NATURECALL ENVIRONMENTAL

Statutory Ecological Assessment:

Project:

Rural-Residential Subdivision of Lot 280 DP 1098732, Cnr Maria River Road and Crescent Head Road, Crescent Head.

Client:

Mid Coast Environmental Services

September 2014

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Executive Summary

The 129.1ha property is located approximately 2km west of Crescent Head, on the corner of Maria River Rd and Crescent Head Rd. It is currently a rural property long used for cattle grazing, with a dwelling and 3 dams. Most of the property is flood-prone, and falls within a SEPP 14 Coastal Wetland. The assessment focuses on the northwest corner of the property which falls on a ridgeline, as the landuse on the remainder of the property is not expected to significantly change due to current statutory restrictions and zoning.

The 16ha site's vegetation predominantly consists of derived grassland, with very sparse scattered trees; a small area of mostly regrowth dry sclerophyll forest; some patches of swamp forest; and part of a billabong. The remainder of the property was not thoroughly investigated, but generally consists of a mosaic of derived pasture/wet meadow and swamp forest with aquatic vegetation in a linear billabong (a paleo-channel) and Connection Creek (which forms the eastern to southern boundary.

No threatened flora species were detected on site, but *Maundia triglochinoides* was considered a potential occurrence in the remainder of the property eg Connection Creek. In addition, three EECs dominate the floodplain and drainage line on site and on the remainder of the property. These were *Swamp Oak Floodplain Forest of the New South Wales North Coast Bioregion, Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions* and *Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions*.

The majority of the site is mapped under the KSC CKPoM as Potential Koala Habitat, but survey determined it was not Core Koala Habitat due to lack of evidence indicating Koalas regularly use the site. The fauna survey found limited hollow-bearing trees on the site but no threatened species were detected (however survey techniques were limited). A large number of mostly wide ranging threatened species were considered to have potential to use the site or more so better habitats in the study area and remainder of the property, as a small part of their home range.

The proposal is for a two stage subdivision and the creation of 14 new Large Lots, with 3 lots attached to the residual land which is mostly SEPP 14. The area proposed to support the new dwellings is within the northwestern section of the existing lot on a flood-free ridge which is mostly cleared. As the site is largely cleared, the proposal will result in the loss of a minimal number of trees. All new dwellings will be required to be located to avoid removal of any Koala Food Tree as listed under the KSC CKPoM; or hollow-bearing tree.

Recommendations are made to permanently retain all Koala Food Trees and hollow-bearing trees on the site, and ensure dwellings do not impact these habitat components.

It is acknowledged that the proposed development will have the generic negative effect of removal of some potential foraging habitat, and hence reduced carrying capacity. However, in context of the ecology of potentially occurring threatened species, and the site's habitat limitations: the proposal is not considered likely to have an impact of sufficient order of magnitude to place a local population at risk of extinction. Hence no referral to DoE or a Species Impact Statement is considered required.

1.0 Introduction

Biodiversity Australia Pty Ltd trading as Naturecall Environmental (hereafter referred to as 'Naturecall') has been requested by Mid Coast Environmental to undertake a statutory ecological assessment for a proposed subdivision of Lot 280 DP 1098732, Cnr Maria River Road and Crescent Head Road, Crescent Head (Figure 1). The findings of this assessment are to be submitted with the Development Application (DA) to Kempsey Shire Council (KSC).

The proposal is for a two stage subdivision and the creation of 14 new lots. The area proposed to support the new dwellings is within the northwestern section of the existing lot on a flood-free ridge which is mostly cleared.

The statutory ecological assessment for this development proposal was undertaken in accordance with the *Environmental Planning and Assessment Act 1979*, as amended by the *Threatened Species Conservation* (TSCA) *Act 1995* which in turn has been amended by the *Threatened Species Conservation Legislation Amendments Act 2002* (Seven Part Test for Significance); NSW SEPP 44 - *Koala Habitat Protection* (KSC CKPoM assessment); and the Commonwealth *Environment Protection and Biodiversity Conservation* (EPBCA) *Act 1999* - Matters of National Environmental Significance (MNES).

The survey and assessment was performed in consideration of the draft *Threatened Species Survey and Assessment – Guidelines for Developments and Activities* (DEC 2004), and the *Threatened Species Assessment Guidelines – Assessment of Significance* (DECC 2007). The assessment has also been undertaken in accordance with the Ecological Consultants Association of NSW – Code of Ethics (2002) available at www.ecansw.org.au.

2.0 Background Information

2.1. Development Proposal

As shown in Figures 2-3, the development proposal is two stage, and includes closure of an unformed Crown Road. The first stage is to subdivide the 129.1ha property into 3 rural Lots ie Lots 2081 (47.69ha), 2082 (44.84ha) and 2083 (41.2ha). The second stage will see subdivision of the northwestern ridgeline into 11 rural-residential and 3 rural lots.

Lots 1-6 and 8-10 will be a minimum of 1ha rural-residential/Large Lots. Lots 7, 11 and 14 will be rural Lots of 41ha, 37.3ha and 41.22ha respectively. All lots have dwelling locations above the 1:100 ARI, with remainder of the rural lots contain the majority of the flood prone land.

All new dwellings will be required to be located to avoid removal of any Koala Food Tree (KFT) as listed under the KSC Comprehensive Koala Plan of Management (CKPoM); or hollow-bearing tree.

2.2. Location of the Study Site and Key Definitions

The 129.1ha property is located is located approximately 2km northwest of Crescent Head, on the corner of Maria River Rd and Crescent Head Rd (Figure 1). Maria River Rd runs along its western boundary, with two small parts of Lot 2083 located west of this road. Crescent Road runs along the northern boundary, and the eastern and southern boundary is provided by Connection Creek.

The **site** is defined as the area proposed for the Large Lots and all dwellings, and is approximately 16ha in area. The **property** is defined as the total 129.1ha property currently known as Lot 208 DP 1098732.

The **study area** is land within 100m of the site, and the **locality** is land within a 10km radius of the site

Photo 1: View of the site looking north-east from Maria River Road
(Source: Google Maps 2014)

Photo 2: View of the site from Crescent Head Road

(Source: Google Maps 2014)

Figure 1: Site location and property extent

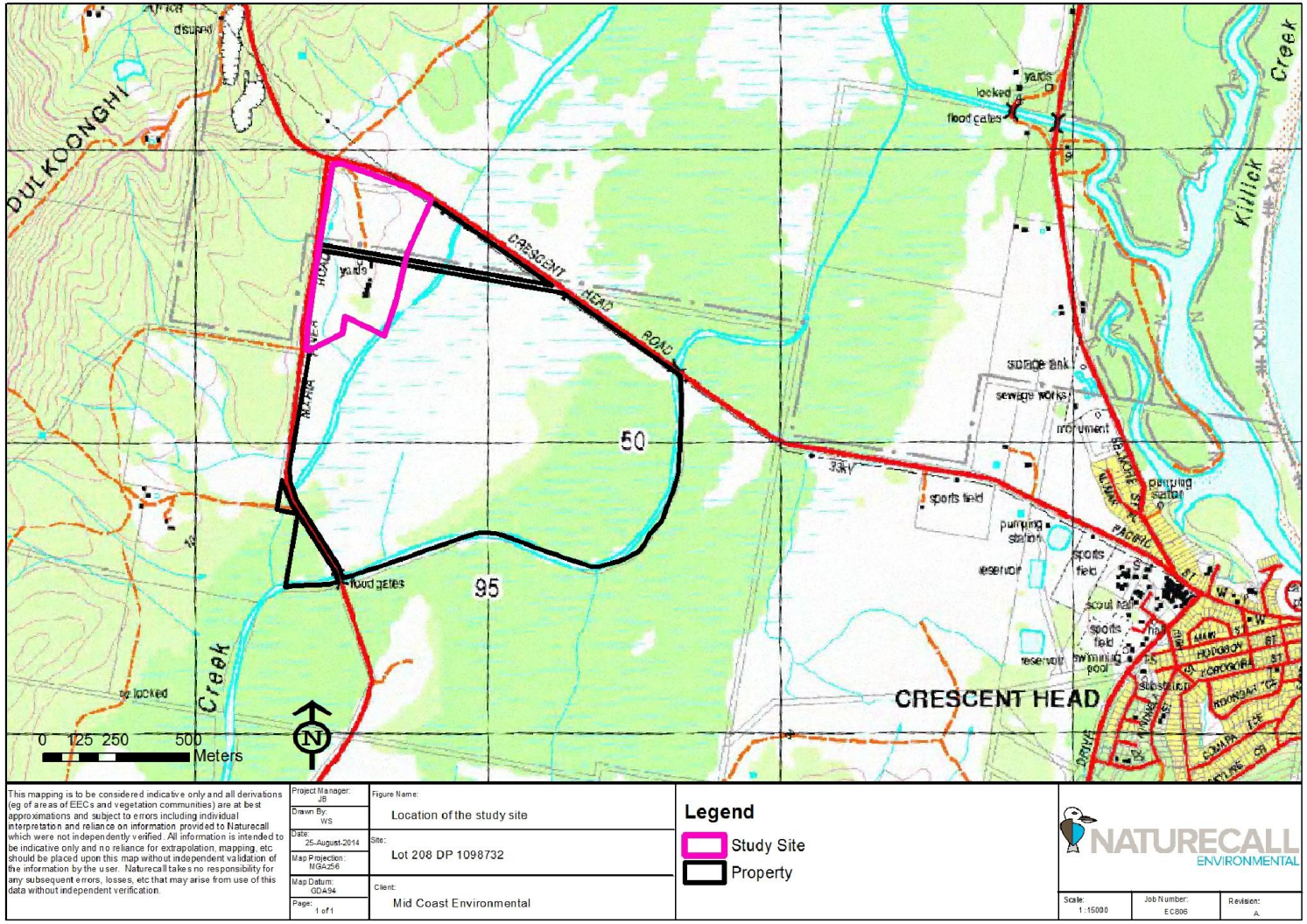


Figure 2: Stage 1 rural lots

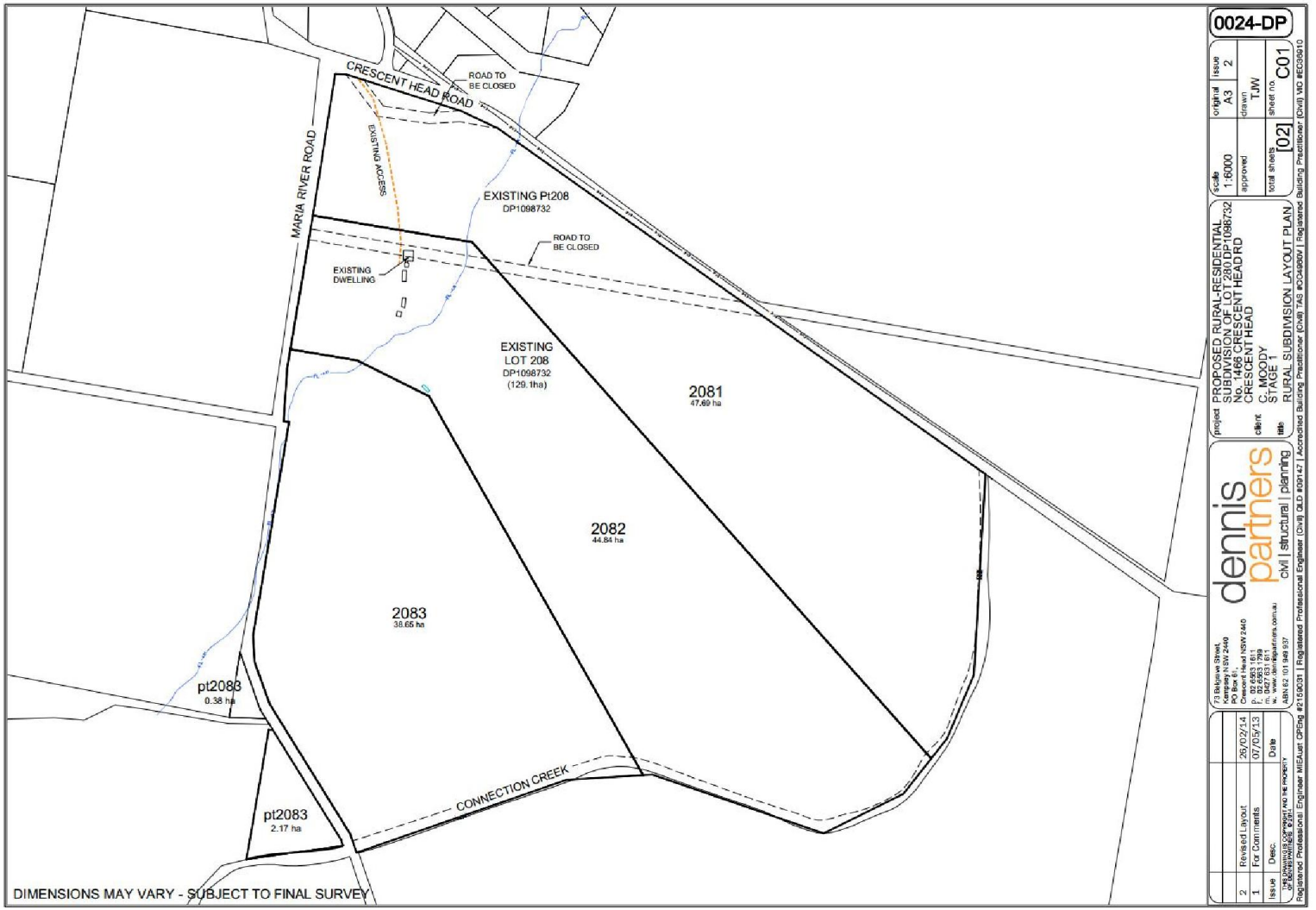
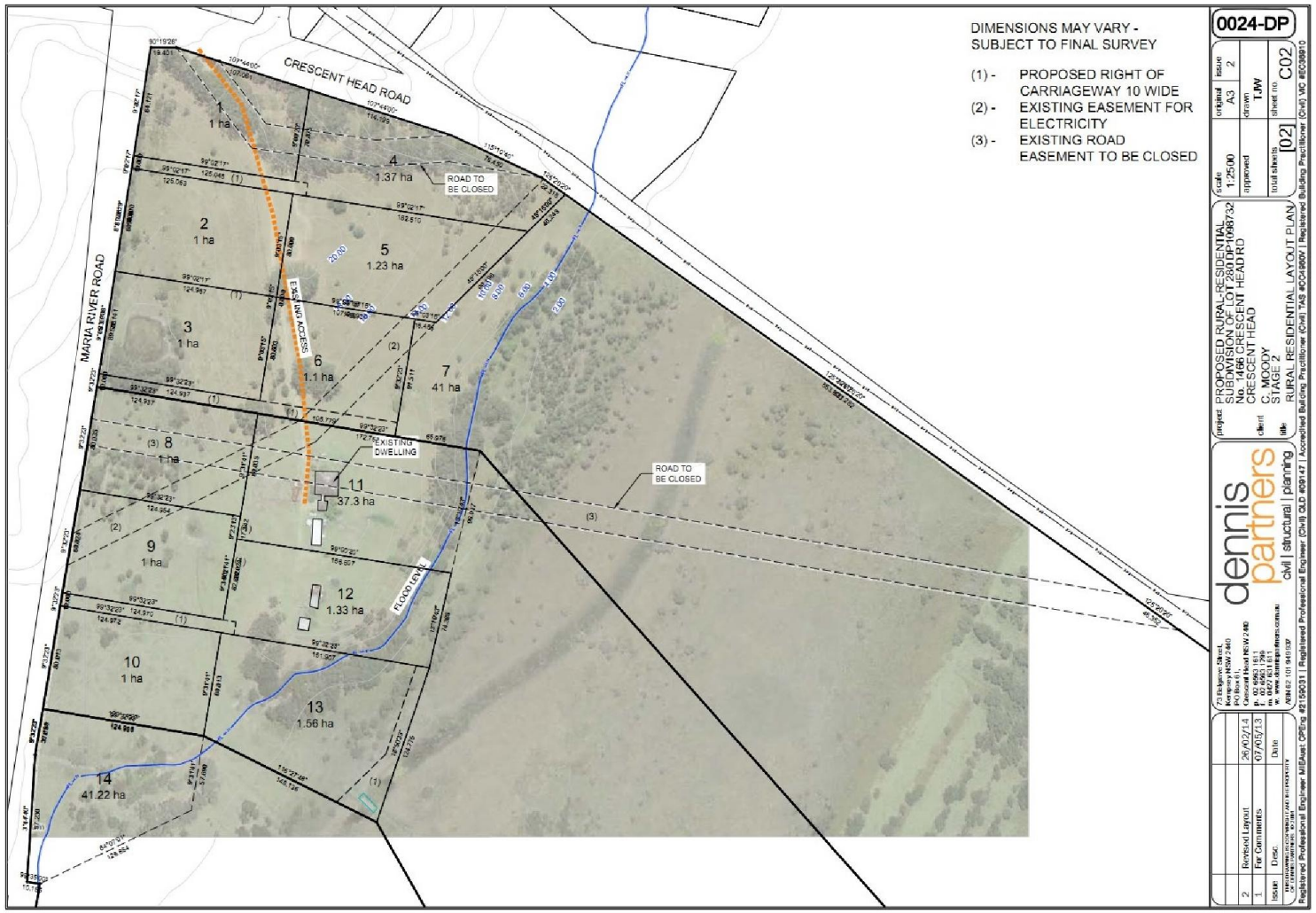


Figure 3: Stage 2 rural and Large Lots



2.3. Soils, Topography and Geology

The property in general is dominated by a floodplain rising to the northwest to a low ridge which forms a foothill of the adjacent Dulconghi Hill.

The ridgeline has an average elevation of 18m with a maximum of 30m above sea level, falling down a short steep slope to the floodplain in the east; a more gradual slope to the south; and a moderate to gentle slope to a drainage line with a dam in the west-southwest, before beginning to rise again at the western and northwest boundary to Maria River Rd.

Connection Creek, a tributary of Maria River, forms the eastern to southeastern property boundary. A modified billabong (a paleo-channel) occurs near the foot of the eastern slope. Both this and western drainage link to Connection Creek.

In terms of Quaternary soil landscape mapping (see Figure 4), the northwestern portion of the property is underlain by Permian Basin bedrock, which comprises a sandstone conglomerate; with the drainage line in the west-southwest including an alluvial plain in the form of valley fill. The balance of the property occurs on a floodplain associated with Connection Creek. This is made up of a mosaic of several alluvial plain units defined by Troesdon and Hashimoto (2008) as ‘backswamp’, ‘alluvial palaeochannel fill and inter-levee swale’, and ‘floodplain’.

Detailed geotechnical investigations have not been undertaken over the site and a field inspection noted the soils comprised clay loams in the elevated areas, and saturated heavy clays in the low lying parts of the site.

2.4. Landuse and Disturbance History

2.4.1. Clearing and Land Use

The subject land is located approximately 2km west-northwest of the town of Crescent Head. The site is generally surrounded by forested rural land to the west and south; rural-residential and hobby farms to the north, and large areas of forested or wetland-dominated rural Lots to the east.

The property supports a current dwelling, and has long been used for pastoralism supporting beef cattle. The site and most of the property has evidently been previously cleared. Three dams have been constructed.

On site, forest vegetation occurs in the northern end, the eastern slope, and in patches along the west to southwest of the site. An inspection noted most of the vegetation is regrowth with some large and several senescent trees present.

The highest ecological values occur in the wetland to the east, which forms part of SEPP 14 – *Coastal Wetlands* #479. This vegetation is comprised of three Endangered Ecological

Communities, and offers excellent support habitat for threatened species such as the Wallum Froglet and Black-necked Stork (see section 4).

Within its broader length in the catchment, Connection Creek has been modified in the past as part of historical attempts to increase the extent of arable land. This saw deepening and formal alignment to Maria River in the wider landscape, resulting in saltwater intrusion and activation of Acid Sulfate Soils (ASS) in various areas and under certain conditions. Some historical work is likely to have occurred on the property to reduce standing water time.

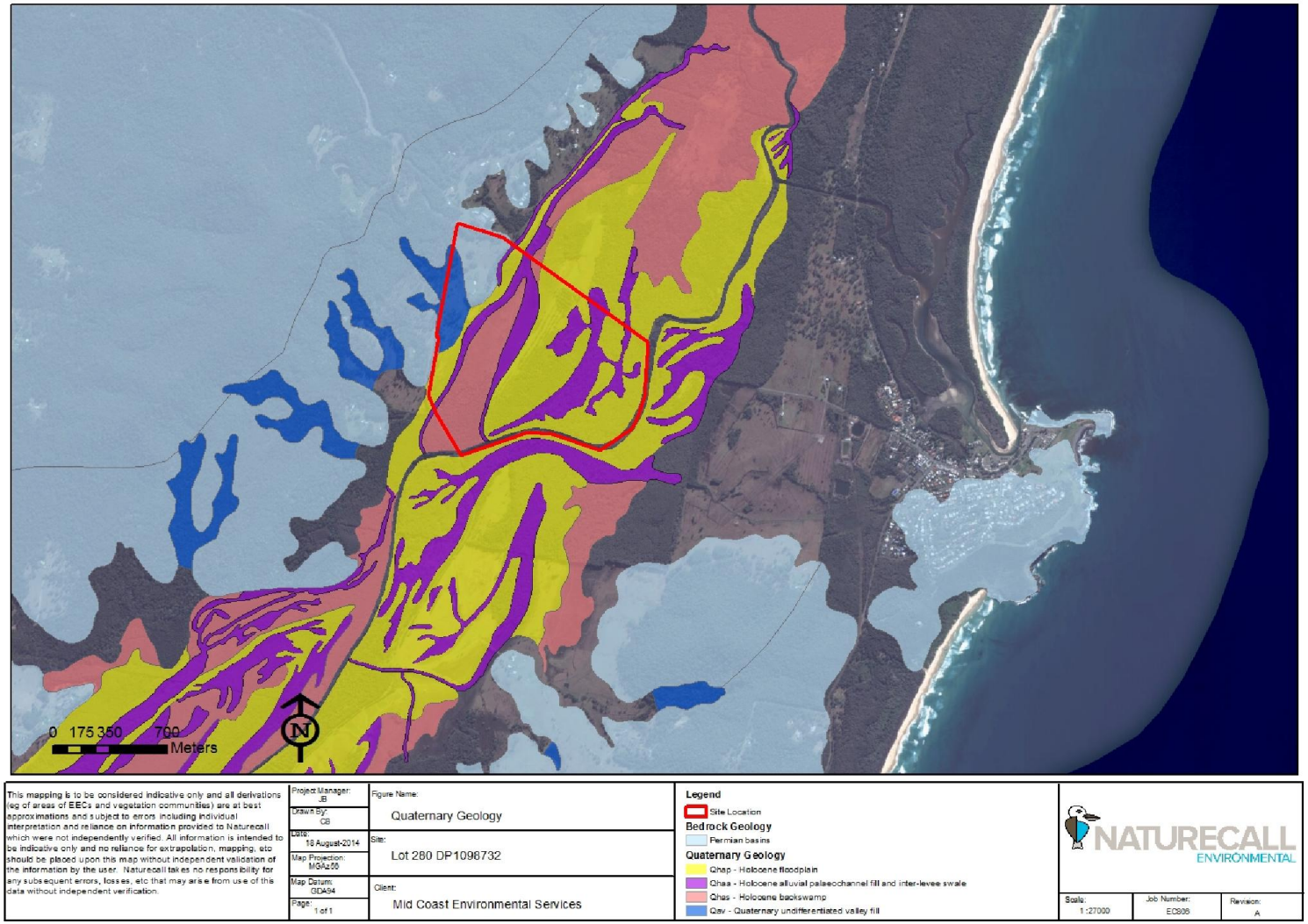
2.4.2. Fire History and Weed Invasion

The previous fire history of the site was not obtained, but the vegetation showed no signs of recent fires, hence any previous fires likely would have likely exceeded >20 years.

Weed infestations on the site predominantly consist of exotic pasture grasses such as Whisky Grass, Carpet Grass, Common Paspalum and Parramatta Grass. Lantana and Blackberry thickets are also common along edges of the site.

These weeds also occur in parts of the remainder of the property.

Figure 4: Quaternary geology



3.0 Flora Survey

While some broad-scale survey was undertaken over the property, the majority of investigations were restricted to the 16ha site for the following reasons:

- No proposal to remove or modify habitat outside the site.
- Vegetation removal post-DA is regulated by provisions of SEPP 14 and the *Native Vegetation Act 2003*.
- Client specification/budget constraints.

Current vegetation mapping (Telfer & Kendall 2006) was used to map the vegetation communities on the rest of the property (see Figure 7).

3.1. Survey and Assessment Methodology

The flora survey essentially routinely consists of three components:

- Identification, description and mapping of the major vegetation communities on site.
- Identification, mapping and condition assessment of any Endangered Ecological Communities listed under the *Threatened Species Conservation Act 1995* (TSC Act), *and Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on the property.
- Searches for and (if found) mapping of threatened species listed under the *Threatened Species Conservation Act 1995* (TSCA), and *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA). This was limited to the site.

3.1.1. Species Identification:

Species identification was made with the assistance of PlantNET, GTCC (2007), Bale (1993), Beadle (1982), Harden (1990, 91, 92, 93, 2000), Williams and Harden (1984), Williams and Harden (1980), Robinson (1994), and Brooker and Kleinig (1999). Plant species were identified to species or subspecies level and nomenclature conforms to that currently recognized by the Royal Botanic Gardens and follows Harden and PlantNET for changes since Harden (1990-1992, 2000).

3.1.2. Vegetation Communities

3.1.2.1. Vegetation Community Description and Mapping

Vegetation communities on site were surveyed over one day by a foot traverse of the entire site, rather than via plots and transects. This was the most effective survey method due to the limited native vegetation present, and site could be effectively covered many times in a day. The remainder of the property was surveyed only by a random meander/slow drive to identify the broad characteristics and extent of vegetation types for habitat evaluation.

Sub-formation names for vegetation types were adapted from the classification proposed by Keith (2004) e.g. 'Dry Sclerophyll Forest' to assist the fauna habitat evaluation, and the structural

classification used by Walker and Hopkins (1990). Biometric classifications were determined by reference to the Biometric Vegetation Types Database (http://www.environment.nsw.gov.au/vegetation/eoam/index.htm).

3.1.2.2. Conservation Status Assessment:

Identification of possible Threatened Ecological Communities (TECs) was based on the data collected by the survey and review of the relevant listings on the OEH website (www.environment.nsw.gov.au) and Department of Environment – MNES SPRAT website (DoE 2014a).

3.1.3. Threatened Flora Species Searches and Occurrence Assessment

3.1.3.1. Searches

Searches for the locally recorded threatened flora recorded in the LGA and regionally (OEH 2014a, DoE2014b) in similar habitats to those occurring on the site (see Appendix 1), were carried out over the survey period.

The site was intensively searched during the flora survey, consisting of undertaking random meanders throughout all habitats on site with targeted searches of potential habitat for locally and regionally recorded threatened species.

As noted above, intensive searches were not undertaken over the remainder of the property.

3.1.3.2. Potential Occurrence Assessment:

Potential occurrence assessment of threatened flora species is provided in Appendix 1. This section assesses all considered threatened species listed under the TSCA 1995 and EPBCA 1999 for their potential to occur on site based on the following factors (DEC 2004, Forest Fauna Surveys 1997, DECC 2007):

- Presence/absence of suitable habitat.
- Condition and disturbance history of habitat.
- Local and regional records.
- Location of site within known distribution of the species.
- Connectivity with habitat where species is known to occur.

3.1.4. Survey Limitations

The study site was intensively traversed by foot during specific flora surveys and during other survey activities during the survey period. The limited extent of the site and its condition led a very high level in confidence that any threatened species potentially present would have been detected. However, as noted above, the remainder of property was not intensively searched.

While the survey was undertaken in winter when most plants are generally not flowering or may be dormant, the condition of the site and the habitats present indicated this was not likely to be a limitation on detectability of threatened plants.

Regardless, any short-term survey will only provide a list of plants detected during a brief interval of time (DEC 2004). The total species list of an area is usually much greater than can be detected in such a short time and it can be influenced by factors such as: size of the property, fire history, time since disturbance, flowering season (particularly orchids), and presence of reproductive material (DEC 2004). As the focus was on detection of threatened species, a comprehensive inventory of all species present was not obtained.

3.2. Flora Survey Results

3.2.1. Site Vegetation Communities

Refer to the vegetation maps in Figures 5 and 6 and site photos following.

The site has been largely previously cleared for agriculture, with only pockets of modified vegetation remaining around the periphery with the remainder comprising pasture and scattered trees. The remainder of the property comprises wet meadows/pasture, and highly modified to intact swamp forest dominated by either Swamp Oak or Broad-leaved Paperbark.

Table 1: Modified dry sclerophyll forest

Vegetation Community	**Modified Very Tall/Dry Sclerophyll Open Forest**
Biometric Vegetation Class	Blackbutt – Pink Bloodwood shrubby open forest of the coastal lowlands of the North Coast.
Keith (2000) Vegetation Formation	Dry Sclerophyll Forests (shrub/grass subformation)
Location and Area	Occurs as a narrow strip along the northern boundary with a finger occurring above the floodplain in the east. Total area on site is 2.72ha.
Description	**(a) Canopy:** *Structure and Species*: Comprises an open canopy ranging from 18-25 m in height with Diameter at Breast Height (DBH) ranging from 40-180cm. Dominated by Blackbutt (*Eucalyptus pilularis*) with occasional Pink Bloodwood (*Corymbia intermedia*), Grey Ironbark (*E. siderophloia*) and Tallowwood (*E. microcorys*). Brush Box (*Lophostemon confertus*) also occurs in the eastern patch. **(b) Understorey:** *Structure and Species*: Generally open to sparse with height ranging from 10-15m.

	Comprises a mix of young canopy trees, Black Oak (Allocasuarina littoralis), Sydney Golden Wattle (*Acacia longifolia subsp. longifolia*) and Camphor Laurel (*Cinnamomum camphora**). **(c) Shrub Layer:** *Structure and Species*: The shrub layer is patchy and ranges from 1-3m in height where present. Lantana (*Lantana camara**) and Mock-olive (*Notelaea longifolia*) were the most common species recorded while Wild Tobacco (*Solanum mauritianum**), Coffee Bush (*Breynia oblongifolia*), Dogwood (*Ozothamnus diosmifolius*) and Rice Flower (*Pimelea linifolia*) were common occurrences. **(d) Ground Layer:** *Structure and Species*: Features an open to dense groundcover dominated by grasses such as Blady Grass (*Imperata cylindrica*), Whisky Grass (*Andropogon virginicus**) and Basket Grass (*Oplismenus aemulus*), along with Spiny Matrush (*Lomandra longifolia*) and pasture weeds such as Fireweed (*Senecio madagascariensis**) and Thistle (*Cirsium vulgare**). **Lianas, scramblers, epiphytes, mistletoe etc.:** Absent
Condition	Generally in poor condition due to weed invasion, underscrubbing and historic clearing.
Threatened plants recorded or potential habitat	None recorded during survey and none considered potential occurrences due to lack of records and level of disturbance.
Threatened Ecological Community or Endangered Population	No. Does not occur on floodplain

Table 2: Swamp Oak swamp forest

Vegetation Community	**Tall Open/Swamp Oak Swamp Forest**
Biometric Vegetation Class	Swamp Oak Swamp Forest of the coastal lowlands of the North Coast
Keith (2000) Vegetation Formation	Forested Wetlands
Location and Area	Small patches occur in the east and west of the site on the slope. Also occurs extensively on the remainder of the property on the floodplain.
Description	**(a) Canopy:** *Structure and Species:* Canopy ranges from open to dense depending on disturbance history. Height ranges from 15-20m with DBH ranging from 15-30cm.

	Dominated by Swamp Oak (*Casuarina glauca*) with occasional Forest Red Gum (*Eucalyptus tereticornis*) and Broad-leaved Paperbark (*Melaleuca quinquenervia*). **(b) Understorey:** *Structure and Species*: This layer was generally sparse to absent and ranged from 4-10m in height and merged with the canopy in some areas. Where present, Cheese Tree (*Glochidion ferdinandi),* Flax-leaf Paperbark (*Melaleuca linariifolia*) and canopy juveniles were the dominant species. **(c) Shrub Layer:** *Structure and Species:* Rarely present due to cattle grazing. A few patches of Lantana occur along with scattered shrubs such as Coffee Bush (*Breynia oblongifolia), Sannantha angusta* and *Persoonia conjuncta.* **(d) Ground Layer:** *Structure and Species*: Comprises a low, dense layer of grasses and sedges such as Carpet Grass (*Axonopus fissifolius**), Broad-leaved Paspalum (*Paspalum mandiocanum**), Saw Sedge (*Gahnia clarkei*), Spiny Matrush and Tall Sedge (*Carex appressa*). **(e) Lianas, scramblers, etc.:** Occasional Monkey Rope (*Parsonsia straminea*) and Sweet Morinda (*Morinda jasminoides*) present in the understorey.
Condition	Low condition overall due to historic clearing, weed invasion and cattle grazing.
Threatened plants recorded or potential habitat	None recorded during survey. Poor potential habitat for threatened plants.
Threatened Ecological Community or Endangered Population	Yes. Qualifies as the EEC *Swamp Oak Floodplain Forest.* See section 3.3 below.

Table 3: Broad-leaved Paperbark swamp forest

Vegetation Community	**Tall Open/Broad-leaved Paperbark Swamp Forest**
Biometric Vegetation Class	Paperbark swamp forest of the coastal lowlands of the North Coast
Keith (2000) Vegetation Formation	Forested Wetlands
Location and Area	A 0.5ha patch occurs in the south of the site. This community also occurs extensively on the remainder of the property.
Description	**(a) Canopy:** *Structure and Species:* Features an open canopy of mature to senescent trees ranging from 15-23m in height and DBH ranging from 30-120cm.

	Dominated by Broad-leaved Paperbark with a few Forest Red Gum and Swamp Oak. **(b) Understorey:** *Structure and Species*: Patches of understorey trees fringe the community to 10m in height. Comprises young canopy trees and a few Strangler Figs (*Ficus sp.*). **(c) Shrub Layer:** *Structure and Species*: Absent aside from a few patches of Lantana and Cockspur Thorn (*Maclura cochinchinensis*) and scattered shrubs such as Bush Lemon (*Citrus X taitensis**), Tuckeroo (*Cupaniopsis anacardioides)* and Mock-olive (*Notelaea longofolia*). **(d) Ground Layer:** *Structure and Species*: Comprises a dense layer of grasses, sedges and herbs to 0.7m in height. Dominated by Tall Sedge, Common Paspalum, Basket Grass and Native Violet, along with weeds such as Fireweed and Blackberry (*Rubus anglocandicans*).* **(e) Lianas, scramblers, etc.:** Absent
Condition	Poor condition due to a range of edge effects and damage from cattle grazing.
Threatened plants recorded or potential habitat	None recorded. Contains potential habitat for *Maundia triglochinoides* however this plant was not found during the survey.
Threatened Ecological Community or Endangered Population	Yes. Qualifies as the EEC *Swamp Sclerophyll Forest.* See section 3.3 below.

Table 4: Pasture

Vegetation Community	**Pasture/wet pasture**
Biometric Vegetation Class	N/A
Keith (2000) Vegetation Formation	N/A
Location and Area	Occurs over the majority of the site and covers approximately 11.5ha.
Description	**(a) Canopy/Understorey:** *Structure and Species:* Occasional isolated eucalypts to 25m in height. Tallowwood and Forest Red Gum were the most common. **(c) Shrub Layer:**

	Structure and Species: Absent, aside from a few shrubs along fencelines including Camphor Laurel, Dogwood, Wild Tobacco and Lantana. **(d) Ground Layer:** *Structure and Species*: Comprises a dense layer of common pasture grasses and weeds along with native species. Common Paspalum, Carpet Grass, Parramatta Grass (*Sporobolus africanus**) were the dominant species overall. Other common to occasional species in the pasture included Blady Grass, Fireweed, Tall Sedge, Lambs Tongue (*Plantago lanceolata**) and White Clover (*Trifolium repens**). Areas of wet pasture contained a few aquatic species such as River Buttercup (*Ranunculus innundatus*), Gotu-Kola (*Centella asiatica*), Tall Sedge, Frogsmouth (*Philydrum lanuginosum*) and *Juncus sp.,* along with Carpet Grass. **(e) Lianas, scramblers, etc.:** Occasional Blackberry thickets.
Condition	Poor – very few native species present.
Threatened plants recorded or potential habitat	None recorded and poor potential habitat.
Threatened Ecological Community or Endangered Population	No – does not meet floristic criteria.

Table 5: Aquatic vegetation

Vegetation Community	**Miscellaneous aquatic vegetation**
Biometric Vegetation Class	N/A
Keith (2000) Vegetation Formation	N/A
Location and Area	Occurs in the farm dams on site, the billabong, and also in Connection Creek in the southeast.
Description	**(a) Canopy/Understorey:** Absent **(c) Shrub Layer:** Absent **(d) Ground Layer:**

	Structure and Species: The farm dams contained a few aquatic species such as Frogsmouth, Lesser Joyweed (*Alternanthera denticulata*), Water Ribbons (*Triglochin procera*), *Myriophyllum sp*. and *Eleocharis equisetina.* The section of Connection Creek on site was dominated by Water Ribbons with patches of Frogsmouth. **(e) Lianas, scramblers, etc.:** Absent
Condition	Poor – low species diversity and degraded from cattle trampling.
Threatened plants recorded or potential habitat	None recorded and poor potential habitat.
Threatened Ecological Community or Endangered Population	Yes – possibly Freshwater Coastal Wetlands on Coastal Floodplains in the billabong, but not in the dams as they are artificial structures.

Photo 3: Dry sclerophyll forest

Photo 4: Swamp Oak forest

Photo 5: Paperbark swamp forest

Photo 6: Pasture

Photo 7: Farm dam in south of site

Figure 5: Site vegetation communities

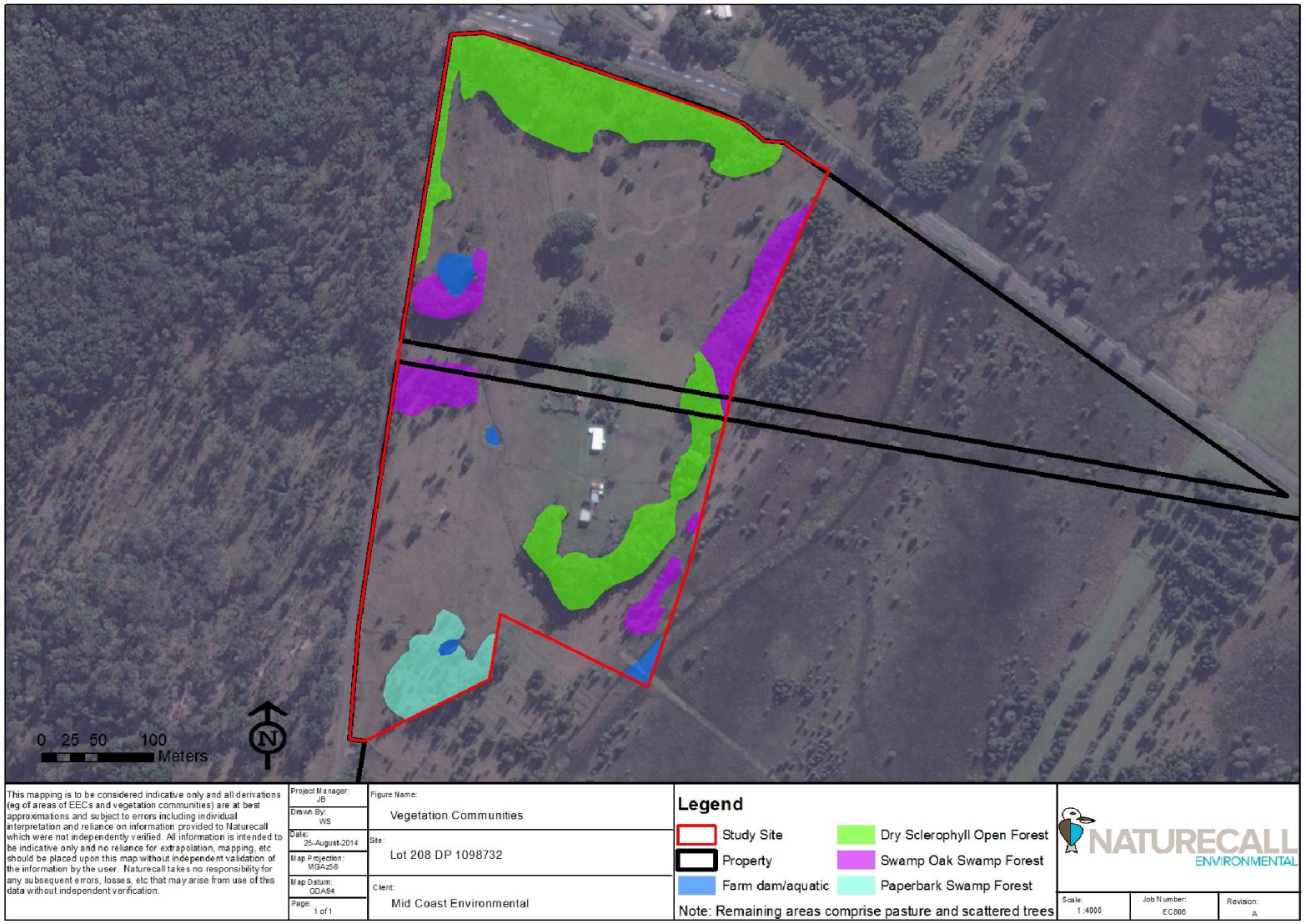
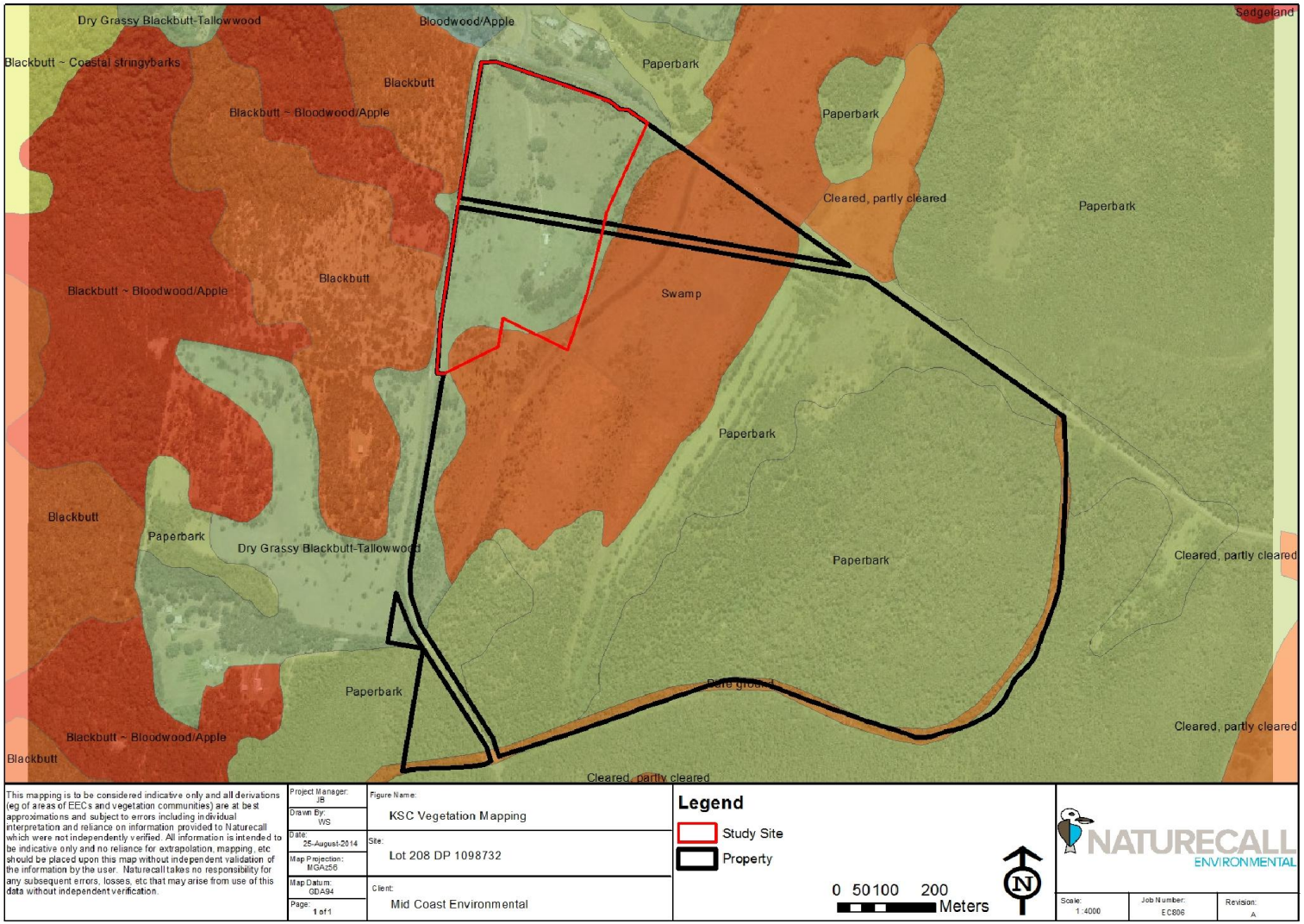


Figure 6: KSC vegetation mapping of the property

(Source: Telfer & Kendall 2006)



3.3. Threatened Ecological Communities

This site and property overall contains three vegetation communities which qualify as a Threatened Ecological Communities listed under the TSC Act 1995:

3.3.1. *Swamp Sclerophyll Forest on Coastal Floodplains* EEC

3.3.1.1. Final Determination Listing Criteria

"Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions" is a characteristic ecological community listed as Endangered under the TSC Act 2004 (NSWSC 2004d). This Endangered Ecological Community (EEC) is associated with humic clay loams and sandy loams, on waterlogged or periodically inundated alluvial flats and drainage lines associated with coastal floodplains. *Swamp Sclerophyll Forest on Coastal Floodplains* (SSFCF) generally occurs below 20 m (though sometimes up to 50 m) elevation, often on small floodplains or where the larger floodplains adjoin lithic substrates or coastal sand plains. The structure of the community is typically open forest (but may be reduced to scattered trees via disturbance), and in some areas the tree stratum is low and dense i.e. a scrub. The community also includes some areas of fernland and tall reedland or sedgeland where trees are very sparse or absent. The most widespread and abundant dominant trees include *Eucalyptus robusta* and *Melaleuca quinquenervia*.

3.3.1.2. Site and Property Evaluation

The drainage line in the west to southwestern portion of the site is mapped at the 1:25 000 scale as occurring on an alluvial soil landscape (Troedson & Hashimoto 2008), in the form of undifferentiated Valley Fill. This area of the site as well as the alluvial floodplain to the east on the property thus meets the geomorphological requirements of the Final Determination for *Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions* (NSWSC 2004d).

Floristically, the Broad-leaved Paperbark swamp forest vegetation occurring within this area and on the remainder of the property meets the floristic criteria for this EEC, with recorded native species matching the species listed under the Final Determination for this EEC. This vegetation is characterised by *Melaleuca quinquenervia,* which is dominant within the canopy layer. Forest Red Gum and Swamp Oak were also noted within this stratum.

The paperbark forest occurring within the southwestern section of the site and on the floodplain to the east therefore qualifies as part of the '*Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions* "EEC as it matches the key floristic descriptors, soil type, habitat and ecological process indicators described by the NSW Scientific Committee's Final Determination (NSWSC 2004d).

3.3.2. Swamp Oak Floodplain Forest EEC

3.3.2.1. Final Determination Listing Criteria

"*Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions*" is an EEC associated with grey-black clay-loams and sandy loams, where the groundwater is saline or sub-saline, on waterlogged or periodically inundated flats, drainage lines, lake margins and estuarine fringes associated with coastal floodplains. *Swamp Oak Floodplain Forest* (SOFF) generally occurs below 20m (rarely above 10m) elevation.

The structure of the community may vary from open forests to low woodlands, scrubs or reedlands with scattered trees. SOFF has a dense to sparse tree layer in which Swamp Oak (*Casuarina glauca)* is the dominant species. Other trees including *Acmena smithii*, *Glochidion* spp. And *Melaleuca* spp. May be present as subordinate species. The understorey is characterised by frequent occurrences of vines i.e. *Parsonsia straminea, Geitonoplesium cymosum* and *Stephania japonica* var. *discolor*, a sparse cover of shrubs, and a continuous groundcover of forbs, sedges, grasses and leaf litter (NSWSC 2004b).

3.3.2.2. Site and Property Evaluation

As shown in Figure 4, soil landscapes derived from alluvial processes occur in the drainage line in the west to southwest of the site, and the remainder of the property which forms part of a large floodplain (Troedson & Hashimoto 2008). This portion of the site and the property thus meets the geomorphological requirements of the Final Determination for *Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions* (NSWSC 2004b).

In floristic terms, the small patches of vegetation associated with these areas of the site meet the floristic criteria for this EEC, with recorded native species matching the species listed under the Final Determination for this EEC. Swamp Oak (*Casuarina glauca)* was recorded as the dominant canopy species in the patches of swamp forest occurring along the middle portion of the western boundary, along the middle of the northeastern boundary, and the southeastern corner of the site; with *Melaleuca quinquenervia* and Cheese Tree (*Glochidion ferdinandi)* also occasionally observed. The ground layer comprised a low, dense layer of exotic grasses and native sedges including Saw Sedge (*Gahnia clarkei*), Spiny Mat-Rush (*Lomandra longifolia*) and Tall Sedge (*Carex appressa*). Swamp Oak also occurs in localised abundance on other parts of the property within a complex mosaic of paperbark-dominated swamp forest.

The Swamp Oak swamp forest vegetation occurring across the site and property therefore qualifies as part of the '*Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions*" EEC as it matches the key floristic descriptors, soil type, habitat and ecological process indicators described by the NSW Scientific Committee's Final Determination (NSWSC 2004b).

3.3.3. Freshwater Coastal Wetlands EEC

3.3.3.1. Final Determination Listing Criteria

"*Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions*" is an EEC associated with periodic or semi-permanent inundation by freshwater, (including areas with minor saline influence). They typically occur on silts, muds or humic loams in depressions, flats, drainage lines, backswamps, lagoons and lakes associated with coastal floodplains i.e. habitats where flooding is periodic and standing fresh water persists for at least part of the year in most years (NSWSC 2004e).

The *Freshwater Wetlands on Coastal Floodplains* EEC generally occur below 20m elevations, and the structure of the community varies from sedgelands and reedlands, to herbfields. Woody species of plants are generally scarce. The structure and composition of the community varies both spatially and temporally depending on the water regime (Yen and Myerscough 1989, Boulton and Brock 1999).

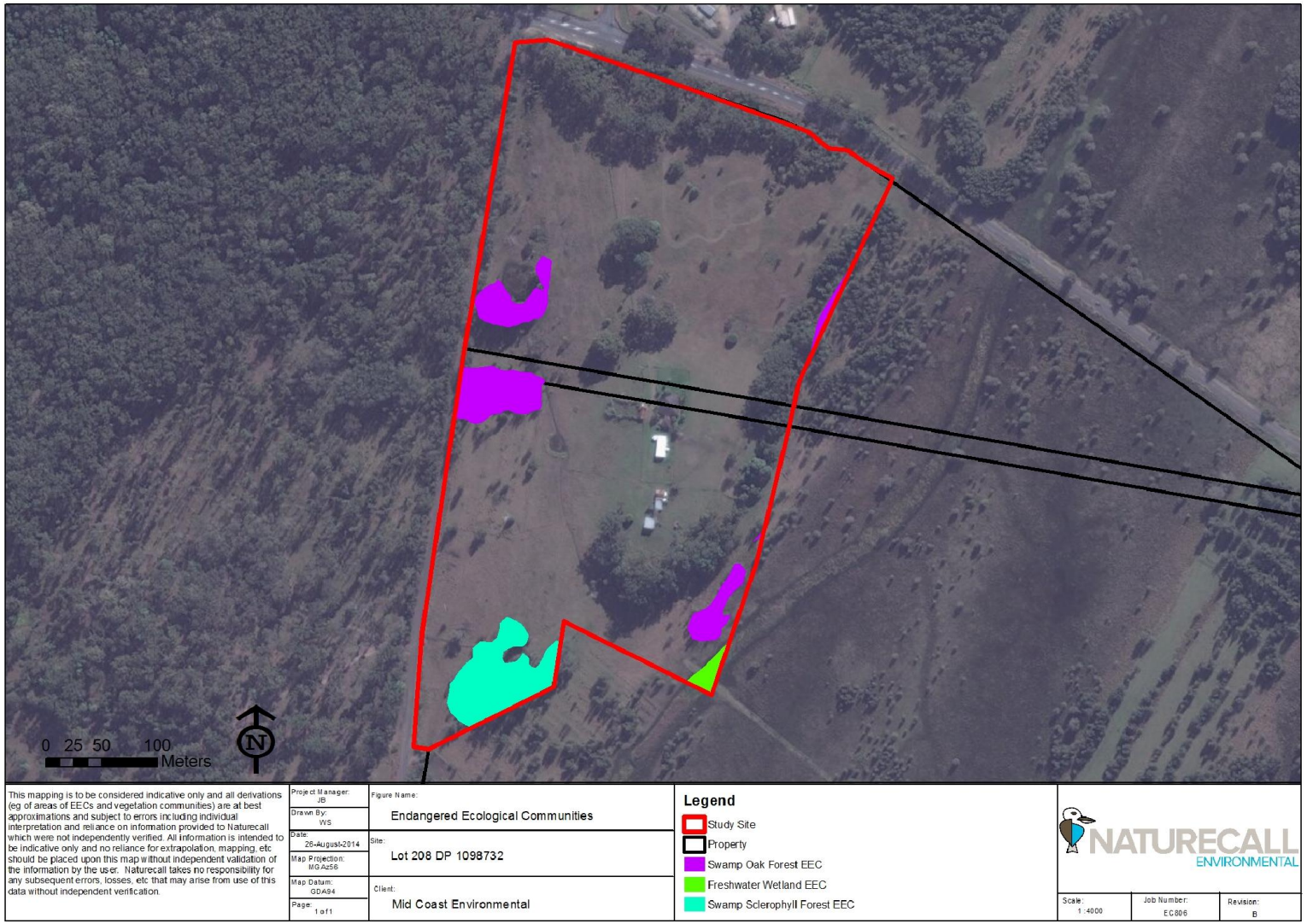
3.3.3.2. Site and Property Evaluation

As shown in Figure 5, soil landscapes derived from alluvial processes occur in the drainage line in the west to southwest of the site, and the remainder of the property (including Connection Creek and various paleo-channels which include a billabong which just falls within the site) which forms part of a large floodplain (Troedson & Hashimoto 2008). This portion of the site and the property thus meets the geomorphological requirements of the Final Determination for *Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions* (NSWSC 2004e).

In floristic terms, the vegetation within the billabong just within the site and running along the eastern base of the ridge line, as well as on other parts of the floodplain on the property meets the floristic criteria of the Final Determination for this EEC. This EEC also occurs other parts of the property as wet meadows, sedgelands and aquatic herbfields within a complex mosaic of paperbark and Swamp Oak dominated swamp forest. Such complex mosaics and intergrades are recognised in the Final Determinations for all Coastal Floodplain EECs, and may be the result of micro-topographical variations, disturbance history (eg clearing and drainage), hydrological regime variations (eg El Nino seasons), or a combination of all or several of these factors.

The 3 dams on site also fall on alluvial soils and contain aquatic vegetation which matches the Final Determination, but artificial wetland structures built on floodplains are specifically excluded from the Final Determinations, hence these do not form part of this EEC (NSWSC 2004e).

Figure 7: Endangered Ecological Communities recorded on the site



3.4. Other listed Threatened Ecological Communities and Populations

A summary review of TECs and Endangered Populations listed under the TSC Act 1995 and EPBC Act 1999 which occur in the North Coast Bioregion (OEH 2014b, DoE 2014a) and their potential for occurrence on site or in the study area, is provided in the following table.

Table 6: Review of TECs and Endangered Populations

Act	Literature Review	Significance
TSC Act	"***River-flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions***" is an EEC associated with silts, clay-loams and sandy loams on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains. *River-flat Eucalypt Forest on Coastal Floodplains* (RfEF) generally occurs below 50m elevations, but may occur on localised river flats up to 250m above sea level. In the North Coast, the most widespread and abundant dominant trees include *Eucalyptus tereticornis, E. amplifolia, Angophora floribunda, A. subvelutina*, *E. saligna* and *E. grandis.*	Vegetation meeting the floristic criteria of this EEC does not occur on the site, study area or property.
TSC Act	***"Subtropical Coastal Floodplain Forest of the NSW North Coast bioregion"*** is a characteristic ecological community listed as Endangered. This Endangered Ecological Community (EEC) is associated with clay-loams and sandy loams, on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains. Subtropical Coastal Floodplain Forest (SCFF) generally occurs below 50 m, but may occur on localised river flats up to 250 m elevation in the NSW North Coast bioregion. While the composition of the SCFF tree stratum varies considerably, the most widespread and abundant dominant canopy trees include *Eucalyptus tereticornis*, *E. siderophloia*, *Corymbia intermedia*, and *Lophostemon suaveolens* (latter only north of the Macleay floodplain).	Vegetation meeting the floristic and geomorphological criteria of this EEC does not occur site, study area or property.
TSC Act	"***Lowland Rainforest on Floodplains on the NSW North Coast Bioregion***" generally occupies riverine corridors and alluvial flats with rich, moist silts often in sub-catchments dominated by basic volcanic substrates. Small, scattered remnants remain on the floodplains of the Tweed, Richmond, Clarence, Bellinger, Macleay, Hastings, Manning, and Hunter Rivers. In its natural state, this community supports a rich diversity of flora and fauna. Tree species often present include Figs, (*Ficus spp.*), Palms (*Archontophoenix cunninghamiana, Livistona australis*), Lilly Pilly's (*Syzygium spp.*) and vines (*Cissus spp., Pandorea pandorana, Flagellaria indica*).	Vegetation meeting the floristic criteria of this EEC does not occur site, study area or property

Act	Literature Review	Significance
TSC Act	***"Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregion***" has been listed as an Endangered Ecological Community since December 2006 on Schedule 1 – Part 3 of the TSC Act 1995. Lowland Rainforest, in a relatively undisturbed state, has a closed canopy, characterised by a high diversity of trees whose leaves may be mesophyllous and encompass a wide variety of shapes and sizes. Typically, the trees form three major strata: emergents, canopy and sub-canopy which, combined with variations in crown shapes and sizes, give the canopy an irregular appearance (Floyd 1990). The trees are taxonomically diverse at the genus and family levels, and some may have buttressed roots. A range of plant growth forms are present in Lowland Rainforest, including palms, vines and vascular epiphytes. Scattered eucalypt emergents may occasionally be present. In disturbed stands the canopy continuity may be broken, or the canopy may be smothered by exotic vines.	Vegetation meeting the floristic criteria of this EEC does not occur on site, study area or property.
EPBC Act	***"Lowland Rainforest of Subtropical Australia"*** is found from Maryborough to the Hunter. Predominantly occurs on basalt and alluvial soils, or enriched rhyolitic and metasediments. Generally occurs <300m above sea level but may occur >300m on north-facing slopes, and only in areas with annual rainfall >1300mm. May intergrade with ***Littoral Rainforest and Coastal Vine Thickets*** but usually occurs >2km from ocean. Typically tall (20-30m) closed forest often with multiple tree layers dominated by diversity of rainforest species with emergent non-rainforest species constituting <30%. Emergents are typically figs, Hoop Pine and Brushbox.	Vegetation meeting the floristic criteria of this EEC does not occur on site, study area or property.
TSC Act	***"Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions"*** is typically a closed forest, the structure and composition of which is strongly influenced by its proximity to the ocean. The plant species of this community are predominantly rainforest species while emergent Eucalypts or Lophostemons are present in some stands. This community grows only in coastal areas within maritime influence on sand dunes and soil derived from underlying rocks.	Vegetation meeting the floristic and geomorphological criteria of this EEC does not occur on site, study area or property.
EPBC Act	"***Littoral Rainforest and Coastal Vine Thickets of Eastern Australia***" is a Critically Endangered Ecological Community listed under the EPBC Act 1999, which is generally identical to the TSC Act listing.	Vegetation meeting the floristic and geomorphological criteria of this EEC does not occur on site, study area or property.

Act	Literature Review	Significance
TSC Act	A localised population of a distinctive variation of ***Glycine clandestina,*** identified as Glycine sp. "Scotts Head", has been listed as an Endangered Population. This population is restricted to part of the headland complex at Scotts Head.	The site and property is well beyond the range of this population.
TSC Act	***"Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregion"*** has been listed as an Endangered Ecological Community under the TSC Act 1995. Coastal Saltmarsh is the ecological community occurring in the intertidal zone on the shores of estuaries and lagoons along the NSW coast. Characteristic species include: *Baumea juncea, Juncus kraussii, Sarcocornia quinqueflora, Sporobolus virginicus, Triglochin striata, Isolepis nodosa, Samolus repens, Selliera radicans, Suaeda australis, Zoysia macrantha.*	Vegetation meeting the floristic and geomorphological criteria of this EEC does not occur on site, study area or property.
TSC Act	***"White Box Yellow Box Blakely's Red Gum Woodland"*** is an EEC predicted to occur in Macksville, Dorrigo, Grafton, Kempsey, Korogoro Part, Nambucca, Coffs Harbour and Bare Part Atlas of Wildlife databases. This community is generally restricted to the tablelands and western slopes.	The site/study area/property does not meet the floristic requirements of this EEC, hence it does not occur.
TSC Act	***"Hunter Lowland Red Gum Forest in the Sydney Basin and North Coast Bioregions"*** is an EEC found on gentle slopes arising from depressions and drainage flats on Permian sediments of the Hunter Valley floor in the Sydney Basin and NSW North Coast Bioregions.	Vegetation meeting the floristic criteria of this EEC does not occur on site, study area or property.
TSC Act	The "Population of *Eucalyptus seeana* in the Greater Taree Local Government Area" has been listed as an Endangered Population.	The site/study area/property does not meet the floristic requirements of this EEC, hence it does not occur.
TSC Act	***"White Gum Moist Forest in the NSW North Coast Bioregion"*** is an ECC characteristically dominated by White Gum (*Eucalyptus dunnii*) either in pure stands or with E. *saligna, E. microcorys* and/or *Lophostemon confertus* (NSWSC 2008a).White Gum Moist Forest typically occurs on the escarpment slopes and foothills of the north-east NSW, most commonly between 400 and 650 m elevation, where mean annual rainfall exceeds approximately 1000 mm and has a summer maximum (DECC 2007) on fertile soils. It is currently known from the local government areas of Clarence Valley, Coffs Harbour, Kyogle and Tenterfield.	White Gum does not occur on the site, study area or property, thus the EEC does not occur.

Act	Literature Review	Significance
TSC Act	***"Hunter Valley Vine Thicket in the NSW North Coast and Sydney Basin Bioregions"*** is a Critically Endangered Ecological Community (CEEC). This CEEC occurs on Carboniferous sediments (often on limestone) mainly on rocky slopes. The community typically forms a low closed forest dominated by low trees, shrubs and vines. The canopy is dominated by both varieties of *Elaeodendron australe* (Red Olive Plum), *Geijera parviflora* (Wilga), *Notelaea microcarpa var. microcarpa* (Native olive), and *Alectryon oleifolius subsp. Elongatus* (Western Rosewood). Emergent eucalypts are common and include *Eucalyptus albens* (White Box), E. dawsonii (Slaty Box), and *E. crebra* (Narrow-leaved Ironbark). Hunter Valley Vine Thicket has been recorded from the local government areas of Muswellbrook, Singleton, and Upper Hunter (NSWSC 2007b).	This community does not occur on the site/study area/property which is located outside the prescribed range, thus the EEC does not occur.
TSC Act	***"Lower Hunter Valley Dry Rainforest in the Sydney Basin and NSW North Coast Bioregions***" is an EEC which occurs on Carboniferous sediments of the Barrington footslopes along the northern rim of the Hunter Valley Floor, where it occupies gullies and steep hill slopes with south facing aspects. The community usually forms a closed forest 15-20m high with emergent trees 20-30m high. Vines are abundant and there is a dense shrub and ground layer (NSWSC 2007c).	This community does not occur on the site/study area/property which is located outside the prescribed range, thus the EEC does not occur.
TSC Act	***"Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions"*** is an that belongs to the Maritime Grasslands vegetation class of Keith (2004) and its structure is typically closed tussock grassland, but may be open shrubland or open heath with a grassy matrix between the shrubs.	Vegetation meeting the floristic and geomorphological criteria of this EEC does not occur on site/study area/property.
TSC Act	***"Carex Sedgelands of the New England Tableland, Nandewar, Brigalow Belt South and NSW North Coast Bioregions"*** is a preliminarily listed EEC in marshy regions dominated by sedges, grasses and semi-aquatic herbs. The species dominants are *Carex appressa, Stellaria angustifolia, Scirpus polystachyus, Carex gaudichaudiana, Carex sp. Bendemeer, Carex tereticaulis and Isachne globosa,* either as single species or in combinations. Other common species include *Geranium solanderi var. solanderi, Haloragis heterophylla, Lythrum salicaria, Epilobium billardierianum subsp. Hydrophilum and Persicaria hydropiper* (Hunter and Bell 2009).	Vegetation meeting the floristic and location criteria of this EEC does not occur on site/study area/property.

Act	Literature Review	Significance
TSC Act	'***Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions'*** is an EEC that generally occurs on floodplains and on floodplains and associated floodplain rises along the Hunter River and tributaries.	This community does not occur on the site/study area/property, which is located outside the prescribed range, thus the EEC does not occur.
TSC Act	'***Coastal Cypress Pine Forest in the NSW North Coast Bioregion'*** is a distinctive vegetation community dominated by Coastal Cypress Pine (*Callitris columellaris*) and is typically found on coastal sand plains, north from the Angourie area on the far north coast of NSW.	The site/study area/property is far beyond the known range of this EEC and the Coastal Pine does not occur, thus the EEC does not occur.

3.5. Threatened Flora

3.5.1. Survey Results

No threatened plants were recorded on the study site during the survey. No threatened species were noted by limited searches of the property.

3.5.2. Potential Occurrence Assessment

Searches of relevant literature and databases (OEH 2014a, Darkheart 2011) found records of 5 threatened flora species in the locality.

Table 7: Threatened flora species recorded in the locality

Common Name	Species	Legal Status	Distance from Study Site
Sand Spurge	*Chamaesyce psammogeton*	E-TSCA	Out-dated record from Crescent Head
White-Flowered Wax Plant	*Cynanchum elegans*	E-TSCA, E-EPBCA	Delicate Nobby
–	*Maundia triglochinoides*	V-TSCA	Lower Macleay Floodplain, Goolawah Lagoon
Southern Swamp Orchid	*Phaius australis*	E-TSCA, E-EPBCA	Loftus Road
Austral Toadflax	*Thesium australe*	V-TSCA	Crescent Head, Racecourse Headland

The site and more so the property only contains potential habitat for the threatened aquatic plant *Maundia triglochinoides.* This plant was not detected on site despite thorough searches of suitable habitat and is therefore considered an unlikely occurrence on site. It is however considered a fair potential occurrence on the remainder of the study area and more so the property which was not intensively searched for threatened flora.

For the remaining locally recorded species, the site either does not contain potential habitat or is too disturbed and they are not considered potential occurrences.

4.0 Fauna and Habitat Survey and Assessment

4.1. Survey Methods

In consideration of the threatened species recorded in the locality, available habitats on site, and potentially occurring species: the following survey methods were employed:

- Qualitative and quantitative habitat assessment.

- Koala survey as per the KSC CKPoM requirements
- Diurnal reptile and bird survey
- Physical searches of habitat e.g. leaf litter, etc.
- Opportunistic sightings, scratches and scats.

It is acknowledged that the full range of techniques (e.g. trapping) which could be used and extent of effort is less than specified by the DEC (2004) guidelines. However, as provided for in the guidelines, a full survey is not considered warranted in this instance given:

- No hollow bearing trees will be removed.
- No Koala food trees will be removed.
- No major change to current landuse is proposed for the remaining parts of the property as part of this DA.

4.1.1. Habitat Evaluation

The site was surveyed to determine the available potential habitats, and the support value of these habitats for threatened species. Habitats were defined according to parameters such as:

- Structural and floristic characteristics of the vegetation e.g. understorey type and development, crown depth, groundcover density, etc.
- Degree and extent of disturbance e.g. fire, logging, weed invasion, modification to structure and diversity, etc.
- Soil type and suitability e.g. for digging and burrowing.
- Presence of water in any form e.g. dams, creeks, drainage lines, soaks.
- Size and abundance of hollows and fallen timber.
- Availability of shelter e.g. rocks, logs, hollows, undergrowth.
- Wildlife corridors, refuges and proximate habitat types.
- Presence of mistletoe, nectar, gum, seed, sap, etc. sources.

Species identification was assisted by Morcombe and Stewart (2010), Pizzey and Knight (2003), Tyler and Knight (2009), Wilson and Knowles (1992), Strahan (2008), Triggs (1996), Robinson (1996), Swan *et al* (2004) and Schodde and Tideman (1990).

4.1.2. Kempsey Shire Council CKPoM Assessment

As shown in Figure 6, the site is mapped as a mix of Potential Koala Habitat (Secondary Class B) in the northwest; Unknown along and south of the drainage line which diagonally bisects the site within the middle section of the property; and Potential Koala Habitat (Secondary Class A) in the south to eastern portion of the site under the KSC CKPoM.

As detailed in section 5, a survey and assessment is required as per section 4.6 of the CKPoM (KSC 2011).

4.1.3. Diurnal Reptile and Bird Survey

Birds were surveyed by detecting calls and searching by binoculars during area searches over the whole site and actively listening/searching for birds. This along with reptile searches were conducted opportunistically and during other activities (e.g. flora survey and habitat evaluation).

This information provided short-term data on bird occurrences in the area for the particular season (DEC 2004).

4.1.4. Herpetofauna and Secondary Evidence Searches

Physical habitat searches of the site were undertaken during the survey which involved:

- Lifting up of debris to search for reptiles and frogs.
- Inspection of dense vegetation for bird nests.
- Raking of leaf litter for frogs and reptiles.
- Observation of likely basking sites (i.e. reptiles and frogs).
- Searches for scats, tracks, digging, sap incisions and scratches (e.g. Koala, gliders, etc.) over the site.
- Searches for scats, owl regurgitation pellets and guano deposits.

A total of 3 hours was specifically spent on general habitat searches. This saw the entire site effectively searched.

4.1.5. Limitations

All surveys are limited in their ability to fully document all species of flora and fauna likely or actually occurring on a site. Surveys such as these are merely “snapshots” in time, and can only be expected to provide an indicative not absolutely comprehensive representation of a site’s species assemblage (DEC 2004, Forest Fauna Surveys 1997). To counter this limitation, this survey has employed methods recommended in literature and known from personal experience to best detect the target species under the site and weather conditions at the time, or implemented a conservative occurrence assessment, as follows.

Fauna detectability is limited by seasonal, behavioural or lifecycle characteristics of each species, and even by habitat variations (e.g. flowering periods), which can occur within a year, between years, decades, etc. (DEC 2004).

The fauna survey period fell in late winter which may a period of low activity for most fauna eg arboreal mammals, Yangochiropteran bats and reptiles (DEC 2004), though it was a mild winter and an early spring. Detection of seasonal breeding frogs would be limited for species breeding in winter to early spring, or year-round. Winter longitudinal and latitudinal migrants such as the Swift Parrot are likely to be present at this time of year. Lack of rainfall during the survey and in the previous month is likely to have limited frog detection.

To counter these limitations, qualitative and quantitative habitat evaluation was used as well as a standard ecological field survey to assess the site's significance to threatened species. Habitat evaluation conservatively assesses the potential occurrence of threatened species based on potentially suitable habitat and local records, providing a prediction of the likelihood of a particular threatened species occurring in the study area (DEC 2004, DECC 2007, Forest Fauna Surveys 1997).

4.2. Corridors and Key Habitats

See Figure 8 showing the following:

4.2.1. Regional Corridors

Regional corridors are typically >500m wide and provide a link between major and/or significant areas of habitat in the region. Ideally they are of sufficient size to provide habitat in their own right and at least twice the width of the average home range area of fauna species identified as likely to use the corridor (OEH 2014c, Scotts 2002).

As evident in Figure 8, this site/property is located adjacent to a regional corridor, which encompasses Maria/Kumbatine National Park further west, runs over Dulconghi, and links to Hat Head National Park, Goolawah Nature Reserve, and Limeburner's Creek Nature Reserve.

4.2.2. Sub-regional Corridors

Sub-regional corridors connect larger landscaped features and are of sufficient width to allow movement and dispersal (generally >300m), but may not provide substantial species habitat (OEH 2014c, Scotts 2002).

The site/study area/property does not fall form or lie adjacent to a sub-regional corridor.

4.2.3. Local Corridors and Habitat Links

Local corridors provide connections between remnant patches of habitat and landscape features. Due to their relatively small area and width (they may be <50m), these corridors are subject to edge effects (OEH 2014c, Scotts 2002). Habitat links are evaluated in this report as links from habitat on-site directly to similar habitat on adjacent land. These would be used by fauna, which depend solely or at least partially on the site for all of their lifecycle requirements, and/or dispersal (Lindenmayer and Fisher 2006).

The site itself is largely disturbed and overall has sparse vegetation cover. The roadside vegetation along the northern boundary may provide only a minor linkage and habitat link for highly mobile species such as woodland birds and bats, but other vegetation on site is patchy and poorly connected. Movement for gliders and other arboreal fauna such as possums across the site would be limited due to overall sparse forest cover and lack of understorey; with pasture posing a barrier to small to medium terrestrials dependant on tall cover such as dense grass and shrubs.

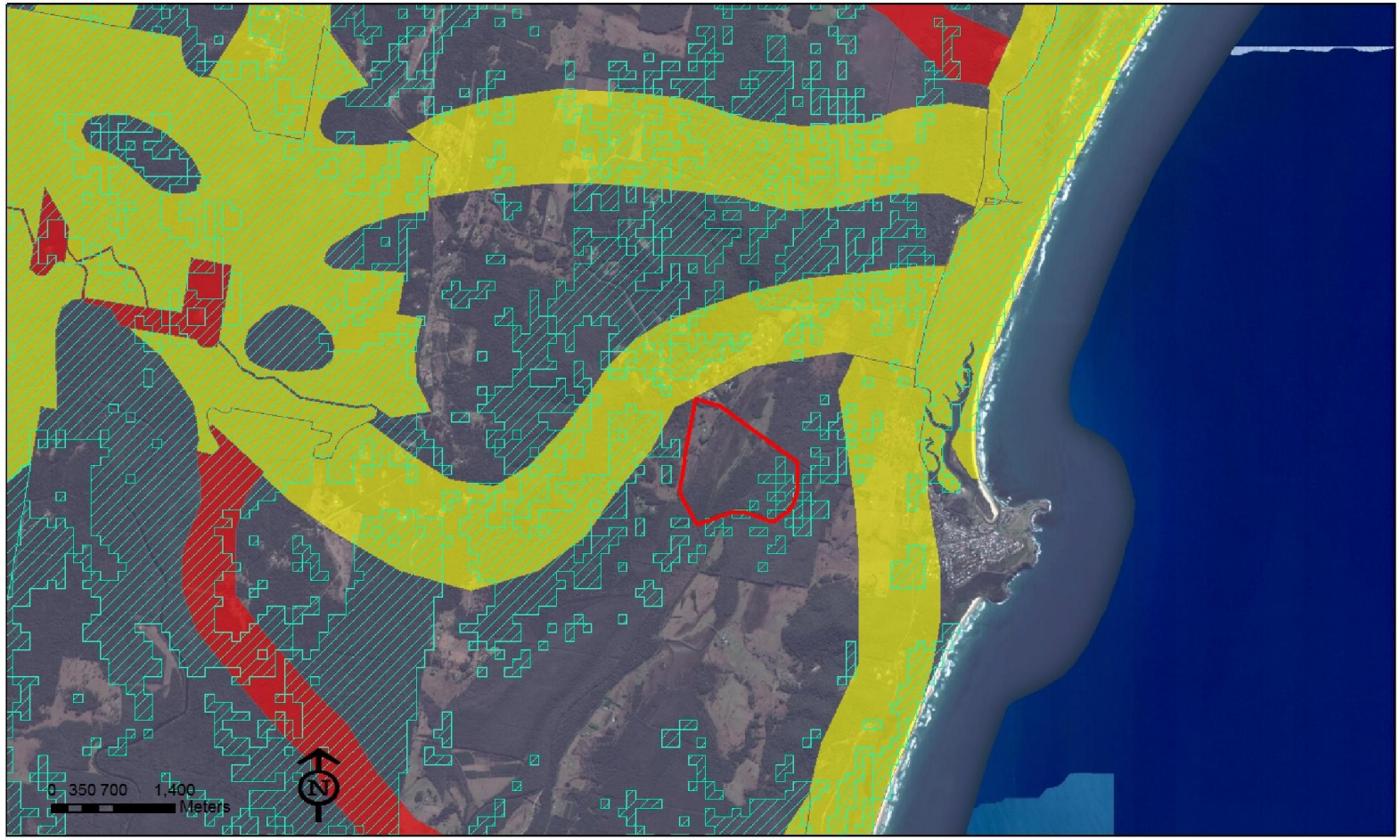
The eastern half of the property is generally forested and forms part of a near continuous belt of swamp forest extending to Hat Head National Park in the north to Goolawah Nature Reserve and eventually Limeburners Creek, as well as connections west to Maria River State Forest/Kumbatine National Park. It is thus a key local corridor, but its habitat types, relative floristic uniformity and limited abundance of hollows restrict its value to a limited range of species.

4.2.4. Key Habitat

Key Habitats are areas of predicted high conservation value for forest faunal assemblages, endemic forest vertebrates or endemic invertebrates; spatially depicted as a merging of mapped assemblage hubs, assemblage hot spots and centres of endemism (OEH 2014c, Scotts 2002).

Although the site is not identified as Key Habitat, some of the swamp forest in the east of the property is mapped. (Figure 8).

Figure 8: OEH Corridors and Key Habitats



4.3. Fauna Survey Results

4.3.1. Habitat Evaluation

The following table summarises the results of the habitat evaluation survey:

Table 8: Habitat evaluation summary

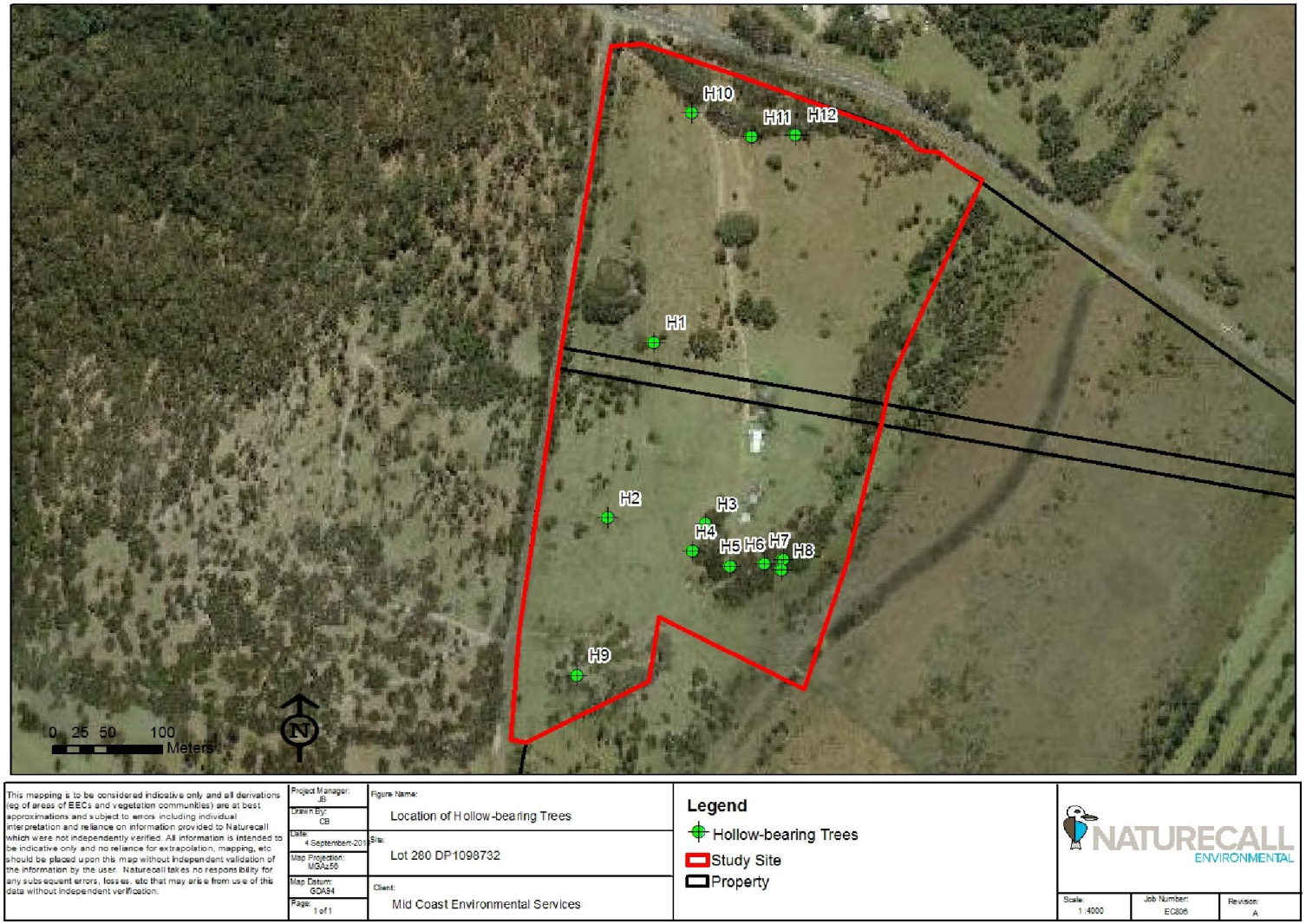
Habitat Attribute/Type	Site/Study Area	Potential Values to Threatened Species Occurrence
Groundcover	Groundcover mostly open and lacks density for small mammals to utilise – only suitable for common skinks. Denser areas of groundcover in swamp forest likely to provide shelter for small mammals and reptiles. Good macropod grazing habitat present in pasture.	These habitat components overall provide limited refuge for common mammals and reptiles (i.e. rodents, dasyurids, Grass Skinks, etc.). This substrate was not considered potentially suitable for threatened species such as the Common Planigale and Eastern Chestnut Mouse due to the lack of dense cover and extent of previous disturbances on the site and in the area, which is likely to have long displaced these species.
Leaf litter	Shallow, dry leaf litter present in the dry sclerophyll. Swamp forest has some moist accumulations of oak needles and leaves.	May at best provide potential substrate for common habitat generalists such as the Garden Sun Skink. Overall however the value of this habitat component is not significant and is unlikely to support any threatened fauna.
Logs and debris	Only a few rotting logs on the site, and were not hollow. Stumps were occasionally encountered but with no significant hollows noted.	Logs and small branches are considered only suitable for refuge for common terrestrial reptiles and mammals (i.e. rodents, Blue-Tongue Lizards, etc).

Habitat Attribute/Type	Site/Study Area	Potential Values to Threatened Species Occurrence
Hollows	A total of 12 hollow-bearing tree/stags were recorded on the site (see Figure 9 and Appendix 3). While a few of these had medium to large hollows, most only contained small branch hollows suitable for Yangochiropteran bats. While not formally surveyed for, this habitat component is likely to be rare in the floodplain forests due to their young age	Limited hollows for medium to large hollow-obligate species Squirrel Glider, Yellow-bellied Glider, Little Lorikeet, etc, and no trees with large enough hollows suitable for forest owls and Glossy Black Cockatoo.
Nectar Sources	The eucalypts on and adjacent to the site offer a potential nectar source for nectivores such as the Grey-headed Flying-fox, Swift Parrot and Little Lorikeet (OEH 2014b, Smith *et al* 1995, Eby 2000a, 2000b). Most of these are summer-early autumn flowers and are limited in abundance. Much more common to west on adjacent land. The paperbarks on site and more so the property offer an excellent nectar source usually in autumn.	Several flowering species present providing potential nectar resources for Squirrel Glider, Grey-headed Flying-fox, Yellow-bellied Glider, Swift Parrot and Little Lorikeet, plus passerine birds. Some of these species may forage on the site during flowering instances (as part of their wider foraging range). The limited extent of the site however only qualifies it as a fraction of the seasonal lifecycle requirements of these species. Bulk flowering of the paperbarks on the floodplain would support a significant number of Grey-headed Flying-fox for a period.
Wattles, Melaleucas, Callistemons and Banksias (shrub layer)	Scattered wattles are present on the site but only in low abundance. Not likely to be preferred sap sources and minor insect attractant.	No significant values
Sap and gum sources	Pink Bloodwood, Forest Red Gum and Brush Box are preferred sap sources for Squirrel and Yellow-bellied Gliders (NPWS 2003a, Gibbons 2002, pers. obs.), but are only present on site in low numbers. Other species present such as Blackbutt and Tallowwood are less preferred.	Limited sap sources for Squirrel Gliders and Yellow-bellied Gliders. No significant sap incisions noted on any trees.

Habitat Attribute/Type	Site/Study Area	Potential Values to Threatened Species Occurrence
Primary preferred Koala browse trees	Forest Red Gum and Tallowwood occur in low and localised abundance over the site (see Figure 10).	Low abundance of preferred browse trees on site which would be unlikely to support Koalas.
Allocasuarinas	Black Oak and Forest Oak present in dry sclerophyll as scattered understorey trees with higher densities noted in the north. No evidence of feeding (chewed cones) found during survey.	Glossy Black Cockatoos are known to forage in study area with a record on Gate Rd. The limited number of Allocasuarinas on site however is unlikely to regularly attract this species.
Aquatic	A few farm dams occur on site and contain emergent and floating aquatic plants. A billabong with aquatic plants also crosses the southeast corner of the site. Low-lying areas in the east and south of the study area have waterlogged soils and some standing water. Colonised by water tolerant grasses with some sedges and aquatics, indicating variable hydrological regime. Beyond the site, a broad floodplain covers most of the property and has extensive swamp forest and wet pasture that would flood after heavy rain. The billabongs and Connection Creek also offer open water habitats in wetter years.	Generic potential Green-thighed Frog, Wallum Froglet and Green and Golden Bell Frog foraging and breeding habitat in swamp forest and wet pasture. No habitat for stream breeding frogs. Aquatic habitat on site unlikely to provide foraging habitat for threatened waterbirds, however higher quality waterbird habitat occurs extensively on the property depending on hydrological regime.
Fruiting species	Cheese Tree occurs in swamp forest. Exotic species such as Camphor Laurel, Lantana and Blackberry provide a potential fruit source. Overall marginal resource suitably mainly for common fauna.	Overall lack of preferred species used by Wompoo Fruit-dove, Rose-crowned Fruit-dove or Barred Cuckoo Shrike. Small potential fruiting source for Grey-Headed Flying Fox.

Habitat Attribute/Type	Site/Study Area	Potential Values to Threatened Species Occurrence
Passerine bird habitat	Poor habitat for shrub-dependant passerine bird species on site due to limited undergrowth apart from along eastern slope, and no significant abundance or diversity noted, but this may be seasonally dependant e.g. flowering trees. Wide gaps between forest patches is a limit on smaller passerines. Swamp habitats on remainder of property likely to support greater abundance and diversity of passerines due to greater habitat complexity.	May be sufficient abundance of passerine birds for property overall to form minute fraction by raptors such as the Square-tailed Kite and Little Eagle.
Caves, cliffs, overhangs, culverts, bridges	Absent.	N/A
Terrestrial prey	Likely presence but low abundance of gliders and possums would provide potential arboreal prey, with perhaps common dasyurids and rodents such as Black Rat and Bush Rat plus House Mouse most likely to form main prey base in adjacent habitat. Wider property would support abundance of frogs (mostly common species), and native rodents (eg Water Rat, Swamp Rat) and dasyurids eg Antechinus. Bandicoots would also be present in protected areas.	Small terrestrial and arboreal prey species over wider study area likely to be barely sufficient to support some brief seasonal foraging by forest owls, but at best only forms minute part of a large area of potential foraging habitat within these species very large foraging range.

Figure 9: Location of hollow-bearing trees



4.3.2. Direct Sighting and Secondary Evidence

A number of common birds were present on site during the survey. These comprised Eastern Rosellas, Willy Wagtail, Pacific Baza, Grey Fantail, Pied Butcherbird, Swamp Hen, White-necked Heron and Magpies. Fauna surveys were not undertaken on the remainder of the property where more diversity and abundance would be expected, but the consultants have previously observed a range of waterfowl in the wetland, including the Great Egret (Migratory – EPBCA) and Cattle Egret (Migratory-EPBCA).

The Common Eastern Froglet (*Crinia signifera*) was detected calling from wet pasture on site and at the largest dam. A Laughing Tree Frog (*Litoria tyleri*) was also heard calling in the dry sclerophyll forest.

Scats of Eastern Grey Kangaroo (*Macropus giganteus*) and Red-necked Wallaby (*Macropus rufogriseus*) were frequently found on site. No diggings, tracks or bones were detected during the survey.

Despite searches under all primary browse trees on site, no Koala scats were found. The landowner also commented that she had never seen a Koala on the property.

The Black-necked Stork (E-TSCA) has been previously observed foraging in the wetland/wet pasture parts of the property by the consultants.

4.3.3. Locally Recorded Threatened Fauna

The following table lists threatened species known to occur in the locality (OEH 2014a, Berrigan 2001c, 1999e, Darkheart 2008e, 2005j, PB 2007).

Table 9: Threatened species recorded in the locality

Group	Common Name	Species	Legal Status	Distance From Study Site/General Location
	Brushtailed Phascogale	*Phascogale tapoatafa*	V-TSCA	Belmore River east, Maria River, Beranghi
	Spotted-tailed Quoll	*Dasyurus maculatus*	V-TSCA, E-EPBCA	Beranghi, west of Crescent Head, Upper Belmore, Maria River Road, Dulconghi
	Long-nosed Potoroo	*Potorous tridactylus*	V-TSCA, V-EPBCA	Limeburners Creek National Park
	Yellow-bellied Glider	*Petaurus australis*	V-TSCA	Maria National Park, Beranghi

Group	Common Name	Species	Legal Status	Distance From Study Site/General Location
	Squirrel Glider	*Petaurus norfolcensis*	V-TSCA	Delicate Nobby, Belmore River east, Maria National Park, Hat Head National Park, Goolawah Nature Reserve
	Koala	*Phascolarctos cinereus*	V-TSCA	Maria River Road, Crescent Head and surrounds, Plomer Road, Beranghi, Goolawah Lagoon/plain, McGuires Crossing, Dulconghi, etc.
	Grey-headed Flying-fox	*Pteropus poliocephalus*	V-TSCA, V-EPBCA	Crescent Head, Limeburners Creek Nature Reserve, Plomer Road, Maria National Park, Hat Head National Park, Belmore River, etc
	Little Bent-wing Bat	*Miniopterus australis*	V-TSCA	Crescent Head, Goolawah Lagoon, Beranghi, McGuires Crossing
	Eastern Bent-wing Bat	*Miniopterus schreibersii oceanensis*	V-TSCA	Crescent Head, Delicate Nobby
	East-coast Freetail Bat	*Mormopterus norfolkensis*	V-TSCA	West of Crescent Head,
	Southern Myotis	*Myotis macropus*	V-TSCA	Dulconghi Hill, Beranghi
	Yellow-bellied Sheathtail Bat	*Saccolaimus flaviventris*	V-TSCA	Dulconghi Hill
	Greater Broad-nosed Bat	*Scoteanax rueppellii*	V-TSCA	Goolawah Lagoon area, Crescent Head, Lower Range Hill
	Eastern Cave Bat	*Vespadelus troughtoni*	V-TSCA	Racecourse Head, Delicate Nobby, west of Crescent Head
	Common Blossom Bat	*Syconycteris australis*	V-TSCA	Goolawah Lagoon area, Crescent Head, Racecourse Hill

Group	Common Name	Species	Legal Status	Distance From Study Site/General Location
	Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	V-TSCA	West of Crescent Head
	Eastern Long-eared Bat	*Nyctophilus bifax*	V-TSCA	Goolawah Lagoon
	Golden-tipped Bat	*Kerivoula papuensis*	V-TSCA	Maria National Park
Birds	Glossy Black Cockatoo	*Calyptorhynchus lathamii*	V-TSCA	Crescent Head, Maria National Park, Lower Range Hill
	Powerful Owl	*Ninox strenua*	V-TSCA	Beranghi, Victoria Valley
	Masked Owl	*Tyto novaehollandiae*	V-TSCA	Beranghi Road, Lower Range Hill, Maria National Park
	Eastern Osprey	*Pandion cristatus*	V-TSCA	Crescent Head, Hat Head National Park, Goolawah Lagoon
	Square Tailed Kite	*Lophoictinia isura*	V-TSCA	Crescent Head
	Little Eagle	*Hieraaetus morphnoides*	V-TSCA	Verges Creek Road
	White-eared Monarch	*Carterornis leucotis*	V-TSCA	Crescent Head
	Olive Whistler	*Pachycephala olivacea*	V-TSCA	Limeburners Creek National Park
	Swift Parrot	*Lathumus discolor*	E-TSCA, E-EPBCA	Crescent Head
	Varied Sittella	*Daphoenositta chrysoptera*	V-TSCA	Crescent Head, Seale Road, Maria National Park
	Little Lorikeet	*Glossopsitta pusilla*	V-TSCA	Maria National Park, Crescent Head
	Rose-crowned Fruit Dove	*Ptilinopus regina*	V-TSCA	Near Racecourse Head
	Wompoo Fruit Dove	*Ptilinopus magnificus*	V-TSCA	Near Racecourse Head, Dulconghi

Group	Common Name	Species	Legal Status	Distance From Study Site/General Location
	Black Bittern	*Dupetor flavicollis*	V-TSCA	Crescent Head
	Australasian Bittern	*Botaurus poiciloptilus*	E-TSCA, E-EPBCA	Ryans Cut, Hat Head National Park
	Jabiru/Black Necked Stork	*Ephippiorhynchus asiaticus*	E-TSCA	Recorded on property, Crescent Head, Maria River, McGuires Crossing, Belmore River/Swamp
	Brolga	*Grus rubicunda*	V-TSCA	Belmore Swamp
	Comb-crested Jacana	*Irediparra gallinacea*	V-TSCA	Goolawah Lagoon, Belmore Swamp, Victoria Valley
Frogs	Green and Golden Bell Frog	*Litoria aurea*	E-TSCA V-EPBCA	Crescent Head, Ryans Cut, Loftus Road, McGuires Crossing
	Green-thighed Frog	*Litoria brevipalmata*	V-TSCA	Beranghi Road
	Stuttering Frog	*Mixophyes balbus*	E-TSCA V-EPBCA	Hat Head National Park
	Wallum Froglet	*Crinia tinnula*	V-TSCA	McGuires Crossing, Delicate Nobby, Loftus Road

The study area is located on land and does not encompass any ocean or estuarine areas, thus sea birds, etc., are not considered in this assessment.

The following species are considered likely to occur in the locality (excluding sea birds, etc.) due to suitable habitat and regional records in similar habitat (some have been recorded within 20km).

Table 10: Threatened fauna potentially occurring in the locality

* listed under the EPBC Act 1999.

Animal Group	Potentially Occurring Species
Mammals	Rufous Bettong, Common Planigale, Eastern Chestnut Mouse, Hoary Wattled Bat, New Holland Mouse*
Birds	Barking Owl, Sooty Owl, Grass Owl, Spotted Harrier, Flame Robin, Scarlet Robin, Superb Fruit Dove, Barred Cuckoo-shrike, Ground Parrot, Regent Honeyeater, Painted Snipe, White-fronted Chat, Turquoise Parrot.
Reptiles	Pale-headed Snake, Stephens Banded Snake, Three-toed Snake-tooth Skink*

Animal Group	Potentially Occurring Species
Frogs	Giant Barred Frog*, Stuttering Frog, Wallum Sedge Frog

4.4. Potential Occurrence Assessment

Each of the species listed in the above two tables have been evaluated for their potential to occur on the study site/area, as well as for the likely significance of the proposal and thus their eligibility for Seven Part Test assessment, in Appendix 1.

From this assessment, threatened species considered to potentially use the site (at best as a small part of a wider foraging range) are listed in the following table:

4.4.1. New South Wales

Each of the species listed above have been evaluated in Appendix 1 for their potential to occur on the site, as well as their potential to occur in the study area and hence be affected by the proposal (and thus require Seven Part Test assessment). Consideration is also given to potential occurrence on the property for due consideration, although landuse here is not expected to change, and hence habitats will retain their current values.

From this assessment, the following species listed under the NSW *Threatened Species Conservation Act* are considered to potentially occur:

Table 11: Threatened species potentially occurring on the site/study area/property

Species	Occurrence Type	Occurrence Likelihood (See Appendix 1)
Square-tailed Kite	Potential to form minute portion of large foraging territory. Generic potential nest trees.	Fair chance as periodic forager.
Little Eagle	Potential to form minute portion of large foraging territory. Generic potential nest trees.	Low to fair chance as periodic forager.
Powerful Owl	Site/study area/property contains broadly suitable foraging habitat that may form small part of a territory. No nesting hollows observed.	Only low chance of periodic forager on marginal fringe of core range.
Masked Owl	Site/study area/property contains broadly suitable foraging habitat that may form small part of a territory. No nesting hollows observed.	Low chance of periodic forager on marginal fringe of core range.
Eastern Osprey	Marginal potential to forage along Connection Creek, or source nesting material – hence potential to form minute portion of large foraging territory.	Low chance as periodic forager as minute part of larger foraging territory.

Species	Occurrence Type	Occurrence Likelihood (See Appendix 1)
Brolga	Marginal habitat around dams and low lying parts of site, but wetland, billabong and Connection Creek offers seasonally-variable habitat which may form small part of non-breeding range.	Low chance of rare occurrence in suitable seasons in open wetland on property.
Australasian Bittern	Wetlands and swamp habitat on property have some potential to form part of local non-breeding range.	Low chance of occurrence due to rarity.
Black Bittern	Wetlands and swamp habitat on property have some potential to form part of local non-breeding range.	Low chance of occurrence due to rarity.
Australian Painted Snipe	Wetlands on property have some potential to form part of local non-breeding range.	Low chance as infrequent or sporadic occurrence in wet meadows during non-breeding movements.
Little Lorikeet	Site/study area/property contains broadly suitable foraging habitat that may be used seasonally. Limited potential nesting hollows observed.	At least fair chance seasonally foraging as small part of local range. Nesting unlikely due to competition for limited hollows.
Varied Sittella	Site/study area/property contains broadly suitable foraging habitat that may be used seasonally. Poor potential to nest on site due to exposure to edge effects.	Low chance seasonally foraging on marginal fringe of range.
Brushtailed Phascogale	Transient dispersing adult or local animal foraging on fringe of core range in adjacent habitat.	Low as rare forager or dispersing male. More likely to occur to west in study area.
Yellow-bellied Glider	Mostly low quality potential foraging and denning habitat on site. At best may form marginal fringe of larger home range.	Very low to unlikely chance of occurrence on site, and low potential in study area to west.
Squirrel Glider	Site/study area/property offers low potential foraging habitat. If occurs, probably in low density due to low quality habitat on site.	Low chance of occurring on the site due to overall low habitat quality. More likely to occur to west in study area.
Koala	Site has some preferred forage species. More abundant and extensive in adjacent forest.	Low chance foraging on site or as transient.
Grey-headed Flying-fox	Small area of generic foraging habitat on site but large area in east on property – likely to form part of seasonal forage range. Not a known roosting area.	Highly likely chance of occurrence on site as occasional forager.

Species	Occurrence Type	Occurrence Likelihood (See Appendix 1)
Common Blossom Bat	Swamp forest dominated by paperbark provides potential foraging habitat, especially in east of property. Limited value habitat on site – unlikely to use.	Fair likelihood of occurrence on property as an occasional forager within swamp forest habitats from core heathland habitat.
Yellow-bellied Sheathtail Bat	Site/study area offers potential foraging and marginal roosting habitat in tree hollows. Potentially breeding locally. Better potential around swamp forest in east of property.	Low chance of foraging within forest canopy on the site. Greater potential in east of property.
East-coast Freetail Bat	Site/study area/property offers potential foraging and marginal roosting habitat as part of large seasonal range. Potentially breeding locally.	Moderate chance of foraging and roosting due to nearby records.
Greater Broad-nosed Bat	Site/study area/property offers potential foraging and marginal roosting habitat as part of large seasonal range. Potentially breeding locally.	Fair chance of foraging and roosting within forest canopy over the site.
Hoary Bat	Small area of marginal potential foraging habitat on site, but better in western study area. Potential roosts on site – could forage in study area and roost on site.	Low as marginal fringe of local range.
Southern Myotis	Several farm dams located on the site may provide foraging habitat for this species. Connection Creek and billabong offer better habitat on property	Fair chance of foraging over dams located on property overall.
Little Bent-wing Bat	Generic overfly and perhaps foraging as part of large range. Potential non-breeding roosts on tree hollows.	Fair chance of foraging in forest canopy over the site.
Eastern Bent-wing Bat	Generic overfly and perhaps foraging as part of large range. Potential non-breeding roosts on tree hollows.	Fair chance of foraging in forest canopy on site.
Wallum Froglet	Swamp forest on the site in drainage line offers marginal potential foraging, refugia and breeding habitat. Wetland in remainder of property offers ideal potential habitat.	Unlikely to occur on site – highly likely to occur in extensive wetland over floodplain in remainder of property.
Green-thighed Frog	Site dams on the site offer generic potential foraging, refugia and breeding habitat.	Unlikely to low chance of occurrence on the site.

4.4.2. Commonwealth

The following species are considered by the DoE Matters of National Environmental Significance search tool as potential occurrences in the locality. Marine birds, mammals and reptiles and all fish listed in the search are irrelevant as the site/study area does not contain habitat and the proposal has no potential to impact these species.

4.4.2.1. Threatened Species

Table 12 summarises the species predicted by the search tool as potential occurrences, and other species with potential to occur in the locality, for their potential to occur on site, in the study area or on the property. The potential for these species to occur on the site is also reviewed in Appendix 1.

Table 12: EPBC Act threatened fauna species potential occurrence assessment

Note: Likelihood of occurrence derived from opinions of consultants in consideration of known ecology of each species (see Appendix 1); and quality of habitat on-site. * indicates listed on DoE website search.

Group	Common Name	Scientific Name	Listing Status	Recorded In Locality	Suitable Habitat On Site/Study Area/Property	Likelihood Of Occurrence
Birds	*Regent Honeyeater	*Xanthomyza phrygia*	CE	N	Limited preferred forage species. Unlikely to occur.	Due to extreme rarity and lack of significant extent of preferred habitat, unlikely to occur.
	*Australian Painted Snipe	*Rostratula australis*	V	N	Some potentially suitable habitat in wetlands on property but no local records.	Low chance as infrequent or sporadic occurrence in wet meadows during non-breeding movements.
	*Red Goshawk	*Erythrotriorchis radiatus*	E	N	Generic potential habitat forming minute fraction of such habitat.	Unlikely as not seen south of Clarence River.
	*Eastern Bristlebird	*Dasyornis brachypterus*	E	N	No suitable habitat.	Unlikely to occur.
	*Australasian Bittern	*Botaurus poiciloptilus*	E	Y	Wetlands and swamp habitat on property have some potential.	Low chance of occurrence due to rarity.
	*Swift Parrot	*Lathumus discolor*	E	Y	Limited preferred forage species. Unlikely to occur.	Due to extreme rarity and lack of significant extent of preferred habitat, unlikely to occur.

Group	Common Name	Scientific Name	Listing Status	Recorded In Locality	Suitable Habitat On Site/Study Area/Property	Likelihood Of Occurrence
Mammals	*Long-nosed Potoroo	*Potorous tridactylus*	V	Y	No suitable habitat.	Unlikely potential to occur – no local records and patchy coastal records throughout its distribution.
	*Koala	*Phascolarctos cinereus*	V	Y	Site has some preferred forage species. More abundant and extensive in adjacent forest.	Low chance foraging on site or as transient.
	*Spotted-tail Quoll	*Dasyurus maculatus*	E	Y	Site too open and exposed and no potential denning habitat.	Unlikely to occur
	*Grey-headed Flying-fox	*Pteropus poliocephalus*	V	Y	Seasonally suitable for nectar foraging but much more abundant in study area and on property.	Very high likelihood of foraging on site and in adjacent forest.
	*Dwyer's/Large Pied Bat	*Chalinolobus dwyeri*	V	N	Generic forage habitat over forest. No potential roosts in study area.	Unlikely chance of occurrence.
	*Brushtailed Rock Wallaby	*Petrogale penicillata*	V	N	No suitable habitat in locality.	Unlikely chance of occurrence.
	*New Holland Mouse	*Pseudomys novaehollandiae*	E	N	No suitable habitat.	Extremely unlikely.

Group	Common Name	Scientific Name	Listing Status	Recorded In Locality	Suitable Habitat On Site/Study Area/Property	Likelihood Of Occurrence
Frogs	*Green and Golden Bell Frog	*Litoria aurea*	V	Y	Aquatic habitat on site and property generically suitable	Unlikely – no known close proximity records and known local records in a hind swamp separated from site/property by dune system.
	*Stuttering Frog	*Mixophyes balbus*	V	Y	No suitable habitat and no local records.	Unlikely to occur.
	Wallum Sedge Frog	*Litoria olongburensis*	V	N	Generic potential habitat but site/property/study area located outside known distribution.	Unlikely to occur.
	*Giant Barred Frog	*M. iteratus*	*E*	N	No suitable habitat and no local records.	Unlikely to occur.

4.4.3. Migratory Species

No EPBC Act 1999 migratory species were recorded on the site by the survey, but previous anecdotal observations have noted the Great Egret and Cattle Egret on the property.

A significant number of EPBC Act 1999 listed migratory bird species are known (OEH 2014a) or considered potential occurrences in the locality (DoE 2014a). A search of the MNES website and literature review (Readers Digest 1990, DoE 2014b) also produced a list of likely occurrences. All of these species plus some considered by the consultant as potential occurrences in the LGA in similar habitat to that on the property are also shown in the following table, with an evaluation made on likelihood of occurrence based on cited ecology. Note this list excludes seabirds, etc as detailed above.

Table 13: EPBC Act migratory species potential occurrence assessment

Common Name	Scientific Name	Predicted Type of Occurrence	Recorded In Locality (10km Radius)	Suitable Habitat On Site/Study Area/Property	Likelihood Of Occurrence
*White-Bellied Sea-Eagle	*Haliaetus benghalensis*	Species and/or habitat likely to occur within area	Y	No suitable foraging habitat on site – dams too small. Connection Creek offers some low potential for foraging on waterbirds, turtles and eels.	Low
Osprey	*Pandion cristatus*	-	Y	As for White-Bellied Sea-Eagle.	As for Sea Eagle.
Latham's Snipe	*Gallinago hardwickii*	Species or habitat may occur in area	Y	Wet meadows and pasture on floodplain offers very good to excellent potential foraging habitat for this species.	>moderate.
Australian Painted Snipe	*Rostratula benghalensis (australis)*	Species and/or habitat may occur in area	N	Some potentially suitable habitat in wetlands on property but no local records.	Low chance as infrequent or sporadic occurrence in wet meadows during non-breeding movements.
Cattle Egret	*Egretta ibis*	Species/habitat may occur in area	Y	Potential foraging habitat on site and especially pastures on floodplain.	**Previously observed.**
Great Egret	*Egretta alba*	Species/habitat may occur in area	Y	Small areas of potential foraging habitat on site around dams, but more extensive on property.	**Previously observed.**

Common Name	Scientific Name	Predicted Type of Occurrence	Recorded In Locality (10km Radius)	Suitable Habitat On Site/Study Area/Property	Likelihood Of Occurrence
Rainbow Bee-eater	*Merops ornatus*	Species/habitat may occur in area	N	Suitable foraging habitat over most of property.	Fair chance of occurrence
Regent Honeyeater	*Xanthomyza phrygia*	Species/habitat may occur in area	N	Limited preferred forage species. Unlikely to occur.	Due to extreme rarity and lack of significant extent of preferred habitat, unlikely to occur.
Swift Parrot	*Lathumus discolor*	Species/habitat may occur in area	Y	Small number of Forest Red Gums that may offer limited potential forage for non-breeding transients.	Insufficient in study area – unlikely to occur.
Rufous Fantail	*Rhipidura rufifrons*	Breeding or breeding habitat may occur in area	Y	No – too open or unsuitable forest type.	unlikely
Satin Flycatcher	*Myiagra cyanoleuca*	Breeding or breeding habitat likely in area	Y	Marginal potential habitat in dry sclerophyll.	very low
Black Faced Monarch	*Monarcha melanopsis*	Breeding or breeding habitat may occur in area	Y	Only small areas of marginal habitat.	unlikely
Spectacled Monarch	*M. trivirgatus*	Breeding or breeding habitat likely in area	Y	Only small areas of marginal habitat.	unlikely

Common Name	Scientific Name	Predicted Type of Occurrence	Recorded In Locality (10km Radius)	Suitable Habitat On Site/Study Area/Property	Likelihood Of Occurrence
White-throated Needletail	*Hirundapus caudacutus*	Species/habitat likely to occur in area	N	Yes as part of a broader area	Moderate-high, as transient, between Dec-April
Fork-tailed Swift	*Apus pacificus*	Species/habitat may occur in area	N	Yes as part of a broader area	Fair potential, as transient, between Oct-April

5.0 SEPP 44 - KSC CKPoM Assessment

The site and property falls within the jurisdiction of the KSC CKPoM (KSC 2011), and hence a compliance assessment is required. The assessment was restricted to the site as landuses and activities on the floodplain are not expected to substantially change or require development consent.

5.1. Site Classification and Required Assessments

As shown in Figure 10, the majority of the site is mapped as Preferred Koala Habitat (PKH) under the Kempsey Shire Council Comprehensive Koala Plan of Management (KSC CKPoM).

Figure 10 also shows that the majority of the site is mapped as Potential Koala Habitat (Secondary Class B) with a narrow band of vegetation mapped as Unknown occurring along the southern boundary, under the KSC CKPoM.

The following assessments are required and undertaken for the site:

- **Unknown**: Section 4.5 requires vegetation community mapping to determine if the Unknown habitat is Potential Koala Habitat, or Other vegetation.
- **Potential Koala Habitat**: Section 4.6 requires that a Koala Habitat assessment must be undertaken using a regularised SAT grid, and all preferred Koala Food Trees (KFTs) potentially affected by the proposal located and mapped.

5.1.1. Unknown Vegetation Assessment

Vegetation mapping of the portion of the site mapped as Unknown is detailed in section 3.2. The vegetation survey identifies the areas mapped as Unknown as containing paperbark forest or pasture and aquatic vegetation. This vegetation qualifies as Other, and hence no further survey is required.

5.1.2. Koala Habitat Assessment

As only a limited area of forest vegetation occurs on site, a regularised grid-based SAT assessment was not undertaken due to lack of trees to satisfy the statistical assumptions of the method. As they were limited in abundance, scat searches were undertaken under all KFTs on site, and if found, an SAT assessment would be performed.

No evidence of Koala activity was found during the searches, thus the SAT recorded zero activity. Hence the mapped PKH on site does not qualify as Core Koala Habitat (CKH), and the proposal must be assessed under the CKPoM provisions for PKH.

All Koala food trees potentially impacted by the development were surveyed and mapped. Their location on the site is shown in Figure 10.

5.2. PKH Compliance Assessment

The proposal is a subdivision, and the proposal has been designed to retain all KFTs (Tim Mecham, pers. comm.), and hence section 4.7(a) applies. Section 4.7(a) requires assessment of the Performance Criteria in section 4.10 of the CKPoM.

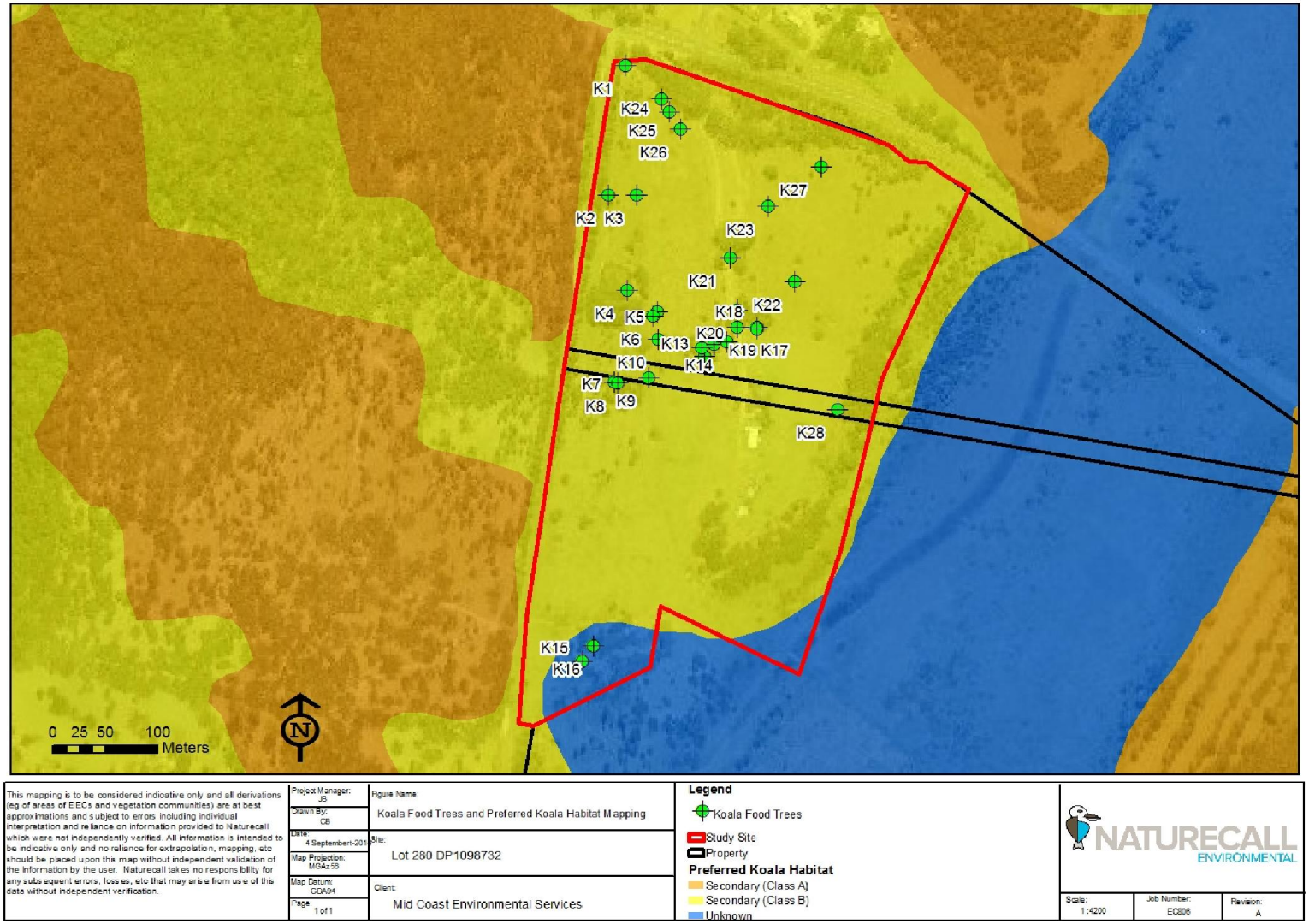
5.2.1. Performance Criteria Compliance Assessment

Section 4.10 of the CKPoM lists Performance Criteria for PKH. The proposal is assessed by these criteria to demonstrate compliance with the CKPoM in the following table:

Table 14: KSC CKPoM Compliance Assessment

Performance Criteria	Compliance Assessment
a) maximise retention and minimise degradation of native vegetation across the subject land	Proposal has been designed to maximize vegetation, and will only result in the removal of a minimal number of trees to establish the APZs. Only non-KFTs will be removed.
b) minimise the removal of any identified preferred koala food trees, where they occur across the subject land	Proposal has been designed to retain all Koala food trees on the site. Title covenants will also see trees protected.
c) ensure such trees will not be negatively impacted by subsequent development works including the construction of buildings, associated infrastructure and/or provision of public utilities	As above.
d) maintain key linkages across the landscape, where they occur, to reduce the effects of habitat fragmentation;	The proposal will result in the removal of only a minimal number of trees, with no KFTs to be removed from the site. Hence, the proposal will not result in further fragmentation of habitat on the site.
e) comply with the Habitat Compensation Measures where relevant as per Section 4.12 of this plan	As no Koala food trees will be removed from the site, no Habitat Compensation Measures apply.
f) Where Onsite PKFT Tree Replacement Measures have been applied, as per Section 4.9 of this plan, measures to ensure the retention of replacement trees over time, which may include but are not limited to restrictions on title	As above.
g) Where koala habitat and associated linkages are proposed to be retained on the development site to mitigate impacts, measures to ensure the protection of those areas in the long term, which may include but are not limited to restrictions on title	Relevant restrictions will be required to retain Koala food trees.
h) Appropriate measures (ie erection of exclusion fencing) are to be in place to ensue koalas are protected during site construction works. Should koalas be found on site during clearing, construction or site works then provisions (i) and (j) in Section 4.11 apply	Minimal Koala habitat occurs on the site and no evidence of usage hence exclusion fencing not warranted. Vegetation to be inspected before clearing commences to ensure site is free of Koalas.

Figure 10: Preferred Koala Habitat mapping and location of Koala food trees



6.0 Impact Identification and Assessment

6.1. Direct Impacts

6.1.1. Establishment of the subdivision

As mentioned previously, the proposal is a two staged development to enable rural-residential subdivision of the site, with the creation of 14 Lots along with a new access road within the site. The total footprint for the development is approximately 16ha.

The layout has been designed to minimise loss of vegetation, with no Koala Food Trees or hollow-bearing trees to be removed (Tim Mecham, pers., comm.). Some of the edge of the swamp forest on site falling within the Asset Protection Zones (APZ) may be underscrubbed and thinned, but generally all Lots have largely cleared envelopes. Maintenance by landowners is expected to see any further regrowth on each lot removed and prevented from regenerating, hence the development footprint is expected to maintained in a modified condition in perpetuity.

Clearing on the floodplain is regulated by SEPP 14 and the *Native Vegetation Act 2003*. Given these controls and associated exclusions currently exist, and will remain in effect post-development, and the nature of the proposal is considered unlikely to see a change in landuse or activity in this area: no direct impacts as a result of the proposal are considered likely in this area.

6.2. Indirect Impacts

The following indirect impacts are generally associated with residential to rural development. The following table evaluates the likelihood of occurrence and potential significance:

Table 15: Indirect impacts associated with the proposal

Threat	Literature Review	Assessment Of Proposal
Direct mortality via clearing and habitat destruction	Animals within hollows and fallen logs, as well as dense vegetation and leaf litter may be killed during clearing of these structures. This risk increases during breeding seasons (generally spring to late autumn), and cooler season when mammals and reptiles enter torpor.	As detailed above, no hollow- bearing trees are to be removed for the development. Given this and current state of the site, direct mortality is considered a minimal risk.
Fragmentation and Landscape change	Fragmentation and the associated landscape changes at all scales is major factor in the decline of biodiversity, the modification of ecosystems, and alteration of ecosystem processes. Its effects vary with factors such as distance of fragments from similar habitat, their position in the landscape, the forms of habitat modification	As the proposal should result in relatively minimal clearing, and given the current fragmentation of forest vegetation and lack of undergrowth on site: fragmentation and isolation of habitat is not expected to be a significant issue.

	of isolates that occurs (e.g. due to edge effects), and types of surrounding land uses in the matrix, the ecology of the species affected, and how these factors influence the movement of organisms between the isolates and larger areas of habitat (Lindenmayer and Fisher 2006, OEH 2014b).	It is preferred that no fence capable of inflicting injury is (e.g., barb wired fence) to be erected. Plain wire and electric fences are preferred.
Erosion and Sedimentation	Sedimentation and erosion impacts can occur at both the construction and establishment phases. Erosion/sedimentation may occur via erosion of fill material and disturbed soils, scouring of exposed soil, earthen banks and habitats adjacent to the development area via directed flow (e.g. stormwater), or where runoff is concentrated.	Standard mechanisms and controls should ensure the prevention of erosion and sedimentation during construction and post-development and such impacts do not extend beyond the footprint of the dwelling envelopes and access roads.
Fencing	Fences have potential to obstruct the movement of threatened fauna across the site. Some threatened fauna can be injured by collision with wire fences, particularly barbed wire e.g. the Yellow-bellied Glider, owls and Squirrel Glider have been recorded being injured by barbed wire fences (Lindenmayer 2002, Berrigan 2001c, Woodford 1999).	Fencing of individual Lots as a result of the subdivision could create barriers to movement and injury risks to species such as Koalas, gliders and possums across the site. It is recommended that no fence capable of inflicting injury is (e.g., barb wired fence) to be erected. Fauna friendly fencing is preferred.
Noise, Vibration and Anthropogenic Disturbances	Noise effects on fauna in Australia are relatively poorly studied (Clancy 2001, Berrigan 2001d). Most evidence presented is anecdotal, but suggests most fauna have at least a fair degree of tolerance and adaptation at least to residential noise depending on species, situation, habitat/lifecycle stage affected, habitat significance, etc.	Currently, noise is derived from traffic on Maria River Drive and more so Crescent Head Road, and rural activities on site and adjoining lands. During the development's establishment, noise will be highest during construction, but limited to day time hence will only impact diurnal birds and mammals. Post-development, noise will be typical of a rural-residential areas which is generally low to nil at night, but periodically moderate via ride-on mowers, which may potentially peak on weekends.

		Noise generated by the proposal is unlikely to disturb fauna occurring on the site, with species expected to have a substantial tolerance to the current level of anthropogenic noise in the area.
Weed Invasion	Disturbance of soil provides the opportunity for weed invasion. Weeds may also be transported to the site from vehicle, people (e.g. on clothing), etc., who visit the development area, and via introduced fill material.	Soil disturbance will occur, providing opportunity for weed invasion, but this will occur within the development envelope where the groundcover will be intensively managed.
On-site Effluent Treatment	Source of nutrients and diseases which may impact on aquatic ecosystems (e.g. algal blooms), increase weed growth, etc. (DLWC 1998a, 1998b). On-site effluent disposal may also advantage weeds via regular irrigation and additional nutrients, with associated impacts on native species adapted to low nutrients and periodic dry conditions (Vallee et al 2004, Bennet et al 2000).	New dwellings are to be serviced by on-site effluent disposal. Statutory controls are expected to ensure adverse impacts do not occur on adjacent habitat e.g. the drainage line.
Introduction of feral/introduced species	Urban, industrial and rural developments are often associated with the introduction of non-native species i.e. rodents, cats and dogs accidentally and intentionally e.g. via creating habitat for such species (e.g. rats, Indian Myna) or as pets. Feral cats and foxes are significant predators of native species (NSWSC 2000a, Dickman 1996, May and Norton 1996, OEH 2014b), and domestic dogs are significant threats to species such as the Koala (Wilkes and Snowden 1998, Port Stephens Council 2001, Connell Wagner 2000b, OEH 2012b). The mere presence of these predators has also been shown to affect fauna behaviour e.g. avoidance and range contraction. Rodents compete with native species but also form component of native species prey (OEH 2014b, Debus 1993).	The conversion of the site to a rural residential land use may result in the introduction of non-native pet species such as dogs and cats to the study area. The introduction of dogs on the site has the potential to increase the risk of attack on Koalas. However given that Koalas have not been found to have a significant association with the site, this risk is unlikely to be significantly increased. The introduction of cats poses a predation risk to Phascogales and Squirrel Gliders and could elevate potential mortality rates. Restrictions on cat ownership are difficult to enforce, hence this is not recommended, especially given adjacent rural and residential areas are not bound by such restrictions, hence cats may roam the site from

		adjoining land. Low potential of both species to occur the site suggest the actual risk is low.

7.0 Recommendations

7.1. Primary Recommendations

The following are recommended to be included as conditions of consent if the proposal is approved in order to mitigate the major potential ecological impacts of the proposal. The conclusions of this assessment assume these measures are implemented and effective in mitigating impacts.

7.1.1. Protection of Koala Food Trees and Hollow-bearing Trees

All Koala food trees (Tallowwood and Forest Red Gum) on the site are protected under the CKPoM. All hollow-bearing trees on site have also been located. Location data is provided in Appendix 3 and 4.

Title covenants will apply to specifically protect these trees to ensure they are retained in perpetuity eg via ensuring dwellings are not placed too close.

7.1.2. Protection of Habitat Trees During Clearing

The retained hollow-bearing trees and Koala Food Trees are to be clearly marked and fenced off (eg with paramesh or bunting) prior to clearing if any construction activity occurs in close proximity.

Site induction is to specify that no vegetation modification via any means is to occur beyond the nominated area, and no storage or dumping of any building material is to occur under the drip line of any retained trees.

Any clearing and earthworks associated with the development is to avoid damage to root zones of retained trees e.g. no parking of vehicles or storage of materials or excavated fill under retained trees.

7.2. Secondary Recommendations

7.2.1. Sedimentation and Erosion Control

Standard soil and sedimentation control measures will be required by Council in the construction stage of the proposal to ensure that habitats on the site and in the study area, as well as subsequent wetlands/aquatic habitats nearby are not substantially affected by the proposed development.

Proposed drainage systems need to be adequately designed and effectively established to prevent the risk of any substantial impacts (e.g. erosion and sedimentation) as per statutory obligations.

7.2.2. Specifications for Landscape Plantings

Any landscaping proposed as part of the development should give due consideration to the establishment of native plants as ornamental species to maintain and/or increase biodiversity, provide replacement habitat, and maximise water efficiency.

Recommended species for planting should include locally indigenous *Eucalypts, Angophoras, Grevilleas, Banksias, Melaleucas, Acacias, Allocasuarinas* and *Callistemons* (especially Winter-flowering species which are useful for the Little Lorikeet, gliders, honeyeaters and Grey-headed Flying-fox e.g. *Banksia integrifolia*); and fruiting rainforest species such as Brush Cherry (*Syzygium australe*), figs, *Acronychia spp, Cryptocarya spp*, etc.

Where possible, plantings should preferably not be in parkland style or isolated trees as this minimises their effectiveness to provide habitat to all but common medium sized species (e.g. Currawongs and Indian Mynahs) and may become detrimental to the presence of other species (Catterall 2004). Rather, plantings should be planned to recreate a natural structure (i.e. layered). Such plantings thus would consist of at least one or two canopy trees, underlain by a few understorey trees, and finally a number of shrubby species. This multi-layered planting can provide effective aesthetics while supporting passerine birds (who depend on the lower stratums and structural complexity), Yangochiropteran bats, and canopy species such as birds, arboreal mammals and Yinpterochiropteran bats (Catterall 2004).

7.2.3. Artificial Lighting

To ensure anthropogenic impacts are minimised, it is recommended that artificial lighting be kept to a minimum and be of a localised and low luminosity, with light directed to the ground and not onto retained trees/adjacent vegetation.

7.2.4. Fencing Materials

Due to its injury risk, barbed wire fencing is recommended to be avoided. Plane wire and electric fencing is preferred.

8.0 Seven Parts Test Assessment

8.1. General Overview

The 7 Part Tests are used to determine whether a proposed development is likely to have a significant effect on threatened species, Endangered Ecological Communities, Endangered Populations and Critical Habitat listed under schedules of the *Threatened Species Conservation Act 1995* known or considered reasonably likely to occur in the area influenced by a development proposal. Considerations must be given to the possible significant impacts a proposed development may have on threatened species, populations, ecological communities, and their habitats (DECC 2007).

The content of the 7 Parts are specified by Section 5A of the *Environmental Planning and Assessment Act 1979*, as amended by the *Threatened Species Act 1995*, which in turn has been amended by the *Threatened Species Conservation Amendments Act 2002*.

8.1.1. Entities to be assessed

No threatened flora species were detected during the survey in the study area, but *Maundia triglochinoides* could potentially occur in other parts of the property. While the proposal has no direct implications for this plant's habitat, the Precautionary Principle requires due consideration.

Three EECs, "*Freshwater Coastal Wetlands on Coastal Floodplains of the North Coast, Sydney Basin and South East Corner bioregions",* "*Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions"* and "*Swamp Oak Coastal Floodplain Forest of the New South Wales North Coast Bioregion"* currently occur in the study area. These automatically require assessment.

No threatened fauna species were detected during the site survey, but the Black-necked Stork has been previously recorded on the property. The following species (see Appendix 1) are also subject to the 7 Part Tests as they are considered to have at least a low potential to use some habitat on the site at some time (e.g. now or if they were to potentially recover and expand):

- **Mammals:** Yellow-bellied Glider, Squirrel Glider, Koala, Brushtailed Phascogale, Grey-headed Flying-fox, Yellow-bellied Sheathtail Bat, Little Bent-wing Bat, Eastern Bent-wing Bat, Greater Broad-nosed Bat, East-coast Freetail Bat, Hoary Bat, Southern Myotis, Common Blossom Bat.
- **Birds:** Glossy Black Cockatoo, Masked Owl, Powerful Owl, Square-tailed Kite, Little Eagle, Little Lorikeet, Varied Sittella, Eastern Osprey, Brolga, Black Bittern, Australasian Bittern, Australian Painted Snipe.
- **Amphibians:** Green-thighed Frog, Wallum Froglet.

Brief ecological profiles are provided in Appendix 1 for these species. More complete profiles can be found online (DoE 2014b, OEH 2014b), and these and the references listed in this assessment were used in combination with personal knowledge when undertaking the impact assessment.

8.1.2. Local Populations Occurrence

The guidelines associated with the revised factors have provided definitions for key terms with the most significant being that of the "*local population*" and "*local occurrence*" as follows (DECC 2007):

"Local population: the population that occurs in the study area. The assessment of the local population may be extended to include individuals beyond the study area if it can be clearly demonstrated that contiguous or interconnecting parts of the population continue beyond the study area, according to the following definitions.

- The *local population* of a threatened *plant* species comprises those individuals occurring in the study area or the cluster of individuals that extend into habitat adjoining and contiguous

with the study area that could reasonably be expected to be cross-pollinating with those in the study area.

- The *local population* of *resident fauna* species comprises those individuals known or likely to occur in the study area, as well as any individuals occurring in adjoining areas (contiguous or otherwise) that are known or likely to utilise habitats in the study area.
- The *local population* of *migratory or nomadic fauna* species comprises those individuals that are likely to occur in the study area from time to time…."

The local population of the potentially occurring threatened species is thus defined as follows:

Table 16: Definition of local population

Species	Local Population
Glossy Black Cockatoo	The local breeding pair for which the study site/area/property constitutes a minute portion of larger potential foraging territory. Local population thus requires much more habitat that found within study area to meet lifecycle requirements.
Masked Owl Powerful Owl	The local breeding pair for which the study site/area/property may constitute a minute portion of larger potential foraging territory. Local population thus requires much more habitat that found within study area to meet lifecycle requirements.
Square-tailed Kite Little Eagle	Any individuals known or potentially using habitat within site/area/property depending on prey abundance as part of larger range. Local population requires much more habitat that found within study area to meet lifecycle requirements.
Little Lorikeet	Any individuals potentially using habitat within the site/area/property depending on flowering incidences. Local population requires much more habitat that found within site/area/property to meet lifecycle requirements.
Varied Sittella	The family group/s which use the site and adjoining habitat in the study area for foraging and breeding. Given the marginal value of habitat on site, the local population would meet the majority of its lifecycle requirements off-site and beyond the study area.
Eastern Osprey	The local breeding pair for which the study site/area/property constitutes a minute portion of larger potential foraging territory. Local population thus requires much more habitat that found within study area to meet lifecycle requirements.
Black-necked Stork Australian Painted Snipe Brolga Australasian Bittern Black Bittern	Individual bird or breeding pairs which may use the dams on site, or more likely the wetland and swamp forest on the floodplain as part of their non-breeding and seasonally-dependant local range. Local population would meet the majority of its lifecycle requirements off-site and beyond the study area and property.

Species	Local Population
Brushtailed Phascogale	Any individuals which may use the site and adjoining habitat in the study area for foraging and breeding. Given the marginal value of habitat on site, the local population would meet the majority of its lifecycle requirements off-site and beyond the study area.
Yellow-bellied Glider	Individuals/colonies in adjacent forest which may use habitat in the study area, with the site forming the marginal fringe. Local population requires much more habitat that found within study area to meet lifecycle requirements, and would meet most of these requirements at most times off-site.
Squirrel Glider	Individuals/colonies in adjacent forest which may use habitat in the study area, with the site forming the marginal fringe. Local population requires much more habitat that found within study area to meet lifecycle requirements, and would meet most of these requirements at most times off-site.
Grey-headed Flying-fox	Any individuals known to be using habitat on site/in the study area/property depending on seasonal flowering incidences. Local population thus requires much more habitat that found within study area to meet lifecycle requirements.
Koala	Any individuals known to be using habitat on the site and or study area as part of a larger home range. Lack of use on site and extent of habitat to west indicates local population would require and satisfy its requirements mostly outside the site and study area.
Bent-Wing Bats, Hoary Bat, East-coast Freetail Bat, Greater Broad-nosed Bat, Yellow-bellied Sheathtail Bat, Southern Myotis	Any individuals/colonies which may use forest in the site/study area/property for foraging and roosting at some stage of their lifecycle which will see them ranging over a far wider range. Local population requires much more habitat that found within study area to meet lifecycle requirements.
Common Blossom Bat	Any individuals using the study area and more so the eastern part of the property for seasonal foraging. Due to limited preferred resources on site/study area/property and seasonal availability of the food resource, local population and individuals would extend well beyond property to meet lifecycle requirements eg roosting habitat.
Green-thighed Frog	Any individuals potentially occurring on site and more so the study area, using the dams for breeding and adjacent habitat for shelter and foraging. Given ecology and marginal habitat on site, local population is likely to well extend beyond the site and study area.
Wallum Froglet	Any individuals potentially occurring on the site in the limited swamp forest and adjoining habitats in the study area, with range varying with hydrological regime. More likely to comprise a likely population in wetland on remainder of property beyond study area, but could potentially expand to study area eg during major flooding when displaced from core habitat.

Species	Local Population
Maundia triglochinoides	This plant is not known to occur on site in the study area or property, but has potential to occur in the latter, and suitable habitat occurs on site in dams and the billabong. Given the species is dispersed by floods and is only a potential occurrence, the local population is considered to be any plants area potentially occurring within habitat within the study area established by floods from other populations within the locality.

The local occurrence of the EECs as per the DECC (2007) definition are that within the study area, This would include the areas shown in Figure 6, and part of the EECs within proximity to the south and west that may be affected by nutrient enrichment flows from on-site effluent treatment. As the landuse on the remainder of the property is not expected to substantially change, this area is not considered part of the study area, hence the majority of the local occurrence of the EEC is outside the study area.

8.2. Seven Part Test Assessment

8.2.1. Seven Part Test Structure

To minimise repetition and superfluous information, the responses to the 7 Part Tests are structured as follows:

- In Part (a), species are grouped together based on broadly common ecology (i.e. mobile bird species such as the owls or species with similar habitats such as the Yangochiropteran bats) or similar impacts, and subject to a common 7 Part Test response to part (a).
- Parts (d) and (f) are collectively depending. Part (b) deals with Endangered Populations of which none are relevant to the proposed development. Part (c) applies specifically to EECs, and the two recorded EECs on site is assessed here. Part (e) deals with Critical Habitat, which is not relevant to the subject proposed development.

8.2.2. Seven Part Test Responses

(a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

In addition to conversion of the current rural landuse to rural-residential in the northwest part of the property, and its associated intensification of associated threats (e.g. anthropogenic activities) on site: the proposed development may see some vegetation removal/modification to enable establishment of dwellings eg 1, 4 and 13. The current extent of cleared land is considered to minimise if not negate the need for tree removal on the other Lots.

To a limited extent, the loss of vegetation on the site as a result of the proposal will incrementally and cumulatively reduce the study area's carrying capacity for some of the subject species via

removal of potential foraging sources (e.g. sap sources and flowering canopy species) and/or potential prey habitat (e.g. Yangochiropteran bats insect prey habitat). No hollow-bearing trees will be removed, hence denning/nesting/roosting habitat will not be removed. The remainder of the property which is flood-prone is also expected to remain in a similar condition as it is now, with current landuses persisting.

The impact of the proposal will vary in significance and context per species/species groups as follows:

***Maundia triglochinoides*:**

This plant is not known to occur on site or the study area, but potential habitat occurs in these areas, with more extensive potential habitat in the nearby SEPP 14 area. This plant appears to spread with floods, hence if a population occurs in the locality, it could potentially be dispersed to habitats in the study area eg the billabong at the foot of the slope.

The proposal has no potential to impact this plant as:

- Known or potential habitat is not directly or indirectly affected by the proposal.
- No barriers to dispersal will be created.
- No change to the hydrological regime will occur.

Consequently, the proposal has no potential to place a local viable population at risk of extinction.

Koala

The Koala was not detected on site during the survey. The Bionet database (OEH 2014a) shows the Koala has been recorded extensively within the locality, with 81 records observed. Dulconghi Hill to the northwest is also well known to support Koalas.

The majority of the site is mapped under the KSC CKPoM as Potential Koala Habitat (Secondary Class B). As determined in section 5, this area is not Core Koala Habitat, and no evidence of Koala usage occurs. The remainder of the property lacks KFTs, hence overall has low Potential Koala Habitat values. In the local context of local known Koala habitat, the site/property is on the eastern fringe of a locally significant area of Koala habitat.

The habitat limitations and lack of usage indicate the site is unlikely to be significant to the Koala for foraging. At best, it may occur infrequently as part of a low density population in the wider area or as a transient during specific lifecycle stages e.g. breeding season dispersal of sub-adults. Thus the local population would extend well beyond the confines of the site/study area and home ranges would be largely centred on adjacent habitat, as records suggest.

Due to requirements of the CKPoM, the proposal will not result in the loss of any KFTs on the site therefore the proposal will not contribute towards the loss of Potential Koala Habitat in the locality.

New dwellings may see an incremental increase in traffic along Maria River and Crescent Head Road, and this will add to the risk of road strike to Koalas. The significance of this increased risk is

considered low due to the lack of Koala records on the site; and the current high level of traffic along Crescent Head Rd (peaking in holiday periods).

Dog attack may also pose a risk due to the increased number of pet dogs that may eventuate, however dogs may already exist on adjacent properties; and the site is not Core Koala Habitat. The proposal will thus incrementally add to this cumulative threat.

Overall, the proposal will not result in the loss of any KFTs, but will generally see an incremental increase in other threats which currently occur in the wider area. Given neither Core Koala Habitat or an area of major activity is impacted; connectivity is not effectively prevented between proximate habitat; and key impacts are relatively mitigable: the proposal is considered unlikely to result in impacts of sufficient order of magnitude to place a local viable population at risk of extinction due to loss of viability.

Yellow-bellied Glider, Squirrel Glider, Brushtailed Phascogale

None of these species have been recorded on the site, however proximate records for the Yellow-bellied Glider, Squirrel Glider and Brushtailed Phascogale exist in interconnected habitat (OEH 2014a, Darkheart 2005j).

The small area of dry sclerophyll on site represents generic potential foraging habitat for these species, and contain preferred sap trees for the gliders. No active sap incisions were noted indicating presence of gliders. Suitable hollows appear to occur on site, but most are located in the southeast of the property with very poor connectivity to suitable habitat. Hence denning is not likely to occur on site.

The proposal will only slightly impact the Yellow-bellied Glider, Squirrel Glider and Brushtailed Phascogale via a minimal loss of carrying capacity as only a small number of trees offering nectar, sap and pollen sources and an insect foraging substrate will be removed. Given this, and that these trees form only a small portion of the local abundance of this resource, while a negative effect, this is not considered sufficient to undermine the local population's ability to obtain sufficient sustenance and raise young. As mentioned, no trees containing suitable hollows will be removed as a result of the proposal. The site's current low connectivity values will also remain.

Cats may be introduced to the site as pets. Cats are potential predators particularly of Phascogales. This will incrementally increase potential predation risk. However given that occurrence on site is only likely as an animal foraging on the marginal fringe of its preferred habitat, the risk and hence significance is considered low. Consequently mortality levels as a direct result of cat predation is not considered a significant risk of compromising the local population's recruitment.

Overall thus, while the proposal will have a negative impact on the current carrying capacity and habitat quality of the site/study area; the impact is not considered likely to be of sufficient order of magnitude to adversely affect the local population's life cycle to the point that it would be at significant risk of loss of viability.

Grey-headed Flying-fox

These species of bats traverse over a very large range according to seasonal flowering and fruiting, and lifecycle stage e.g. maternity season (OEH 2014b, Eby 2002, 2000a, 2000b). Hence the site/study area only has potential to form a small to minute part of a local breeding colony's seasonal range, and consequently, a local population of either species needs to fulfil the majority of its lifecycle requirements well beyond the site/study area.

Only a handful of canopy trees and a small area of regrowth will be removed as part of the proposed development, and all KFTs which are also a food source for Grey-headed Flying-fox will be retained. The paperbark swamp forest which offers key habitat for this species in the eastern part of the property will also remain as is. Given the ecology of the species, extent of local habitat, and extent of habitat removed, this loss is clearly not capable of disrupting the lifecycle of a local population of these bat species.

Overall, given the ecology of these species i.e. that the seasonally variable range of the species is measured in terms of tens to hundreds of thousands of hectares (Eby 2002, 2000a, 2000b), and hence the habitat loss is miniscule in this context; that no barrier to connectivity for these species will be created; that the subject species are also known to forage in rural areas and in retained habitat within or adjacent to rural-residential and urban areas (hence are likely to occur in the study area post-development to an equivalent level of current probability); and that the local populations of the subject species would extend well beyond the confines of the site/study area to meet the majority of their life cycle requirements: the order of magnitude of the proposal's sum negative effect is not considered sufficient to result in a direct decline (i.e. reduce viability) of a local population of these species.

Masked Owl and Powerful Owl

These species of owl were not recorded during this or previous surveys, but these large range species are often only detected by long term surveys using specific survey methods (DEC 2004). Both have been recorded in the locality and on nearby Dulconghi Hill (OEH 2014a).

The subject owls require very large territories, or seasonably variable ranges that far exceed the site/study area/property (OEH 2014b, Smith *et al* 1995, DECC 2006a, Debus 1994, 1995, NPWS 2003). Hence the site/study area/property only has potential to form a small to minute part of a local pair's range, and consequently, a local population needs to fulfil its lifecycle requirements well beyond the study area/property.

The proposal will impact these owls via a minor but incremental and cumulative loss of habitat within their territory. This may result in a minor reduction of potential habitat for prey species such as rodents, possums and birds, however the majority of habitat on the site along with linkages to adjacent habitat will be retained. No suitable hollow-bearing trees for these species occur on the site, hence none will be removed by the proposal.

As the territories of these species are measured in terms of hundreds to thousands of hectares (DECC 2006), the relatively minor loss of carrying capacity resulting from the proposal, while a

negative impact, is not sufficient to undermine the local pair's ability to obtain sufficient forage to raise young to fledging.

Given that that no barrier for these species will be created; that the subject species are also known to forage in rural areas and in retained habitat within or adjacent to rural-residential and urban areas (hence are likely to occur in the study area post-development), and that the local populations of the subject species would extend well beyond the confines of the site/study area/property to meet the majority of their life cycle requirements: the order of magnitude of the proposal's sum negative effect is not considered sufficient to result in a direct decline (i.e. reduce viability) of a local population of these species.

Square-tailed Kite and Little Eagle

These raptors were not recorded by the survey, however the Square-tailed Kite has been recorded within the locality (OEH 2014a).

These raptors require very large territories, or seasonably variable ranges that far exceed the site/study area (OEH 2014b, Debus 2012, NSWSC 2009). Hence the site only has potential to form a small to minute part of their range, and consequently, a local population needs to fulfil its lifecycle requirements well beyond the site/study area/property.

The site/study area/property overall offers some generic potential foraging opportunities, although due to the extent of modification, prey abundance would be low. The proposal will impact the Square-tailed Kite and Little Eagle via a relatively minute but incremental and cumulative loss of potential foraging habitat within their territory. The territories of this species is measured in terms of square kilometres (Debus 2012), hence the relatively minute loss of carrying capacity to their territories, while a negative impact, is not sufficient to undermine the local pair's ability to obtain sufficient forage to raise young to fledging.

No known nest sites will be removed, hence there is negligible risk of direct mortality. The species has been recorded building nests in urban remnants and along busy roads, hence its potential to nest on site will be retained.

Overall, due to the ecology of the subject species; that no critical habitat will be removed; and the presence of extensive areas of forest adjacent and within range of the site/study area/property : the proposal will essentially constitute a relatively minute contraction of their wider foraging range.

Given this; that no barrier to connectivity for these species will be created; that the subject species are also known to forage in rural areas and in retained habitat within or adjacent to rural-residential and urban areas (hence are likely to occur in the study area post-development), and that the local populations of the subject species would extend well beyond the confines of the site/study area/property to meet the majority of their life cycle requirements: the order of magnitude of the proposal's sum negative effect is not considered sufficient to result in a direct or indirect decline (i.e. reduce viability) of the local population of the subject species.

Little Lorikeet

This bird traverses over a very large range according to seasonal flowering (OEH 2014b, NSWSC 2009). Hence the site/study area/property only has potential to form a small to minute part of a local pair's seasonal range, and consequently, a local population needs to fulfil its lifecycle requirements well beyond the site/study area/Precinct.

As the proposal will only result in the removal of a minimal number of canopy trees (none of which contain a potential nesting hollow) and some limited undergrowth (mostly Swamp Oak); and given the seasonal range of this bird and extent of other habitat remaining locally: this is not considered likely to directly affect breeding success.

Given the above; the ecology of the subject species and the presence of extensive areas of forest on the property, adjacent and within range of the site/study area/property; that no barrier to connectivity for this species will be created; that the species are known to forage in retained habitat within or adjacent to rural-residential and urban areas (hence likely to occur in the study area post-development); and that the local populations of the species would extend well beyond the confines of the site/study area/property to meet life cycle requirements: the order of magnitude of the proposal's sum negative effect is not considered sufficient to result in a direct decline of a local population of the Little Lorikeet.

Varied Sittella

This species have not been recorded on site, however records exist in the locality with the nearest being west of the study site within Maria National Park (OEH 2014a).

The loss of some marginal generic foraging habitat on site would not have any measureable impact on the current potential carrying capacity of the site, given that it only offers a relatively small and marginal area of potential habitat on the outermost fringe of a large body of potential habitat.

The potential increased presence of cats will incrementally add to the predation risk, but given the current exposure of the area to raptors and cats from established dwellings, the incremental elevation in risk is not considered likely to be significant.

Overall, considering the minor amount of habitat loss relative to the extent of habitat in the study area and beyond, the order of magnitude of impacts associated with the proposal is not considered likely to be sufficient to be considered likely to place a local population of these birds at risk of extinction.

Eastern Osprey, Black-necked Stork, Brolga, Australian Painted Snipe, Black Bittern and Australasian Bittern:

The Black-necked Stork has been previously recorded on the property, foraging in the large wetlands which form part of a larger and locally significant SEPP 14 wetland. This wetland also offers potential foraging habitat for the Brolga, Australian Painted Snipe, Black Bittern and Australasian Bittern. Connection Creek offers marginal potential forage for the Osprey, and the extensive swamp forest offers generic nest material which is locally abundant. An Osprey nest occurs west of Crescent Head,

and no nest occurs on site. The other birds are unlikely to breed on the property due to their ecology and variable hydrological regime.

The proposal has no direct impact on these species as the existing landuse in areas of potential habitat is not likely to change. Human presence could elevate, but this has been an impact associated with current and historical usage, and the busy adjacent road. Cattle are currently allowed to freely graze this area, hence this and similar agricultural impacts will remain.

New overhead powerlines may be established on the site, but as these do not fall in the flight path to access the wetlands, these are not considered to pose a hazard to these birds.

Cats may be introduced to the site as pets, but as these will be largely restricted to the site which is generally well-separated from the potential habitat, they are not considered a significant predation threat.

Overall thus, it is clearly apparent that the proposal has no potential to place a local viable population at likely risk of extinction.

Glossy Black Cockatoo:

This species has limited potential to occur due to a limited abundance of preferred food species on site, and lack of potential nesting hollows. Numerous records occur to the west and northwest on Dulconghi Hill where a relative abundance of food trees occur.

The proposal may impact this bird via some loss of potential food trees on site for APZs. While a negative impact, the site constitutes the marginal fringe of a large body of locally significant habitat, and is not a nesting site. Hence the loss will not compromise the local pair or local population's ability to breed or obtain sufficient forage to survive. Consequently, the proposal has no potential to place a local viable population at risk of extinction.

Common Blossom Bat:

This species is not likely to occur on site. It is more likely to occur in the extensive paperbark forest on the property during peak flowering events. There is no potential roosting habitat on the property, hence this species would range from such habitat elsewhere, if it occurred close enough.

The proposal will not place a local population at risk of extinction given:

- Roosting habitat is not affected.
- The overwhelming majority of potential foraging habitat is not affected at all.
- No barriers to access will be created.
- No new mortality threat will be created.

Yangochiropteran Bats: East-coast Freetail Bat, Eastern Bent-wing Bat, Little Bent-wing Bat, Greater Broad-nosed Bat, Yellow-bellied Sheathtail Bat, Southern Myotis, Hoary Bat.

Although none of these bats have been recorded on the site (though targeted survey was not undertaken), the study site/area/property is considered to provide some suitable foraging and roosting habitat. The presence of hollow-bearing trees may provide potential roosts but due to rarity, would be subject to competition with common species. This habitat is a minute fraction of similar and much more optimum habitat in nearby forested habitat to the south and east of the site/study area/property.

The larger dams on the site may offer foraging habitat for the Southern Myotis, but these are considered marginal for this species ie limited carrying capacity. More likely foraging habitat occurs in the wetland in the remainder of the property, particularly in wetter years.

All of these bats require home ranges or seasonably variable ranges that far exceed the site/study area at least seasonally depending on lifecycle stage or due to their ecology e.g. summer migrants in the south of the bioregion e.g. Dwyer 1966, 1968, OEH 2014b, ABS 2014, Smith *et al* 1995, Churchill 2009, etc.). Hence ecologically, while an individual/s may use the site/study area for foraging or possibly roosting in tree hollows at some time, any known/potentially occurring local population of these species would extend well beyond the site/study area to meet all their full lifecycle requirements.

The proposal will see removal of very few trees none of which contain hollows. The majority of habitat on the site will be retained, including the remainder of the property.

Considering the minor amount of habitat loss relative to the extent of habitat in the area, and that a local population of these bats would extend well beyond the site, the order of magnitude of impacts associated with the proposal is not considered likely to be sufficient to be considered likely to place a local population of the subject bats at risk of extinction.

Green-thighed Frog:

The Green-thighed Frog was not detected on the site, however survey was not undertaken during optimal detection periods i.e. after summer rainfall. This species has been recorded in the locality, with the nearest record to the west of the study site (OEH 2014a).

The dams on the site are considered to contain marginally potentially breeding habitat for this species, with the adjacent forest offering potential foraging and refuge habitat. Fallen logs, dense groundcover and leaf litter offer diurnal shelter (Ehmann 2007, Dadds 2007, OEH 2014b), but these are rare and poorly developed on site, as is sheltering vegetation. Given the marginal habitat on site, if present, the local population's range would extend offsite and outside the study area as non-breeding range appears to be substantial at least in some situations (Ehmann 2007, Dadds 2000, Lemckert *et al* 2006, 1997). Hence the local population would range beyond the study area for its lifecycle requirements.

The potential breeding sites should not be adversely affected by the proposal provided recommendations of this assessment are effectively implemented. The potential presence of

domestic cats may incrementally increase predation risk, but given current predation threat by foxes and native fauna, this increase is not considered likely to potentially compromise recruitment.

Hence, the order of magnitude of impacts associated with the proposal are not considered likely to be sufficient to be considered likely to place a local population at risk of extinction.

Wallum Froglet:

The Wallum Froglet was not detected by the survey despite targeted searches but has been recorded within 2km southeast of the site at Delicate Nobby. The site contains limited suitable habitat for this species within the margins of the site, with the billabong in the study area and more so the wetland forest occurring in the remainder of the property offering high quality potential habitat.

As detailed above, the proposal is not likely to remove habitat from these areas thus this will have nil consequence on the Wallum Froglet habitat. Therefore, no significant reduction in the site, study area or property's carrying capacity is likely.

The Wallum Froglet is considered sensitive to changes in water quality. Standard council control measures should mitigate the potential for impacts on water quality due to sedimentation, eutrophication and runoff associated with sewage and stormwater. The proposed building envelopes are also likely to be located a significant distance from potential habitat for the subject species. The vegetative buffer provided by surrounding habitat should also limit the potential for garden chemicals or petrochemicals to degrade water quality of potential habitats.

No new roads will be constructed though Wallum Froglet habitat and no isolation of habitat will occur as a result of the proposal. Consequently, the proposal has no capability of placing a local viable population at risk of extinction.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

No Endangered Population occurs on site or in the study area, hence none are affected by the proposal.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

As mentioned previously, three EECs occur on low-lying parts of the site and more extensively over the total property and on adjoining land. These comprise *Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions* (most extensive), *Freshwater Coastal Wetlands on Coastal Floodplains of the NSW North Coast,*

Sydney Basin and South East Corner bioregions and *Swamp Oak Floodplain Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner*.

The proposal generally avoids these majority of the local occurrence of these EECs as the new dwellings are located above the 1:100 ARI. At most, some edges of the Swamp Oak Floodplain Forest EEC and Swamp Sclerophyll Forest EEC may be modified for an APZ. Due to the extent of the local occurrence of these EECs, and that the underlying ecological processes will not be affected, this has no capability of placing these EECs at risk of local extinction.

(d) in relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed,

The dwellings can be located in existing clearings which will minimise tree removal for the proposal. A handful of trees and undergrowth may require removal for APZ. Small areas of modified groundcover vegetation and scattered shrubs will also require removal. Ongoing maintenance of the groundcover via slashing/mowing is also expected to prevent regeneration.

No KFTs or hollow-bearing trees will be removed from the site. The remainder of the property is expected to remain under the same landuse, with existing protective provisions under the *Native Vegetation Act 2003* and SEPP 14.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action,

The site is not mapped as a regional or sub-regional corridor, and offers no significant linkage values due to the patchy nature of the mostly regrowth vegetation. In contrast, the extensive swamp forest in the east of the property forms part of a key local corridor.

The proposal will see relatively minor change to current vegetation patterns and hence connectivity due the current state of the site ie mostly open paddock. Some narrowing of the regrowth of dry sclerophyll may occur in the north, but overall, current patterns and limitations are expected to remain.

The proposal is thus not considered likely to significantly increase the level of fragmentation on the site and current connectivity from habitat on site to adjacent habitat will essentially be maintained.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

As noted in part (a), the study site and on-site study area generally offers some mostly low quality potential foraging and refuge (denning, roosting, etc.) habitat for a number of threatened fauna species. However, to meet all lifecycle and routine foraging requirements, the range of all the species is considered likely to extend off the site/study area due to key habitat constraints (e.g. hollow-bearing trees, foraging resources). Hence it is not of any key significance to any fauna species, other than potentially to the Green-thighed Frog if it were to occur and use a dam for breeding. This

however appears unlikely given limited support habitat around the dams. Overall thus no habitat of critical importance to the survival of any species in the locality is to be removed.

For the EECs, the study area compromises only a very small fraction of the local occurrence due to extent on the remainder of the property, adjacent land and the larger SEPP 14 area. It is thus not critical for genetic viability or connectivity. Hence it is not critical to the persistence of the EEC in the locality.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No relevant areas of critical habitat have been declared, as yet, under Part 3 of the TSCA.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

Draft/final recovery plans have only been prepared for the Forest Owls, Yellow-bellied Glider, Grey-headed Flying-fox and Koala (DEC 2006, NPWS 2003, DECCW 2009, DECC 2008). Priority actions have been identified for all of the other species, and the EECs (OEH 2014b).

The *Recovery Plan for Koalas* (DECC 2008) specifies actions considered to be key threats to Koalas. This plan specifies habitat loss, fragmentation and degradation as the most important threats to Koalas throughout their range. The proposal is consistent with this Plan as it is consistent with the KSC CKPoM.

The proposal is slightly inconsistent with the Recovery Plans for the Forest Owls, Yellow-bellied Glider, Grey-headed Flying-fox as it will see some minor loss of generic potential habitat, however as this habitat is not of any specific importance, and no barriers to movement created, it is not capable of significantly affecting the objectives of any of these Plans.

For all other species and the EECs, the proposal may remove vegetation from the site which by strict interpretation could be considered as adding to the main threatening process affecting these species (habitat loss), and hence is inconsistent with the recovery of these species. However, given the relatively marginal quality of the habitat to be affected, the minor area of habitat to be removed, the extent of habitat and EECs to be retained on the property, current maintenance regime, and the abundance of similar habitat on adjacent land and in the locality; the loss is considered to be insignificant to the long term recovery of these species or the EECs.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The TSCA 1995 defines a “threatening process” as “a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities”. Loss and fragmentation of habitat due to urban, residential and rural development is a recognised threat to these species (Smith *et al* 1995, Lindenmayer and Fisher 2006, Johnson *et al* 2007, Smith *et al* 1995, Gibbons and Lindenmayer 2002, OEH 2014b, NPWS 1999b, Watson *et*

al 2003, Gilmore and Parnaby 1994, NPWS 2003b, etc.). The proposal thus generically qualifies as a class of activity that is considered a threatening process.

For all of the subject species and the EECs, the proposal will or may contribute (to varying extents) to the following Key Threatening Processes:

Table 17: Key threatening processes

KTP	Extent/Manner Which Proposal Affects KTP	Mitigable?
Clearing of native vegetation (NSWSC 2001c).	Removal of a small number native trees within the eastern portion of the site and some loss of native groundcover and shrubs.	Subdivision design has minimised clearing by placing development envelopes in open areas of the site. All KFTs and hollow-bearing trees will be retained.
Human caused climate change (NSWSC 2000d).	As above and generation of greenhouse gasses by machinery during construction.	As above.

9.0 Matters of National Environmental Significance

9.1. General Assessment Overview

The provisions of the EPBCA 1999 require determination of whether the proposal has, will or is likely to have a significant impact on a "*matter of national environmental significance"*. These matters are listed and addressed in summary as follows:

1. **World Heritage Properties**: The site is not listed as a World Heritage area nor does the proposal affect any such area.
2. **Ramsar Wetlands of International Significance**: A Ramsar wetland does not occur on the site, nor does the proposal affect a Ramsar Wetland.
3. **EPBCA listed Threatened Species and Communities**: The Grey-headed Flying-fox (Vulnerable), Koala (Vulnerable), Australasian Bittern (Endangered) and Australian Painted Snipe (Vulneralbe0 may potentially occur in the study area (more so the property). As detailed in section 9.2, none are considered at risk of a significant impact.
4. **Migratory Species Protected under International Agreements**: No Migratory species is likely to be significantly affected by the proposal as assessed below.
5. **Nuclear Actions**: The proposal is not a nuclear action.
6. **The Commonwealth Marine Environment (CME)**: The site is not within the CME nor does it affect such.

7. **National Heritage**: The site is not listed as National Heritage

The proposal thus is not considered to require referral to Department of Environment (DoE) for approval under the EPBCA.

9.2. EPBCA Threatened Species

9.2.1. Protected Species Assessments

The following EPBCA threatened species are considered potential occurrences and require assessment:

- Grey-headed Flying-fox (Vulnerable)
- Koala (Vulnerable)
- Australasian Bittern (Endangered)
- Australian Painted Snipe (Vulnerable)

9.2.1.1. Factors to be Considered for a Vulnerable and Endangered Species:

The guidelines to assessment of significance to this Matter, define an action is as likely to have a significant impact on a Vulnerable or Endangered species, if it will:

a) Lead to a long-term decrease in the size of an important population (Vulnerable) or population (Endangered) of a species, or:

b) Reduce the area of occupancy of an important population (Vulnerable) or population (Endangered), or:

c) Fragment an existing important population (Vulnerable) or population (Endangered) into two or more populations, or:

d) Adversely affect habitat critical to the survival of a species, or:

e) Disrupt the breeding cycle of an important population (Vulnerable) or population (Endangered), or:

f) Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or:

g) Result in invasive species, that are harmful (by competition, modification of habitat, or predation) to a Vulnerable or Endangered species, becoming established in the Vulnerable and/or Endangered species' habitat, or:

h) Introduce a disease that may cause a species to decline, or:

i) Interferes substantially with the recovery of the species.

An *important population* is one that is necessary for a species' long-term recovery. This includes such populations as:

- Key populations either for breeding or dispersal.
- Populations that are necessary for maintaining genetic diversity, and or:
- Populations that are near the limit of the species range:

9.2.1.2. Assessment of Significance

This section addresses each of the previous points listed.

For the purposes of discussion, the "*important population*" of Grey-headed Flying-foxes is defined as that population of the species likely to depend on colonial roosts in the locality (e.g. Crescent Head Rd), or within foraging range of the site/study area/property.

For the Koala, the important population would be the population of Koalas in at least the Kempsey to Crescent Head Rd environs (DoE 2014), which is a population that is a key source population for recruitment and necessary for maintaining genetic diversity.

For the Australian Painted Snipe, the important population would be any birds in the locality given the rarity of this bird.

a) Lead to a long-term decrease in the size of an important population (Vulnerable) or population (Endangered) of a species, or:

Grey-headed Flying-fox:

In the context of the Grey-headed Flying-fox's ecology, the site and the property overall provides a relatively minute area of potential generic foraging habitat. It is not known nor considered suitable as roosting habitat for this species, thus no such areas are affected by the proposal.

Due to the retention of the majority of habitat on site; extent of habitat in the study area and the significant extent on the property; the ecology of the species; and that the species readily forages and roosts in human-modified environments e.g. the Sydney Royal Botanical Gardens (Parry-Jones 2006): the proposal will not lead to a long-term decrease in the size of an important population.

Koala:

The Koala is only a low potential occurrence on site due to low quality habitat, sparse records and poor local soil quality meaning Koalas would have large home ranges (Biolink 2011, 2013).

All KFTs will be retained on the site as per the CKPoM, hence the current potential of the site to support Koalas will be retained. No barrier to access of these trees is expected, and no significant increase in road kill or dog attacks is expected.

Australasian Bittern and Australian Painted Snipe:

These birds may occur in the eastern end of the property as transients most likely seeking a drought refuge, or in the study area taking opportunity of major local flood events. The proposal will have no

impact on this potential occurrence as all potential habitat will remain, and no barrier to access created. Hence the proposal will not lead to any decrease in population size.

b) Reduce the area of occupancy of an important population (Vulnerable) or population (Endangered), or:

The area of occupancy of the local population of the Grey-headed Flying-fox would extend well beyond the confines of the site/property (as their ecology indicates an area of occupancy is likely to be tens if not hundreds of thousands of hectares – Eby 2000a, 2000b, Eby and Lunney 2002, Eby 2002).

As mentioned previously, establishment of the proposal may require the removal of a small number of trees (mostly immature regrowth for APZs) which offer generic potential forage for the Grey-headed Flying-fox. This loss is only a minor fraction of the potential habitat remaining in the study area. In this context, and in the context of the species' area of occupancy as discussed above, the proposal will reduce only a very small portion of the habitat available to an important population. Furthermore, the species is known to readily use habitat within urban areas indicating usage of highly modified habitat and adjustment to high levels of human presence (e.g. Smith 2002, Eby 2002, Parry-Jones 2006).

Given all KFTs are to be retained on the site and no barrier to access created, the proposal will have nil effect on the area of occupancy of the Koala.

The wetland habitat potentially used by the Australasian Bittern and Australian Painted Snipe will also remain unaffected hence the area of occupancy of these seasonally wide-ranging birds will not be reduced.

c) Fragment an existing important population (Vulnerable) or population (Endangered) into two or more populations, or:

The Grey-headed Flying-fox is highly mobile and known to be capable of crossing human-modified habitat (personal observations, Eby 2002, Parry-Jones 2006, Smith 2002). The proposal will thus offer no barrier to movement and hence will not fragment an existing important population.

The Koala is also relatively mobile, able to cross clearings and roads, though is highly susceptible to other threats such as dog attack and vehicle strike. Koala movement across the site may be inhibited by fencing with sheet metal, but this is unlikely due to cost or localised. Given the likelihood of free movement retained on site, there is no potential for fragmentation or isolation of an important population.

The Australasian Bittern and Australian Painted Snipe range widely across the region according to climatic conditions and their lifecycle stage.The proposal will not pose any barrier to these birds.

d) Adversely affect habitat critical to the survival of a species, or:

According to the MNES guidelines, "*critical habitat*" refers to areas critical to the survival of a species or ecological community and may include areas that are necessary for/to:

- Activities such as foraging, breeding, roosting or dispersal.
- Succession.
- Maintain genetic diversity and long term evolutionary development, or
- Reintroduction of populations or recovery of the species/community.

As mentioned previously, the study site/area is not known roosting habitat for the Grey-headed Flying-fox, nor is any significant extent of potential or known foraging habitat affected by the proposal. Post-development, due to the retention of the majority of habitat on the site and the demonstrated tolerance of the species to human presence (e.g. Eby 2002, Smith 2002, Parry-Jones 2006, Eby and Lunney 2002, Richards 2000), the site will readily retain its essential capacity to support foraging by the Grey-headed Flying-fox, as part of such locally abundant habitat. Hence the proposal is not considered likely to affect the viability of an important population.

The site contains only a limited area of Potential Koala Habitat marginally matching the definition of Critical Habitat in the Draft Referral Guidelines (DoE 2014). Additionally, all of the KFTs on site can be retained. No significant increase in threats from vehicle strike and the presence of dogs and cats is considered likely as a direct result of the proposal given current threat status.. Hence the proposal will not have a significant adverse effect on critical habitat.

The wetland habitat in the study area and on the property will retain its values to the Australasian Bittern and Australian Painted Snipe.

Given the above, the proposal is not considered to significantly affect habitat critical to the survival of this species.

e) Disrupt the breeding cycle of an important population, or:

The proposal will not disrupt the breeding cycle of an important population/population given that:

- The site/study area do not represent potential or known breeding habitat for any of the subject species;
- The potential for these species to occur on the site/in the study area/on the property will be retained post development;
- The site/study area/property potentially only forms a minute part of their local range, and hence lifecycle requirements.
- Alternative potential habitat in the locality is extensive.

f) Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or:

As detailed previously, the degree of possible vegetation loss imposed by the proposed development is not significant enough to affect the local population of the subject species to the point that it could cause a decline of the species.

g) **Result in invasive species, that are harmful (by competition, modification of habitat, or predation) to an Endangered species, becoming established in the Vulnerable and/or Endangered species' habitat, or**:

No new species that affects any of the subject species is likely to be introduced as a direct result of the proposed works. The introduction of domestic dogs and cats into the area would incrementally increase the risk of attack on Koalas utilising or transiting through the site. Given the low potential for occurrence of Koalas on the site, this impact can be adequately managed.

h) Introduce disease that may cause a species to decline, or:

No disease that poses a potential risk to these species is likely to be introduced to the site.

i) Interferes substantially with the recovery of the species.

Ideally, the goal in threatened species recovery is to increase the abundance and range of the threatened species, so that it is not in risk of becoming extinct. One major means of achieving this is to avoid habitat loss which is the principal cause of threatened species decline (Eby and Lunney 2002, Eby 2000a, 2000b, Richards 2000, Smith 2002, DECC 2007a, OEH 2014b, DoE 2014).

As detailed previously, the proposal is unlikely to significantly impact on the Koala, Australasian Bittern, Australian Painted Snipe or Grey-headed Flying-fox, thus it will have no significant effect on the recovery of these species.

9.2.2. Conclusion

The proposal is not considered likely to have a significant impact on the Koala, Australasian Bittern, Australian Painted Snipe or Grey-headed Flying-fox

9.3. Migratory Species

No migratory bird species were recorded by the survey, but the Great Egret and Cattle Egret have been previously observed on the property. The site/study area also offers potential habitat for a number of species such as the Eastern Osprey, White-bellied Sea-eagle, White-throated Needletail, Rainbow Bee-eater and Satin Flycatcher. These species are collectively assessed below.

9.3.1. Factors To Be Considered

The guidelines to assessment of significance to this Matter, define an action as likely to have a significant impact on a migratory species, if it will:

a) Substantially modify (including fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat of the migratory species, or;

b) Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat of the migratory species, or;

c) Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of the species.

An important area of habitat is:

1. Habitat used by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, or:
2. Habitat utilised by a migratory species which is at the limit of the species range, or;
3. Habitat within an area where the species is declining.

9.3.2. Assessment of Significance

This section addresses each of the previous points listed.

The site is not considered likely to constitute an important area of habitat on the basis of the following:

1. The site is not of sufficient extent to support an ecologically significant proportion of any of the above listed species (at most, only a small group or transient individuals). This value of the habitat is as a fraction of a significant extent of similar habitat not only in the LGA, but the North Coast Bioregion.
2. While some migratory species occurring in the locality may be at the limits of their range, no such species were recorded in the survey area.
3. If the site was located at the limits of a species whose abundance and range is declining, it would not be considered significant as such habitat is locally abundant in the area, and habitat with greater capability occurs within 10km e.g. State Forest, conservation reserves, etc.

In regards to point (**a**): The proposal does not affect important habitat (as detailed above). Occurrence of the subject species on site/study area/property is considered most likely to be as a short term seasonal forager with the site constituting a small part of their large seasonal nomadic range. The value of habitat on the site/study area/property is as a minor fraction of the significant area of potential habitat in the LGA and the North Coast Bioregion.

In regards to point (**b**): An invasive species is one that may become established in the habitat, and harm the migratory species by direct competition, modification of habitat, or predation. The proposal will not introduce any such invasive species.

In regards to point (**c**): No disruption of the lifecycle of any migratory bird is likely as:

- Habitat affected is either only marginally suitable, and/or locally abundant i.e. pasture and open woodland.
- No significant nesting/breeding habitat is affected.
- No significant foraging habitat will be affected ie pasture habitat identical to the site is locally abundant.

In view of the above, no migratory bird is considered likely to be significantly affected by the proposal.

10.0 Conclusion

The study site and property overall has evidently been subject to a significant disturbance history, which has seen the majority of the site and property cleared at some time. The site and much of the study area has subsequently been regularly maintained via slashing, effectively preventing regeneration and reducing habitat support values. Despite this, a number of mostly wide ranging threatened fauna species were considered to potentially occur to various degrees on the property, and three Coastal Floodplain EECs are present.

Overall, due to the current and future management of the site and property; ecology of the subject species; habitat limitations of the site; lack of any substantial impact on the EECs; and that all the subject species would depend on habitat well beyond the site/study area (and property) for their viability: the proposal is not considered likely to result in impacts of sufficient order of magnitude to place a local viable population or EEC at risk of extinction.

11.0 References

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Appendix 1: TSC Act – Seven Part Test Eligibility

A1.0 Potential Occurrence Assessment

The following tables are used as a summary to address threatened species (as detailed below) in terms of potential occurrence, and likelihood of being significantly affected by the proposal, and hence requiring formal 7 Part Test assessments. Threatened species have been assessed if it is:

a) Recorded on-site;

b) Not recorded on site, but recorded within a 10km radius (the locality), and may occur to some degree on-site or in the study area (land within 100m of site) due to potential habitat, key habitat component, etc.;

c) Not recorded in the locality as yet, but recorded in the bioregion, and thus may occur in the locality, and possibly to some extent, may occur on the site, due to potential habitat.

The "*habitat requirements*" column is derived from the previously listed references. Likelihood of occurrence is based on the probability of occurrence in terms of:

- Habitat extent (e.g. sufficient to support an individual or the local population; comprises all of home range; forms part of larger territory, etc.); quality (i.e. condition, including an assessment of threats, historical land uses on and off-site, and future pressures); interconnectivity to other habitat; and ability to provide all the species life-cycle requirements (either the site alone, or other habitat within its range);
- Occurrence frequency (i.e. on-site resident; portion of larger territory; seasonal migrant or transitory opportunist and thus when and how often, etc.)
- Usage ie breeding or non-breeding; opportunistic foraging (e.g. seasonal, migratory or opportunistic); marginal fringe of core range; refuge; roosts; etc.

An indicative 1-5 scale used by the author to indicate the likelihood of the species to potentially occur in the habitat on the study sites (if they have not been recorded in the locality) is as follows:

- 0: *Unlikely* (<1% probability) - no potentially suitable habitat; too disturbed; or habitat is very poor. No or few records in region or records/site very isolated eg by pastoral land, urbanisation, etc.
- 1: *Low* (1-10%)- few minor areas of potential habitat; highly modified site/habitat; or few habitat parameters present, but others absent or relatively insignificant (sub-optimum habitat). Usually very few records in locality.
- 2: *Fair* (11-25%) - some significant areas of potential habitat, but some habitat parameters limited. Potential for occasional foraging eg from nearby more optimal areas or known habitat. Records at least within 10-15km radius of site.
- 3: *Good* (26-50%) - significant abundance of habitat parameters/areas of habitat, and more locally e.g. adjacent. Potential part of larger territory, but probably unable to support breeding in isolation. Recorded within 10km in similar habitat/environs.

- 4: *Moderate* (51-75%) - quite good potentially suitable habitat on and adjacent to the site, and/or good quality and abundance of some vital habitat parameters. Records within <10km, or adjacent to site, or adjacent to high quality habitat where species likely to occur.
- 5: *High* (>75%) - very good to optimum habitat occurring on or adjacent to the site (support breeding pair or population). Recorded within 5-10km of site in same or similar habitat.

The "*Assessment of Significance*" column is based on consideration of the habitat on-site, likelihood of occurrence, and consideration of the DECC guidelines for assessment under the 7 Part Tests (DECC 2007). Recognising that some species with very large ranges or varying tolerances to habitat modification, some species which may have low potential to occur in the study area and will obviously not be significantly affected by the proposal will not be formally assessed to avoid production of superfluous information. Rather these species are assessed in the final column with justification for this assessment. However, recognising that significance is open to interpretation, the decision on whether a species is formally assessed or not by the 7 Part Tests in this assessment is based on the following rules:

a) If there is *any* justifiable risk, based on consideration, of a significant impact as a result of direct or indirect impacts, a 7 Part Test is required (ie the Principle of Uncertainty is applied).

b) Any threatened species recorded on-site or in the study area, or of at least fair chance of occurrence on-site in terms of potential habitat, is **automatically** selected for the 7 part Tests, unless the proposal has no effect (justification provided).

A1.1 Flora

Searches of relevant literature and databases (OEH/Bionet 2014a) found records of 3 threatened flora species in the locality. Subsequent surveys recorded this species within the drainage line of the site.

Table 18: Eligibility for Seven Part Test Assessment - Flora

Species	TSC Act	EPBC Act	Habitat Requirement	No. of records	Likelihood of Occurrence and Impact Significance	7 Part Test Required?
Sand Spurge	*Chamaesyce psammogeton*	E-TSCA	A herb that grows on fore dunes and exposed sites on headlands. Recorded on Bare Point, Kempsey, Hastings, Nambucca, Coffs Harbour, Port Stephens and Bulahdelah LGA databases.	1	Site does not contain suitable habitat for this species. No significant impact is therefore likely.	NO
–	*Maundia triglochinoides*	V-TSCA	An aquatic herbaceous plant found in swamps or shallow fresh water on heavy clay on the north and central NSW coast. Recorded on Hastings, Port Stephens, Richmond Valley and Kempsey databases.	2	The site contains potential habitat for this aquatic plant however it was not detected on site despite thorough searches of suitable habitat. Suitable habitat also occurs in the study area, and more so the property, and there is potential for this species to colonise. The proposal has no potential to impact this species given existing statutory provisions however potential to occur requires assessment.	**YES**

Species	TSC Act	EPBC Act	Habitat Requirement	No. of records	Likelihood of Occurrence and Impact Significance	7 Part Test Required?
Austral Toadflax	*Thesium australe*	V-TSCA	A parasitic herb commonly associated with Kangaroo Grass, and has been recorded on coastal headlands at Coffs Harbour, Hat Head, Crescent Head, Diamond Head and Perpendicular Point in Kangaroo Grass areas. Recorded on Hastings LGA, Kempsey, Bare Point, Coffs Harbour, Korogoro and Camden Haven databases.	3	Site does not contain suitable habitat for this species, therefore no significant impact likely.	NO
White-Flowered Wax Plant	*Cynanchum elegans*	E-TSCA, E-EPBCA	A twiner occurring predominately in dry rainforest, littoral rainforest and the ecotone between dry rainforest and open forest, however it has been found in the Manning Valley and Hastings in Open Forest types on specific geologies eg limestone and serpentine respectively (Garry Germon pers. comm. 2004, personal observations). It occurs on a variety of lithology's and soil types. It has been found between the altitudinal ranges of 0 to 600 metres ASL and rainfall >760mm annually (NPWS 1999). Common associated species include Geijera parviflora, *Notelaea microcarpa, Banksia integrifolia, Ficus* spp., *Guioa semiglauca, Melia azedarach, Streblus brunonianus* and *Pittosporum revolutum*. Recorded in Camden Haven, Port Macquarie-Hastings, Clarence Valley, Kempsey, Byron, Wingham, and Bulahdelah databases.	1	No suitable habitat occurs on the site, therefore no significant impact likely.	NO

Species	TSC Act	EPBC Act	Habitat Requirement	No. of records	Likelihood of Occurrence and Impact Significance	7 Part Test Required?
Southern Swamp Orchid	*Phaius australis*	E-TSCA, E-EPBCA	Are orchids that generally grows in *Melaleuca quinquenervia* swamps on the coast or at sea level, as well as littoral rainforest, dunes (including stabilised dunes), riparian forests (including gallery rainforests), swamp forests, swamps (including marshes and intermittent wetlands), mainly at low altitudes. Sandy alluvium is the favoured geology and sandy, damp to humic soils are favoured. Both recorded in Byron LGA, Richmond Valley LGA, Tweed LGA, and Ballina LGA.	1	Extensive swamp forest on property offers generic potential habitat, but this conspicuous plant is sought after by collectors and the history of the property (ie total clearing) strongly suggests its is unlikely to occur.	NO

A number of other species (see table below) are known or considered potential occurrences within the locality. However due to a number of factors, these species were not considered potential occurrences on site. Thus the proposal is not considered to have a significant impact on the viability of any local population of the subject species and Seven Part Test evaluation was not required.

Table 19: Threatened flora unlikely to occur

Refer to table overleaf.

Preferred Habitat	Species	Site considered unsuitable habitat	Disturbance history likely to have excluded this species	Lack of local records
Dry Sclerophyll Open Forest Woodland	*Acacia ruppii*	X		X
	Ancistrachne maidenii	X		X
	Angophora inopina	X		X
	Angophora robur	X		X
	Babingtonia prominens	X		X
	Banksia conferta subsp. Conferta	X		X
	Bertya sp.(Chambigne NR, M Fatemi 24)	X		X
	Bertya ingramii	X		X
	Bertya sp. Cobar-Coolabah	X		X
	Boronia hapalophylla	X		X
	Caesia parviflora var. minor	X	X	X
	Chiloglottis anaticeps	X		X

	Diuris venosa	X	X	X
	Diuris disposita	X		X
	Diuris pedunculate	X	X	X
	Diuris praecox	X	X	X
	Dillwynia tenuiflora		X	X
	Eucalyptus tetrapleura	X	X	X
	Grevillea banyabba	X		X
	Grevillea beadleana	X		X
	Grevillea caleyi	X	X	X
	Grevillea quadricuada	X		X
	Hakea archaeoides	X		X
	Hakea trineura	X		X
	Hibbertia superans	X		X
	Leucopogon confertus	X		X
	Lindsaea incisa	X		X
	Macrozamia johnsonii	X		X

	Melichrus hirsutus	X		X
Rainforest Wet Sclerophyll Forest Riparian	*Olax angulata*	X		X
	Philotheca obovatifolia	X		X
	Polygala linariifolia	X		X
	Corybas dowlingii	X		X
	Dracophyllum macranthum	X		X
	Acacia chrysotricha	X	X	X
	Acalypha eremorum	X	X	X
	Acronychia littoralis	X		X
	Amorphospermum whitei	X		X
	Archidendron hendersonii	X		X
	Arthraxon hispidus	X		X
	Arthropteris palisotii	X		X
	Boronia umbellata	X		X
	Calophanoides hygrophiloides	X		X
	Corynocarpus rupestris subsp. Rupestris	X		X

	Dendrocnide moroides	X		X
	Desmodium acanthocladum	X		X
	Diospyros mabacea	X		X
	Diploglottis cambelli	X		X
	Eidothea hardeniana	X		X
	Endiandra floydii	X		X
	Endiandra hayesii	X		X
	Eucalyptus tetrapleura	X	X	X
	Gingidia montana	X		X
	Grammitis stenophylla	X		X
	Grevillea guthrieana	X	X	X
	Haloragis exalata subsp. velutina.	X		X
	Harnieria hygrophiloides	X		X
	Lindsaea brachypoda	X		X
	Macadamia tetraphylla	X		X
	Marsdenia longiloba	X	X	X

	Olearia flocktoniae	X	X	X
	Peristeranthus hillii	X	X	X
	Phyllanthus microcladus	X		X
	Plectranthus nitidus	X		X
	Pomaderris queenslandica	X		X
	Psilotum complanatum	X		X
	Quassia sp. Moonee Creek	X		X
	Sarcochilus dilatatus	X		X
	Sarcochilus fitzgeraldii	X		X
	Sarcochilus hartmannii	X		X
	Siah's Backbone (Streblus pendulinus/brunonianus)		X	X
	Syzygium paniculatum	X		X
	Tinospora smilacina	X		X
	Tinospora tinosporoides	X		X
	Triplarina imbricata (formerly Baeckea camphorata)	X	X	X
Swamp Forest	*Tylophora woolsii*	X		X

Aquatic Freshwater Wetland Estuarine	*Typhonium sp. aff. brownii*	X		X
	Dendrobium melaleucaphilum	X		X
	Oberonia titania	X		X
	Uromyrtus australis	X		X
	Alexfloydia repens	X		X
	Cyperus aquatilis	X		X
	Eleocharis tetraquetra	X		X
	Phaius tancarvilleae	X	X	X
	• Melaleuca biconvexa			X
	Melaleuca tamariscina ssp irbyana	X		X
Heathland Shrubland Grasslands	***Allocasuarina defungens***	X		X
	Allocasuarina simulans	X		X
	Sophora tomentosa subsp. australis	X		X
	Babingtonia silvestris	X		X
	Centranthera cochinchinensis	X		X
	Chamaesyce psammogeton	X		X

	Diuris sp. aff. chrysantha	X		X
	Lindernia alsinoides	X		X
	Phaius australis	X		X
	Rotala tripartita	X		X
	Elyonurus citreus	X		X
	Eucalyptus approximans	X		X
	Glycine clandestina (Broad leaf form)	X		X
	Pimelea spicata	X	X	X
	Rutidosis heterogama	X		X
	Zieria prostrata	X		X
Various Habitats, Miscellaneous, Other.	*Pultenaea maritima*	X		X
	Cryptostylis hunteriana (Leafless Tongue Orchid)	X	X	
	Galium australe (Tangled Bedstraw)	X	X	X
	Zieria prostrata	X		X

	Zieria smithii	**X**		**X**
	Hibbertia hexandra	**X**	**X**	**X**
	Neoastelia spectabilis	**X**		**X**
	Zieria lasiocaulis	**X**		**X**
	Kennedia retrorsa	**X**		**X**
	Tetratheca juncea	**X**	**X**	**X**
	Prostanthera spnosa	**X**		**X**
	Senecio spathulatus	**X**		**X**
	Styphelia perileuca	**X**		**X**

A1.2 Fauna

As previously noted in section 4, a significant number of threatened fauna have been recorded in the locality, and a number of others are considered potential occurrences by the consultant. In the table below, these species are evaluated for their potential to occur on the site; significance of the proposal to this potential occurrence; and thus their eligibility/requirement for Seven Part Test assessment.

Table 20: Eligibility for Seven Part Test Assessment – Fauna

Animal Group	Common Name (Scientific Name)	Local Records	Legal Status	Habitat/Ecology Profile	Likelihood Of Occurrence? Risk of Significant Impact? Seven Part Test Required?
BIRDS	Glossy Black Cockatoo (*Calyptorhynchus lathamii*)	12	V-TSC Act	Dry sclerophyll forest and woodland containing Allocasuarina and Casuarina, and large tree hollows. Preferred regional forage species are A. littoralis and A. torulosa. Requires sufficient extent of forage within home range to support breeding. Breeds Mar-Aug, takes 90 days to hatch and fledge (Lindsey 1992).	Known to forage in the area with a record near Gate Rd. Limited number of Allocasuarinas on site is unlikely to regularly attract this species other than as rare transients. No nest trees to be removed, but slight risk of potential food trees to be removed. Low chance of occurrence, **hence 7 Part Test required.**

Animal Group	Common Name (Scientific Name)	Local Records	Legal Status	Habitat/Ecology Profile	Likelihood Of Occurrence? Risk of Significant Impact? Seven Part Test Required?
	Scarlet Robin (*Petroica boodang*)	0	V-TSC Act	Found in southeastern Australia and southwest Western Australia. In NSW it occupies open forests and woodlands from the coast to the inland slopes (Higgins and Peter 2002). Some dispersing birds may appear in Autumn or Winter on the eastern fringe of the inland plains. It breeds in drier eucalypt forests and temperate woodlands, often on ridges and slopes, within an open understorey of shrubs and grasses and sometimes in open areas. Abundant logs and coarse woody debris are important structural components of its habitat. In autumn and winter it migrates to more open habitats such as grassy open woodland or paddocks with scattered trees. It forages from low perches, feeding on invertebrates taken from the ground, tree trunks, logs and other coarse woody debris. The robin builds an open cup nest of plant fibres and cobwebs, sited in the fork of tree (often a dead branch in a live tree, or in a dead tree or shrub) which is usually more than 2 m above the ground (Higgins and Peter 2002; Debus 2006a,b).	Marginal potential habitat on site and high edge effects. No local records, unlikely to occur. No risk of impact, hence 7 Part Test not required.

Animal Group	Common Name (Scientific Name)	Local Records	Legal Status	Habitat/Ecology Profile	Likelihood Of Occurrence? Risk of Significant Impact? Seven Part Test Required?
	Flame Robin (*Petroica phoenicea*)	0	V-TSC Act	Found in southeastern Australia. In NSW it breeds in upland moist eucalypt forests and woodlands, often on ridges and slopes, in areas of open understorey. It migrates in winter to more open lowland habitats such as grassland with scattered trees and open woodland on the inland slopes and plains (Higgins and Peter 2002). There may be two disjunct breeding populations in NSW on the Northern Tablelands and the Central–Southern Tablelands (Barrett et al. 2003 and the NSW Wildlife Atlas). Forages from low perches, feeding on invertebrates taken from the ground, tree trunks, logs and other coarse woody debris. The robin builds an open cup nest of plant fibres and cobweb, which is often near the ground in a sheltered niche, ledge or shallow cavity in a tree, stump or bank.	As for Scarlet Robin. Seven Part Test not required.

Animal Group	Common Name (Scientific Name)	Local Records	Legal Status	Habitat/Ecology Profile	Likelihood Of Occurrence? Risk of Significant Impact? Seven Part Test Required?
	Brown Treecreeper (*Climacteris picumnus*) eastern subspecies	0	V-TSC Act	Medium-sized insectivorous bird occupying eucalypt woodlands, particularly open woodland lacking a dense understorey. Sedentary and nests in tree hollows within permanent territories, breeding in pairs or communally in small groups (Noske 1991). Birds forage on tree trunks and on the ground amongst leaf litter and on fallen logs for ants, beetles and larvae (Noske 1979). Distributed through central NSW on the western side of the Great Dividing Range and sparsely scattered to the east of the Divide in drier areas such as the Cumberland Plain of Western Sydney, and in parts of the Hunter, Clarence, Richmond and Snowy River valleys, Coffs Harbour and Great Lakes Shire.	Site provides only very marginal and artificial habitat with site largely lacking preferred structure, and no local records, hence unlikely to occur. No risk of impact, hence 7 Part Test not required.
	Powerful Owl (*Ninox strenua*)	1	V-TSC Act	Wet and dry sclerophyll forests. Nests in tree hollows. Requires high diversity and abundance of medium-sized arboreal prey. Very large territory (500-5000ha).	The site is very open and lacks nesting hollows. Likely to be low prey abundance and diversity on the site, however as recorded locally, the site has potential to form part of the foraging range of this species. Proposal highly unlikely to impact given limited habitat loss and extent of higher quality habitat in adjacent forest. No loss of potential nest trees. Impact insignificant however **Seven Part Test required** as potential to occur.

Animal Group	Common Name (Scientific Name)	Local Records	Legal Status	Habitat/Ecology Profile	Likelihood Of Occurrence? Risk of Significant Impact? Seven Part Test Required?
	Masked Owl (*Tyto novaehollandiae*)	4	V-TSC Act	Eucalypt forest and woodlands with sparse understorey. Nests in tree hollows. Requires high diversity and abundance of prey 200-600g weight. Large territory.	As for Powerful Owl. **Seven Part Test required**.
	Sooty Owl (*Tyto tenebricosa*)	0	V-TSC Act	Rainforest and tall, moist eucalypt forest. Nests in tree hollows. Requires high diversity and abundance of medium-sized arboreal prey. Large territory.	Site is not suitable habitat. Unlikely to occur on or in close proximity to site. Not recorded within 10km radius. No impact likely as unlikely to occur on or in close proximity to the site. No risk of impact, hence 7 Part Test not required.
	Barking Owl (*Ninox connivens*)	0	V-TSC Act	Well-forested hills and flats, eucalypt savannah (especially), and riverine woodland in coastal and subcoastal areas. Prefers hunting in more open country for mammals (rabbits, rats, mice, small bats and small marsupials) and birds (small up to Frogmouths and Magpies). Large territories. Nest in hollows.	No typical habitat in study area and no local records, hence unlikely to occur. No risk of impact, hence 7 Part Test not required.

Animal Group	Common Name (Scientific Name)	Local Records	Legal Status	Habitat/Ecology Profile	Likelihood Of Occurrence? Risk of Significant Impact? Seven Part Test Required?
	Square-tailed Kite (*Lophoictinia isura*)	1	V-TSC Act	Open forests and woodlands in coastal and sub-coastal areas. Forages low over, or in, canopy for eggs, nestlings, passerines, small vertebrates and invertebrates. Large home range (>100km^2). Observed foraging in residential areas of Port Macquarie. Large stick nest in high fork of living tree. Breeds July-December. Lays 2-3 eggs with 1-2 birds fledging after 100days. Appears to be adapting to an abundance of passerines in well-vegetated outer fringes of cities. Probably migrates to northern Australia in winter. (Debus 1998, NSW NPWS 2000)	Site offers some generic potential habitat, and foraging opportunities. Considered fair chance of occurrence at some stage in survey area. Proposal highly unlikely to detectably impact given limited habitat loss and extent of higher quality habitat in adjacent forest. Impact clearly insignificant but **7 Part Test required** as fair potential to occur.
	Little Eagle (*Hieraaetus morphnoides*)	0	V-TSC Act	Occupies habitats rich in prey within open eucalypt forest, woodland or open woodland, sheoak or acacia woodlands and riparian woodlands of interior NSW are also used (Marchant and Higgins 1993; Aumann 2001a). For nest sites it requires a tall living tree within a remnant patch, where pairs build a large stick nest in winter and lay in early spring. It eats birds, reptiles and mammals, occasionally adding large insects and carrion (Marchant and Higgins 1993; Aumann 2001b; Debus et al. 2007). It is distributed throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment (Marchant and Higgins 1993). It occurs as a single population throughout NSW.	As for Square-tailed Kite. **Seven Part Test required.**

Animal Group	Common Name (Scientific Name)	Local Records	Legal Status	Habitat/Ecology Profile	Likelihood Of Occurrence? Risk of Significant Impact? Seven Part Test Required?
	Spotted Harrier (*Circus assimilis*)	0	V-TSC Act	Occurs in grassy open woodland including acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe (e.g. chenopods) (Marchant and Higgins 1993; Aumann 2001a). It is found mostly commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands. The species builds a stick nest in a tree and lays eggs in spring (or sometimes autumn), with young remaining in the nest for several months. Diet includes terrestrial mammals, birds and reptiles, occasionally large insects and rarely carrion (Marchant and Higgins 1993; Aumann 2001b). Many of the remaining key prey species (e.g. terrestrial grassland birds such as quail, button-quail, pipits, larks and songlarks) require ground cover and are sensitive to habitat degradation from grazing (Marchant and Higgins 1993).	General area including site largely unsuitable with low prey abundance and no local records. Unlikely to occur. No risk of impact, hence 7 Part Test not required.

Animal Group	Common Name (Scientific Name)	Local Records	Legal Status	Habitat/Ecology Profile	Likelihood Of Occurrence? Risk of Significant Impact? Seven Part Test Required?
	Regent Honeyeater (*Xanthomyza phrygia*)	0	E-TSC Act. E-EPBC Act	Nomadic, may move coastwards in late summer. Inhabits temperate eucalypt woodlands and open forest, including forest edges, woodland remnants on farmland and urban areas. Also uses *Casuarina cunninghamiana* gallery forests. Requires reliable and ample nectar supplies to support semi-permanent (core breeding) habitat. Favoured nectar sources are *E. sideroxylon, E. albens, E. melliodora, E. leucoxylon, E. robusta, E. planchoniana*, and heavy infestations of mistletoe. Also take insects and orchard fruits. Coastal forests of Swamp Mahogany or Spotted Gum an important drought refuge. Preference for large emergent trees. Breeds in pairs or small colonies in open woodland/forest and occasionally more disturbed woodland near housing and farmland, depending on food availability, from August-January. Breeding less likely to occur if nectar flows are low or unreliable, or heavy competition with more aggressive honeyeaters eg Noisy Miner, Red Wattlebirds and Noisy Friarbirds. (Menkhorst *et al* 1999)	Limited preferred forage species on site or adjacent and lack of local records indicates not a preferred non-breeding locality. Unlikely to occur and no risk of impact, hence 7 Part Test not required.

Animal Group	Common Name (Scientific Name)	Local Records	Legal Status	Habitat/Ecology Profile	Likelihood Of Occurrence? Risk of Significant Impact? Seven Part Test Required?
	Little Lorikeet (*Glossopsitta pusilla*)	2	V-TSC Act	Gregarious, usually foraging in small flocks, often with other species of lorikeet feeding primarily on nectar and pollen in the tree canopy, particularly on profusely-flowering eucalypts, but also on a variety of other species including, melaleucas and mistletoes. Mostly occurs in dry, open eucalypt forests and woodlands. They have been recorded from both old-growth and logged forests in the eastern part of their range, and in remnant woodland patches and roadside vegetation on the western slopes. In south-east Queensland (Smyth *et al.* 2002), were more likely to occupy forest sites with relatively short to intermediate logging rotations (15–23 years) and sites that have had short intervals (2.5– 4 years) between fires.	Wider study area is potential foraging and nesting habitat, although is likely limited by high competition from other species. Considered low chance of occurrence at some stage in study area. Proposal highly unlikely to impact given limited habitat loss and extent of higher quality habitat in adjacent forest. Impact clearly insignificant but **7 Part Test required** as potential to occur.
	Turquoise Parrot (*Neophema pulchella*)	0	V-TSC Act	Inhabits eucalypt and cypress-pine open forests and woodlands (commonly box or box-ironbark) with native grasses, sometimes with a low shrubby understorey, open woodland or riparian gum woodland, and often near ecotones between woodland and grassland, or coastal forest and heath (OEH 2014b). Prefers richer habitat types on creek or river flats and foothills. They nest in live or dead trees, stumps and logs, require trees and shrubs for shelter, and seeding grasses and forbs for food (OEH 2009).	Site habitat is largely unsuitable as it is highly disturbed. Not recorded locally. Considered unlikely to occur. No risk of impact, hence 7 Part Test not required.

Animal Group	Common Name (Scientific Name)	Local Records	Legal Status	Habitat/Ecology Profile	Likelihood Of Occurrence? Risk of Significant Impact? Seven Part Test Required?
	Swift Parrot (*Lathumus discolor*)	1	E-TSC Act, E-EPBC Act	Breeds in Tasmania and winters on mainland, from Victoria to southern Queensland. Feeds mostly on pollen and nectar of winter flowering eucalypts and banksias, but also on fruit, seeds, lerps and insect larvae (Schodde and Tideman 1990). Favoured species are *E. robusta*, *Corymbia gummifera*, *E. globulus, E. sideroxylon, E. leucoxylon, E. labens, E. ovata, E. maculata, Banksia serrata* and *B. integrifolia.* In coastal NSW, Swamp Mahogany, Spotted Gum and Bloodwood forests are important foraging habitats and larger trees may be selected. Disperse according to changing local food resources.	Several flowering species present providing potential nectar resources, however only one local record and large areas of higher quality habitat occur locally. Unlikely to occur. No risk of significant impact hence 7 Part Tests not undertaken.
	Varied Sittella (*Daphoenositta chrysoptera*)	3	V-TSC Act	Sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands, with a nearly continuous distribution in NSW from the coast to the far west (Higgins and Peter 2002; Barrett *et al.* 2003). It inhabits eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums with dead branches, mallee and *Acacia* woodland. Feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees, and from small branches and twigs in the tree canopy. It builds a cup-shaped nest of plant fibres and cobweb in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years.	Open forest along northern boundary of the site and adjacent in study area is marginal potential foraging habitat, although potentially limited by high competition from other species. Considered low chance of occurrence at some stage in survey area. Proposal highly unlikely to impact given limited habitat loss and extent of higher quality habitat in adjacent forest. Impact clearly insignificant but **7 Part Test required** as potential to occur.

Animal Group	Common Name (Scientific Name)	Local Records	Legal Status	Habitat/Ecology Profile	Likelihood Of Occurrence? Risk of Significant Impact? Seven Part Test Required?
	White-eared Monarch (*Carterornis leucotis*)	1	V-TSC Act	A small monarch-flycatcher endemic to the coastal lowlands and eastern slopes of the great dividing range. In NSW they are distributed from the QLD border south to Iluka and inland to Richmond Range. Prey upon insects in rainforest and wet and dry sclerophyll forest, swamp forest and regrowth forest where they seem to prefer edges, openings and ecotones (DECCW 2011b).	Some generic habitat but well outside known range – only single record in locality. Unlikely to very low potential to occur only as brief transient. Potential to occur will be retained, hence impact clearly insignificant and 7 Part Test not required.
	Eastern Osprey (*Pandion cristatus*)	6	V-TSC Act	Fish (mostly Mullet) and carrion eater. Forages along coastal rivers, lakes, beaches, creeks and inlets. Tall, dead tree for staging or feeding roost. Nests on exposed tree within 2km of water, but rarely adjacent, and with access to Paperbark or Swamp Oak for nest material. Breeds April-Sept. (Clancy, 1991)	Site does not contain suitable foraging habitat. This species may access the site or more so the property to collect nesting material from swamp forest areas during breeding season. Low chance of occurring on the site therefore **7 Part Test required.**

Animal Group	Common Name (Scientific Name)	Local Records	Legal Status	Habitat/Ecology Profile	Likelihood Of Occurrence? Risk of Significant Impact? Seven Part Test Required?
	Black Bittern (*Dupetor flavicollis*)	1	V-TSC Act	Coastal waterways and rivers lined with mangroves etc; denser paperbark woodlands near coastal swamps.	Site habitat not suitable. Swamp forest on remainder of property offers generic potential, especially during very wet seasons where flooding may be extensive. Potential to forage and perhaps nest on the property using it as part of larger local range. No risk of significant impact but as potential to occur in study area, **7 Part Tests undertaken.**
	Australasian Bittern (*Botaurus poiciloptilus*)	2	V-TSCA E-EPBCA	Inhabits estuarine and freshwater wetlands, generally with permanent water and dense vegetation of sedges, rushes and reeds, particularly Bullrush and Spikerush. Solitary or groups up to 12. Usually sedentary. Roosts in reeds by day, forages in shallow water at dusk/night for frogs, fish, invertebrates, fruit, leaves. Tramples reeds, sedges to make a foraging platform. Nests in dense vegetation over water. (NSW NPWS 2000)	Site habitat not suitable. Swamp forest on remainder of property offers generic potential, especially during very wet seasons where flooding may be extensive. Potential to forage on the property using it as part of larger local range. No risk of significant impact but as potential to occur in study area, **7 Part Tests undertaken.**

Animal Group	Common Name (Scientific Name)	Local Records	Legal Status	Habitat/Ecology Profile	Likelihood Of Occurrence? Risk of Significant Impact? Seven Part Test Required?
	Brolga (*Grus rubicunda*)	1	V-TSCA	Inhabits coastal and inland wetlands, shallow lakes, grassland, saltmarsh, farm and dry open land. Forages for large invertebrates, frogs, fish, seeds, green shoots and bulbs. Breeding occurs predominantly in tropical wetland and large inland swamps and irrigated grasslands at inland and central northern Australia (eg Queensland and Northern Territory), though has been recorded in the northwest and north-eastern corner of NSW and Victoria.	Site habitat not suitable. Open wet meadows, billabong and creek on remainder of property offers generic potential, especially during very wet seasons where flooding may be extensive. Potential to forage on the property using it as part of larger local range. No risk of significant impact but as potential to occur in study area, **7 Part Tests undertaken.**
	Painted Snipe (*Rostratula benghalensis*)	0	E-TSCA V-EPBCA	Nomadic in small groups in response to rainfall, may be part-migratory. Prefer fringes of freshwater wetlands with good vegetative cover. Rests in dense vegetation by day, emerging at dusk to feed on mudflats and other open areas. Diet includes seeds, insects and small aquatic invertebrates. Breeds Sept-Dec. Nest a saucer of twigs/reeds/grass in shelter, close to water. (NSW NPWS 2000,Lindsey 1992)	Site habitat not suitable. Open wet meadows remainder of property offers generic potential, especially during very wet seasons where flooding may be extensive. Potential to forage on the property using it as part of larger local range. No risk of significant impact but as potential to occur in study area, **7 Part Tests undertaken.**

Animal Group	Common Name (Scientific Name)	Local Records	Legal Status	Habitat/Ecology Profile	Likelihood Of Occurrence? Risk of Significant Impact? Seven Part Test Required?
	Black-Necked Stork/Jabiru (*Ephippiorhynchus asiaticus*)	5	E-TSCA	Wetlands, mudflats, mangroves, floodplains, irrigated fields, farm dams. Forages in shallow water for small vertebrates. Shuns cover, prefers extensive open shallows. Nests in a tree, often above water in a secluded swamp. Eggs laid Aug-Nov in NSW. Adults resident, juveniles dispersive (DEC 2005a, Lindsey 1992).	Site habitat not suitable. Open wet meadows, billabong and creek on remainder of property offers generic potential, especially during very wet seasons where flooding may be extensive. Potential to forage on the property using it as part of larger local range. No risk of significant impact but as potential to occur in study area, **7 Part Tests undertaken.**
	Comb-Crested Jacana (*Irediparra gallinacea*)	4	V-TSCA	Deep, permanent freshwater with surface/floating vegetation (eg Water Lily). Sedentary or locally nomadic. Forages on surface. Nest a raft in screened, emergent vegetation. Sensitive to water level changes and to disturbance. Breeds in response to rising water level Sep-Jan (Lindsey 1992).	Dams on site too small. Billabong and creek don't have preferred aquatic vegetation. Unlikely to occur hence 7 Part Tests not required.
	Sooty Oystercatcher (*Haematopus fuliginosus*)	3	V-TSC Act	Beaches, sandy-shored bays, estuaries, exposed sand bars and mudflats.	No suitable habitat on the site. No risk of significant impact hence 7 Part Tests not undertaken.

Animal Group	Common Name (Scientific Name)	Local Records	Legal Status	Habitat/Ecology Profile	Likelihood Of Occurrence? Risk of Significant Impact? Seven Part Test Required?
	Pied Oystercatcher (*Haematopus longirostris)*	2	E-TSC Act	Beaches, sandy-shored bays, estuaries, exposed sand bars and mudflats.	No suitable habitat on the site. No risk of significant impact hence 7 Part Tests not undertaken.
MAMMALS	Spotted-tail Quoll (*Dasyurus maculatus*)	5	V-TSC Act, E-EPBC Act	Various forested habitats with preference for dense forests. Requires tree hollows, hollow logs or caves for nesting. Large home range (>500ha) and may move over several kilometres in a few days. Tends to follow drainage lines.	Lack of suitable habitat on site - consists largely of pasture and open woodland with minimal understorey cover and denning opportunities. Swamp forest in remainder of property also not preferred habitat. Unlikely to occur. No risk of significant impact hence 7 Part Tests not undertaken.

Animal Group	Common Name (Scientific Name)	Local Records	Legal Status	Habitat/Ecology Profile	Likelihood Of Occurrence? Risk of Significant Impact? Seven Part Test Required?
	Brushtailed Phascogale (*Phascogale tapoatafa*)	1	V-TSC Act	Range of forest habitats but prefers drier sclerophyll forest with sparse ground cover. Forages on large rough-barked trees for small fauna, also utilises eucalypt nectar. Rests in tree hollows, stumps, bird nests. Requires tree hollows for nesting. (NPWS, 2000) Breeds May-July. Occupies territory of 20-100ha. Has been recorded in swamp forest.	Small areas of suitable foraging and denning habitat occur site and are connected to larger expanses of suitable habitat to west – site only marginal fringe. Considered low chance of occurrence as rare forager or dispersing male Proposal overall has limited effect – only low quality potential foraging habitat and no hollows are likely to be affected. Considered a low chance of occurrence hence **Seven Part Test required** to assess significance.
	Yellow-bellied Glider (*Petaurus australis*)	1	V-TSC Act	Moist and dry tall mature eucalypt forest and woodland. Requires mature hollow-bearing trees, winter-flowering eucalypts, suitable sap-feeding eucalypt species and a mosaic of forest types (NPWS 1999). Sap trees utilised include: *E. propinqua, E. tereticornis, E. microcorys, & E. resinifera* (NPWS 2000). Home range of 30-65ha (NPWS 1999).	Some preferred sap species along with nectar sources occur on site and few potential den sites in tree hollows. Site habitat is however of low quality overall, and remainder of property not preferred habitat. Considered low change of occurring on site as marginal fringe of core habitat to west. Proposal highly unlikely to impact given limited habitat loss and extent of higher quality habitat in adjacent forest. **Seven Part Test** undertaken due to potential to occur.

Animal Group	Common Name (Scientific Name)	Local Records	Legal Status	Habitat/Ecology Profile	Likelihood Of Occurrence? Risk of Significant Impact? Seven Part Test Required?
	Squirrel Glider (*P. norfolcensis*)	2	V-TSC Act	Moist and dry tall mature eucalypt forest and woodland. Requires mature hollow-bearing trees, winter-flowering eucalypts, suitable sap-feeding eucalypt species and a mosaic of forest types (NPWS 1999). Sap trees utilised include: *E. propinqua, E. tereticornis, E. microcorys, & E. resinifera* (NPWS 2000). Home range of 30-65ha (NPWS 1999).	Open forest on the site contains some preferred sap species and a nectar source, however the lack of an understorey and poor connectivity over the site is a limitation. Minimal potential dens due to scarce hollows on the site. No proximate records. Considered low chance of occurrence overall, using margins of site as outermost fringe of preferred habitat to west. Swamp forest on remainder of property unsuitable. Proposal unlikely to impact due to retention of most of site habitat and minimal hollow trees. **Seven Part Test required** due to potential to occur.

Animal Group	Common Name (Scientific Name)	Local Records	Legal Status	Habitat/Ecology Profile	Likelihood Of Occurrence? Risk of Significant Impact? Seven Part Test Required?
	Long-Nosed Potoroo (*Potorous tridactylous*)	1	V-TSCA V-EPBCA	Coastal heath and shrublands; paperbark forest; woodland with dry heathy understorey; high elevation rainforest or moist hardwood forest; moist shrublands with dense or moderately dense understoreys and sedge-dominated groundcover; wet or dry sclerophyll forests where average annual precipitation exceeds 760mm. Requires thick groundcover for refuge, while foraging in open areas on ridges, slopes or gullies, typically on ecotones, and prefers sandy soils for digging. Eats roots, tubers, fungi, fleshy fruits, leaves, insects and other soil invertebrates. Optimum habitat generally considered a mosaic of regenerating dense understorey vegetation as result of patchwork of periodic low to medium intensity fires. Home range 2-5ha (NSW NPWS 2000).	Site too disturbed and open, and likely to have foxes. Swamp forest on property not considered suitable habitat. Recorded in locality but not considered a potential occurrence on site. No risk of significant impact hence 7 Part Tests not required.
	Grey-headed Flying Fox (*Pteropus poliocephalus*)	8	V-TSC Act V-EPBC Act	Nomadic, roosting in camps. Camps often located near rivers and in subtropical rainforest, wet sclerophyll forest, melaleucas, casuarinas or mangroves. Feeds on nectar, pollen, flowers and fruit of rainforest trees, vines, Melaleucas, eucalypts and banksias, and occasionally exotic species e.g. Camphor Laurel and orchard fruits.	Eucalypts and melaleucas on site offer generic foraging habitat. Major colonial roosts in locality. Highly likely chance of occurrence. Recorded within 1km. Minor loss of habitat considered insignificant relative to range. No risk of significant impact, however **Seven Part Test required as potential to occur.**

Animal Group	Common Name (Scientific Name)	Local Records	Legal Status	Habitat/Ecology Profile	Likelihood Of Occurrence? Risk of Significant Impact? Seven Part Test Required?
	Yellow-Bellied Sheathtail Bat *(Saccolaimus flaviventris)*	1	V-TSC Act	Ecology poorly known. Found in almost all habitats, particularly wet and dry sclerophyll forests and woodlands below 500m altitude, and also open woodland, Acacia shrubland, mallee, grasslands and desert. Roosts mainly in tree hollows, but also under bark, under roof eaves and in other artificial structures. Fast flying species, believed to forage above the canopy or closer to the ground in open areas. Insectivorous. May be Summer migrant.	Site may provide generic foraging habitat. Low chance foraging and roosting in study area given single record within the locality. No risk of significant impact but **7 Part Test required** due to potential to occur.
	Eastern False Pipistrelle (*Falsistrellus tasmaniensis)*	2	V-TSCA	A large vespertilionid which feeds on moths and insects. Known to roost in caves, abandoned buildings, but mostly in trees hollows higher rainfall forested areas. It is suspected that some populations migrate in Winter from higher altitudes to coastal areas, or may simply enter torpor. Prefers tall forests (>20m high) and extensive movements (eg 12km recorded between foraging and roost sites). Recently recorded in Thrumster west of Port Macquarie.	Site habitat largely unsuitable due to disturbance, lack of continuous forest cover and no local records. Swamp forest also not preferred forest type. Very low to unlikely chance of occurrence. Proposal unlikely to impact and unlikely to occur hence 7 Part Test not required.

Animal Group	Common Name (Scientific Name)	Local Records	Legal Status	Habitat/Ecology Profile	Likelihood Of Occurrence? Risk of Significant Impact? Seven Part Test Required?
	East-coast Freetail Bat (*Mormopterus norfolkensis*)	2	V-TSC Act	Specific habitat requirements of this species are poorly known. Has been recorded in habitats ranging from rainforest to dry sclerophyll and woodland, with most recorded in the latter (State Forests 1995, Allison 1991). Roosts in small colonies under tree hollows and under loose bark; has been found under house eaves, in roofs and metal caps on telegraph poles. Recorded roosting in roof in Hat Head village. Probably forages above forest or woodland canopy, and in clearings adjacent to forest. Most records are of single individuals, and is likely to occur at low densities over its range.	Fair chance of foraging in forest canopy and cleared grassland over study area. Fair chance of occurring on the site, hence **7 Part Test required.**
	Common Blossom Bat (*Syconycteris australis)*	2	V-TSCA	Found in well timbered habitats. Roosts in rainforest and wet sclerophyll forest. Feeds in heathlands and paperbark swamps up to 4km from roost. Key food species include Banksia, Melaleucas, Callistemons and Bloodwoods.	Swamp forest on the site and especially extensive paperbark forest on eastern half of property provides potential foraging habitat for this species. No potential roost sites. May use eastern margins during peak flowering events. Fair chance of occurring in study area and more so property, hence **7 Part Test required.**

Animal Group	Common Name (Scientific Name)	Local Records	Legal Status	Habitat/Ecology Profile	Likelihood Of Occurrence? Risk of Significant Impact? Seven Part Test Required?
	Eastern Long-eared Bat (*Nyctophilus bifax*)	1	V-TSCA	Found in lowland subtropical rainforest and wet and swamp eucalypt forest, extending into adjacent moist eucalypt forest. Coastal rainforest and patches of coastal scrub are particularly favoured. Roosts in tree hollows, the hanging foliage of palms, in dense clumps of foliage of rainforest trees, under bark and in shallow depressions on trunks and branches, among epiphytes, in the roots of strangler figs, among dead fronds of tree ferns and less often in buildings. They appear to be confined to the coastal plain and nearby coastal ranges, extending south to the Clarence River area, with a few records further south around Coffs Harbour. The species can be locally common within its restricted range.	Unlikely to occur on the site given it is beyond the species typical distribution range and not preferred habitat – more often associated with high clutter habitats ie littoral rainforest. Proposal unlikely to impact and unlikely to occur hence 7 Part Test not required.
	Eastern Cave Bat (*Vespadelus troughtoni*)	3	V-TSC Act	Rare and poorly known bat. Cave dwelling bat roosting in small (5-50) to large (500) groups in sandstone overhang caves, boulder piles, mines, tunnels and sometimes buildings. Tend to roost in well-lit portions of caves in avons, domes, cracks and crevices. Occasionally found along cliff lines in wet eucalypt forest and rainforest on the coast and dividing range, but extend into drier forest on western slopes.	Lack of preferred roosting habitat within range of site and low number of records in locality suggests unlikely to occur. 7 Part Tests not considered required as no risk of significant impact.

Animal Group	Common Name (Scientific Name)	Local Records	Legal Status	Habitat/Ecology Profile	Likelihood Of Occurrence? Risk of Significant Impact? Seven Part Test Required?
	Little Bent-wing Bat (*Miniopterus australis*)	9	V-TSC Act	Forages above and below canopy of well-forested areas. Roosts in old buildings, caves, mines etc. Dependant on nursery caves and communal roosts.	> Fair chance of foraging in forest canopy over study area and likely to forage over extensive swamp forest on property. Loss of minor portion of potential foraging habitat highly unlikely to impact. However as fair potential to occur, **7 Part Test undertaken to assess.**
	Eastern Bent-wing Bat (*M. schreibersii oceanensis*)	4	V-TSC Act	Habitat generalist - forages above well-forested areas. Roosts in old buildings, caves, mines etc. Dependant on nursery caves and communal roosts.	> Fair chance of foraging in forest canopy over study area and likely to forage over extensive swamp forest on property. Loss of minor portion of potential foraging habitat highly unlikely to impact. However as fair potential to occur, **7 Part Test undertaken to assess.**
	Greater Broad-nosed Bat (*Scoteanax rueppellii)*	6	V-TSC Act	Forages over range of habitats including rainforests and moist forests, but prefers ecotones between riparian forest, woodland and cleared land. Requires sparse understorey and will forage over water. Roosts in tree hollows. Feeds on larger insects, small vertebrates and perhaps other bats.	Fair chance of foraging in forest canopy and cleared grassland over study area.Some hollow-bearing trees offer potential roosting habitat. **7 Part Test undertaken** as fair potential to occur.

Animal Group	Common Name (Scientific Name)	Local Records	Legal Status	Habitat/Ecology Profile	Likelihood Of Occurrence? Risk of Significant Impact? Seven Part Test Required?
	Hoary Bat (*Chalinolobus nigrogriseus*)	0	V-TSCA	Occurs in a range of habitats, such as monsoon forest, tall open forest, open woodland, vine thickets, coastal scrub, sand dunes, grasslands, floodplains, watercourses and dams. Roosts in eucalypt tree hollows, as well as rock crevices. Breeding colonies have been recorded in roofs of buildings. Preferred prey is beetles and moths, but also spiders, mantids, crickets, grasshoppers, cicadas, bugs, diving beetles, flies and ants (thus may land and forage).	Preference for habitats with decorticating bark such as dry sclerophyll forest which is very limited on site but dominant in western study area. Potential roosts occur on site, hence low potential to roost on site and foraging in study area. No loss of hollows but **7 Part Tests required** as potential to occur.
	Golden-tipped Bat (*Kerivoula papuensis*)	1	V-TSC Act	Spider eating specialist, capable of hovering and high manoeuvrability. Normally found in rainforest and along rainforest gullies within wet sclerophyll forest (often when lot of vines which suit prey species), but has been recorded in recently logged dry sclerophyll forest, and also known to forage in areas of mosaic forest (dry and wet sclerophyll). Roosts in abandoned nests of gerygones and scrubwrens, but also found in dense foliage, rooves, and caves.	Lack of preferred foraging and roosting habitat suggests unlikely to occur. 7 Part Tests not considered required as no risk of significant impact.
	Southern Myotis *(Myotis macropus*)	1	V-TSC Act	Tunnel, cave, bridges, old buildings, tree hollow and dense foliage roosting bat which prefers riparian habitat over 500m long with nearby roosting habitat. Key habitats are streams, rivers, creeks, lagoons, lakes and other water bodies. Feeds on aquatic insects and small fish. Has recently been observed foraging in small bodies of water.	Several site dams may provide suitable foraging habitat for this species. Connection Creek and floodplain also offer potential habitat mainly in wetter seasons. Potential roosts in tree hollows. Fair chance of occurrence therefore **7 Part Tests required.**

Animal Group	Common Name (Scientific Name)	Local Records	Legal Status	Habitat/Ecology Profile	Likelihood Of Occurrence? Risk of Significant Impact? Seven Part Test Required?
	Green and Golden Bell Frog (*Litoria aurea)*	4	E-TSCA V-EPBCA	Found in permanent swamps and ponds. Prefers water bodies which are: still; shallow; unshaded; ephemeral; unpolluted; generally isolated; and free of native fish species or Plague Minnow (*Gambusia holbrooki)* and little macro-algae. Requires emergent vegetation, grass tussocks or rocks for shelter. May use disturbed sites opportunistically - may depend on several stages. Eats insects and other frogs. Summer breeder. (Hero *et al* 2004).	Dams offer generic potential habitat, as may billabongs and perhaps Connection Creek. Local current records of this species however restricted to a hind dune swamp where high quality habitat, and no records in interconnected habitat. Other records old. Considered unlikely to occur. 7 Part Tests not considered required as no risk of significant impact.
	Green-thighed Frog (*Litoria brevipalmata*)	1	V-TSC Act	Poorly known. Found in range of habitats such as warm temperate open forest, rainforest, and forestry dams in dry, open forest; breeding aggregations around oxbow lakes, ditches, flooded paddocks, overflows and grassy semi-permanent ponds. Males call only for few days after spring and early summer rains. Possibly a lowland forest ground-dweller.	Habitat associated with site dams and drainage line considered marginally suitable for this species. Given sparse records within the locality, considered only at best a low chance of occurrence at the site. **Seven Part Test undertaken** as potential to occur.

Animal Group	Common Name (Scientific Name)	Local Records	Legal Status	Habitat/Ecology Profile	Likelihood Of Occurrence? Risk of Significant Impact? Seven Part Test Required?
	Wallum Froglet (*Crinia tinnula*)	0	V-TSCA	Predominantly associated with acidic paperbark swamps of coastal areas (Cogger 1992). Also found in wet heathland and *Melaleuca* sedgelands. Recorded breeding in flooded pasture adjacent to paperbark swamps.	Habitat associated with the *Melaleuca* swamp forest and dams on site may be suitable for this species. More optimum habitat in remainder of property where high chance of occurrence. Low chance of occurrence on the site but high on property, therefore **Seven Part Test undertaken**.

A number of other species (see table below) are known or considered potential occurrences within the locality. However due to a number of factors, these species were not considered potential occurrences on site. Thus the proposal is not considered to have a significant impact on the viability of any local population of the subject species and Seven Part Test evaluation was not required.

Table 21: Fauna unlikely to occur on site

Preferred Habitat	Species	Site considered unsuitable habitat	Presence of predators likely to have excluded the species	Disturbance history likely to have excluded this species	Lack of local records
Dry Sclerophyll/Open Woodland/Grassy Open Woodland	Painted Honeyeater (*Grantiella picta*)	X		X	X
	Black-chinned Honeyeater (*Melithreptus gularis gularis*) eastern subspecies	X			X
	Hooded Robin (*Melanodryas cucullatacucullata*) southeastern form	X			X
	Bush-stone Curlew (*Burchinus grallaris*)		X	X	X
	Diamond Firetail (*Stagonopleura guttata*)	X			X
	Grey-crowned Babbler (*Pomatostomus temporalis temporalis*) eastern subspecies	X		X	X
Rainforest/Wet Sclerophyll Forest	Olive Whistler (*Pachycephala olivacea*)	X			Recorded in locality
	Sooty Owl (*Tyto tenebricosa)*	X			X
	Wompoo Fruit Dove (*Ptilinopus magnificus*)	X			Recorded in locality
	Rose-Crowned Fruit Dove (*P. regina*)	X			Recorded in locality

Preferred Habitat	Species	Site considered unsuitable habitat	Presence of predators likely to have excluded the species	Disturbance history likely to have excluded this species	Lack of local records
	Superb Fruit Dove (*P. superbus*)	X			X
	Barred Cuckoo Shrike (*Coracina lineata*)	X			X
	Parma Wallaby (*Macropus parma*)	X	X	X	X
	Three-Toed Snake-Tooth Skink (*Coeranoscincus reticulatus*)	X		X	X
	Pale-Headed Snake *(Hoplocephalus bitorquatus)*	X		X	X
	White-Crowned Snake (*Cacophis harriettae*)	X		X	X
	Red-Legged Pademelon *(Thylogale stigmatica)*	X	X	X	X
	Giant Barred Frog *(Mixophyes iteratus)*	X			Recorded in locality
	Stuttering Frog *(M. balbus)*	X			Recorded in locality
Swamp/ Aquatic/ Freshwater Wetland/ Estuarine/ Marine	Pink Underwing Moth (*Phyllodes imperialis*) southern species	X			X
	Blue-Billed Duck (*Oxyura australis*)	X			X
	Freckled Duck (*Stictonetta naevosa*)	X			X

Preferred Habitat	Species	Site considered unsuitable habitat	Presence of predators likely to have excluded the species	Disturbance history likely to have excluded this species	Lack of local records
	Magpie Goose (*Anseranas semipalmata*)	X			X
	White-fronted Chat (*Epthianura albifrons)*	X			X
	Olongburra Sedge Frog (*Litoria olongburensis*)	X		X	X
Shrubland/Heathland/ Grassland	Eastern Pygmy Possum (*Certatetus nanus*)	X	X		X
	New Holland Mouse (*Pseudomys novaehollandiae)*	X	X	X	X
	Grass Owl (*Tyto capensis*)	X			X
	Ground Parrot (*Pezoporus wallicus wallicus*)	X	X	X	X

Appendix 2: Site flora species list

Frequency: C Common,
D Dominant at least in some areas,
C Common,
U Uncommon,
R Rare on site, few specimens.

Community: DSF Dry Sclerophyll Forest
SF Swamp Forest
P Pasture
D Dam/aquatic

* Denotes an introduced species

Common Name	Scientific Name	Community	Frequency
Canopy Trees			
Swamp Oak	*Casuarina glauca*	SF, P	D
Pink Bloodwood	*Corymbia intermedia*	DSF	U
White Mahogany	*Eucalyptus. acmenoides*	DSF, P	R
Tallowwood	*E. microcorys*	DSF, P	O
Grey Ironbark	*E. siderophloia*	DSF	O
Forest Red Gum	*E. tereticornis*	SF, P	O
Blackbutt	*E. pilularis*	DSF	D
Broadleaf Paperbark	*Melaleuca quinquenervia*	SF, P	O
Brush Box	*Lophostemon confertus*	DSF	O
Understorey Trees			
Black Oak	*Allocasuarina littoralis*	DSF	C
Forest Oak	*Allocasuarina torulosa*	DSF	U
Willow Bottlebrush	*Callistemon salignus*	DSF, SF	O
Flax-Leaved Paperbark	*Melaleuca linariifolia*	SF	O
Cheese Tree	*Glochidion ferdinandi*	SF, DSF	O
Strangler Fig	*Ficus sp.*	SF	U
Camphor Laurel	*Cinnamomum camphora*	DSF, SF, P	U
Shrubs			
-	*Acacia falcata*	DSF	R
Maidens Wattle	*Acacia maidenii*	DSF	U
Bush Lemon	*Citrus X taitensis*	SF, P	C
Coffee Bush	*Breynia oblongifolia*	DSF, SF	C
Sydney Golden Wattle	*Acacia longifolia subsp, longifolia*	DSF	O
Mock-Olive	*Notelaea longifolia*	DSF, SF	O
Lantana	*Lantana camara**	DSF, SF, P	D
-	*Persoonia conjuncta*	DSF, SF	U
Ribbonwood	*Euroschinus falcatus*	SF	R
Red Ash	*Alphitonia excelsa*	DSF	R
Cherry Ballart	*Exocarpos cupressiformis*	DSF	U

Common Name	Scientific Name	Community	Frequency
Canopy Trees			
Wild Tobacco	*Solanum mauritianum**	DSF, SF	C
Tuckeroo	*Cupaniopsis anacardioides*	SF	R
Senna	*Senna pendula**	SF	R
-	*Sannantha angusta*	SF	U
Bitou Bush	*Chrysanthemoides monilifera*	DSF	R
Prickly Beard-Heath	*Leucopogon juniperinus*	DSF, P	O
Dogwood	*Ozothamnus diosmifolius*	DSF, SF	U
Rice Flower	*Pimelea linifolia*	DSF, P	C
Harsh Ground Fern	*Hypolepis muelleri*	SF	C
Bracken Fern	*Pteridium esculentum*	DSF, P	C
Grasses			
Whisky Grass	*Andropogon virginicus**	DSF, P	C
Carpet Grass	*Axonopus fissifolius**	DSF, SF, P	D
Bordered Panic	*Entolasia marginata*	DSF	O
Wiry Panic	*E. stricta*	DSF	O
Browns Lovegrass	*Eragrostis brownii*	DSF, P	U
Blady Grass	*Imperata cylindrica*	DSF, P	D
Swamp Millet	*Isachne globosa*	P, D	U
Basket Grass	*Oplismenus aemulus*	DSF, SF, P	C
Beard Grass	*O. imbecillis*	DSF	C
Common Paspalum	*Paspalum dilatatum**	DSF, SF, P	D
Broadleaf Paspalum	*Paspalum mandiocanum**	SF, P	C
Parramatta Grass	*Sporobolus africanus**	P	C
Kangaroo Grass	*Themeda australis*	DSF	U
Sedges, rushes, aquatics			
Tall Sedge	*Carex appressa*	DSF, SF, P	D
Saw Sedge	*Gahnia clarkei*	SF	O
-	*Cyperus eragrostis*	SF	U
-	*Eleocharis equisetina*	D	U
-	*Juncus usitatus*	P, D	O
Dock	*Rumex sp.**	P, D	U
Water Ribbons	*Triglochin procera*	D	O
Spiny-Headed Matrush	*Lomandra longifolia*	DSF, SF, P	D
Brahmi	*Bacopa monnieri*	D	U
Water Primrose	*Ludwigia peploides*	D	R
Frogsmouth	*Philydrum lanuginosum*	D	O
River Buttercup	*Ranunculus inundatus*	D	O
Lesser Joyweed	*Alternanthera denticulata*	D	U
Groundcovers			
Billygoat Weed	*Ageratum houstonianum**	DSF, SF, P	C
White Clover	*Trifolium repens**	P	O
Gotu-Kola	*Centella asiatica*	SF, P	C
Fireweed	*Senecio madagascariensis**	SF, P	C
Lambs Tongue	*Plantago lanceolata**	P	C
Cats Ear	*Hypochaeris radicata**	P	O

Common Name	Scientific Name	Community	Frequency
Canopy Trees			
Kidney Weed	*Dichondra repens*	P	U
White Root	*Pratia purpurascens*	DSF, SF, P	O
Paddy's Lucerne	*Sida rhombifolia**	P	O
Purple Top	*Verbena bonariensis**	P	U
Native Violet	*Viola hederacea*	DSF, SF, P	C
Vines and scramblers			
Blackberry	*Rubus anglocandicans**	SF, P	O
Scrambling Lily	*Geitonoplesium cymosum*	DSF, SF	O
Austral Smilax	*Smilax australis*	SF	R
Glycine	*Glycine clandestina*	DSF	U
Snake Vine	*Stephania japonica*	SF	R
Sweet Morinda	*Morinda jasminoides*	DSF, SF	O
Monkey Rope	*Parsonsia straminea*	SF	C
Epiphytes			
Elkhorn	*Platycerium bifurcatum*	DSF, SF	R

Appendix 3: Hollow-bearing tree data

Table 22: HBT data

Number	Species	Height	DBH (cm)	Latitude	Longitude	Comments
H1	Forest Red Gum	23	75	-31.1779	152.9423	Medium trunk hollow, small branch hollow in dead limb
H2	Stag	17	50	-31.1794	152.9418	6 medium and 4 small branch hollows
H3	Blackbutt	25	100	-31.1794	152.9428	1 medium and 1 small branch hollows
H4	Bloodwood	15	75	-31.1796	152.9427	Large chimney in dead trunk section
H5	Blackbutt	25	160	-31.1798	152.9430	2 medium and 2 small branch hollows
H6	Brush Box	18	60	-31.1797	152.9433	1 long trunk scar cavity, large trunk hollow above fork
H7	Blackbutt	25	80	-31.1797	152.9435	2 medium and 3 small branch hollows
H8	Stag	15	50	-31.1798	152.9435	5 medium branch hollows, 2 small trunk hollows
H9	Forest Red Gum	25	120	-31.1807	152.9416	1 medium trunk hollow, 3 medium and 3 small branch hollows
H10	Blackbutt	25	180	-31.1760	152.9427	2 small branch hollows
H11	Stag	15	60	-31.1762	152.9432	5 small branch hollows
H12	Blackbutt	20	100,80	-31.1762	152.9436	At least 10 small hollows in dead branches

Appendix 4: Koala Food Tree Data

Table 23: KFT data

Number	Species	Height (m)	DBH (cm)	Latitude	Longitude
K1	Tallowwood	20	40,60	-31.1755	152.9420
K2	Tallowwood	15	40	-31.1766	152.9418
K3	Tallowwood	10	25	-31.1766	152.9421
K4	Forest Red Gum	13	30	-31.1775	152.9420
K5	Forest Red Gum	15	40	-31.1776	152.9423
K6	Forest Red Gum	23	75	-31.1777	152.9423
K7	Forest Red Gum	17	45	-31.1783	152.9419
K8	Forest Red Gum	15	35	-31.1783	152.9419
K9	Tallowwood	12	30	-31.1782	152.9422
K10	Tallowwood	12	30	-31.1779	152.9423
K11	Tallowwood	23	130	-31.1780	152.9428
K12	Tallowwood	23	100	-31.1779	152.9429
K13	Tallowwood	12	26	-31.1780	152.9428
K14	Tallowwood	12	27	-31.1779	152.9430
K15	Forest Red Gum	25	120	-31.1807	152.9416
K16	Forest Red Gum	15	30,15,20,20,17	-31.1805	152.9417
K17	Tallowwood	23	120	-31.1778	152.9433
K18	Tallowwood	23	100	-31.1778	152.9433
K19	Tallowwood	23	100	-31.1778	152.9431
K20	Tallowwood	12	25	-31.1776	152.9431
K21	Tallowwood	15	40	-31.1772	152.9430
K22	Forest Red Gum	10	40	-31.1774	152.9437
K23	Tallowwood	8	30	-31.1767	152.9434
K24	Tallowwood	23	100	-31.1758	152.9424
K25	Tallowwood	23	50	-31.1759	152.9424
K26	Tallowwood	23	40	-31.1761	152.9425
K27	Tallowwood	12	25,20	-31.1764	152.9440
K28	Tallowwood	12	35	-31.1785	152.9441