta Grass													1
Poaceae	*	*Sporobolus fertilis*	Giant Parramatta Grass													
Poaceae	*	*Stenotaphrum secundatum*	Buffalo Grass													
Poaceae		*Themeda australis*	Kangaroo Grass			4	3			2						
Polygalaceae		*Comesperma ericinum*	Pyramid Flower													
Polygonaceae		*Muehlenbeckia gracillima*	Slender Lignum									1	2		2	
Polypodiaceae		*Platycerium superbum*	Staghorn									2				
Proteaceae		*Banksia spinulosa*	Hairpin Banksia													
Proteaceae		*Conospermum ellipticum*	0													
Proteaceae		*Lomatia silaifolia*	Crinkle Bush							1	0					
Proteaceae		*Persoonia levis*	Broad-leaved Geebung													
Proteaceae		*Persoonia levis*	Broad-leaved Geebung													
Proteaceae		*Persoonia linearis*	Narrow-leaved Geebung			2	1		2	2	0					
Putranjivaceae		*Drypetes deplanchei*	Yellow Tulipwood					2								
Ranunculaceae		*Clematis aristata*	Old Man's Beard			1		1								
Ranunculaceae		*Ranunculus plebeius*	Forest Buttercup											1		
Rhamnaceae		*Alphitonia excelsa*	Red Ash									3				
Rhamnaceae		*Pomaderris aspera*	Hazel Pomaderris									1				

Family	Exotic	Scientific Name	Common Name	TSC Status	EPBC Status	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	Plot 10	Plot 11
Rhamnaceae		*Pomaderris ferruginea*	0										2			
Ripogonaceae		*Ripogonum brevifolium*	Small-leaved Supplejack													
Rosaceae	*	*Rubus fruticosus sp. agg.*	Blackberry complex													1
Rosaceae		*Rubus moluccanus var. trilobus*	Molucca Bramble					1	1		0				2	
Rosaceae		*Rubus moluccanus var. trilobus*	Molucca Bramble													
Rosaceae		*Rubus parvifolius*	Native Raspberry			2										
Rosaceae		*Rubus rosifolius*	Rose-leaf Bramble													
Rubiaceae		*Galium propinquum*	Maori Bedstraw												1	
Rubiaceae		*Morinda jasminoides*	Sweet Morinda					2				2	2		2	
Rubiaceae		*Opercularia varia*	Variable Stinkweed				1									
Rubiaceae		*Pomax umbellata*	Pomax													
Rutaceae		*Boronia barkeriana*	Barker's Boronia													
Rutaceae	*	*Citrus spp.*	0													
Rutaceae		*Zieria smithii*	Sandfly Zieria							1						
Santalaceae		*Leptomeria acida*	Sour Currant Bush													
Sapindaceae		*Alectryon subcinereus*	Wild Quince												1	
Sapindaceae		*Dodonaea triquetra*	Large-leaf Hop-bush			4	1		5	4						
Smilacaceae		*Smilax australis*	Lawyer Vine			1		2				2	2		2	
Smilacaceae		*Smilax glyciphylla*	Sweet Sarsparilla					2			0		1			
Solanaceae		*Solanum prinophyllum*	Forest Nightshade						1							
Solanaceae		*Solanum pungetium*	Eastern Nightshade													
Solanaceae	*	*Solanum spp.*	0			2				1						
Stylidiaceae		*Stylidium graminifolium*	Grass Triggerplant													
Thymelaeaceae		*Pimelea linifolia*	Slender Rice Flower						1							

Family	Exotic	Scientific Name	Common Name	TSC Status	EPBC Status	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	Plot 10	Plot 11
Uvulariaceae		*Tripladenia cunninghamii*	0			2						2	2		2	
Verbenaceae	*	*Lantana camara*	Lantana					2			0	1	2		2	
Verbenaceae	*	*Verbena bonariensis*	Purpletop								0					
Violaceae		*Hybanthus monopetalus*	Slender Violet-bush													
Violaceae		*Viola betonicifolia subsp. betonicifolia*	0				1									
Violaceae		*Viola hederacea*	Ivy-leaved Violet						1	2			2		2	
Vitaceae		*Cayratia clematidea*	Native Grape			1										
Vitaceae		*Cissus antarctica*	Water Vine										1		2	
Vitaceae		*Cissus hypoglauca*	Giant Water Vine			1		2	1		0				1	
Xanthorrhoeaceae		*Xanthorrhoea fulva*	0							1						
Xanthorrhoeaceae		*Xanthorrhoea minor subsp. minor*	0			1	1									
Xanthorrhoeaceae		*Xanthorrhoea spp.*	0								1					
Zingiberaceae		*Alpinia caerulea*	Native Ginger					2				2	2		1	

Flora species Plots 12-23

Family	Exotic	Scientific Name	Common Name	TSC Status	EPBC Status	Plot 12	Plot 13	Plot 14	Plot 15	Plot 16	Plot 17	Plot 18	Plot 19	Plot 2	Plot 21	Plot 22	Plot 23	Supplementary Area Search
Acanthaceae		*Brunoniella australis*	Blue Trumpet															
Acanthaceae		*Pseuderanthemum variabile*	Pastel Flower			2	2						1	1				
Adiantaceae		*Adiantum formosum*	Giant Maidenhair					1										
Adiantaceae		*Pellaea falcata*	Sickle Fern															
Apiaceae		*Centella asiatica*	Indian Pennywort							2								

Apiaceae		*Daucus glochidiatus*	Native Carrot															
Apiaceae	*	*Hydrocotyle bonariensis*							2	2								
Apocynaceae		*Parsonsia straminea*	Common Silkpod			2	1	1	2					2	1			
Araceae		*Gymnostachys anceps*	Settler's Twine					1					1					
Araliaceae		*Astrotricha latifolia*																X
Araliaceae		*Polyscias sambucifolia*	Elderberry Panax			1	1				1	1		2			1	
Arecaceae		*Livistona australis*	Cabbage Palm				2	2				1	3	1	3		2	
Aspleniaceae		*Asplenium flabellifolium*	Necklace Fern									2						
Asteliaceae		*Cordyline stricta*	Narrow-leaved Palm Lily			2		2			1		2		2	1		
Asteraceae	*	*Chrysanthemoides monilifera*										1	1					
Asteraceae	*	*Cirsium vulgare*	Spear Thistle															
Asteraceae	*	*Conyza bonariensis*	Flaxleaf Fleabane															
Asteraceae		*Euchiton involucratus*	Star Cudweed															
Asteraceae		*Euchiton sphaericus*	Star Cudweed															
Asteraceae	*	*Hypochaeris radicata*	Catsear			1			2	2	1						1	
Asteraceae		*Lagenophora stipitata*	Common Lagenophora			2										1	1	
Asteraceae		*Ozothamnus diosmifolius*	White Dogwood								1					1		
Asteraceae		*Senecio linearifolius*	Fireweed Groundsel															
Asteraceae	*	*Senecio madagascariensis*	Fireweed							2								
Asteraceae	*	*Senecio spp.*	Groundsel, Fireweed															
Asteraceae		*Senecio vagus subsp. eglandulosus*																
Asteraceae		*Solenogyne bellioides*	Solengyne															
Asteraceae	*	*Taraxacum officinale*	Dandelion			1			2							2		X (2)

Asteraceae		*Vernonia cinerea*				2	2		1						1			
Bignoniaceae		*Pandorea pandorana*	Wonga Wonga Vine			1								1				
Blechnaceae		*Blechnum cartilagineum*	Gristle Fern				2	2					2					
Blechnaceae		*Blechnum nudum*	Fishbone Water Fern															
Blechnaceae		*Doodia aspera*	Prickly Rasp Fern				2	2					2					
Boraginaceae		*Ehretia acuminata var. acuminata*	Koda															
Caryophyllaceae		*Stellaria flaccida*																
Caryophyllaceae	*	*Stellaria media*	Common Chickweed						1									
Casuarinaceae		*Allocasuarina littoralis*	Black She-Oak											3				
Casuarinaceae		*Allocasuarina spp.*																
Casuarinaceae		*Allocasuarina torulosa*	Forest Oak					3										X (2)
Casuarinaceae		*Casuarina glauca*	Swamp Oak			2			2	2								
Casuarinaceae		*Casuarina spp.*																
Celastraceae		*Maytenus silvestris*	Narrow-leaved Orangebark				1	1										
Clusiaceae		*Hypericum gramineum*	Small St John's Wort														1	
Clusiaceae		*Hypericum japonicum*																
Commelinaceae		*Aneilema acuminatum*																
Commelinaceae		*Commelina cyanea*	Native Wandering Jew							2								
Convolvulaceae		*Dichondra repens*	Kidney Weed								1					2		
Convolvulaceae		*Polymeria calycina*				1												
Cunoniaceae		*Callicoma serratifolia*	Black Wattle										2					

Cunoniaceae		*Schizomeria ovata*	Crabapple															
Cyperaceae		*Baumea teretifolia*													3	2		
Cyperaceae		*Carex appressa*	Tall Sedge										2					
Cyperaceae		*Carex longebrachiata*				3							3		3			
Cyperaceae		*Carex spp.*							2	2								
Cyperaceae		*Chorizandra sphaerocephala*	Roundhead Bristle-sedge						2						2			
Cyperaceae	*	*Cyperus brevifolius*															1	
Cyperaceae		*Cyperus flaccidus*	Lax Flat-sedge										2					
Cyperaceae		*Gahnia aspera*	Rough Saw-sedge					2		3			2					
Cyperaceae		*Gahnia clarkei*	Tall Saw-sedge			3			X						5	3		
Cyperaceae		*Gahnia sieberiana*	Red-fruit Saw-sedge											3				
Cyperaceae		*Lepidosperma laterale*	Variable Sword-sedge				2	2				2		2		2	1	
Cyperaceae		*Lepidosperma spp.*					1		1			2						
Cyperaceae		*Schoenoplectus spp.*																
Dennstaedtiaceae		*Hypolepis muelleri*	Harsh Ground Fern										2					
Dennstaedtiaceae		*Pteridium esculentum*	Bracken								2	2		3			1	
Dicksoniaceae		*Calochlaena dubia*	Rainbow Fern												2			
Dilleniaceae		*Hibbertia aspera*	Rough Guinea Flower								2	2		2			2	
Dilleniaceae		*Hibbertia dentata*	Twining Guinea Flower				2						1	1				
Dilleniaceae		*Hibbertia obtusifolia*	Hoary Guinea Flower			1												
Dilleniaceae		*Hibbertia scandens*	Climbing Guinea Flower			2	2				2			2		1		
Dilleniaceae		*Hibbertia spp.*															2	
Dryopteridaceae		*Lastreopsis decomposita*	Trim Shield Fern					3		1								
Ebenaceae		*Diospyros australis*	Black Plum					1					1					

Elaeocarpaceae		*Elaeocarpus reticulatus*	Blueberry Ash								3			2				
Elaeocarpaceae		*Tetratheca ericifolia*									1	2		1			2	
Ericaceae		*Epacris microphylla*	Coral Heath							2	1	2					2	
Ericaceae		*Leucopogon lanceolatus*									1							
Ericaceae		*Trochocarpa laurina*	Tree Heath				1	2										
Euphorbiaceae		*Homalanthus populifolius*	#N/A	#N/A									1					
Euphorbiaceae		*Baloghia inophylla*	Brush Bloodwood										1					
Fabaceae (Faboideae)		*Aotus ericoides*							2						2	1		
Fabaceae (Faboideae)		*Bossiaea heterophylla*	Variable Bossiaea									1					1	
Fabaceae (Faboideae)		*Desmodium rhytidophyllum*					1		1									
Fabaceae (Faboideae)		*Desmodium varians*	Slender Tick-trefoil				1				2							
Fabaceae (Faboideae)		*Dillwynia acicularis*									2							
Fabaceae (Faboideae)		*Glycine microphylla*	Small-leaf Glycine				1				2	1		1				
Fabaceae (Faboideae)		*Gompholobium pinnatum*	Pinnate Wedge Pea									1						
Fabaceae (Faboideae)		*Hardenbergia violacea*	False Sarsaparilla							1		1					1	
Fabaceae (Faboideae)		*Kennedia rubicunda*	Dusky Coral Pea															
Fabaceae (Faboideae)	*	*Medicago minima*	Woolly Burr Medic															
Fabaceae (Faboideae)		*Platylobium formosum subsp. formosum*																
Fabaceae (Faboideae)		*Podolobium ilicifolium*	Prickly Shaggy Pea									1						
Fabaceae (Faboideae)		*Podolobium scandens*	Netted Shaggy Pea									1						
Fabaceae		*Pultenaea daphnoides*	Large-leaf															

(Faboideae)			Bush-pea															
Fabaceae (Faboideae)		*Pultenaea linophylla*								1		2		1			1	
Fabaceae (Faboideae)		*Pultenaea spp.*				1												
Fabaceae (Faboideae)	*	*Trifolium spp.*	A Clover						1									
Fabaceae (Faboideae)	*	*Trifolium subterraneum*	Subterranean Clover															
Fabaceae (Mimosoideae)		*Acacia binervata*	Two-veined Hickory															
Fabaceae (Mimosoideae)		*Acacia floribunda*	White Sally															
Fabaceae (Mimosoideae)		*Acacia irrorata*	Green Wattle										2					X (3)
Fabaceae (Mimosoideae)		*Acacia linifolia*	White Wattle										3					X (3)
Fabaceae (Mimosoideae)		*Acacia longifolia subsp. longifolia*	Sydney Golden Wattle															
Fabaceae (Mimosoideae)		*Acacia myrtifolia*	Red-stemmed Wattle								2	2						
Fabaceae (Mimosoideae)		*Acacia stricta*	Straight Wattle								3							X (3)
Fabaceae (Mimosoideae)		*Acacia suaveolens*	Sweet Wattle									2						
Fabaceae (Mimosoideae)		*Acacia ulicifolia*	Prickly Moses								1	2					1	
Flacourtiaceae		*Scolopia braunii*	Flintwood															
Flagellariaceae		*Flagellaria indica*	Whip Vine															
Geraniaceae		*Geranium homeanum*				1					1							

Geraniaceae		*Geranium solanderi var. solanderi*																
Goodeniaceae		*Dampiera stricta*										1						
Goodeniaceae		*Goodenia hederacea*	Ivy Goodenia														2	
Goodeniaceae		*Goodenia heterophylla*									1	2		2				
Goodeniaceae		*Goodenia paniculata*				1			1							1	2	
Goodeniaceae		*Goodenia paniculata*								2								
Haloragaceae		*Gonocarpus tetragynus*	Poverty Raspwort			1	1			1		2					1	
Icacinaceae		*Pennantia cunninghamii*	Brown Beech															
Iridaceae		*Patersonia glabrata*	Leafy Purple-flag									2		1			1	
Iridaceae		*Patersonia sericea*	Silky Purple-Flag														1	
Juncaceae		*Juncus continuus*								1								
Juncaceae		*Juncus usitatus*							2	3								
Lamiaceae		*Clerodendrum tomentosum*	Hairy Clerodendrum				1	1					2					
Lauraceae		*Cryptocarya glaucescens*	Jackwood				1	4					3					
Lauraceae		*Cryptocarya microneura*	Murrogun					3					1					X (3)
Lindsaeaceae		*Lindsaea linearis*	Screw Fern														2	
Lobeliaceae		*Lobelia anceps*				1			1									
Lobeliaceae		*Lobelia anceps*																
Lobeliaceae		*Pratia purpurascens*	Whiteroot			2	2		2	2	2	1				1		
Lomandraceae		*Lomandra confertifolia subsp. rubiginosa*																
Lomandraceae		*Lomandra filiformis subsp. coriacea*	Wattle Matt-rush															
Lomandraceae		*Lomandra longifolia*	Spiny-headed Mat-rush			2	1	1	3	1		2		3	2		2	

Lomandraceae		Lomandra multiflora subsp. multiflora	Many-flowered Mat-rush									1						
Loranthaceae		*Muellerina eucalyptoides*															1	
Luzuriagaceae		*Eustrephus latifolius*	Wombat Berry			2	2							1		1		
Luzuriagaceae		*Geitonoplesium cymosum*	Scrambling Lily			2	2	2			2		1	1	1	1		
Malvaceae	*	*Modiola caroliniana*	Red-flowered Mallow															
Malvaceae	*	*Sida rhombifolia*	Paddy's Lucerne															
Meliaceae		*Synoum glandulosum subsp. glandulosum*	Scentless Rosewood				1											
Menispermaceae		*Sarcopetalum harveyanum*	Pearl Vine				1	2										
Menispermaceae		*Stephania japonica*	Snake vine				2				1		2					
Monimiaceae		*Wilkiea huegeliana*	Veiny Wilkiea				1	2										
Moraceae		*Ficus coronata*	Creek Sandpaper Fig										2					
Moraceae		*Ficus rubiginosa*	Port Jackson Fig															
Moraceae	*	*Ficus spp.*																
Moraceae		*Streblus brunonianus*	Whalebone Tree															
Myrsinaceae	*	*Anagallis arvensis*	Scarlet Pimpernel															
Myrsinaceae		*Myrsine variabilis*					2											
Myrtaceae		*Syzigium smithii*	Lilly Pilly										1					
Myrtaceae		*Angophora costata*	Sydney Red Gum								3	4		4			4	
Myrtaceae		*Backhousia sciadophora*	Shatterwood															
Myrtaceae		*Callistemon salignus*	Willow Bottlebrush			2									3			
Myrtaceae		*Corymbia maculata*	Spotted Gum															
Myrtaceae		*Eucalyptus*	White										3					

		acmenoides	Mahogany															
Myrtaceae		*Eucalyptus grandis*	Flooded Gum				4						4					
Myrtaceae		*Eucalyptus microcorys*	Tallowwood				4				4	1		3			2	
Myrtaceae		*Eucalyptus paniculata subsp. paniculata*					2											
Myrtaceae		*Eucalyptus pilularis*	Blackbutt									3		3				
Myrtaceae		*Eucalyptus piperita*	Sydney Peppermint														4	
Myrtaceae		*Eucalyptus propinqua*	Small-fruited Grey Gum					4										X (3)
Myrtaceae		*Eucalyptus punctata*	Grey Gum															
Myrtaceae		*Eucalyptus robusta*	Swamp Mahogany			4			5	2					3	4		
Myrtaceae		*Eucalyptus siderophloia*	Grey Ironbark															
Myrtaceae		*Eucalyptus spp.*																
Myrtaceae		*Leptospermum polygalifolium*	Tantoon									2						
Myrtaceae		*Lophostemon confertus*	Brush Box					3					2					
Myrtaceae		*Melaleuca linariifolia*	Flax-leaved Paperbark			3			3						4	3		
Myrtaceae		*Melaleuca quinquenervia*	Broad-leaved Paperbark			2			4	3					3			
Myrtaceae		*Melaleuca styphelioides*	Prickly-leaved Tea Tree													3		
Myrtaceae		*Rhodamnia rubescens*	Scrub Turpentine				2	2			1							
Myrtaceae		*Syncarpia glomulifera*	Turpentine				3	3					3	1				X (3)
Nyctaginaceae		*Pisonia umbellifera*	Birdlime Tree					3					3					
Ochnaceae	*	*Ochna serrulata*	Mickey Mouse Plant															
Oleaceae		*Notelaea longifolia*	Large Mock-olive				2	2										
Ophioglossaceae		*Ophioglossum lusitanicum*	Adder's Tongue												2			

Orchidaceae		*Cryptostylis subulata*	Large Tongue Orchid									1					2	
Orchidaceae		*Dendrobium tetragonum*	Tree Spider Orchid															
Orchidaceae		*Dipodium spp.*									1							
Orchidaceae		*Pterostylis spp.*	Greenhood															
Oxalidaceae		*Oxalis perennans*										1		1				
Passifloraceae		*Passiflora herbertiana*					1						2					
Phormiaceae		*Dianella caerulea var. producta*				1			2		2	2	2	2	2		2	
Phyllanthaceae		*Breynia oblongifolia*	Coffee Bush			1	1	2			2			2				
Phyllanthaceae		*Glochidion ferdinandi*	Cheese Tree			2					3	1	1	1	2		1	
Phyllanthaceae		*Phyllanthus similis*																
Pittosporaceae		*Billardiera scandens*	Hairy Apple Berry			1	2				2			2	1	2	2	
Pittosporaceae		*Pittosporum multiflorum*	Orange Thorn					2										
Pittosporaceae		*Pittosporum revolutum*	Rough Fruit Pittosporum														1	
Pittosporaceae		*Pittosporum undulatum*	Sweet Pittosporum												1			
Plantaginaceae	*	*Plantago lanceolata*	Lamb's Tongues							2								
Plantaginaceae		*Veronica plebeia*	Trailing Speedwell										1					
Poaceae	*	*Andropogon virginicus*	Whisky Grass						2	2		2				2	2	
Poaceae		*Austrodanthonia tenuior*	A Wallaby Grass								1							
Poaceae		*Austrostipa pubescens*										3					4	
Poaceae	*	*Axonopus fissifolius*	Narrow-leafed Carpet Grass			3			4		2					4	2	
Poaceae	*	*Briza maxima*	Quaking Grass							2								
Poaceae	*	*Briza minor*	Shivery Grass							2								

Poaceae		*Cynodon dactylon*	Common Couch			2	2		2	2						2		
Poaceae		*Deyeuxia decipiens*	Devious Bent-grass									2						
Poaceae		*Echinopogon caespitosus*	Bushy Hedgehog-grass														2	
Poaceae		*Echinopogon ovatus*	Forest Hedgehog Grass								2							
Poaceae		*Entolasia marginata*	Bordered Panic						1			2	2					
Poaceae		*Entolasia stricta*	Wiry Panic			2	2		2			2	2	2	3	2	2	
Poaceae		*Eragrostis brownii*	Brown's Lovegrass								2							
Poaceae	*	*Eragrostis curvula*	African Lovegrass							2								
Poaceae		*Imperata cylindrica*	Blady Grass						3	2	2				1	2		
Poaceae		*Microlaena stipoides*	Weeping Grass			2	3		2		2						2	
Poaceae		*Oplismenus aemulus*														2		
Poaceae		*Oplismenus imbecillis*				2	1	1			2				2			
Poaceae	*	*Paspalum dilatatum*	Paspalum							2								
Poaceae	*	*Pennisetum clandestinum*	Kikuyu Grass															
Poaceae		*Poa affinis*									2	3		1				
Poaceae	*	*Poa spp.*				1												
Poaceae	*	*Setaria pumila*	Pale Pigeon Grass															X(9)
Poaceae	*	*Setaria spp.*																
Poaceae	*	*Setaria viridis*	Green Pigeon Grass															
Poaceae	*	*Sporobolus africanus*	Parramatta Grass							1								
Poaceae	*	*Sporobolus fertilis*	Giant Parramatta Grass															X (9)
Poaceae	*	*Stenotaphrum secundatum*	Buffalo Grass						3									

Poaceae		*Themeda australis*	Kangaroo Grass								2	2					2	
Polygalaceae		*Comesperma ericinum*	Pyramid Flower									2					2	
Polygonaceae		*Muehlenbeckia gracillima*	Slender Lignum				1	2										
Polypodiaceae		*Platycerium superbum*	Staghorn															X (3)
Proteaceae		*Banksia spinulosa*	Hairpin Banksia									2						
Proteaceae		*Conospermum ellipticum*												2				
Proteaceae		*Lomatia silaifolia*	Crinkle Bush									2						
Proteaceae		*Persoonia levis*	Broad-leaved Geebung									1						
Proteaceae		*Persoonia levis*	Broad-leaved Geebung									1						
Proteaceae		*Persoonia linearis*	Narrow-leaved Geebung									2		2				
Putranjivaceae		*Drypetes deplanchei*	Yellow Tulipwood															
Ranunculaceae		*Clematis aristata*	Old Man's Beard															
Ranunculaceae		*Ranunculus plebeius*	Forest Buttercup			1												
Rhamnaceae		*Alphitonia excelsa*	Red Ash															
Rhamnaceae		*Pomaderris aspera*	Hazel Pomaderris															
Rhamnaceae		*Pomaderris ferruginea*					2											
Ripogonaceae		*Ripogonum brevifolium*	Small-leaved Supplejack										2		2			
Rosaceae	*	*Rubus fruticosus sp. agg.*	Blackberry complex			1												
Rosaceae		*Rubus moluccanus var. trilobus*	Molucca Bramble			2	2			3	2			1	2	1		
Rosaceae		*Rubus moluccanus var. trilobus*	Molucca Bramble										2					
Rosaceae		*Rubus parvifolius*	Native Raspberry															

Rosaceae		*Rubus rosifolius*	Rose-leaf Bramble															
Rubiaceae		*Galium propinquum*	Maori Bedstraw															
Rubiaceae		*Morinda jasminoides*	Sweet Morinda			2		2					1					
Rubiaceae		*Opercularia varia*	Variable Stinkweed															
Rubiaceae		*Pomax umbellata*	Pomax														1	
Rutaceae		*Boronia barkeriana*	Barker's Boronia									1						
Rutaceae	*	*Citrus spp.*									1							
Rutaceae		*Zieria smithii*	Sandfly Zieria											2		1	2	
Santalaceae		*Leptomeria acida*	Sour Currant Bush								1							
Sapindaceae		*Alectryon subcinereus*	Wild Quince										2					
Sapindaceae		*Dodonaea triquetra*	Large-leaf Hop-bush								2	2		5			2	
Smilacaceae		*Smilax australis*	Lawyer Vine				2						2		2		2	
Smilacaceae		*Smilax glyciphylla*	Sweet Sarsparilla						2		1		2	2			2	
Solanaceae		*Solanum prinophyllum*	Forest Nightshade															
Solanaceae		*Solanum pungetium*	Eastern Nightshade											1				
Solanaceae	*	*Solanum spp.*																
Stylidiaceae		*Stylidium graminifolium*	Grass Triggerplant														2	
Thymelaeaceae		*Pimelea linifolia*	Slender Rice Flower								1	2		1			1	
Uvulariaceae		*Tripladenia cunninghamii*					2	1										
Verbenaceae	*	*Lantana camara*	Lantana			1	2	3			1		3					
Verbenaceae	*	*Verbena bonariensis*	Purpletop															
Violaceae		*Hybanthus monopetalus*	Slender Violet-bush									1						
Violaceae		*Viola betonicifolia subsp. betonicifolia*										1						

Violaceae		*Viola hederacea*	Ivy-leaved Violet			2	2		2	2		1			2	1	1	
Vitaceae		*Cayratia clematidea*	Native Grape															
Vitaceae		*Cissus antarctica*	Water Vine					2					1					
Vitaceae		*Cissus hypoglauca*	Giant Water Vine				1	2					2					
Xanthorrhoeaceae		*Xanthorrhoea fulva*				1												
Xanthorrhoeaceae		*Xanthorrhoea minor subsp. minor*																
Xanthorrhoeaceae		*Xanthorrhoea spp.*																
Zingiberaceae		*Alpinia caerulea*	Native Ginger					2					2					

Fauna species

Class	Family	Exotic	Scientific Name	Common Name	TSC Status	EPBC Status	Observation Type
Actinopterygii	Poeciliidae	*	*Gambusia holbrooki*	Mosquito Fish			O
Amphibia	Myobatrachidae		*Adelotus brevis*	Tusked Frog			W
Amphibia	Hylidae		*Litoria dentata*	Bleating Tree Frog			W
Amphibia	Hylidae		*Litoria fallax*	Eastern Dwarf Tree Frog			W
Amphibia	Hylidae		*Litoria tyleri*				W
Amphibia	Myobatrachidae		*Pseudophryne coriacea*	Red-backed Toadlet			W
Aves	Cacatuidae		*Calyptorhynchus lathami*	Glossy Black-Cockatoo	V		O
Aves	Acanthizidae		*Acanthiza lineata*	Striated Thornbill			W
Aves	Meliphagidae		*Acanthorhynchus tenuirostris*	Eastern Spinebill			W
Aves	Ptilonorhynchidae		*Ailuroedus crassirostris*	Green Catbird			O
Aves	Megapodiidae		*Alectura lathami*	Scrub Turkey			O
Aves	Anatidae		*Anas superciliosa*	Pacific Black Duck			O
Aves	Meliphagidae		*Anthochaera carunculata*	Red Wattlebird			W
Aves	Meliphagidae		*Anthochaera chrysoptera*	Little Wattlebird			W
Aves	Ardeidae		*Ardea ibis*	Cattle Egret			O
Aves	Cacatuidae		*Cacatua galerita*	Sulphur-crested Cockatoo			W
Aves	Cuculidae		*Cacomantis flabelliformis*	Fan-tailed Cuckoo			W
Aves	Cuculidae		*Cacomantis pallidus*	Pallid Cuckoo			W
Aves	Centropodidae		*Centropus phasianinus*	Pheasant Coucal			W
Aves	Anatidae		*Chenonetta jubata*	Australian Wood Duck			O
Aves	Cuculidae		*Chrysococcyx lucidus*	Shining Bronze-Cuckoo			W
Aves	Pachycephalidae		*Colluricincla harmonica*	Grey Shrike-thrush			W
Aves	Campephagidae		*Coracina novaehollandiae*	Black-faced Cuckoo-shrike			W
Aves	Campephagidae		*Coracina tenuirostris*	Cicadabird			W
Aves	Climacteridae		*Cormobates leucophaea*	White-throated Treecreeper			W
Aves	Corvidae		*Corvus coronoides*	Australian Raven			W

Class	Family	Exotic	Scientific Name	Common Name	TSC Status	EPBC Status	Observation Type
Aves	Artamidae		*Cracticus nigrogularis*	Pied Butcherbird			O
Aves	Artamidae		*Cracticus tibicen*	Australian magpie			W
Aves	Artamidae		*Cracticus torquatus*	Grey Butcherbird			W
Aves	Alcedinidae		*Dacelo novaeguineae*	Laughing Kookaburra			W
Aves	Ardeidae		*Egretta novaehollandiae*	White-faced Heron			O
Aves	Cacatuidae		*Eolophus roseicapillus*	Galah			O
Aves	Petroicidae		*Eopsaltria australis*	Eastern Yellow Robin			W
Aves	Cuculidae		*Eudynamys orientalis*	Eastern Koel			W
Aves	Coraciidae		*Eurystomus orientalis*	Dollarbird			W
Aves	Rallidae		*Gallinula tenebrosa*	Dusky Moorhen			W
Aves	Acanthizidae		*Gerygone albogularis*	White-throated Gerygone			W
Aves	Acanthizidae		*Gerygone mouki*	Brown Gerygone			W
Aves	Psittacidae		*Glossopsitta concinna*	Musk Lorikeet			W
Aves	Psittacidae		*Glossopsitta pusilla*	Little Lorikeet	V		O
Aves	Accipitridae		*Haliaeetus leucogaster*	White-bellied Sea Eagle			O
Aves	Accipitridae		*Haliastur sphenurus*	Whistling Kite			O
Aves	Columbidae		*Leucosarcia picata*	Wonga Pigeon			O
Aves	Meliphagidae		*Lichenostomus chrysops*	Yellow-faced honeyeater			W
Aves	Columbidae		*Macropygia amboinensis*	Brown Cuckoo-Dove			W
Aves	Maluridae		*Malurus lamberti*	Variegated Fairywren			O
Aves	Meliphagidae		*Manorina melanocephala*	Noisy Miner			W
Aves	Meliphagidae		*Meliphaga lewinii*	Lewin's Honeyeater			W
Aves	Meliphagidae		*Melithreptus lunatus*	White-naped Honeyeater			W
Aves	Monarchidae		*Monarcha melanopsis*	Black-faced Monarch			W
Aves	Monarchidae		*Myiagra rubecula*	Leaden Flycatcher			S
Aves	Meliphagidae		*Myzomela sanguinolenta*	Scarlet honeyeater			W
Aves	Estrildidae		*Neochmia temporalis*	Red-Browed Finch			O
Aves	Oriolidae		*Oriolus sagittatus*	Olive-backed Oriole			W

Class	Family	Exotic	Scientific Name	Common Name	TSC Status	EPBC Status	Observation Type
Aves	Pachycephalidae		*Pachycephala pectoralis*	Golden Whistler			O
Aves	Pachycephalidae		*Pachycephala rufiventris*	Rufous Whistler			O
Aves	Pardalotidae		*Pardalotus striatus*	Striated Pardalote			W
Aves	Phalacrocoracidae		*Phalacrocorax sulcirostris*	Little Black Cormorant			O
Aves	Meliphagidae		*Philemon corniculatus*	Noisy Friarbird			W
Aves	Meliphagidae		*Phylidonyris novaehollandiae*	New Holland Honeyeater			O
Aves	Psittacidae		*Platycercus elegans*	Crimson Rosella			W
Aves	Psittacidae		*Platycercus eximius*	Eastern Rosella			O
Aves	Psophodidae		*Psophodes olivaceus*	Eastern Whipbird			W
Aves	Ptilonorhynchidae		*Ptilonorhynchus violaceus*	Satin Bowerbird			W
Aves	Rhipiduridae		*Rhipidura albiscapa*	Grey Fantail			W
Aves	Rhipiduridae		*Rhipidura rufifrons*	Rufous Fantail			O
Aves	Acanthizidae		*Sericornis frontalis*	White-browed Scrubwren			W
Aves	Artamidae		*Strepera graculina*	Pied Currawong			O
Aves	Alcedinidae		*Todiramphus sanctus*	Sacred Kingfisher			W
Aves	Psittacidae		*Trichoglossus chlorolepidotus*	Scaly-breasted Lorikeet			O
Aves	Psittacidae		*Trichoglossus haematodus*	Rainbow Lorikeet			W
Aves	Charadriidae		*Vanellus miles*	Masked Lapwing			O
Mammalia	Macropodidae		*Macropus giganteus*	Eastern Grey Kangaroo			P, O
Mammalia	Phascolarctidae		*Phascolarctos cinereus*	Koala	V	V	Z
Mammalia	Macropodidae		*Wallabia bicolor*	Swamp Wallaby			P
Reptilia	Agamidae		*Physignathus lesueurii*	Eastern Water Dragon			O

Appendix B – Threatened Biota Assessment

- NSW Office of Environment and Heritage (OEH) Wildlife Atlas database for records of threatened species listed under the TSC Act (OEH 2012a; data supplied by OEH on 26 September 2012).
- Only OEH (2012a) Wildlife Atlas records from 198 or later were considered. The date of the last record is included for any species which have not been recorded within the last 2 years.
- OEH NSW threatened species database online search for threatened ecological communities listed under the TSC Act (OEH 2012b database queried on 8 November 2012).
- Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) Protected Matters Online Search Tool for MNES listed under the EPBC Act and predicted to occur in the locality (DSEWPaC 2012; database queried on 8 November 2012).Notes;

Threatened Ecological Communities

Scientific Name	Common Name	TSC/FM Act	EPBC Act	Habitat Association	Nature of Record	Presence on site
TECs						
Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Coastal Saltmarsh	EEC	-	Occurs on landward side of mangrove stands in intertidal zones along the shores of estuaries and lagoons that are permanently or intermittently open to the sea. Characterised by *Baumea juncea, Juncus kraussii, Sarcocornia quinqueflora, Sporobolus virginicus, Triglochin striata, Isolepis nodosa, Samolus repens, Selliera radicans, Suaeda australis and Zoysia macrantha*, with occasional scattered mangroves occurring throughout the saltmarsh. Saltpans and tall reeds may also occur.	Predicted (OEH, 20122012b)	Not present
Freshwater	Freshwater	EEC	-	Occurs in coastal areas subject to periodic flooding with standing	Known (OEH,	Not present

Scientific Name	Common Name	TSC/FM Act	EPBC Act	Habitat Association	Nature of Record	Presence on site
Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Wetlands on Coastal Floodplains			fresh water for at least part of the year. Typically on silts, muds or humic loams below 2 m elevation in low-lying parts of floodplains, alluvial flats, depressions, drainage lines, backswamps, lagoons and lakes. Structure and composition varies spatially and temporally depending on the water regime, though is usually dominated by herbaceous plants and has few woody species.	20122012b)	
Hunter Lowland Redgum Forest in the Sydney Basin and New South Wales North Coast Bioregions	Hunter Lowland Redgum Forest	EEC	-	Occurs in the lower Hunter Valley, growing on Permian sediments on gentle slopes of depressions and drainage flats of the valley floor. Open forest dominated by *Eucalyptus tereticornis* and *E. punctata, over an open shrub layer commonly including Breynia oblongifolia, Leucopogon juniperinus, Daviesia ulicifolia* and *Jacksonia scoparia*. Ground cover comprises grasses and herbs.	Known (OEH, 20122012b)	Not present
Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Littoral Rainforest	EEC	CEEC	Occurs along the NSW coast, usually within 2 km of the ocean on a variety of substrates. Variable structure and composition, typically with closed canopy. Generally rainforest species with vines a major component.	Predicted (OEH, 20122012b)	Not present
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia		-	CEEC	Occurs close to the coast from northern Queensland southwards to eastern Victoria and on offshore islands. It occurs as a series of naturally disjunct and localised stands, on a range of landforms which have been influenced by coastal processes including dunes and flats, headlands and sea-cliffs. The vegetation generally is structurally diverse, with native trees, shrubs, vines and ground	Likely to occur within area (SEWPaC, 20122012)	Not present

Scientific Name	Common Name	TSC/FM Act	EPBC Act	Habitat Association	Nature of Record	Presence on site
				layers all potentially being present. The vegetation typically has a closed canopy.		
Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions	Lowland Rainforest	EEC	CEEC	The Hawkesbury River notionally marks the southern limit of Lowland Rainforest in the NSW North Coast and Sydney Basin bioregions. South of the Sydney metropolitan area, Lowland Rainforest is replaced by Illawarra Subtropical Rainforest of the Sydney Basin Bioregion. In the north of its range, Lowland Rainforest is found up to 6m above sea level, but in the Sydney Basin bioregion it is limited to elevations below 35 m. May be associated with a range of high-nutrient geological substrates, notably basalts and fine-grained sedimentary rocks, on coastal plains and plateaux, footslopes and foothills. In a relatively undisturbed state, it has a closed canopy, characterised by a high diversity of trees such as *Acacia irrorata, Acmena smithii, Alpinia caerulea, Backhousia* spp., and *Ficus* spp..	Known (OEH, 20122012b)	Not present
River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	River-Flat Eucalypt Forest	EEC	-	Occurs on flats, drainage lines and river terraces of coastal floodplains where flooding is periodic and soils generally rich in silt, lack deep humic layers and have little or no saline (salt) influence. Occurs south from Port Stephens in the NSW North Coast, Sydney Basin and South East Corner bioregions. Characterised by a tall open canopy layer of eucalypts with variable species composition.	Known (OEH, 20122012b)	Not present

Scientific Name	Common Name	TSC/FM Act	EPBC Act	Habitat Association	Nature of Record	Presence on site
Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion	Subtropical Coastal Floodplain Forest	EEC	-	Known from parts of the Local Government Areas of Tweed, Byron, Lismore, Ballina, Richmond Valley, Clarence Valley, Coffs Harbour, Bellingen, Nambucca, Kempsey, Hastings, Greater Taree, Great Lakes and Port Stephens, but may occur elsewhere in this bioregion. It has a tall open tree layer of eucalypts, angophoras, melaleucas and bloodwoods, which may exceed 4 m in height, but can be considerably shorter in regrowth stands or under conditions of lower site quality.	Known (OEH, 20122012b)	**Present.** Flooded Gum – brushbox moist forest in the subject land comprises an occurrence of the EEC.
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Swamp Oak Floodplain Forest	EEC	-	Typically occurs below 2m asl on waterlogged or periodically inundated flats, drainage lines, lake margins and estuarine fringes on coastal floodplains of NSW. Associated with grey-black clay-loams and sandy loams, saline or sub-saline groundwater. Structure variable from open forests to scrubs or reedlands with scattered trees. Canopy dominated by *Casuarina glauca* (north of Bermagui) or *Melaleuca ericifolia* (south of Bermagui). Understorey characterised by frequent occurrences of vines, a sparse cover of shrubs, and a continuous groundcover of forbs, sedges, grasses and leaf litter.	Known (OEH, 20122012b)	Not present
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner		EEC	-	Usually occurs below 2m asl (sometimes up to 5m). Associated with humic clay loams and sandy loams, on waterlogged or periodically inundated alluvial flats and drainage lines associated with coastal floodplains. Characterised by open to dense tree layer of eucalypts and paperbarks, with trees up to or higher than 25 m. Includes areas of fern land and tall reed or sedge land, where trees are sparse or absent.	Known (OEH, 20122012b)	**Present.** Swamp Mahogany forest in the subject land comprises an occurrence of the EEC.

Scientific Name	Common Name	TSC/FM Act	EPBC Act	Habitat Association	Nature of Record	Presence on site
Bioregion						
Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions		EEC	-	Found on a range of substrates in the NSW North Coast, Sydney Basin and South East Corner bioregions. Stands on sandstone are infrequent and small. Larger stands are found on old sand dunes above cliffs. *Themeda australis* is the dominant species. *Themeda australis* is an extremely widespread species, but in this community it may have a distinctive appearance, being prostrate and having glaucous leaves. These features are retained in cultivation and the form is believed to be genetically distinct. *Banksia integrifolia* subsp. integrifolia, *Westringia fruticosa* and *Acacia sophorae* occur as an emergent shrub or as a dense cover where they have recruited over grasslands.	Known (OEH, 20122012b)	Not present

Threatened Flora

Scientific Name	Common Name	TSC/FM Act	EPBC Act	Habitat Association	Nature of Record	Presence on site
Acronychia littoralis	Scented Acronychia	E	E	Scented Acronychia is found between Fraser Island in Queensland and Port Macquarie on the north coast of NSW. Scented Acronychia grows in littoral rainforest on sand.	Broadly suitable habitat present.	Not detected during survey. Possible as there is suitable habitat associated with the rainforest understorey of flooded gum moist forest in the subject land.
Allocasuarina simulans	Nabiac Casuarina	V	V	The Nabiac Casuarina is restricted to the mid-north coast of NSW, from Nabiac to Forster and is very rare. The Nabiac Casuarina grows in heathland on coastal sands. It is a straggling shrub of the sheoak family, 1 to 3 m in height. Like all sheoaks it has wiry foliage consisting of jointed branchlets rather than leaves.	**7 records** within 1 km (OEH, 20122012a) Species or species habitat likely to occur within area (SEWPaC, 20122012)	Not detected during survey. Unlikley as there is no suitable heathland on coastal sands in the subject land.
Allocasuarina defungens	Dwarf Heath Casuarina	-	E	Confined to the mid coast region of NSW, between Raymond Terrace and Port Macquarie. A small number of individuals have been located at Port Macquarie. Found in coastal areas of wet to dry, dense, low, closed heath land. Occurs in heath on sand, on clay soils and sandstone. The species also extends onto exposed nearby coastal hills or headlands adjacent to sandplains.	Species or species habitat likely to occur within area (SEWPaC, 20122012)	Not detected during survey. Unlikley as there is no suitable low closed heathland in the subject land.

Scientific Name	Common Name	TSC/FM Act	EPBC Act	Habitat Association	Nature of Record	Presence on site
Chamaesyce psammogeton	Sand Spurge	E	-	Sparse populations along the coast from south of Jervis Bay to Queensland. Grows on fore-dunes and exposed headlands, often with *Spinifex sericeous*.	**3 records** within 1 km (OEH, 20122012a)	Not detected during survey. Unlikley as there is no suitable fore dune habitat in the subject land.
Corunastylis littoralis	Tuncurry Midge Orchid	-	CE	The Tuncurry Midge Orchid is endemic to NSW where it is known from three populations in the Forster/Tuncurry district of the NSW North Coast. occurs on well-drained, open sand ridges in low dense heath dominated by Straggly Baeckea (*Ochrosperma lineare*), in sparse shrubland of Tree Broom-heath (*Monotoca elliptica*) and Daphne Heath (*Brachyloma daphnoides*), and in Teatree (*Leptospermum* spp.) thickets in Blackbutt (*Eucalyptus pilularis*) woodland, with little ground cover beneath the shrubs.	Species or species habitat known to occur within area (SEWPaC, 20122012)	Not detected during survey. Unlikley as there is no suitable well-drained, open sand ridges in the subject land.
Cryptostylis hunteriana	Leafless Tongue-orchid	-	V	Occurs in coastal areas from East Gippsland in Victoria, through coasal NSW, to southern Queensland. In NSW this species is highly localised. Habitat preferences not well defined. Grows in a wide vairety of habitats including coastal districts, heathlands, margins of coastal swamps and sedgelands, coastal forest, dry woodland, and lowland forest. Prefers open areas in the understorey and is often found in association with *Cryptostylis subulata* and the *Cryptostylis erecta*.	Species or species habitat may occur within area (SEWPaC, 20122012)	Not detected during survey. Possible as there is broadly suitable habitat in Blackbutt – Angophora forest and the margins of moist forest and swamp forest in the subject land.
Cynanchum elegans	White-flowered Wax Plant	E	E	Occurs from Gerroa (Illawarra) to Brunswick Heads and west to Merriwa in the upper Hunter. Most common near Kempsey. Usually occurs on the edge of dry rainforest or littoral rainforest, but also occurs in Coastal Banksia Scrub, open forest and	**1 record** within 1 km (OEH, 20122012a)	Not detected during survey. Possible as there is suitable habitat associated with the

Scientific Name	Common Name	TSC/FM Act	EPBC Act	Habitat Association	Nature of Record	Presence on site
				woodland, and Melaleuca scrub. Soil and geology types are not limiting.	Species or species habitat likely to occur within area (SEWPaC, 20122012)	rainforest understorey of flooded gum moist forest in the subject land.
Diuris praecox	Rough Doubletail	V	V	Known from between Bateau Bay and Smiths Lake. Grows on hills and slopes of near-coastal districts in open forests which have a grassy to fairly dense understorey. Exists as subterranean tubers most of the year. It produces leaves and flowering stems in winter.	**1 record** within 1 km (OEH, 20122012a) Species or species habitat likely to occur within area (SEWPaC, 20122012)	Not detected during survey. Possible as there is broadly suitable habitat in Blackbutt – Angophora forest in the subject land.
Lindernia alsinoides	Noah's False Chickweed	E	-	Recorded in coastal areas from Buladelah to Coopernook and with occurrences further north at Shannon Creek west of Coutts Crossing and also at Bungawalbyn. Grows in swamp forests and wetlands along coastal and hinterland creeks.	**1 record** within 1 km (OEH, 2012a) as well as a record on immediately adjacent land owned (Bell, M., Great Lakes Council, pers. comm.)	Not detected during survey. Possible as there is suitable habitat in Swamp Mahogany forest in the subject land.

Scientific Name	Common Name	TSC/FM Act	EPBC Act	Habitat Association	Nature of Record	Presence on site
Phaius australis	Lesser Swamp-orchid	E	E	Occurs in Queensland and north-east NSW as far south as Coffs Harbour. Historically, it extended farther south, to Port Macquarie. Found in swampy grassland or swampy forest including rainforest, eucalypt or paperbark forest, mostly in coastal areas.	Species or species habitat may occur within area (SEWPaC, 20122012). Recorded at North Tuncurry (Bell, M., Great Lakes Council, pers. comm.)	Not detected during survey. Possible as there is suitable habitat in Swamp Mahogany forest in the subject land
Senecio spathulatus	Coast Groundsel	E	-	Occurs in Nadgee Nature Reserve (Cape Howe) and between Kurnell in Sydney and Myall Lakes National Park (with a possible occurrence at Cudmirrah). In Victoria there are scattered populations from Wilsons Promontory to the NSW border. Coast Groundsel grows on frontal dunes.	**1 record** within 1 km (OEH, 20122012a)	Not detected during survey. Unlikley as there is no suitable fore dune habitat in the subject land.
Streblus pendulinus	Siah's Backbone,	-	E	Occurs in south-east New South Wales. Found in warmer rainforests, chiefly along watercourses. The altitudinal range is from near sea level to 8 m above sea level. The species grows in well developed rainforest, gallery forest and drier, more seasonal rainforest.	Species or species habitat likely to occur within area (SEWPaC, 20122012)	Not detected during survey. Possible as there is suitable habitat associated with the rainforest understorey of flooded gum moist forest in the subject land.

Scientific Name	Common Name	TSC/FM Act	EPBC Act	Habitat Association	Nature of Record	Presence on site
Syzygium paniculatum	Magenta Lilly Pilly	E	V	Occurs in narrow coastal strip from Bulahdelah to Conjola State Forest. Grows in rainforest on sandy soils or stabilised Quaternary sand dunes at low altitudes in coastal areas, often in remnant littoral or gallery rainforests.	**8 records** within 1 km (OEH, 20122012a) Species or species habitat likely to occur within area (SEWPaC, 20122012)	Not detected during survey. Possible as there is suitable habitat associated with the rainforest understorey of flooded gum moist forest in the subject land.
Tetratheca juncea	Black-eyed Susan	-	V	Regarded as extinct within the Sydney area, current range from Wyong north to Bulahdelah and inland 5km to edge of Sugarloaf Range. Occurs predominately in areas of over 1 mm annual rainfall, within dry sclerophyll forest, and sometimes heath and moist forest, with a preference for Coastal Plains Smooth-barked Apple Woodland and Coastal Plains Scribbly Gum Woodland.	Species or species habitat likely to occur within area (SEWPaC, 20122012)	Not detected during survey. Unlikley as the subject land is outside the species' known geographic range.
Thesium australe	Austral Toadflax,	-	V	Found in small, scattered populations along the east coast, northern and southern tablelands. Occurs in grassland or grassy woodland, and is often found in association with Kangaroo Grass (*Themeda australis*). Also grows on outer branches and branchlets of rainforest trees; coast and coastal ranges.	Species or species habitat likely to occur within area (SEWPaC, 20122012)	Not detected during survey. Possible as there is broadly suitable habitat in Blackbutt – Angophora forest and the margins of moist forest and swamp forest in the subject land.

Scientific Name	Common Name	TSC/FM Act	EPBC Act	Habitat Association	Nature of Record	Presence on site
Tylophora woollsii	Cryptic Forest Twiner	E	E	The Cryptic Forest Twiner is found from the NSW north coast and New England Tablelands to southern Queensland, but is very rare within that range. Known on the Tablelands from the Bald Rock and Boonoo Boonoo areas north of Tenterfield. This species grows in moist eucalypt forest, moist sites in dry eucalypt forest and rainforest margins.	Broadly suitable habitat present.	Not detected during survey. Possible as there is suitable habitat associated with the rainforest understorey of flooded gum moist forest in the subject land.

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