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Planning

Working Beyond Expectations

Transitional Part 3A Project Supporting Document

75W Application to Amend Concept Approval

Development:
Residential Subdivision

Property:
Lot 22 DP 1070182 and
Lots 497 and 498 DP 227298
Pacific Highway, Sandy Beach North

Applicant:
Elite Construction NSW Pty Ltd

Date:
February 2018

Document Control Sheet

Issue No.	Amendment	Date	Prepared By	Checked By
A	Draft	20.02.2018	BS	TC
B	Final	27.02.2018	BS	TC

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1.0 Introduction

ADW Johnson Pty Ltd has been engaged by Elite Construction NSW Pty Ltd to assist with development of the Sandy Beach residential development in Coffs Harbour.

The purpose of this document is to seek amendment to the Concept Approval MP 05_0083 for the proposed subdivision and increase the development footprint for the site to allow development of part of the site currently excluded from the Concept Approval.

A copy of owners consent to the making of this application is included as **Appendix E.**

The original constraints mapping was undertaken based upon a limited site inspection, no vegetation plots and no targeted surveys for threatened flora. New constraints mapping has now been carried out for the site, based on a rigorous ecological examination of the site. This ecological review of the site undertaken by Cumberland Ecology indicates the constraints are not as significant as were considered at the time of approval and indicates there is scope to now include additional land as part of the approved development area.

The majority of the vegetation on the site does not constitute a Threatened Ecological Community. Further the proposal avoids the most intact vegetation remnants that will be retained within the area proposed to be added to the Coffs Coast Regional Park.

Specifically we are seeking to reinstate Stage 6, a reduced form of Stage 2, and part of Stage 1, which were deleted from the concept plan at the time of approval. The proponent also seeks to clarify the offsetting and conservation area requirements that will apply to the development of the land, having regard to the updated ecological data and the potential to provide off-site offsets in additional to the on-site offsets that will be provided and vary the entry to Stage 4 of the development to provide alternate access for emergency service vehicles.

The development footprint for Stage 2 has been amended to provide a buffer to the Coffs Coast Regional Park, a buffer to Hearnes Lake and allowance for bushfire Asset Protection Zones (APZ's) consistent with current requirements.

This supporting document provides the following information:

- A description of the site and locality;
- A description of the proposal; and
- A justification for the proposal.

2.0 Background

The subject site is located to the north of Sandy Beach within the Coffs Harbour Local Government Area.

In December 2010 Concept Plan Approval was issued for Part of The Sandy Beach North residential subdivision under Application No MP 05_0083. The approval did not include development within the areas described as Stage 6, Stage 2 and part of Stage 1 east of the extension of Ti-Tree Road as depicted below. A development application has been lodged with Coffs Harbour Council for Stages 1, 3, 4 and 5 and this application is currently under assessment.

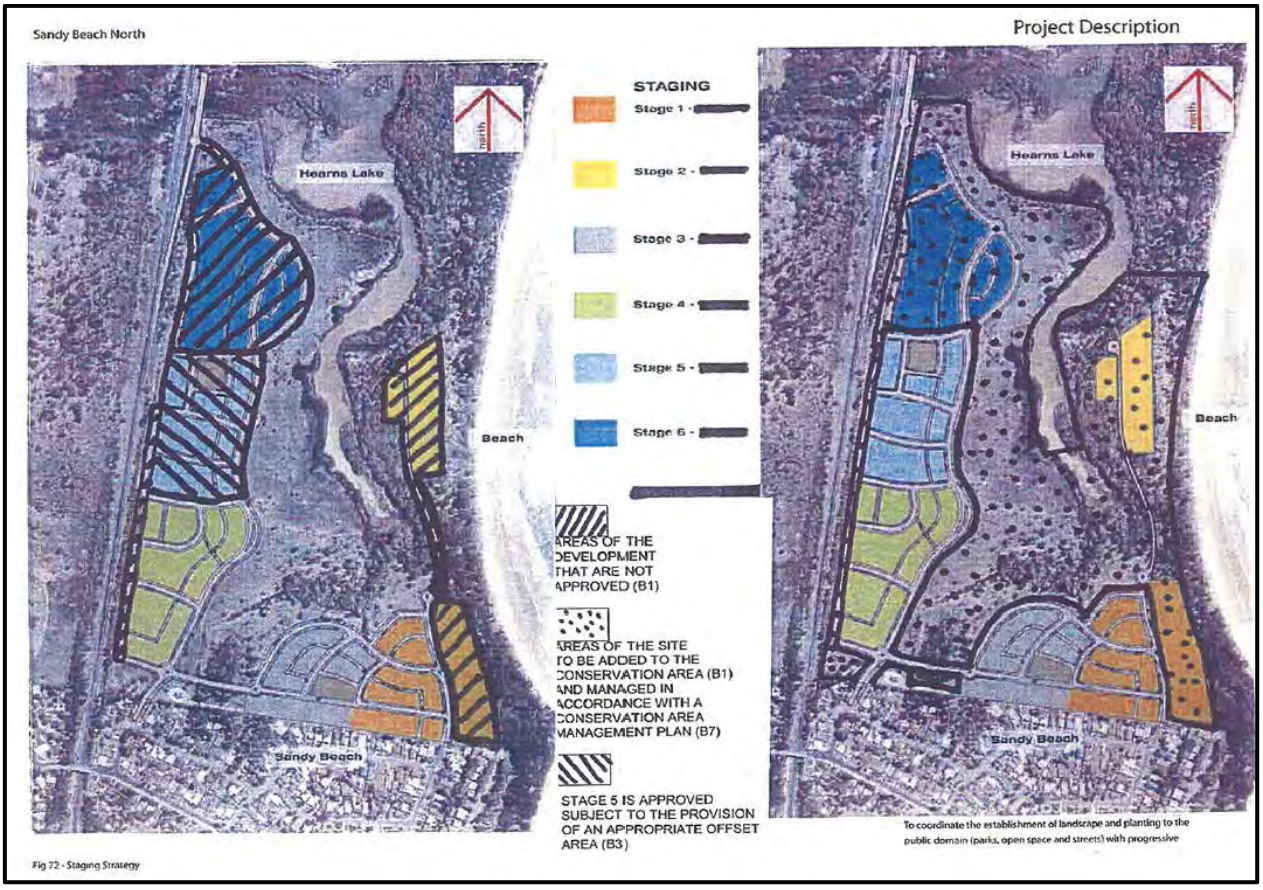


Figure 1: Approved Concept Plan.

3.0 Characteristics of the Site & Locality

The site lies to the east of the Pacific Highway between the highway and the coast to the north of the township of Sandy Beach. The site has an area of 49.5 hectares and includes the coastal dunes and the Hearnes Lake and lagoon estuary. The site is relatively flat and contains pockets of open woodland, swamp sclerophyll forest and coastal saltmarsh. The following aerial photographs show the site location and an indication of vegetation cover.

Land to the east of the site includes the Coffs Coast Regional Park. It is proposed that approximately 20 hectares or 40% of the site be added to the Regional Park. Land on the northern side of the watercourse that drains to Hearns Lake between Hearns Lake and the Pacific Highway is developed as a tourist park. Buffers between the Tourist Park and Hearnes Lake are in the order of 20 metres which is significantly less than those proposed in this development. Significant development is also occurring south of Woolgoolga and north of the tourist park.

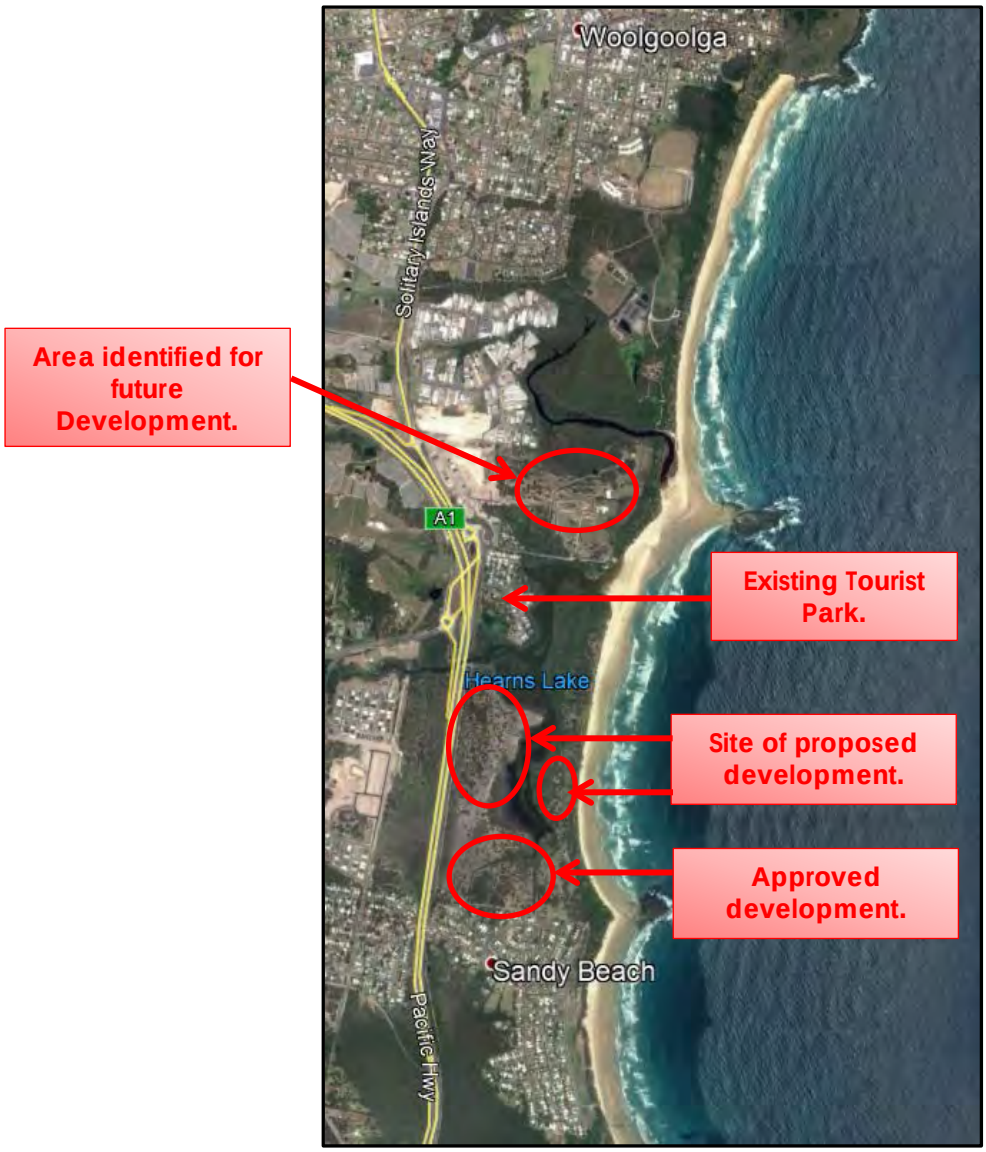


Figure 2: Aerial Image Sandy Beach to Woolgoolga.

Figure 3: Tourist Park to the north of the site.

Figure 4: Aerial image of the site.

4.0 The Proposal

The 75W Application seeks to allow development of those stages not approved in the Concept Approval (as amended to meet current requirements for bushfire management). As part of the proposal it now intended to increase the area of land to be included as an addition to Coffs Coast Regional Park from approximately 6 hectares to 20.58 hectares. The impacts of the development will be further offset by the acquisition of off-site offsets and a total of 633 BioBanking credits will be retired.

A copy of the concept approval is included as **Appendix A**. The following image also included in **Appendix B** shows the current proposal and the footprint from the original application. The additional footprint proposed for development when compared to the Concept Approval is 11.5 hectares.

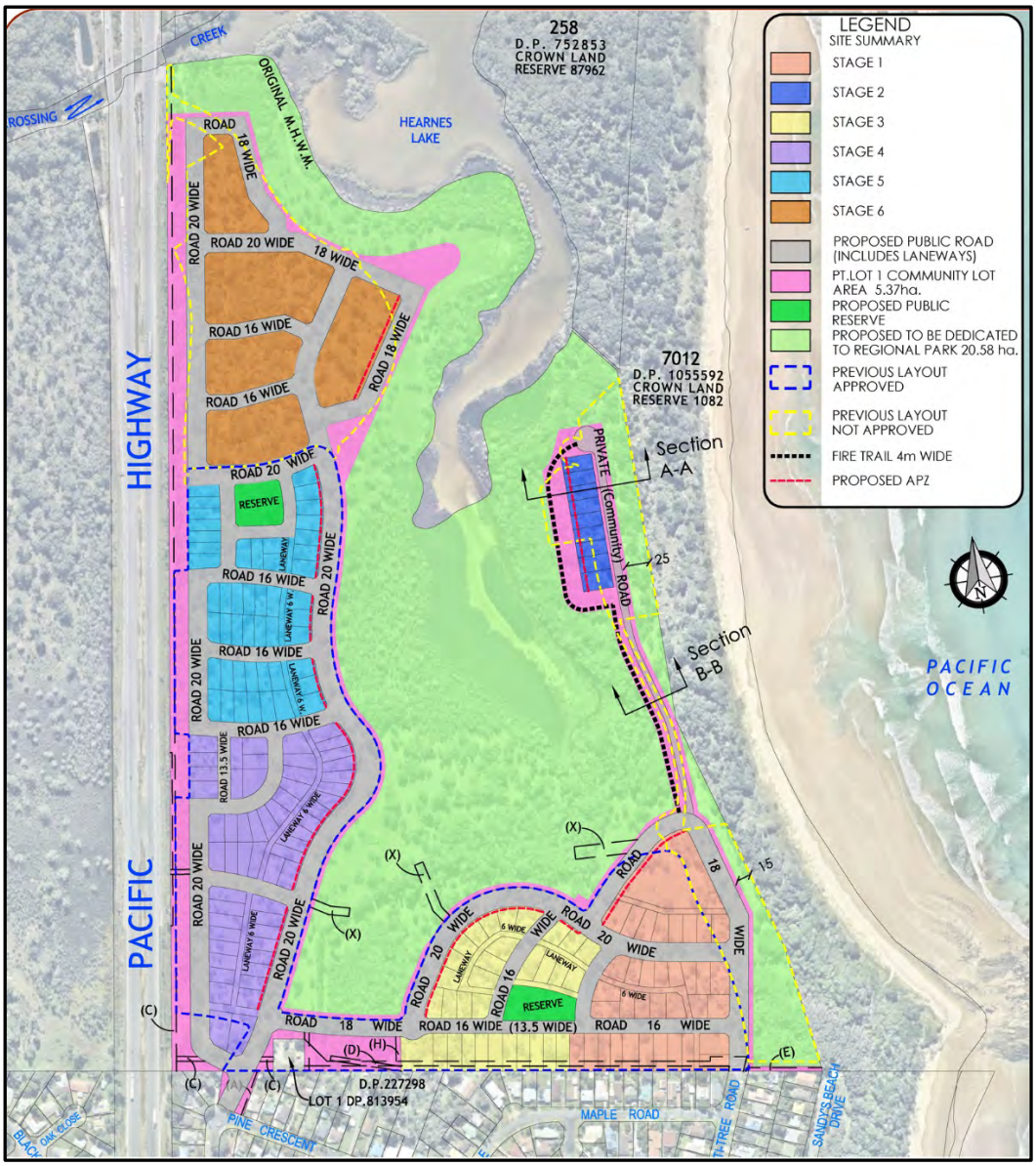


Figure 5: Amended Concept Plan.

Specifically we are seeking to amend the Concept Approval by:

- **Deleting Condition A2**

"A2 To avoid any doubt, this Concept Plan approval does not include any future development within the areas described as Stage 6, Stage 2 and that part of Stage 1 east of the extension of Ti Tree Road as depicted on the modified staging plan at schedule 3."

Comment: We have amended the development footprint for Stage 2 and the eastern part of Stage 1 having regard for buffers to the Coffs Coast Regional Park, Hearnes Lake the location of endangered ecological communities and bushfire protection requirements.

- **Deleting Condition B1**; which states:

" B1 The north west precinct (Stage 6) containing approximately 45 lots, the north eastern precinct (Stage 2) containing approximately 15 lots and the eastern edge of the southern precinct, east of the extension of Ti Tree Road (part of Stage 1) containing approximately 14 lots are not approved and this land is to be added to the Conservation Area."

Comment: A total of 20.58 hectares of land is now proposed to be added to the Coffs Coast Regional Park for conservation purposes. Vegetation offset calculations have been undertaken to quantify the offsets package proposed for the development.

- **Deleting Condition B3;**

"B3 Stage 5 is approved subject to the further requirements listed in C11."

Comment: Refer to comments below in relation to Condition C11.

- **Deleting Condition C11;**

"The future application for the residential subdivision of Stage 5 must include:

a) An assessment of the Stage 5 land to determine an appropriate offset for the development of this stage to the satisfaction of the Director General;
b) Proposed arrangements to secure an offset and the protection and management of that land for conservation purposes in perpetuity to the satisfaction of the Director General; and
c) Any offset is to be managed in accordance with a specific Conservation Area management Plan including details as per C10.

Note: this may include consideration of on site and off site offsets.

Comment: The ecological report provided as part of this application provides details of the proposed offset strategy having regard for the total development now proposed. The on-site offset will be provided in the land proposed to be added to the Coffs Coast Regional Park. Additional off-site offsets will also be required as detailed in the ecological report. A total of 633 BioBanking credits are required.

- **Deleting of Condition C13;**

"C13 Prior to any construction or as otherwise determined by the Director-General, the proponent must provide evidence of an agreement for the dedication by the proponent to LPMA of approximately 6 ha of land as addition to the Coffs Coast Regional Park, as committed to by letter dated 27 October 2010. Once dedicated the proponent is not required to manage the land in accordance with the Conservation Management Plan.

Such agreement must outline the Proponents commitment to establish boundary fences and trails satisfactory to the needs of the LPMA prior to the land being added to the Regional Park. The proponent must ensure suitable funding for the amendment of existing reserve specific fire pest weed and management plans. The funding should be sufficient to ensure actions within the amended plans relevant to the new additions are able to be completed."

Comment: It is now proposed to dedicate 20.58 hectares of land as an additional to Coffs Coast Regional Park. The additional dedication includes land that was previously proposed within the community association lot.

5.0 Planning Controls & Statutory Requirements

5.1 STATE PLANNING CONTROLS

Environmental Planning and Assessment Act 1979 and Environmental Planning and Assessment Regulation 2000

The Environmental Planning and Assessment Act 1979 (EP&A Act) and Regulation are the principal planning legislation in NSW and amongst other functions, sets out process and matters for assessment of development proposals.

The development is subject to the transitional provision applying to projects approved under part 3A of the Act. Schedule 6A details the transitional provisions.

Clause 3C Modification of concept plans

(1) Section 75W continues to apply for the purpose of the modification of a concept plan approved before or after the repeal of Part 3A, whether or not the project or any stage of the project is or was a transitional Part 3A project.

(2) This clause applies despite anything to the contrary in this Schedule (other than provisions relating to approval for the carrying out of a project or stage of a project that is given in connection with an approval to modify a concept plan).

Clause 8N of the Regulation details Projects or concept plans for which approval may not be given concerning environmentally sensitive land or sensitive coastal locations. Clause 8N does not expressly apply to modifications of existing concept plan approvals. It provides:

(1) For the purposes of sections 75J (3) and 75O (3) of the Act, approval for a project application may not be given under Part 3A of the Act for any project, or part of a project, that:

> (a) is located within an environmentally sensitive area of State significance or a sensitive coastal location, **and**
>
> (b) is prohibited by an environmental planning instrument that would not (because of section 75R of the Act) apply to the project if approved.

(2) To avoid doubt, a project is not prohibited for the purposes of subclause (1) (b) if:

> (a) it is not permitted because of the application of a development standard under the environmental planning instrument, or
>
> (b) it is prohibited under the environmental planning instrument but is permitted to be carried out because of the application of another environmental planning instrument to the environmental planning instrument.

(3) In this clause:

environmentally sensitive area of State significance has the same meaning as it has in State Environmental Planning Policy (State and Regional Development) 2011as detailed below:

environmentally sensitive area of State significance means:
(a) coastal waters of the State, or
(b) land to which State Environmental Planning Policy No 14—Coastal Wetlands or State Environmental Planning Policy No 26—Littoral Rainforests applies, or
(c) land reserved as an aquatic reserve under the Fisheries Management Act 1994 or as a marine park under the Marine Parks Act 1997, or
(d) a declared Ramsar wetland within the meaning of the Environment Protection and Biodiversity Conservation Act 1999 of the Commonwealth, or
(e) a declared World Heritage property within the meaning of the Environment Protection and Biodiversity Conservation Act 1999 of the Commonwealth, or
(f) land identified in an environmental planning instrument as being of high Aboriginal cultural significance or high biodiversity significance, or
(g) land reserved as a state conservation area under the National Parks and Wildlife Act 1974, or
(h) land, places, buildings or structures listed on the State Heritage Register under the Heritage Act 1977, or
(i) land reserved or dedicated under the Crown Lands Act 1989 for the preservation of flora, fauna, geological formations or for other environmental protection purposes, or
(j) land identified as being critical habitat under the Threatened Species Conservation Act 1995 or Part 7A of the Fisheries Management Act 1994.

sensitive coastal location has the same meaning as it has in Schedule 4A to the Act as detailed below:

sensitive coastal location means any of the following which occur within the coastal zone:
(a) land within 100m above mean high water mark of the sea, a bay or an estuary,
(b) a coastal lake,
(c) a declared Ramsar wetland within the meaning of the Environment Protection and Biodiversity Conservation Act 1999 of the Commonwealth,
(d) a declared World Heritage property within the meaning of the Environment Protection and Biodiversity Conservation Act 1999 of the Commonwealth,
(e) land declared as a marine park or an aquatic reserve under the Marine Estate Management Act 2014,
(f) (Repealed)
(g) land within 100m of any of the following:
(i) the water's edge of a coastal lake,
(ii) land to which paragraph (c), (d) or (e) applies,
(iii) land reserved under the National Parks and Wildlife Act 1974,
(iv) land to which State Environmental Planning Policy No 14—Coastal Wetlands applies,
(h) residential land (within the meaning of State Environmental Planning Policy No 26—Littoral Rainforests) that is within a distance of 100m from the outer edge of the heavy black line on the series of maps held in the Department and marked "State Environmental Planning Policy No 26—Littoral Rainforests (Amendment No 2)".

This clause 8N applies only where the project is **both** located within an environmentally sensitive area or sensitive coastal location **AND** is prohibited under an EPI. The proposal is not prohibited. A Planning Proposal has been submitted by Coffs Harbour Council however this has not been finalised and the current zoning of the site identified as "Deferred matter" reverts back to the previous zoning of the land in Coffs Harbour LEP2000. An extract from the LEP is included below. The land proposed for development includes land in the 2E Residential Tourist Zone and part of the 2A Low Density Residential Zone. A buffer around Hearnes Lake as depicted by the 7A Environmental Protection Habitat and Protection Zone forms part of the land proposed to be dedicated for conservation purposes as part of the Coffs Coast Regional Park.

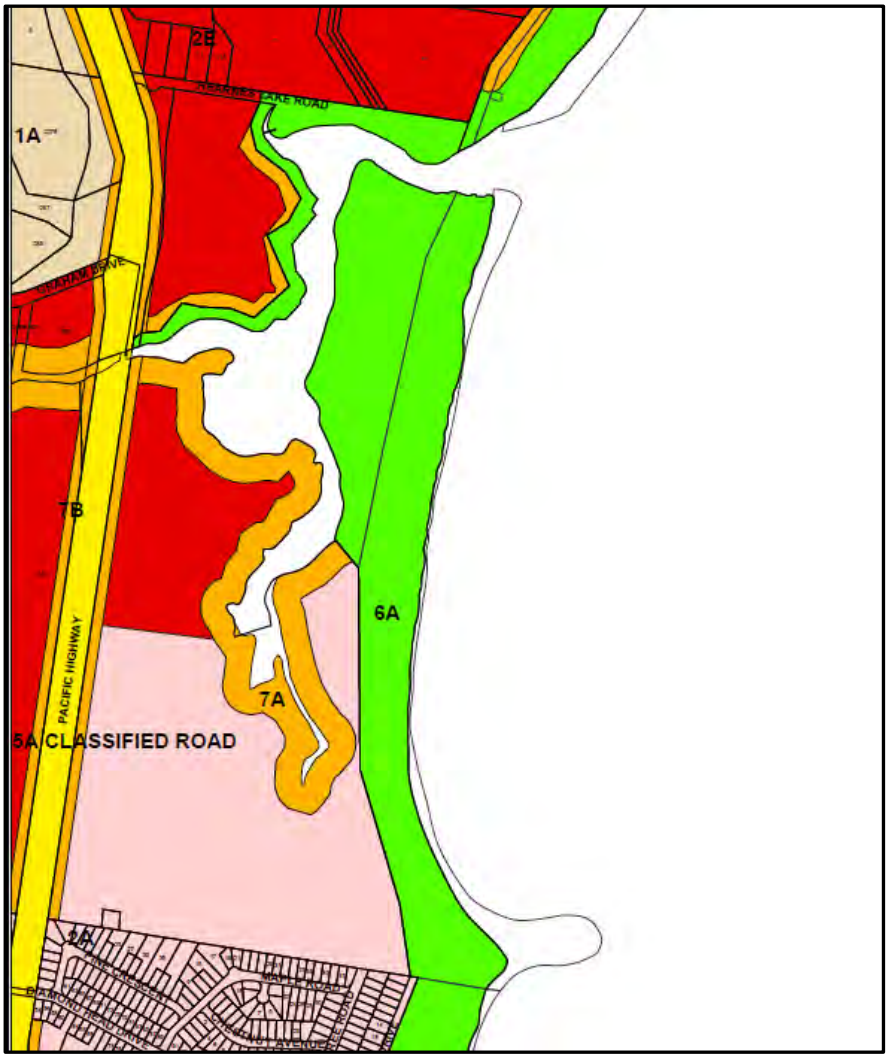


Figure 6: Coffs Harbour LEP 2000.

Rural Fires Act 1997

The proposed development is classified as residential development within a bushfire prone area and as such requires referral to the NSW Rural Fire Service (RFS) in accordance with Section 100B of the Rural Fires Act. A bushfire threat assessment was undertaken as part of the original environmental assessment. An amended report has been prepared and this matter is further discussed in **Section 6** of this report.

Water Management Act 2000

Controlled activities carried out in on or under water front land are regulated by the Water Management Act 2000. The NSW Office of Water administers the Water Management Act and is required to assess the impact of any controlled activity. The requirements of the Water Management Act are triggered by the proximity of works to existing watercourses.

5.1.1 State Environmental Planning Policies

State Environmental Planning Policy No 14

The site does not include SEPP 14 Wetland as indicated on the map below.

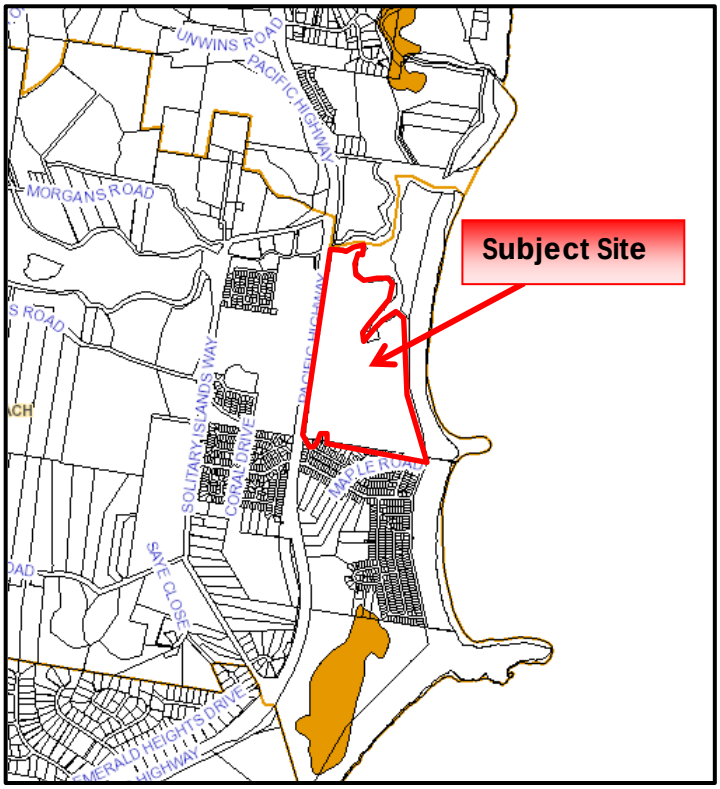


Figure 7: SEPP 14 Wetlands in vicinity of proposed development.

State Environmental Planning policy No 26 Littoral Rainforest

The site is not mapped as containing Littoral Rainforest. A small area is mapped to the north of the site. An area of littoral rainforest has been identified on the site however is not of sufficient site to have been mapped on the SEPP mapping layer.

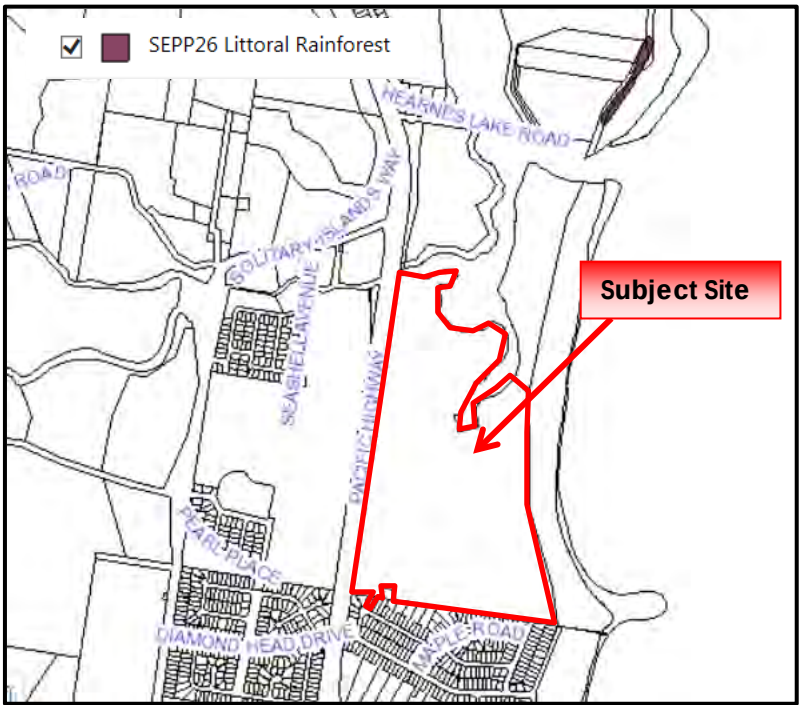


Figure 8: SEPP 26 Littoral Rainforest in vicinity of the site.

State Environmental Planning Policy No 55 Remediation of Land

1. A consent authority must not consent to the carrying out of any development on land unless:
    a. it has considered whether the land is contaminated, and
    b. if the land is contaminated, it is satisfied that the land is suitable in its contaminated state (or will be suitable, after remediation) for the purpose for which the development is proposed to be carried out, and
    c. if the land requires remediation to be made suitable for the purpose for which the development is proposed to be carried out, it is satisfied that the land will be remediated before the land is used for that purpose.

Having regard for the findings of the Coffey Report included in the original environmental assessment it is considered that the site is not likely to be contaminated and further investigation is not required.

State Environmental Planning Policy (Infrastructure (2007)

Clause 102 of the SEPP has requirements in relation to the impact of road noise or vibration on non-road development

1. This clause applies to development for any of the following purposes that is on land in or adjacent to the road corridor for a freeway, a tollway or a transit way or any other road with an annual average daily traffic volume of more than 40,000 vehicles (based on the traffic volume data published on the website of RMS) and that the consent authority considers is likely to be adversely affected by road noise or vibration:
    a. a building for residential use,
    b. a place of public worship,
    c. a hospital,
    d. an educational establishment or centre-based child care facility.

2. Before determining a development application for development to which this clause applies, the consent authority must take into consideration any guidelines that are issued by the Secretary for the purposes of this clause and published in the Gazette.

3. If the development is for the purposes of a building for residential use, the consent authority must not grant consent to the development unless it is satisfied that appropriate measures will be taken to ensure that the following LAeq levels are not exceeded:
    a. in any bedroom in the building—35 dB(A) at any time between 10 pm and 7 am,
    b. anywhere else in the building (other than a garage, kitchen, bathroom or hallway)—40 dB(A) at any time.

4. In this clause, freeway, tollway and transit way have the same meanings as they have in the Roads Act 1993.

In addition to the SEPP provisions Council's mapping shows the following noise corridor as affecting the site.

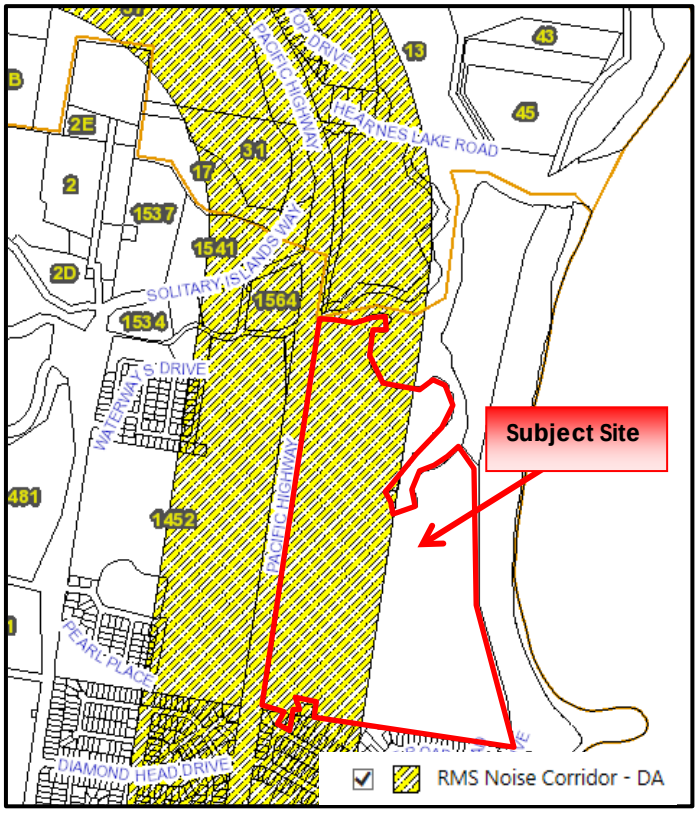


Figure 9: Council Road Noise Corridor Map.

Stage 6 of the development adjoins the Pacific Highway similar noise mitigation strategies to those required for Stages 4 and 5 will be required for Stage 6 and include construction of an acoustic barrier and controls on building design.

State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017

The aims of this Policy are:

(a) to protect the biodiversity values of trees and other vegetation in non-rural areas of the State, and
(b) to preserve the amenity of non-rural areas of the State through the preservation of trees and other vegetation.

As the development will require approval under part 4 of the EP and A Act separate approval under the SEPP is not required as the clearing is ancillary to the proposed development.

State Environmental Planning Policy No 71 Coastal Protection

The site is within the coastal zone and is not part of the metropolitan coastal zone. The site also includes land mapped as a sensitive coastal location as indicated below.

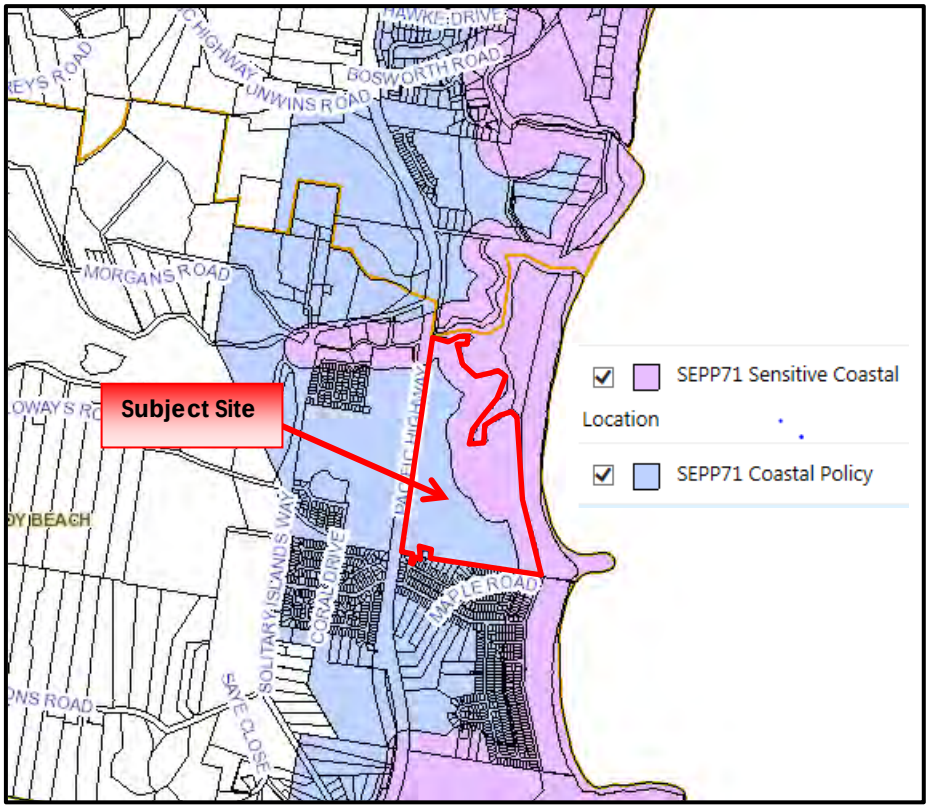


Figure 10: SEPP 71 Mapping Sourced from Council web site.

The provisions of SEPP 71 require the consent authority to consider the aims and objectives of the SEPP together with the matters for consideration listed in Clause 8, when determining an application within the coastal zone.

An assessment of the proposed development against the provisions of Clause 8 is included in the table below:

SEPP 71 – COASTAL PROTECTION	
CLAUSE 8	
Matters for Consideration	**Proposed**
A *The aims of the Policy:* *(a) to protect and manage the natural, cultural, recreational and economic attributes of the New South Wales coast, and*	a) The proposed development will provide a balance between development and conservation outcomes in a coastal location. Additional land is proposed to be added to the Coffs Coast reginal Park.
(b) to protect and improve existing public access to and along coastal foreshores to the extent that this is compatible with the natural attributes of the coastal foreshore, and	(b) Public access to Sandy Beach will be maintained.
(c) to ensure that new opportunities for public access to and along coastal foreshores are identified and realised to the extent that this is compatible with the natural attributes of the coastal foreshore, and	(c) Additional Public Access is not required but could be provided.
(d) to protect and preserve Aboriginal cultural heritage, and Aboriginal places, values, customs, beliefs and traditional knowledge, and	(d) An Aboriginal Heritage Assessment of the site has been undertaken. The proposal will not adversely impact heritage items.
(e) to ensure that the visual amenity of the coast is protected, and	(e) Buffers are provided as part of the development to the coast.
(f) to protect and preserve beach environments and beach amenity, and	(f) The existing beach environment will not be impacted by the proposal.
(g) to protect and preserve native coastal vegetation, and	(g) The proposed development will have no significant impact on native coastal vegetation. Significant parts of the site will be retained for conservation purposes.
(h) to protect and preserve the marine environment of New South Wales, and	(h) The proposed development will have no impact on the marine environment of New South Wales.
(i) to protect and preserve rock platforms, and	(i) The proposed development will have no impact on rock platforms.
(j) to manage the coastal zone in accordance with the principles of ecologically sustainable development (within the meaning of section 6 (2) of the Protection of the Environment Administration Act 1991), and	(j) The proposed development is considered to achieve a balance in terms of ecologically sustainable development.
(k) to ensure that the type, bulk, scale and size of development is appropriate for the location and protects and improves the natural scenic quality of the surrounding area,	(k) The proposed development is of an appropriate scale.

B *Existing public access to and along the coastal foreshore for pedestrians or persons with a disability should be retained and, where possible, public access to and along the coastal foreshore for pedestrians or persons with a disability should be improved.*	The proposed development will not remove or preclude any existing public access to the Sandy Beach foreshore.
C *Opportunities to provide new public access to and along the coastal foreshore for pedestrians or persons with a disability.*	Footpaths will be provided as part of the development which will improve public access to Sandy Beach.
D *The suitability of development given its type, location and design and its relationship with the surrounding area.*	The proposed development will complement the surrounding area by providing additional residential housing adjacent to an existing residential area.
E *Any detrimental impact that development may have on the amenity of the coastal foreshore, including any significant overshadowing of the coastal foreshore and any significant loss of views from a public place to the coastal foreshore.*	The proposed development will not overshadow the coastal foreshore or reduce views.
F *The scenic qualities of the New South Wales coast, and means to protect and improve these qualities.*	The proposed development will not adversely affect scenic qualities of the coast. The existing dune will protect views from the coast.
G *Measures to conserve animals (within the meaning of the Threatened Species Conservation Act 1995) and plants (within the meaning of that Act), and their habitats.*	The proposed development will have no significant impact on any threatened species under the TSC Act or FM Act. Dogs and cats are not permitted in the development. Conservation measures will enhance retained habitat.
H *Measures to conserve fish (within the meaning of Part 7A of the Fisheries Management Act 1994) and marine vegetation (within the meaning of that Part), and their habitats.*	No marine vegetation will be impacted by the proposal.
I *Existing wildlife corridors and the impact of development on these corridors.*	The proposed development will have a minimal impact on any existing wildlife corridors. The proposed development will remove some of the more disturbed and less connected vegetation from the site. The main area of connection is along the coastal dune system.
J *The likely impact of coastal processes and coastal hazards on development and any likely impacts of development on coastal processes and coastal hazards.*	The proposed development is setback from the coastal foreshore and is unlikely to impact coastal processes. A coastal hazard assessment report was undertaken for the original proposal. The buffer distance to the coast has been increased in this proposal.

K *Measures to reduce the potential for conflict between land-based and water-based coastal activities.*	N/A
L *Measures to protect the cultural places, values, customs, beliefs and traditional knowledge of Aboriginals.*	The proposed development will have no impact on any matters of Aboriginal significance.
M *Likely impacts of development on the water quality of coastal water bodies.*	The development will incorporate stormwater controls and erosion and sedimentation controls to ensure it does not impact on the water quality of coastal waters.
N *The conservation and preservation of items of heritage, archaeological or historic significance.*	N/A
O *Only in cases in which a council prepares a draft local environmental plan that applies to land to which this Policy applies, the means to encourage compact towns and cities.*	N/A

Taking the above into consideration, the proposed development is consistent with the aims and objectives of SEPP 71.

5.1.2 Draft Coastal Management SEPP

The Coastal Management SEPP will consolidate and improve current coastal-related SEPPs. It will replace SEPP 14 (Coastal Wetlands), SEPP 26 (Littoral Rainforests) and SEPP 71 (Coastal Protection) and ensure that future coastal development is appropriate and sensitive to our coastal environment, and that we maintain public access to beaches and foreshore areas.

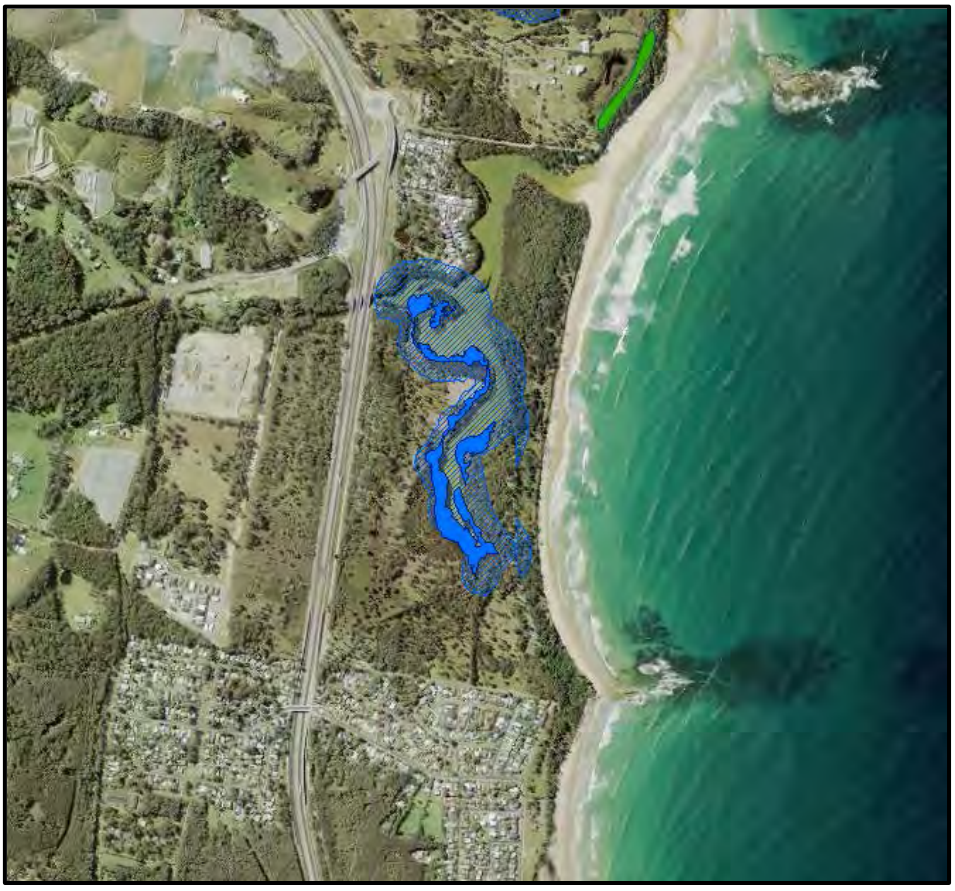


Figure 11: Coastal Wetlands Mapping draft NSW Coastal Management SEPP.

The site is within Coastal Environmental Area as mapped in the draft SEPP. Parts of Hearnes Lake are mapped as Coastal Wetlands as indicated above.

Clause 14 of the draft SEPP specifies with respect to development on land within the coastal environment area

(1) Development consent must not be granted to development on land that is wholly or partly within the coastal environment area unless the consent authority is satisfied that the proposed development:

a. is not likely to cause adverse impacts on the biophysical, hydrological (surface and groundwater) and ecological environment, and

b. is not likely to significantly impact on geological and geomorphological coastal processes and features or be significantly impacted by those processes and features, and

c. is not likely to have an adverse impact on the water quality of the marine estate (within the meaning of the *Marine Estate Management Act 2014*), in particular, having regard to the cumulative impacts of the proposed development on the marine estate including sensitive coastal lakes, and

d. is not likely to have an adverse impact on native vegetation and fauna and their habitats, undeveloped headlands and rock platforms, and

e. will not adversely impact Aboriginal cultural heritage and places, and

f. incorporates water sensitive design, including consideration of effluent and stormwater management, and

g. will not adversely impact on the use of the surf zone.

(2) In this clause, ***sensitive coastal lake*** means a body of water identified in Schedule 1.

(3) Hearnes Lake is identified as a coastal lake in schedule 2 of the SEPP. It is not listed as sensitive coastal lake in Schedule 1.

The draft SEPP does not yet apply and as it is essentially a consolidation of existing controls, the relevant matters are covered in existing SEPP's, which are addressed elsewhere in this report.

5.2 LOCAL PLANNING CONTROLS

5.2.1 Coffs Harbour Local Environmental Plan

Zoning

The land is within the deferred area of the Coffs Harbour LEP 2013 hence the 2000 LEP is applicable. The site is zoned 2E Residential Tourist Zone, 2A Low Density Residential and 7A Environmental Protection as indicated in the Image below.

The proposal remains consistent with the current zoning.

A draft LEP has been prepared to amend the existing zoning. The planning proposal was lodged on 26 June 2015 but has not been finalised. Under the most recent extension to the Gateway Determination, the LEP amendment was required to be finalised by 31 January 2018, but this has not yet occurred. The Gateway Approval for this draft LEP has therefore lapsed and it cannot be said to be either certain or imminent.

The planning proposal seeks to reduce the amount of land able to be developed by reducing the residential zoned land to the area approved under the Concept Approval (excluding stage 5 which has conditional approval). It essentially recognises the existing Concept Plan approval and seeks to zone the remainder of the site for environmental purposes, which is consistent with the current Concept Plan approval. For the reasons explained in this application, however, it is appropriate that a greater proportion of the land be used for residential purposes, and if the draft LEP amendment proceeds in the future, it should recognise any change to the Concept Plan approval.

Figure 12: Coffs Harbour LEP 2000 Zoning Map.

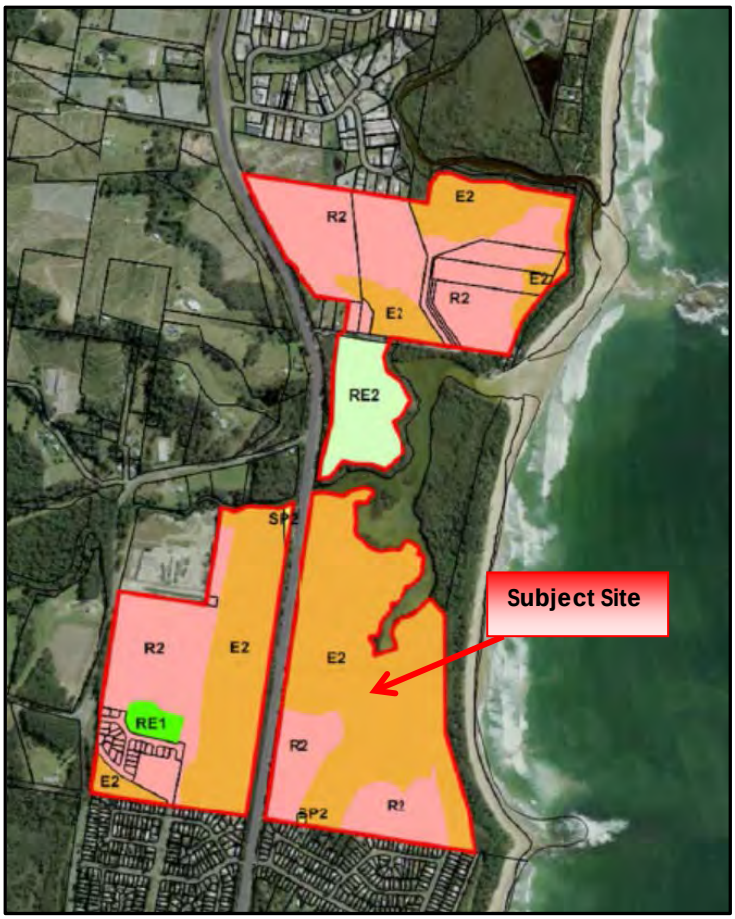


Figure 13: Draft LEP 2015 Planning Proposal.

6.0 Justification for the Proposed Amendment to Concept Plan

This application is seeking to amend the existing Concept Approval to allow development of the areas not approved in the Concept Application. In a strategic context development is occurring along the coast strip between Sandy Beach and Woolgoolga including land immediately north of Hearnes Lake. The Coffs Harbour LEP 2000 identified development potential of the site outside of the buffer area to Hearnes Lake identified as the 7A Environmental Protection Zone.

The key reason for deleting Stage 6, Stage 2 and part of Stage 1 from the original concept approval was due to perceived ecological constraints. The site does not form part of an ecological corridor although there is connection along the coast via the vegetation on the retained coastal dunes.

The ecological constraints on the site, particularly where development is proposed, are not as significant as the Department believed at the time of approval. A new flora and fauna report prepared by Cumberland Ecology is included as **Appendix C**. Further we believe the impacts of development of the previously excluded parts of the site can be mitigated by off- site vegetation offsets whereas the Concept Approval as it stands relied upon on-site offsets only. The use of off-site offsets to mitigate vegetation loss is an accepted planning approach.

The additional land to be added to the Coffs Coast Regional Park will ensure the conservation land is protected and managed into the future.

It is important that development of the site achieves the right balance between environmental protection and provision of housing. In this context we believe additional housing could be delivered on the site without compromising ecological objectives.

The original concept plan has been amended having regard for bushfire protection requirements and providing an increased buffer to the Coffs Coast Regional Park Boundary as it currently exists. The Coffs Coastal Regional Park Board has agreed to accept additional lands being added to the Regional Park. The footprint of the original road reserves and lots has been overlaid on the proposed subdivision plan to show where the current proposal differs from that originally proposed.

The number of potential lots in Stage 2 has been reduced from 15 to 9 lots. Stage 2 of the proposed development is located between Hearnes Lake and the coastal dune contained within the Coffs Coast Regional Park. It is proposed that a nominal 50 metre wide buffer be provided to the eastern side of Hearnes Lake and a 30 metre buffer be provided to the Regional Park noting that this 30 metre buffer area includes land that will be managed as Asset protection Zone.

The Bushfire Assessment Report provided with the environmental assessment undertaken for the Concept Plan by Conacher Environmental Group in 2008 has been reviewed by Kleinfelder Australia Pty Ltd and the assessment report is included as **Appendix D.** The Asset Protection Zones, access requirements and other fire protection measures as recommended have been incorporated into the proposal.

Part of this land is to be included in the Community Association Lot to be managed as Asset Protection Zone including fire fighting infrastructure and the remainder as road and residential lots. This is similar to the development constructed at Sapphire Beach (refer to image below).

Figure 14: Sapphire Beach development.

The proposed Stage 2 development differs from the Concept Plan Application in that only a single row of houses is proposed (similar to Sapphire Beach). The location of the access road serving Stage 2 has been retained on an alignment similar to that proposed in the Concept Plan Application. It is proposed to provide a 6.5 metre wide carriageway as a private road within community property to access Stage 2. The community land adjacent to the access road will include a fire trail and water service. The access off Pine Crescent within Stage 4 has been amended to provide alternate egress from the western part of the development in the event of one of the intersections being blocked.

7.0 Conclusion

It is considered reasonable to reconsider the impacts of those stages of the Sandy Beach residential development, deleted from the Concept Plan approval, on the basis of the ecological constraints not being as significant as previously thought and that the impacts of the development can be mitigated by off-site vegetation offsets.

There is strategic merit in permitting additional development in the Sandy Beach to Woolgoolga release area.

The demand for housing in the region remains strong and the site has potential to deliver additional high quality housing. The proposed development is an extension to an existing developed area in a highly desirable location.

Appendix A

CONCEPT APPROVAL

Concept Approval

Section 75O of the *Environmental Planning & Assessment Act 1979*

I determine:

(a) Pursuant to section 75O of the *Environmental Planning and Assessment Act 1979* (the Act) to approve the concept plan referred to in Schedule 1, subject to the terms of approval and modifications in Schedule 2 and the proponent's Statement of Commitments in Schedule 3; and

(b) Pursuant to section 75P(1)(b) of the Act, that approval to carry out the project shall be subject to Part 3A of the Act.

The modification and further assessment requirements are required to:

- Encourage the orderly future development of the site;
- Ensure adequate mitigation of environmental impacts of future development; and
- Ensure protection and restoration of threatened species and their habitat.

Anthony (Tony) Kelly MLC
Minister for Planning

Sydney 20 DEC 2010 2010.

SCHEDULE 1

Application No.:	05_0083
Proponent:	Sydney NSW Property Consultants Pty Ltd
Approval Authority:	Minister for Planning
Land:	Lot 22 DP 1070182 and Lots 497 and 498 DP 227298, Pacific Highway and Pine Crescent, Sandy Beach, Coffs Harbour LGA.
Project:	Sandy Beach North residential subdivision including: • Community title residential subdivision; • Associated road, cycle and pedestrian traffic routes; • Indicative architectural concepts for six building types; • Landscape concept; • Noise attenuation barriers; • Recreational open space; • Ecological buffers and environmental protection areas; • Vegetation, habitat, bushfire and foreshore management concepts;; and • Stormwater management concept. Note: Not all aspects of the Concept Plan have been approved

DEFINITIONS

Act	means the *Environmental Planning and Assessment Act 1979.*
BCA	means Building Code of Australia.
Concept Plan	means the project as described in Schedule 1 and as modified by Schedule 2.
Council	means Coffs Harbour City Council.
DECCW	means the Department of Environment Climate Change and Water or its successors.
Department	means the Department of Planning or its successors.
Director-General	means the Director-General of the Department or his/her nominee.
Environmental Assessment	means the Environmental Assessment entitled *Concept Plan Application for Residential Subdivision Sandy Beach North, Pacific Highway Sandy Beach Volumes 1 and 2 prepared by Planning Workshop Australia and dated 17 March 2009.*
Conservation Area (CA)	means that part of the site outside the boundaries of the lakeside perimeter road of the southern and western precincts and identifed as Conservation Area (CA) as depicted in Schedule 3.
LPMA	means the Land and Property Management Authority or its successors.
Minister	means the Minister for Planning.
PCA	means a Principal Certifying Authority and has the same meaning as Part 4A of the Act.
Preferred Project Report	means the Preferred Project Report (PPR) entitled *Preferred Project Report MP 05_0083 Pacific Highway Sandy Beach North* prepared by Willana Associates Pty Ltd and dated August 2010 and addendum letter dated 27 October 2010.
Proponent	means Sydney NSW Property Consultants Pty Ltd or any party acting upon this approval.
Regulation	means the *Environmental Planning and Assessment Regulation 2000.*
Site	means the land identified in Schedule 1.

SCHEDULE 2

PART A – ADMINISTRATIVE CONDITIONS

Concept Plan Description

A1. Concept Plan approval only is granted to the project described generally below:
a) Community Title residential subdivision;
b) Associated road, cycle and pedestrian traffic routes;
c) Indicative architectural concepts for six building types;
d) Landscape concepts;
e) Noise attenuation barriers;
f) Recreational open space areas;
g) Rehabilitation of ecological buffers and environmental protection areas;
h) Vegetation, habitat and bushfire foreshore management concepts; and
i) Stormwater management concepts.

As modified by the modifications in Part B of Schedule 2.

Note: The proponent sought Concept Plan approval for community title subdivision of 280 lots. Due to environmental constraints, approval has not been granted to a scheme of this size. Modifications to the Concept Plan are detailed in Part B of this schedule.

A2. To avoid any doubt, this Concept Plan approval does not approve any future development within the areas described as Stage 6, Stage 2, and that part of Stage 1 east of the extension of Ti-Tree Road as depicted on the modified staging plan at Schedule 3.

Consistency of Future Development

A3. The proponent shall carry out the Concept Plan and all related future applications generally in accordance with the:
a) Environmental Assessment;
b) Preferred Project Report and addendum letter; and
c) The Statement of Commitments.

except for:
1) Any modification which may be necessary for the purpose of compliance with the BCA and any Australian Standard incorporated into the BCA; and
2) Otherwise provided by the modifications and further assessment requirements of this approval.

A4. In the event of any inconsistency between:
a) The modifications and further assessment requirements of this approval and the drawings/documents referred to in condition A3, the modifications and further assessment requirements of this approval shall prevail to the extent of the inconsistency; and
b) Any drawing/document listed in condition A3, the most recent document shall prevail to the extent of the inconsistency; and
c) The modifications and further assessment requirements of this approval and the Statement of Commitments, the modifications and further assessment requirements of this approval prevail to the extent of the inconsistency.

A5. If there is any inconsistency between this Concept Plan approval and any future application, this Concept Plan approval shall prevail to the extent of the inconsistency.

Limits of Approval

A6. This Concept Plan approval shall lapse five (5) years after the date the approval is endorsed by the Minister, unless works the subject of any related application are physically commenced, on or before that lapse date. The Director-General may extend this lapse date if the Proponent demonstrates to the satisfaction of the Director-General that the project remains current,

appropriate and reflective of the best use of the site at the date the approval would otherwise lapse.

A7. To avoid any doubt, this approval does not permit the construction of any component of the Concept Plan (including any clearing of vegetation).

PART B – MODIFICATIONS TO CONCEPT PLAN PURSUANT TO SECTION 75O(4) OF THE ACT

Note: In making the modifications as described in this schedule, the Minister has only granted Concept Plan approval to a community title subdivision of approximately 200 residential lots along the western and southern boundaries of the site.

Subdivision Layout

B1. The north western precinct (Stage 6) containing approximately 45 lots, the north eastern precinct (Stage 2) containing approximately 15 lots, and the eastern edge of the southern precinct, east of the extension of Ti-Tree Road (part of Stage 1) containing approximately 14 lots are not approved and this land is to be added to the Conservation Area (see Schedule 3).

B2. No roads, acoustic barrier walls or residential lots are to encroach into the 20 metre wide 7B Scenic Buffer zoned land that runs immediately parallel to the Pacific Highway road reserve along the western boundary of the site.

B3. Stage 5 is approved subject to the further requirements listed at C11.

Access

B4. The proposed direct connection to the Pacific Highway in the north-western corner of the site is not approved.

B5. Both Lots 497 and 498 DP 227298 are to be used for the access road from Pine Crescent to the site.

B6. The perimeter road on the lakeside of the development (refer Schedule 3) is to have a finished surface level of RL3.6m AHD. The construction of all roads is to be in accordance with the specifications of Coffs Harbour Council.

Environment

B7. All land within the Conservation Area is to be managed in accordance with a Conservation Area Management Plan (CAMP) (refer C10).

PART C - FURTHER ENVIRONMENTAL ASSESSMENT REQUIREMENTS

Pursuant to section 75P(2)(c) of the Act, the following environmental assessment requirements apply with respect to future stages of the project:

Subdivision

C1. Each future application for subdivision is to include:

(a) subdivision plans to Council's specifications, that show as a minimum, the following:
   i. dimensions of proposed allotments;
   ii. location of all structures proposed and retained on site;
   iii. location and width of asset protection zones (APZ);
   iv. access points; and
   v. any easements, covenants or other restrictions either existing or required on the site.

(b) draft community management statement;

(c) design guidelines for future housing developed in consultation with Council;

(d) outline of landscaping using locally native species and taking into consideration bushfire safety and the knowledge of the traditional Aboriginal custodians;

(e) details of construction methods, including sensitive fauna clearance and re-location methods prior to vegetation removal, methods to protect vegetation to be retained and erosion and sediment control;

(f) stormwater management incorporating water sensitive urban design principles;

(g) roads constructed to Council's specifications; and

(h) demonstration of compliance with this approval.

Acid Sulfate Soils Management

C2. An Acid Sulfate Soils Management Plan describing methods for determining the presence of such soils and the proposed methods for dealing with such soils should they be encountered.

Wallum froglet

C3. Clarification of the nature and extent of Wallum froglet habitat, including details of protective measures to mitigate against impacts on this species.

Noise

C4. In order to determine appropriate noise attenuation measures, it must be demonstrated that a road traffic noise modelling and assessment has been undertaken in accordance with all relevant guidelines for traffic noise attenuation for residential dwellings.

Water Management

C5. In order to ensure the protection of groundwater quality and the water quality of Hearnes Lake:

a) A detailed groundwater assessment is to be undertaken to determine the pre-development groundwater levels and groundwater quality over the proposed development area and the contribution of groundwater to Hearnes Lake and coastal dunes (any groundwater monitoring bores are to be licensed under the *Water Act 1912* and *Water Management Act 2000)*;

b) base line water quality data within Hearnes Lake and underlying groundwater is to be established, as are the development of trigger levels;

c) monitoring of water quality within the underlying groundwater and stormwater treatment system within the proposed Hearnes lake is to be incorporated in the monitoring program in the draft Environmental Management System (EMS);

d) All stormwater to be discharged is to be treated and any stormwater discharge will have a neutral or beneficial impact on surface and groundwater water quality;

e) Water quality control devices are to be sited in such a way as to minimise their impact with the Conservation Area.

Access

C6. A traffic, parking and access assessment report is to be submitted which accurately assesses the impact of the proposal on the local road network using the traffic generation rates used in recent RTA household surveys. Consideration is to be given to providing safe connections for pedestrians and cyclists to the existing network, this should include appropriate traffic management treatments at conflict points and off-road facilities;

Aboriginal Cultural Heritage

C7. The applicant shall develop and implement an archaeological sub-surface investigation program in consultation with the Director-General, local Aboriginal community and DECCW to ascertain the location, nature, scale, and significance of the Aboriginal Cultural Heritage (ACH) values located within the potential archaeological deposits within the project area, particularly the areas identified as PAD 1, as detailed in the Aboriginal Archaeological report prepared by Mary Dallas Consulting, submitted with the EA.

The result of the program, including any proposed management recommendations should be made available to Registered Aboriginal stakeholders for discussion prior to any decision regarding their management being determined. This program should be implemented and finalised prior to determination of the first subdivision application.

Domestic Animals

C8. Future applications must demonstrate that the keeping of cats and dogs (with the exception of assistance animals, as defined under the *Commonwealth Disability Discrimination Act 1992)* within the site is prohibited and that all residential lots are to be encumbered to this effect with a Section 88B instrument under the *NSW Conveyancing Act 1919*.

Recycled Water Supply

C9. Future applications must include an assessment investigating the viability of providing dual reticulation to future housing lots.

Conservation Area Management Plan

C10. The Conservation Area Management Plan shall at a minimum include the following:

(a) dimensions and area of the Conservation Area;
(b) details of how rehabilitation of degraded areas within the Conservation Area is to occur;
(c) measures to address any archaeological artefacts/sites;
(d) measures to control weeds;
(e) measures to control feral dogs and cats;
(f) details of fencing and other measures to be provided to protect existing and future vegetation;
(g) details of measures to protect threatened species and endangered ecological communities;
(h) details of how the area is to be managed having regard to the Coffs Harbour Koala Plan of Management;
(i) bushfire management;
(j) measures to control public access within the conservation area to minimise damage;
(k) details of future management and funding arrangements for the area and measures to be implemented for the long term protection of the area, for example through dedication;
(l) consultation to be undertaken with Council, LPMA and DECCW;
(m) performance objectives detailing measurable performance and completion criteria;
(n) detailed planting species list, composition and density for each vegetation community and, for EECs to be rehabilitated, this is to include ground, mid and canopy species and species composition must be benchmarked against a reference EEC community;
(o) details on creek bank erosion management;
(p) timing and responsibilities;
(q) monitoring, reporting and adaptive management procedures; and
(r) developer maintenance period reflecting completion criteria.

Environmental Impact of Stage 5

C11. The future application for the residential subdivision of Stage 5 must include:

a) an assessment of the Stage 5 land to determine an appropriate offset for the development of this stage to the satisfaction of the Director General;

b) proposed arrangements to secure an offset and the protection and management of that land for conservation purposes in perpetuity to the satisfaction of the Director General; and

c) any offset is to be managed in accordance with a specific Conservation Area Management Plan including details as per C10.

Note: this may include consideration of both on-site and off-site offsets

Flood Floor Levels

C12. Future applications for dwellings are to demonstrate that the minimum floor levels for habitable rooms are RL 4.1m AHD. All residential lots are to be encumbered to this effect with a Section 88B instrument under the *NSW Conveyancing Act 1919.*

Dedication of Land

C13. Prior to any construction, or as otherwise determined by the Director-General, the Proponent must provide evidence of an agreement for the dedication by the Proponent to LPMA of approximately 6 ha of land as addition to the Coffs Coast Regional Park, as committed to by letter dated 27 October 2010. Once dedicated the Proponent is not required to manage the dedicated land in accordance with the Conservation Area Management Plan.

Such an agreement must outline the Proponent's commitment to establish boundary fences and trails satisfactory to the needs of LPMA prior to the land being added to the Regional Park. The proponent must ensure suitable funding for the amendment of existing reserve-specific fire, pest, weed and management plans. The funding should be sufficient to ensure actions within the amended plans relevant to the new additions are able to be completed.

Drainage

C14. A flooding and drainage assessment is to be undertaken to:

a) ensure that adequate provision is made for the drainage under the highway via the existing and extended culverts. The hydraulic performance and the degree of flood immunity provided by the highway or flood behaviour upstream of the highway is not to be affected; and

b) demonstrate that the proposed perimeter road/levee system is capable of draining stormwater form the site as well as protecting the future residential subdivision from regular inundation.

SCHEDULE 3

Sandy Beach North

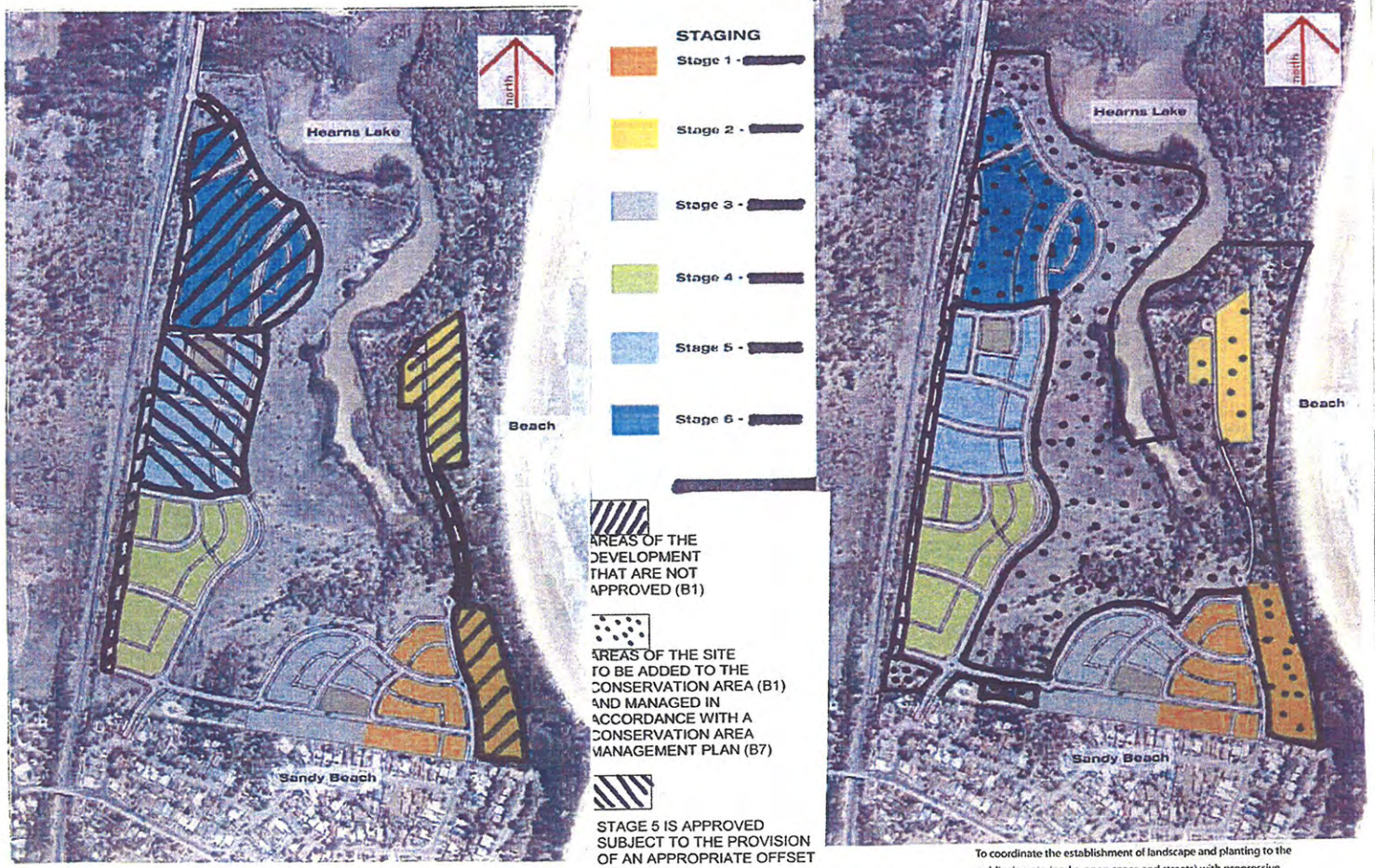


Fig 72 - Staging Strategy

To coordinate the establishment of landscape and planting to the public domain (parks, open space and streets) with progressive

Appendix B

AMENDED CONCEPT PLAN

239312-DA-005-C

CREEK

CROSSING

HIGHWAY

ORIGINAL M.H.W.M.

HEARNES LAKE

258
D.P. 752853
CROWN LAND
RESERVE 87962

7012
D.P. 1055592
CROWN LAND
RESERVE 1082

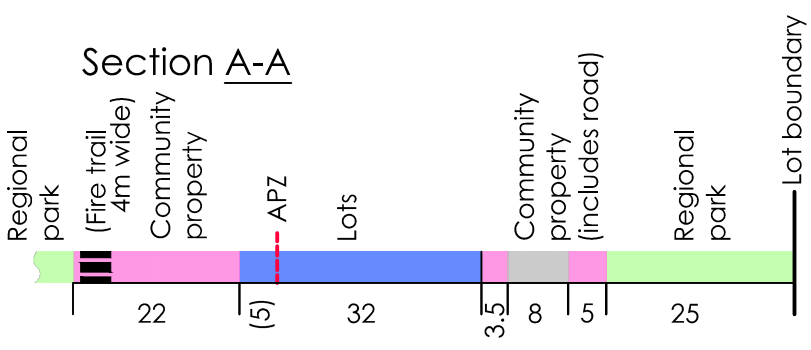
ROAD 18 WIDE
ROAD 20 WIDE
ROAD 16 WIDE
ROAD 13.5 WIDE
RESERVE
LANEWAY
LANEWAY 6 W.
LANEWAY 6 WIDE
6 WIDE
PRIVATE (Community) ROAD
25
18
15
Section A-A
Section B-B
(A) (C) (D) (E) (H) (X)
D.P.227298
LOT 1 DP.813954
PACIFIC OCEAN
PACIFIC
OAK CLOSE
PINE CRESCENT
MAPLE ROAD
SANDY'S BEACH DRIVE

LEGEND

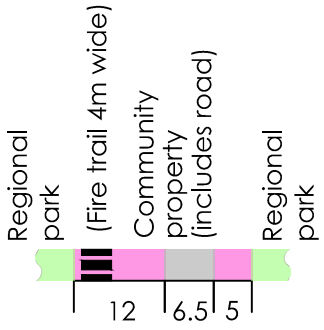
SITE SUMMARY

- STAGE 1
- STAGE 2
- STAGE 3
- STAGE 4
- STAGE 5
- STAGE 6
- PROPOSED PUBLIC ROAD (INCLUDES LANEWAYS)
- PT.LOT 1 COMMUNITY LOT AREA 5.37ha.
- PROPOSED PUBLIC RESERVE
- PROPOSED TO BE DEDICATED TO REGIONAL PARK 20.58 ha.
- PREVIOUS LAYOUT APPROVED
- PREVIOUS LAYOUT NOT APPROVED
- FIRE TRAIL 4m WIDE
- PROPOSED APZ

Section A-A



Section B-B



(A) EASEMENT TO DRAIN WATER 1.82 WIDE (DP.227298)
(C) EASEMENT FOR SEWER PIPELINE 5 WIDE (E.740455)
(D) EASEMENT FOR ACCESS 5 WIDE AND VARIABLE (D.P. 813954) E740455
(E) EASEMENT FOR WATER 3.5 WIDE (T.536154)
(H) PROPOSED EASEMENT FOR ACCESS 5 WIDE (SUBJECT TO DESIGN)
(X) PROPOSED EASEMENT TO DRAIN VARIABLE WIDTH (SUBJECT TO DESIGN)

EXISTING SITE INFORMATION

LOT 22 D.P.1070182 (49.59 ha.)
LOT 497 D.P.227298 (689.2m²)
LOT 498 D.P.227298 (714.5m²)
TOTAL = 49.73 ha.

ver.	date	comment	drawn	pm	level information	scale (A3 original size)
C	27-2-18	ROAD AMEND STAGAE 4	MS	TC	DATUM: N/A CONTOUR INTERVAL: N/A	0 100 200m SCALE: 1:4000 (FULL)

working beyond expectations

drawing title:
PLAN OF PROPOSED SUBDIVISION

location: WOOLGOOLGA COFFS HARBOUR
council: COFFS HARBOUR
dwg ref: 239312-DA-005-C
client: Elite Constructions NSW Pty Ltd

adw johnson
central coast office ph: (02) 4305 4300
hunter office ph: (02) 4978 5100
www.adwjohnson.com.au

• project management • civil engineering • infrastructure • superintendency • economic analysis • social impact • town planning • surveying • development feasibility • visualisation • urban design

Appendix C

FLORA & FAUNA ASSESSMENT REPORT

SANDY BEACH - COFFS HARBOUR

Flora and Fauna Assessment

For:

Dentons Australia Pty Ltd

February 2018

Final Report

PO Box 2474
Carlingford Court 2118

Report No. 17073RP4

The preparation of this report has been in accordance with the brief provided by the Client and has relied upon the data and results collected at or under the times and conditions specified in the report. All findings, conclusions or recommendations contained within the report are based only on the aforementioned circumstances. The report has been prepared for use by the Client and no responsibility for its use by other parties is accepted by Cumberland Ecology.

Version	Date Issued	Amended by	Details

Approved by: Dr David Robertson

Position: Director

Signed: David Robertson

Date: *27 February, 2018*

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Glossary of Terms

BBAM	BioBanking Assessment Methodology
BC Act	NSW *Biodiversity Conservation Act 2016*
BVT	Biometric Vegetation Type
CEEC	Critically Endangered Ecological Community
CHLEP 2013	*Coffs Harbour Local Environmental Plan 2013*
DoEE	Commonwealth Department of the Environment and Energy
DoP	NSW Department of Planning
EEC	Endangered Ecological Community
EP&A Act	NSW *Environment Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
FFA	Flora and Fauna Assessment
FM Act	NSW *Fisheries Management Act 1994*
GPS	Global Positioning System
ICOLL	Intermittently Closed and Open Lakes and Lagoons
LEP	Local Environment Plan
LGA	Local Government Area
Locality	The area within the 10 km radius of the study area
MNES	Matters of National Environmental Significance
OEH	NSW Office of the Environment and Heritage
PCT	Plant Community Type
SEPP	State Environmental Planning Policy
Study Area	The area including the subject site and any areas affected by the proposal, either directly or indirectly
Subject Site	The area subject to the proposal action, as shown in Figure 1.3
TEC	Threatened Ecological Community
TSC Act	NSW *Threatened Species Conservation Act 1995*
VEC	Vulnerable Ecological Community
VIS	NSW Vegetation Information System Classification

Executive Summary

S1.1 Introduction

Cumberland Ecology Pty Ltd (Cumberland Ecology) has been commissioned by Dentons Australia Pty Ltd (Dentons) on behalf of Elite Constructions NSW Pty Ltd (the client) to prepare a Flora and Fauna Assessment (FFA) to support an application for a modification to an existing Concept Approval under Section 75W of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The project comprises the construction of residential development within Lot 22 DP 1070182 and Lots 497 and 498 DP 227298 (hereafter referred to as the 'study area').

The purpose of this report is to document the findings of ecological investigations completed across the study area, and to assess the impacts of the proposed development on the biodiversity values present. Biodiversity values include threatened species, populations and ecological communities protected under the NSW *Threatened Species Conservation Act 1995* (TSC Act) – (repealed) and/or Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

S1.2 Background

A Concept Plan providing for staged residential development and the provision of a Conservation Area within the study area has been granted partial approval under the former Section 3A of the EP&A Act. The Concept Plan entailed residential development across the more elevated areas of the study area and retention and conservation management of the majority of the native vegetation in the study area, including the low lying vegetation around Hearnes Lake within a dedicated Conservation Area.

The Concept Plan included six stages of residential development, but Stages 2 and 6 were not approved, and only the following four stages were approved:

- Stage 1 (the western portion), Stage 3 and Stage 4 were approved, with biodiversity offsets consisting of creation and management in perpetuity of a Conservation Area within the study area; and
- Stage 5 was approved subject to the provision of an appropriate offset area outside the study area.

An ecological review of the vegetation in the study area and current mapping from Coffs Harbour Council was undertaken by Cumberland Ecology which indicates that the ecological constraints to development may not be as significant as were considered at the time of approval and that there is scope to now include previously unapproved areas as part of the approved development area. It is proposed to provide off-site offsets to compensate for the removal of native vegetation in these areas in addition to the on-site offsets that will be

provided as part of the approved stages of the proposed development to mitigate the impacts of any vegetation loss. Therefore a reconsideration of the ecological constraints to development of the subject site is warranted.

The purpose of this FFA is to support an application for an amendment to the Concept Approval MP 05_0083 under Section 75W of the EP&A Act for the proposed development to allow development of those parts of the site currently excluded from the Concept Approval in the subject site.

S1.3 Methodology

This FFA is based upon results from literature review, database assessments, vegetation mapping, tree hollow mapping and targeted surveys of threatened species.

The study area has been extensively mapped and assessed by a range of flora and fauna investigations dating back to 2003. Those flora and fauna reports were reviewed to gain an understanding of the baseline flora and fauna conditions, and threatened species likely to be present. Additionally, the NSW Wildlife Atlas and the EPBC Act Protected Matters Search Tool flora and fauna records were obtained and reviewed to determine threatened species that had been recorded from the locality and to assist in determining the likelihood of occurrence of threatened species in the study area.

To supplement the extensive dataset available on the biodiversity in the study area, flora surveys were undertaken within the study area by Cumberland Ecology between 30 May 2017 and 2 June 2017. Plot-based sampling was done in accordance with the BioBanking Assessment Methodology (BBAM). A total of 33 BioBanking plots were surveyed. The sampling regime aimed to collect data from each vegetation community, with additional plots utilised to capture variation in the condition or floristics of each vegetation community.

Targeted threatened flora searches via random meanders were undertaken for threatened flora species known from the locality and considered to have potential to occur.

Additional fauna surveys were undertaken in November 2017 and February 2018, including targeted searches for hollow-bearing trees, microchiropteran bat surveys, and bird surveys.

Traverses were undertaken across the western portion of the study area in November 2017; and in the eastern portion of the study area in February 2018 to search for hollow bearing trees. Where found, the location was recorded using GPS. Microchiropteran bat calls were recorded using two Anabat SD1 detectors and one Song Meter SM2 BAT detector between the 8 November and 12 November 2017. Additional bird surveys were conducted in the study area between 4 February and 8 February, 2018. Two transects were established, with a total of nine survey points, at which all birds heard or seen were recorded.

Fauna habitat assessments were undertaken during both the November 2017 and February 2018 fauna surveys, including consideration of important indicators of habitat condition and complexity including the occurrence of microhabitats such as tree hollows, Koala habitat trees, fallen logs, bush rock and wetland areas such as creeks and soaks. Structural features considered included the nature and extent of the understorey and ground stratum

and extent of canopy. The survey also included an assessment of the presence of habitat features suitable for use by threatened fauna species known from the locality.

S1.4 Results

The study area is approximately 49 ha in area and comprises flat land between coastal dunes in the east and the Pacific Highway in the west. It is in the catchment of Hearnes Lake, an Intermittently Closed and Open Lakes or Lagoon (ICOLL). Overall, the land is low lying and broad areas of the study area beside the lake are below the 1:100 year flood level.

The study area has historically been cleared for farming, and in some areas for sand mining. Drainage channels have also been made across some portions of the land and these have historically drained and impacted some swamp communities. It is currently used for grazing and bee keeping and is not managed for conservation.

Despite past clearing, the study area contains a mosaic of native plant communities that are zoned in relation to their proximity to the lake, and the drainage patterns associated with it. Dry eucalypt forests occur on well drained soils above the 1:100 year flood level. At lower elevations various swamp forest communities grade into shrubland, saltmarsh and mangroves that form fringing communities around the lake.

S1.4.1 Vegetation Communities

Seventeen (17) plant communities occur within the study area. Vegetation communities names used in this report are aligned with the map units identified within *Development of a Fine-scale Vegetation Map for the Coffs Harbour Local Government Area*. **Table S.1.1** below lists the vegetation communities occurring in the study area and the approximate area of each.

Five (5) threatened ecological communities (TECs) listed under the TSC Act and/or the EPBC Act occur in the study area, including Swamp Sclerophyll Forest, Swamp Oak Floodplain Forest, Subtropical Coastal Floodplain Forest, Littoral Rainforest and Coastal Saltmarsh. These communities are largely confined to the low lying areas of the study area.

Table S.1.1 Vegetation communities within the study area

Vegetation Community	Area (ha)
Rainforest	
CH_RF07: Coastal Exposed Dune Littoral Rainforest	0.12
Dry Sclerophyll Forest	
CH_DOF06: Lowlands Swamp Box - Paperbark -Red Gum Dry Forest	2.16
CH_DOF06: Lowlands Swamp Box - Paperbark -Red Gum Dry Forest – Derived Open Woodland	1.09
CH_DOF08: Coastal Sand Bloodwood-Banksia Forest	1.43

Table S.1.1 Vegetation communities within the study area

Vegetation Community	Area (ha)
Freshwater Wetlands	
CH_FW04: Coastal Wallum Baumea Sedgeland	6.46
CH_FW05: Coastal Wallum Paperbark Wet Shrubland	0.95
Forested Wetlands	
CH_FRW01: Coastal Paperbark Swamp Oak Floodplain Forest	3.81
CH_FRW02: Coastal Swamp Mahogany Forest	3.36
CH_FRW04: Coastal Paperbark Sedgeland Dominated Forest	4.89
CH_FRW04: Coastal Paperbark Sedgeland Dominated Forest – Derived Open Woodland	1.92
CH_FRW05: Coastal Paperbark Swamp Box Littoral Forest	1.88
CH_FRW09: Coastal Wallum Swamp Mahogany Siebers Paperbark Forest	11.30
CH_FRW10: Swamp Oak Forested Wetland	2.02
CH_FRW11: Estuarine Paperbark Twig-rush Forest	1.35
Saline Wetlands	
CH_SW01: Estuarine Mangrove Forest	0.09
CH_SW02: Estuarine Twig Rush Saltmarsh	2.73
Derived Grassland	
Derived Grasslands	3.11
Water	
Water	0.46
TOTAL	**49**

S1.4.2 Flora Species

Despite past clearing and livestock grazing over 400 flora species have been recorded within the study area. That notwithstanding, no threatened flora species have been recorded from within the study area, and none are considered likely to occur. This is largely due to the absence of local records of threatened species and the degraded condition of the study area.

S1.4.3 Fauna Habitat Assessment

The study area contains a range of fauna habitats, ranging from dry eucalypt forests occurring on well drained soils above the 1:100 year flood level to various swamp forest communities that grade into shrubland, saltmarsh and mangroves around the lake.

Past clearing and habitat modification on and immediately adjacent to the study area have impacted the fauna habitat values of the land. The habitats on site are fragmented and separated from other habitats to a substantial degree by the Pacific Highway that forms the western site boundary. They have also been fragmented by existing residential developments to the north and south of the land, and by Hearn Lake itself. A high proportion of the site has been previously cleared and in such areas tree hollows are rare or absent. Older trees with hollows exist and are concentrated in the north east and north west of the study area. Hollows are generally small to medium in size but would provide roosting habitat for a range of birds, bats, non-flying mammals, reptiles and amphibians.

The drier forest communities have been grazed by livestock and much of the fallen timber has been removed. Some fallen trees are present but these are sparse. Forests on site contain Koala feed trees, including two primary browse species Swamp Mahogany (*Eucalyptus robusta*) and Forest Red Gum (*Eucalyptus tereticornis*).

S1.4.4 Fauna Species

Over 100 vertebrate species have been recorded from the study area. The species found are dominated by birds, with lesser numbers of other fauna. This likely reflects the disturbed and grazed nature of the ground stratum. The fauna species list includes 87 birds, 15 mammals, 4 amphibians and 3 reptiles.

Several threatened fauna species have been recorded within the study area. These can broadly be divided into species associated with wetland habitats and those associated with forest habitats:

- Wetland Species: Wallum Froglet (*Crinia tinnula*), Black-necked Stork (*Ephippiorhynchus asiaticus*), White-bellied Sea-eagle (*Haliaeetus leucogaste*r) and Eastern Osprey (*Pandion cristatus*); and

- Forest Species: Greater Broad-nosed Bat (*Scoteanax rueppellii*), Eastern Freetail-bat (*Mormopterus norfolkensis*), Grey-headed Flying-fox (*Pteropus poliocephalus*) and Glossy Black-cockatoo (*Calyptorhynchus funereus*).

Database and habitat analysis also indicate that other threatened fauna species have potential to occur in the study area due to the presence of suitable habitat. These species include:

- Microbats: Southern Myotis (*Myotis macropus*), Little Bentwing Bat (*Miniopterus australis*), and the Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*);

- Owls: Powerful Owl (*Ninox strenua*), Masked Owl (*Tyto novaehollandiae*), and Sooty Owl (*Tyto tenebricosa*);

- Fruit doves: Wompoo Fruit Dove (*Ptilinopus magnificus*), and the Rose-crowned Fruit-dove (*Ptilinopus regina*); and
- The Varied Sittella (*Daphoenositta chrysoptera*) and Caspian Tern (*Hydroprogne caspia*).

Threatened fauna species not recorded from the study area but with potential to occur due to the presence of suitable habitat have been assessed in the impact assessment on a precautionary basis.

Koalas would originally have occurred on the study area, and it contains primary browse trees. However, Koalas or evidence of Koala occurrence has not been found during surveys and the study area is isolated from other potential habitat by the Pacific Highway, Hearnes Lake and existing residential development to the north and south of the study area. Accordingly, Koala useage of the site is considered unlikely to occur.

S1.5 Impact Assessment

The impacts of vegetation removal within Stages 3, 4 and the western part of Stage 1 have been offset by the provision of the on-site Conservation Area, and impacts of Stage 5 of the proposed development will be offset with an off-site offset area in accordance with the Conditions of Consent for these stages.

This impact assessment considers the impacts of the project on the remaining components of the proposal, comprising Stage 2, Stage 6 and the eastern section of Stage 1 (the subject site). The subject site is approximately 12.67 ha, of which 9.49 ha contains native vegetation, including a small area (0.14 ha) of TEC.

S1.5.1 Direct Impacts

During the development of the partially approved Concept Plan and the subsequent development of the proposed layout for the remaining portions, there has been consideration of avoidance of sensitive habitats. The approved stages of the Concept Plan are generally in excess of 100 metres from Hearnes Lake and so largely avoid clearing swamp forest and wetland communities. The area retained will include representative areas of all vegetation types that currently occur.

The majority of the impacts from the overall development have already been compensated for as part of the partially approved Concept Plan. This included the provision of a Conservation Area (now an addition to the Regional Park) and calculation of BioBanking credits to be retired offsite for the impacts of Stage 5.

Additional impacts will occur as a result of development in the remaining stages in the subject site (Part Stage 1, Stage 2 and Stage 6). The primary direct impact that would result from the proposed development in the subject site is the clearing of vegetation – approximately 9.49 ha. Clearing is necessary for road construction, housing construction, and bushfire protection (Asset Protection Zones). The 20.58 ha of native vegetation that was included in the previously approved Conservation Area will be dedicated to a Regional Park where it will be managed for conservation in perpetuity.

A minor area of TEC vegetation will be removed that occurs below the 1:100 year floodline. Approximately 0.02 ha of Swamp Oak Forest, and 0.12 ha of Swamp Sclerophyll Forest will be removed, which is a total of 0.14 ha of TEC vegetation to be removed. However, large areas of TEC vegetation will be retained in the addition to the Regional Park, and appropriate biodiversity credits will be sourced and retired offsite to compensate for the residual impact to TECs. For this reason, assessments of significance that were conducted for TEC vegetation concluded that no significant impacts are likely as a result of the proposed development.

Some habitats suitable for threatened fauna species will be cleared, and there will be impacts to some threatened fauna species. However, large areas of habitat that currently occurs will be maintained in the study area within the addition to the Regional Park, and offsite offsets will be secured for the additional areas of vegetation to be impacted. Assessments of significance concluded that with the provision of appropriate offsite offsets, the proposed development is unlikely to result in significant impact on threatened fauna species.

The Koala (*Phascolarctos cinereus*) is considered unlikely to occur on the subject site owing to the location of the subject site within highly modified, fragmented vegetation. Therefore the proposed development is not predicted to have significant impacts on the species so no site specific Koala Management Plan is required.

S1.5.2 Indirect Impacts

As the proposed development is in the catchment of an ICOL and is upslope of swamp forest and various wetland communities there are a range of potential impacts that could occur. These include but are not limited to:

- Changes in the volume and composition of surface runoff to the lake and associated vegetation communities;
- Weed invasion as vegetation is cleared and residential areas are developed;
- Disturbance of habitats and wildlife by people and pets;
- Noise and lighting impacts from residential areas; and
- Road kill.

If unmitigated, such indirect impacts could degrade the swamp forest and wetland communities around the lake, and may indirectly reduce habitat suitability for a range of wildlife. For this reason, a range of mitigation measures has been developed including the preparation of a Stormwater Management Plan to mitigate potential impacts from stormwater runoff into sensitive habitats around the lake (see below).

S1.6 Mitigation Measures

The primary mitigation measure for the proposed development is the retention of the majority of the high quality native vegetation in the addition to the Regional Park. Approximately

20.58 ha of native vegetation will be added to the Regional Park and will be managed according to a Regional Park Management Plan (RPMP). This will prescribe a range of management measures including:

- Rehabilitation of degraded areas;
- Weed control;
- Feral dog and cat control;
- Access management;
- Protection of threatened species;
- Protection of TECs;
- Creek bank erosion management;
- Bushfire hazard management.

Currently, the study area is not being managed for conservation and is subject to a range of threatening processes. Livestock currently have direct access to Hearnes Lake foreshore and TEC swamp forest and wetland communities, with associated impacts of trampling, nutrient enrichment of waterways and grazing. There is no active management of weeds, feral animals or firewood collection. Under existing land usage, there are a range of ongoing harmful impacts to flora and fauna that are expected to result in the ongoing degradation of native habitats.

The implementation of the RPMP is expected to address these impacts and significantly improve the ecological condition of the Regional Park relative to current conditions, as most of these threats are ameliorated and managed. The RPMP will also enable the potential impacts on the retained native vegetation in the Regional Park to be managed and minimised.

A Stormwater Management Plan has been developed to manage potential impacts from stormwater emanating from the developed areas. The plan specifically addresses both stormwater runoff and quality. The stormwater discharging from the proposed development will be conveyed via roadside bioretention swales and discharged into Hearnes Lake, consistent with current stormwater disposal. A water quality system consisting of rainwater tanks, bioretention swales and gross pollutant traps has been modelled to improve water quality runoff discharging from the proposed development. Such measures are expected to successfully protect flora and fauna habitats around the lake from impacts associated with stormwater discharge from the proposed development.

S1.7 Biodiversity Offsets

The addition to the Regional Park provides for a conservation outcome that addresses the impacts of Part Stage 1, and Stages 3 and 4 under the Concept Plan approval process. In order to compensate for the impacts to Stage 5 of the development, the Concept Plan

approval stipulated the provision of offsite offsets, and the quantum of these offsets have been calculated using the BioBanking Assessment Methodology (BBAM).

In order to offset the additional residual impact of the project on Part Stage 1, Stage 2 and Stage 6, offsite offsets will also be required. The removal of a total of 9.49 ha of native vegetation within these additional areas will be offset offsite, and the quantum of offsets required has been calculated using the BBAM. Offsets will include retirement of biodiversity credits, including the "ecosystem credits" listed in the table below.

Table S.1.2 Ecosystem Credits to be Acquired and Retired as an Offset for the Residual Impacts in the Subject Site

Vegetation Community	Area (ha)	Ecosystem Credits
Coastal Wallum Baumea Wetland	0.05	2.00
Coastal Paperbark Swamp Oak Floodplain Forest	1.68	96.09
Coastal Sand Bloodwood-Banksia Forest	0.66	23
Coastal Wallum Swamp Mahogany Siebers Paperbark Forest	7.04	403.00
Estuarine Paperbark Twig-rush Forest	0.04	2.29
Coastal Wallum Paperbark Wet Shrubland	0.02	1
TOTAL	**9.49**	**527**

S1.8 Conclusion

The subject site is approximately 12.67 ha in the study area, of which 9.49 ha contains native vegetation. Approximately 20.58 ha will be retained for conservation in the addition to the Regional Park. The proposal avoids the most intact vegetation remnants and provides a substantial buffer to Hearnes Lake.

There will be clearing of some native forest and woodland vegetation, and this will mean some minor impacts to some TECs and threatened species. The majority of the impacts of the overall project, including those in Part Stage 1, and Stages 3, 4, and 5 have already been approved based on the protection of the majority of the high quality habitat in the study area within the Conservation Area (now the Regional Park) and the provision of offsite offsets for Stage 5.

Additional impacts to those already approved include the removal of an additional 9.49 ha of native vegetation in the subject site. These impacts are proposed to be appropriately offset by the provision of offsite offsets, and this has been calculated using the BBAM. A total of 527 ecosystem credits are required to be retired to offset this impact. The proposal also entails substantial additional mitigation measures including the preparation and implementation of a RPMP and a Stormwater Management Plan.

With the conservation and ongoing management of the area dedicated to a Regional Park, and the retirement of the ecosystem credits calculated for the residual impacts on native vegetation within the subject site, no significant impact is likely to threatened flora and fauna listed either by the TSC Act or the EPBC Act.

Chapter 1

Introduction

Cumberland Ecology was commissioned by Dentons Australia Pty Ltd on behalf of Elite Construction NSW Pty Ltd (the proponent) to prepare a Flora and Fauna Assessment (FFA) for a proposed residential development at Lot 22 DP 1070182 and Lots 497 and 498 DP 227298, Sandy Beach (the study area).

The purpose of this FFA is to support an application for an amendment to the Concept Approval under Section 75W of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act)for the proposed development to allow development of those parts of the site currently excluded from the Concept Approval (the subject site).

1.1 Background

A Concept Plan providing for staged residential development of the study area and the creation of a Conservation Area was granted partial approval under the former Section 3A of the EP&A Act in 2010. The Concept Plan proposed six stages of residential development across the more elevated areas of the study area and the retention and conservation management of the majority of the native vegetation in the study area, including the low lying vegetation around Hearnes Lake (see **Figure 1.2**).

The flora and fauna values and likely impacts of the proposal were evaluated in a series of reports prepared on behalf of the then proponent by Conacher Travers (Conacher Travers, 2006a; Conacher Travers, 2007a; Conacher Travers, 2007c) and Conacher Environmental Group (Conacher Environmental Group, 2008c; Conacher Environmental Group, 2010).

When considering the merits of the Concept Plan and its implications for flora and fauna, the then NSW Department of Planning (DoP) relied heavily upon technical advice received from Geoff Sainty, a specialist peer reviewer retained by the Department (Sainty and Associates, 2006), which resulted in only parts of the Concept Plan being approved due to perceived ecological constraints to development. The Stages and actions not approved or partially approved include:

- Stage 6, Stage 2 and part of Stage 1 were not approved and are required to be added to the Conservation Area; and
- Stage 5 was approved subject to the provision of offsite offsets and the preparation of a Conservation Area Management Plan.

The peer review work by Sainty and Associates (2006) for DoP was done without reference to the 1:100 year flood contour. Consequently, Sainty and Associates (2006) adopted a conservative approach and treated the majority of site forest and woodland as the Threatened Ecological Community (TEC) Swamp Sclerophyll Floodplain Forest. As a result, the Concept Approval excluded development from some extensive areas of forest in the north-west and north-east of the study area.

Cumberland Ecology revisited the work done by Sainty and Associates (2006) and for the purposes of this report, mapped and identified vegetation in relation to the 1:100 year flood contour. The flood contour is important because the TEC forest vegetation is swamp forest that is confined to floodplains that receive regular flooding and have alluvial soils. The more recent analysis of vegetation in this manner revealed that a portion of the vegetation previously mapped as TEC by Sainty and Associates (2006) is above the regular floodline, and so does not comprise threatened vegetation.

1.2 Purpose

The purpose of this FFA is to support an application for an amendment to the Concept Approval MP 05_0083 under Section 75W of the EP&A Act for the proposed development to allow development of those parts of the site currently excluded from the Concept Approval. Specifically, these include Part Stage 1, Stage 2, and Stage 6. The Concept Plan layout is shown in **Figure 1.2**, and indicates which areas have already been approved, and for which areas approval is being sought.

An ecological review of the vegetation in the study area and current mapping from Coffs Harbour Council was undertaken by Cumberland Ecology and indicates that the ecological constraints to development may not be as significant as were considered at the time of approval and that there is scope to now include these lands as part of the approved development area. Furthermore, there is scope to provide off-site offsets in addition to the on-site offsets that will be provided as part of the proposed development to mitigate the impacts of any vegetation loss. Therefore a reconsideration of the ecological constraints to development of the subject site is warranted.

This FFA documents the findings of ecological investigations completed across the study area and assesses the impacts of the proposed development on the biodiversity values present. Biodiversity values include threatened species, populations and ecological communities protected under the NSW *Threatened Species Conservation Act 1995* (TSC Act) (see ***Section 1.5.2*** and ***Section 1.5.3***) and/or Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Specifically, the objectives of this FFA are to:

- Describe the vegetation communities within the study area;
- Describe fauna habitats and fauna usage of the study area;

- Identify any threatened species, populations or ecological communities (as listed under the TSC Act and/or EPBC Act) existing within the study area;
- Assess the likelihood of occurrence of threatened species, populations or communities (as listed under the TSC Act and/or EPBC Act) within the study area;
- Assess the potential impact of the project on threatened communities, flora and fauna, including the completion of Assessments of Significance under the former Section 5A of the EP&A Act; and
- Where relevant, recommend mitigation and compensatory measures to reduce the impacts of the proposed development on biodiversity values.

1.3 Site Description

1.3.1 Study Area

The study area comprises Lot 22 DP 1070182 and Lots 497 and 498 DP 227298 and is located at Ti-Tree Road and 15 and 17 Pine Crescent Road, Sandy Beach (**Figure 1.1**). It is approximately 49 ha in size and is located within the Coffs Harbour Local Government Area (LGA). The study area is bounded by the hind-side of the foredune of Sandy Beach to the east, existing housing (Sandy Beach) to the south, the Pacific Motorway to the west and Hearnes Lake to the north. Hearnes Lake is a coastal estuary with an inlet that protrudes into the study area from the north. It is what is known as an Intermittently Closed and Open Lakes or Lagoon (ICOLL) and can remain closed for long periods of time.

The study area operates as a small grazing property, and as such much of the vegetation has been modified, largely as a result of the removal of understorey vegetation, and replacement with exotic pasture grasses. Extensive regrowth following previous clearing appears to have taken place.

The study area is located on the coastal plain, and is low-lying with many areas prone to inundation. More elevated areas occur along a hind-dune that occurs parallel to the foredune along Sandy Beach. In addition to Hearnes Lake, the study area contains two drainage channels that drain from existing housing into Hearnes Lake. The study area contains coastal sands, peaty soils in swampy areas, saline soils around Hearnes Lake, and grey mottled clays.

Overall, the land is low lying and broad areas of the study area beside the lake are below the 1:100 year flood level. It has historically been cleared for farming, and in some areas for sand mining. Drainage channels have also been made across some portions of the land and these have historically drained and impacted some swamp communities. It is currently used for grazing and bee keeping and is not managed for conservation.

Despite past clearing, the study area contains a mosaic of native plant communities that are zoned in relation to their proximity to the lake, and the drainage patterns associated with it. Dry eucalypt forests occur on well drained soils above the 1:100 year flood level. At lower

elevations various swamp forest communities grade into shrubland, saltmarsh and mangroves that form fringing communities around the lake.

1.3.2 Subject Site

As outlined previously, land within Part Stage 1, Stage 3, Stage 4 and Stage 5 have already been approved under the former Section 3A of the EP&A Act. Approval is now sought for development of the remaining part of Stage 1, Stage 2 and Stage 6, and these areas are hereafter termed "the subject site". For context, the layout of the overall proposed development including the subject site is shown in **Figure 1.3**.

The subject site is approximately 12.67 ha in size and is located in the north western and eastern portions of the study area (see **Figure 1.3**). The subject site includes areas proposed for construction of roads and associated infrastructure, housing and areas proposed asset protection zones (APZs). Approximately 20.58 ha of residual land within the study area will be dedicated to a Regional Park.

The proposed development in the subject site includes the following:

- Residential development within Part Stage 1, and Stages 2 and 6;
- Two public reserves;
- Construction of three drains in the Regional Park;
- Construction of public roads and laneways; and
- A community lot, on Part Lot 1.

1.4 Zoning

The majority of the study area is currently zoned as a DM – Deferred Matter (i.e. Lot 22 DP 1070182), a minor part as W2 – Recreational Waterways and another small area as R2 – Low Density Residential (i.e. Lots 497 and 498 DP 227298) under the *Coffs Harbour Local Environmental Plan 2013* (CHLEP 2013). Land mapped as Deferred Matters in the CHLEP 2013 is still governed by the provisions of *Coffs Harbour City Local Environmental Plan 2000* (CH-LEP 2000). The study area is zoned mainly as Zone 2A – Low Density Residential and Zone 2E – Residential Tourist with minor areas zoned as Zone 7A – Environmental Protection (Habitat and Catchment) and Zone 7B – Environmental Protection (Scenic Buffer).

1.5 Relevant Legislation

1.5.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is the Australian Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important

flora, fauna, ecological communities and heritage places — defined in the EPBC Act as Matters of National Environmental Significance (MNES). Under the EPBC Act, any action (which includes a development, project or activity) that is considered likely to have a significant impact on MNES (including nationally listed threatened ecological communities and species, and listed migratory species) must be referred to the Australian Government Minister for the Environment (the Minister). The purpose of the referral is to allow a decision to be made about whether an action requires approval on a Commonwealth level. If an action is declared a "controlled action", then Commonwealth approval is required.

1.5.2 Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) is the key piece of threatened species legislation in NSW relating to the protection and management of biodiversity and threatened species. The BC Act aims to protect and encourage the recovery of threatened species, populations and communities that are listed under the Act through threat abatement and species recovery programs. Any development proposals are required to aim to minimise the potential for impact on threatened species, populations and communities, and their habitats.

The BC Act came into force on 25 August 2017 replacing the *Threatened Species Conservation Act 1995* (TSC Act), the *Nature Conservation Trust Act 2001* and parts of the *National Parks and Wildlife Act 1974.*

Part 7 of the BC Act applies to Part 4 development and does not apply to the former Part 3A development. Coffs Harbour has been declared an interim designated area, meaning that the BC Act will not apply to Part 4 development until the 25 November 2018.

1.5.3 Threatened Species Conservation Act 1995

As the BC Act does not apply to this application (as it does not apply to the former Part 3A), this report has assessed the proposed development under the TSC Act instead of the BC Act, as was the original Concept Plan.

1.5.4 Fisheries Management Act 1994

The *Fisheries Management Act 1994* (FM Act) provides for the protection, conservation and recovery of fish stocks, key fish habitats, threatened species, populations and ecological communities of fish and marine vegetation as well as management of threats to threatened species, populations and ecological communities defined under the Act. In particular, the FM Act has mechanisms for the protection of fish, fish habitats, mangroves, seagrasses and seaweeds on public water land and foreshores.

1.5.5 Biosecurity Act 2015

The NSW *Biosecurity Act 2015* provides a framework for the roles of government, private landholders and public authorities regarding the management of weeds which may have an impact on the economy, community or environment. The aim of this legislation is to manage the negative impact of weeds by preventing, eliminating, or restricting significant weeds from

spreading or establishing, and implementing effective management and monitoring of widespread weeds.

1.5.6 Environmental Planning and Assessment Act 1979

The EP&A Act is the overarching planning legislation in NSW. This act provides for the creation of planning instruments that guide land use. The EP&A Act also provides for the consideration of the environment and biodiversity values, which is addressed in Section 5A (significant effect on species, populations or ecological communities or their habitats) (now repealed) should a land use change be proposed. This includes threatened species, communities, habitat and processes as listed under the TSC Act and FM Act.

Pursuant to the EP&A Act, a number of State Environmental Planning Policies (SEPPs) have been implemented. These policies provide the planning criteria and development controls for specific environmental matters. SEPPs relevant to the subject site have been detailed in the following sections.

i. SEPP No. 14 – Coastal Wetlands

The aim of this policy is to ensure that the coastal wetlands are preserved and protected in the environmental and economic interests of the State. Under Section 6 of this policy, the Council in which the proposed development is located will be the consent authority.

ii. Draft SEPP – Coastal Management

This is a draft SEPP that is currently under consultation, which will consolidate and update the existing SEPP 14 – Coastal Wetlands, SEPP 26 - Littoral Rainforests and SEPP 71 - Coastal Protection. This SEPP will aim to enforce the objectives of the *Coastal Management Act 2016*.

The draft Coastal Management SEPP will apply to land that is in the coastal zone, identified as land within the following four areas:

- The coastal wetlands and littoral rainforests area;
- The coastal vulnerability area;
- The coastal environment area; and
- The coastal use area

These areas are identified on corresponding maps that have been prepared as part of the SEPP. The study area is located within the coastal zone as identified by the draft Coastal Management SEPP mapping.

iii. SEPP No. 26 – Littoral Rainforests

The aim of this policy is to provide a mechanism for the consideration of applications for development that are likely to damage or destroy littoral rainforest areas with a view to the preservation of those areas in their natural state.

iv. SEPP No. 44 – Koala Habitat Protection

This policy aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for Koalas (*Phascolarctos cinereus*) to ensure a permanent free-living population over their present range and reverse the current trend of Koala population decline. This policy requires the preparation of plans of management before development consent can be granted in relation to areas of core Koala habitat by encouraging the identification of areas of core Koala habitat, and by encouraging the inclusion of areas of core Koala habitat in environment protection zones.

The subject site falls under the Coffs Harbour Council Koala Plan of Management (Lunney *et al.*, 1999). Under the Coffs Harbour Council Koala Plan of Management (KPoM) areas may be defined as Primary, Secondary or Tertiary Koala Habitat, and includes a range of measures to protect and manage Koala habitat.

v. SEPP No. 71 – Coastal Protection

The aims of this Policy are to:

- Protect and manage the natural, cultural, recreational and economic attributes of the New South Wales coast;
- Protect and improve existing public access to and along coastal foreshores to the extent that this is compatible with the natural attributes of the coastal foreshore;
- Ensure that new opportunities for public access to and along coastal foreshores are identified and realised to the extent that this is compatible with the natural attributes of the coastal foreshore;
- Protect and preserve Aboriginal cultural heritage, and Aboriginal places, values, customs, beliefs and traditional knowledge;
- Ensure that the visual amenity of the coast is protected;
- Protect and preserve beach environments and beach amenity;
- Protect and preserve native coastal vegetation;
- Protect and preserve the marine environment of New South Wales;
- Protect and preserve rock platforms;

- Manage the coastal zone in accordance with the principles of ecologically sustainable development (within the meaning of section 6 (2) of *The Protection of the Environment Administration Act 1991*);

- Ensure that the type, bulk, scale and size of development is appropriate for the location and protects and improves the natural scenic quality of the surrounding area; and

- Encourage a strategic approach to coastal management.

Legend

Subject Site

Study Area

Image Source:
Image © NearMap
(02/05/2017)

Coordinate System: MGA Zone 56 (GDA 94)

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0 100 200 300 400 m

I:\...\17073\Figures\RP4\20180214\Figure 1.1. Location_Subject Site_Study Area

Figure 1.1. Location of the subject site and study area

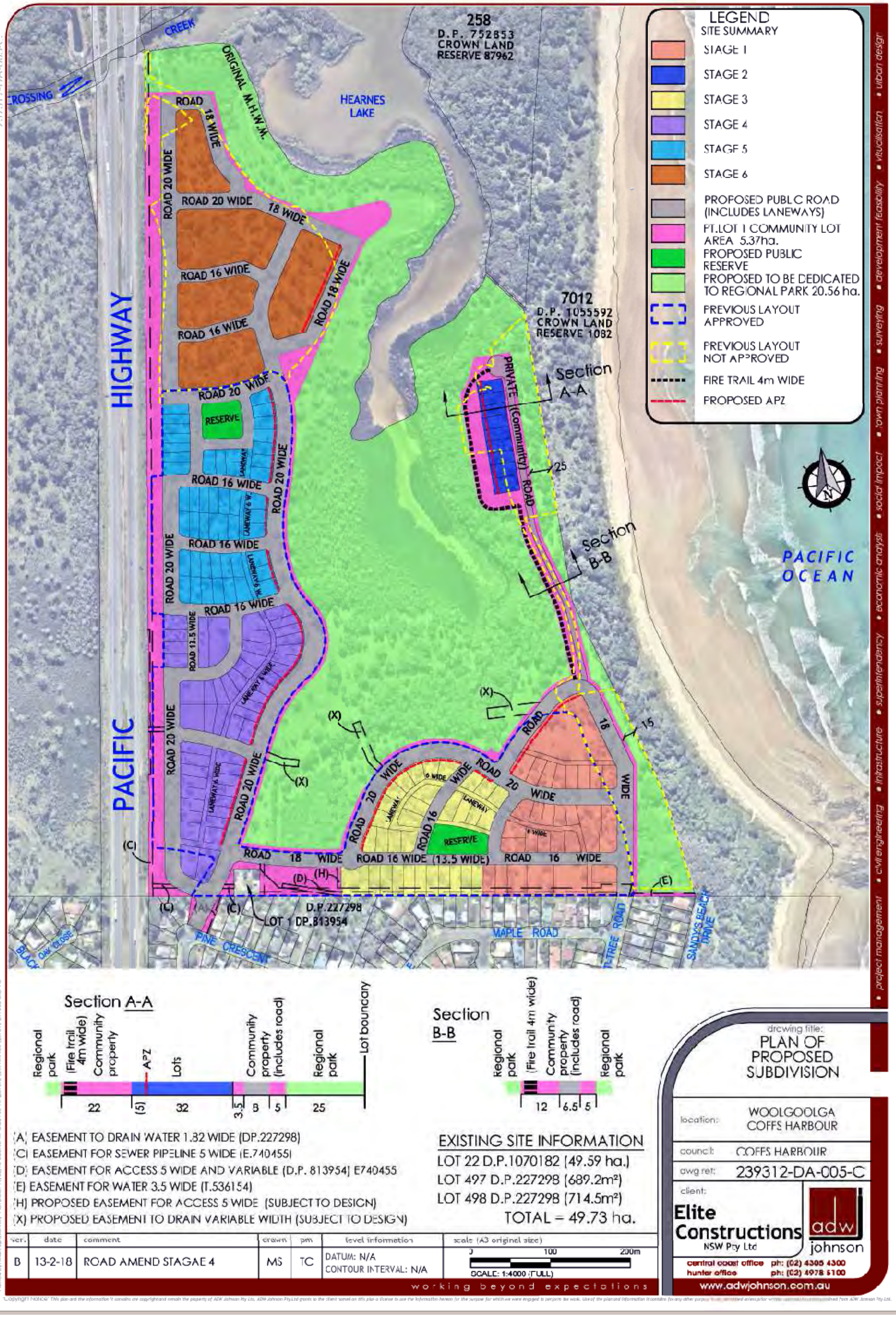

Figure 1.2. Concept plan layout

Image Source: Elite Constructions (2018)

Figure 1.3. Proposed development

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Chapter 2

Methodology

2.1 Literature Review

A review of ecological literature relevant to the study area was undertaken as part of this flora and fauna assessment to evaluate the flora and fauna values associated with the study area. Key documents reviewed include:

- Sainty and Associates (2006) Environmental Constraints Analysis.
- Conacher Travers (2006a) Appendix 16: Comments on environmental constraints analysis report, Lot 22 DP 1070182 Pacific Highway, Sandy Beach North. In: Concept Plan Application and Environmental Assessment prepared on behalf of Sandy Shores Development Pty Ltd.
- Conacher Travers (2006b) Environment Protection and Biodiversity Conservation Act (1999) Referral Form for Proposed Residential Development at Part Lot 2 DP 813954 Pacific Highway, Sandy Beach North.
- Conacher Travers (2007b) Appendix 6: Historical Land use Ecological Assessment. In: Concept Plan Application and Environmental Assessment prepared on behalf of Sandy Shores Development Pty Ltd.
- Conacher Travers (2007c) Koala Habitat Assessment for Proposed Residential Development Part Lot 2 DP 813954 Pacific Highway, Sandy Beach North (Ref: 6107, April 2007).
- Conacher Environmental Group (2008c) Ecological Survey and Assessment Report for Proposed Residential Development Lot 22 DP 1070182, Pacific Highway, Sandy Beach North. This report was provided without appendices, with exception of the following:
  - Conacher Environmental Group (2008a) Appendix I – Fauna Survey Methodology (Ref 8108).
  - Conacher Environmental Group (2008b) Appendix II – Flora Quadrat Data (Ref 8108).
- Conacher Environmental Group (2010) Comments on extent of Endangered Ecological Communities.

- Whelan Insites (2010) Ecological Constraints and Development Opportunities.
- Conacher Environmental Group (2013) Soil and Soil Landscape Investigations.
- Cumberland Ecology (2017) Vegetation Mapping and Threatened Flora Survey, Sandy Beach – Coffs Harbour.

The information collected during the literature review guided the field surveys undertaken for this FFA. Information within the literature reviewed was also utilised in determining the likelihood of threatened species occurring within the study area and assessing the potential impacts of the proposed development.

2.2 Database Analysis

Database analysis was conducted for the locality which is defined as the area within a 10 km radius of the study area. Database analysis were undertaken using both the NSW Office of Environment and Heritage (OEH) BioNet Database{OEH, 2018 #7820} and the Commonwealth Department of the Environment and Energy (DoEE) Protected Matters Search Tool {DoEE, 2018 #7800}.

The BioNet Database search was used to generate records of threatened flora and fauna species listed under the TSC Act and/or EPBC Act within the locality of the study area. The Protected Matters Search Tool generated a list of MNES listed under the EPBC Act potentially occurring within the locality of the study area. Marine birds, marine mammals, turtles and fish species were excluded for the purpose of this report, given the location of the study area in a terrestrial location.

The lists generated from these databases were reviewed against available knowledge of the study area, in conjunction with the abundance, distribution and age of records, to ascertain the likelihood of occurrence of threatened species within the study area. The results of the database analysis and the assessment of the likelihood of occurrence of threatened speices are presented in **Appendix E**.

2.3 2017 Flora Survey

Although the site had previously been surveyed and mapped, additional flora surveys were undertaken within the study area and subject site by Cumberland Ecology between 30 May 2017 and 2 June 2017 by Cumberland Ecology ecologists Dr Trevor Meers and Dr Adriana Corona Mothe. These were completed to update information about the condition of the vegetation, to collect data for BioBanking, and to conduct updated searches for threatened species. Surveys were also undertaken to update vegetation community names to current nomenclature because plant community names have changed several times since the previous surveys.

Flora surveys included vegetation mapping, plot survey and targeted threatened flora searches. Further details of each of the survey methods are provided below.

2.3.1 Vegetation Mapping

Previous mapping of the study area by Sainty and Associates (2006) was reviewed along with the fine-scale vegetation mapping of the Coffs Harbour LGA (OEH, 2012a; OEH, 2012b). Cumberland Ecology conducted vegetation mapping surveys to revise and update the existing vegetation mapping prepared by Sainty and Associates (2006). These surveys were undertaken as part of a four-step process, including:

- Meander through the study area and subject site to determine the vegetation associations within the study area;
- Review of the noted vegetation associations against descriptions in the *Development of a Fine-scale Vegetation Map for the Coffs Harbour Local Government Area* (OEH, 2012b), to determine the best fit vegetation communities;
- Consideration of the 1:100 year flood level to determine the upper boundary of floodplain TECs;
- Detailed floristic surveys in each vegetation community (see ***Section 2.3.2***); and
- Mark up of boundaries between vegetation units based on field observations and aerial imagery.

The locations of meanders through the study area are shown on **Figure 2.1**.

2.3.2 Vegetation Sampling

Vegetation sampling within the study area and subject site was undertaken in accordance with the BioBanking Assessment Methodology (BBAM) (OEH, 2014). A total of 33 BioBanking plots were surveyed, the locations of which are shown on **Figure 2.1**. The sampling regime aimed to collect data from each vegetation community, with additional plots utilised to capture variation in the condition or floristics of each vegetation community.

Surveys included establishment of a 20 m x 50 m plot within which the following data was collected:

- Native species richness recorded within each stratum of a 20 m x 20 m plot;
- Native overstorey projected foliage cover recorded at 10 points along a 50 m transect;
- Native mid-storey projected foliage cover recorded at 10 points along a 50 m transect;
- Native groundcover projected foliage cover recorded at 10 points along a 50 m transect for three life forms (shrubs, grasses and other);
- Weed species projective foliage cover expressed as a percentage of overstorey, mid-storey and ground cover along a 50 m transect;

- Number of trees with hollows where entrance width is over 5 cm and hollow is at least 1 m above ground within the 20 m x 50 m plot;
- The percentage of regenerating canopy species within the vegetation zone; and
- The total length in metres of fallen logs over 10 cm in diameter within the 20 m x 50 m plot.

In addition to collection of native plant species richness within a 20 m x 20 m plot, full floristic data was also collected to enable classification of each vegetation zone to the best-fit PCT.

All vascular plants recorded or collected were identified using keys and nomenclature provided in Harden (1990-1993). Where known, taxonomic and nomenclatural changes have been incorporated into the results, as derived from PlantNET (Botanic Gardens Trust, 2017).

2.3.3 Threatened Flora Species Survey

Targeted threatened flora searches via random meanders were undertaken for threatened flora species known from the locality and considered to have potential to occur. Minimum requirements for survey are for two observers to conduct a 30 minute random meander within each stratification unit (habitat type) (DEC (NSW), 2004), and these requirements were met by the field surveys.

Given the species identified in searches and the habitat types observed within the subject site, timed meanders were undertaken in areas considered likely to contain threatened fauna species (in addition to more general searches during the entire survey). These areas included:

- Littoral rainforest or areas containing littoral rainforest species in the mid-layer/shrub layer (two areas); and
- Wet heath/wallum heath, or areas with a heathy/shrubby understorey (two areas).

2.3.4 Data Analysis

i. Vegetation Community Classification

Vegetation communities identified within the study area were assigned to vegetation communities identified within *Development of a Fine-scale Vegetation Map for the Coffs Harbour Local Government Area* (OEH, 2012b). These vegetation communities were then assessed against the Plant Community Types (PCTs) held within the Vegetation Information System (VIS) Classification Database.

ii. Threatened Ecological Communities

Following review of potentially occurring threatened ecological communities (TECs), the vegetation communities identified within the study area were compared with the description of TECs listed under the TSC Act and EPBC Act, to determine if they occurred.

For TECs listed under the TSC Act, vegetation communities occurring in the study area were compared with the final determinations for potentially occurring TECs. A component of this analysis was to compare the species lists from the vegetation communities mapped within the study area with the species lists provided in the final determinations. Additional information such as location and biophysical aspects of each final determination were also taken into account in the assessment. For TECs considered to occur on the coastal floodplain, the 100 year flood level (as defined by Coffs Harbour City Council Flood Mapping) (Coffs Harbour City Council, 2017) was used to define the upper extent of the floodplain, and hence the upper extent of these communities.

For TECs listed under the EPBC Act, vegetation communities were compared with the DoEE Species Profile and Threats Database for each community and any associated documentation, such as listing advice and policy statements.

2.4 Fauna Surveys

2.4.1 Previous Surveys

The study area has previously been subject to an extensive suite of surveys conducted by Conacher Travers (Conacher Travers, 2006a; Conacher Travers, 2007a; Conacher Travers, 2007c) and Conacher Environmental Group (Conacher Environmental Group, 2008c; Conacher Environmental Group, 2010).

The methods used to survey fauna during previous assessments include the following:

- Nocturnal spotlighting;
- Bat echolocation call detection;
- Arboreal and terrestrial mammal trapping using Elliott traps and cage traps;
- Arboreal and terrestrial mammal habitat searches;
- Arboreal and terrestrial mammal hair tubing;
- “Spot Assessment Technique” to determine Koala habitation;
- Hollow tree density assessment;
- Amphibian searches;
- Habitat searches;
- Playback of recorded owl calls; and
- Diurnal and nocturnal bird surveys.

A summary of survey effort of previous surveys is detailed within Conacher Environmental Group (2008c) and is summarised in **Table 2.1** below. The fauna survey locations of previous ecological assessments are provided in **Figure 2.2**.

Table 2.1 Survey effort of Conacher Environmental Group (2008c)

Fauna Group	Date	Weather Conditions	Survey Method	Survey Effort/Time (24hr)
Diurnal Birds	15/12/03	8/8 cloud, 5k SE wind, light rain, 23-300C 8/8 cloud, 5k SE wind, no rain, 20-250C 2/8 cloud, 5k NE wind, no rain, 28-300C 2/8 cloud, 5k SE wind, no rain, 20-280C 0/8 cloud, 5k NE wind, no rain, 28-320C 1/8 cloud, 5k SE wind, no rain, 180C	Diurnal surveys/ Opportunistic sightings	3hrs 1400-1700
	16/12/03		Diurnal surveys/ Opportunistic sightings	4.5hrs 0630-1100
	16/12/03		Diurnal surveys/ Opportunistic sightings	3hrs 1400-1700
	17/12/03		Diurnal surveys/ Opportunistic sightings	4.5hrs 0630-1100
	17/12/03		Diurnal surveys/ Opportunistic sightings	3hrs 1400-1700
	16/8/04	2/8-8/8 cloud, 5k S wind, no rain 11-180C 2/8 cloud, 5k S wind, no rain 180C	Diurnal surveys/ Opportunistic sightings	5hrs 1100-1600
	17/8/04		Diurnal surveys/ Opportunistic sightings	4.5hrs 0630-1100
	17/8/04	8/8 cloud, no wind, light rain, 120C	Diurnal surveys/ Opportunistic sightings	2hrs 1430-1630
	18/8/04	8/8 cloud, light S wind, light rain, 120C 0/8 cloud, light NE wind, 300C.	Diurnal surveys/ Opportunistic sightings	3hrs 0730-1030
	19/8/04		Diurnal surveys/ Opportunistic sightings	2hrs 0600-0800
	12/10/04	0/8 cloud, light NE wind, 300C.	Diurnal surveys/ Opportunistic sightings	3hrs 1300-1600
	13/10/04	6/8 cloud, mod NE wind, 190C. 2/8 cloud, calm, 210C	Diurnal surveys/ Opportunistic sightings	2hrs 0700-0900
	15/10/04		Diurnal surveys/ Opportunistic sightings	2hrs 0700-0900
	10/3/05		Diurnal surveys/ Opportunistic sightings	3hrs 1000-1300
Nocturnal Birds	15/12/03	2/8-5/8 cloud, no wind, 20oC, no moon (late)	Owl call playback & spotlight	40mins 2020 – 2100
	16/12/03	3/8 cloud, no wind, 19oC, no moon (late)	Owl call playback & spotlight	40mins 2020 – 2100
	17/12/03	0/8 cloud, no wind, 23oC, no moon (late)	Owl call playback & spotlight	40mins 2020 – 2100
	16/8/04	2/8 cloud, 5kSE wind, no rain 150C, ¼ moon	Owl call playback & spotlight	50min 1840-1930
	17/8/04	6/8 cloud, no wind, no rain 120C, ¼ moon	Owl call playback & spotlight	50min 1840-1930
	18/8/04	8/8 cloud, 5kSE wind, light rain 160C, ¼ moon	Owl call playback & spotlight	1.5hrs 1800-1930

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Table 2.1 Survey effort of Conacher Environmental Group (2008c)

Fauna Group	Date	Weather Conditions	Survey Method	Survey Effort/Time (24hr)
	12/10/04	0/8 cloud, light NE wind, 0/4 moon, 20OC	Owl call playback & spotlight	50min 1830-1720
	14/10/04	0/8 cloud, light NE wind, 0/4 moon, 20OC 3/8 cloud, calm, 2/4 moon, 16 OC	Owl call playback & spotlight	30min 1815-1845
	26/7/07		Call listening	1 hr 1800-1900
Arboreal Mammals	15/12/03	2/8-5/8 cloud, no wind, 20oC, no moon (late)	Elliott trapping / hair tubing / spotlighting.	1hr 2030 – 2130
	16/12/03	3/8 cloud, no wind, 19oC, no moon (late)	Elliott trapping / hair tubing / spotlighting.	1hr 2030 – 2130
	17/12/03	0/8 cloud, no wind, 23oC, no moon (late)	Elliott trapping / hair tubing / spotlighting	1hr 2030 – 2130
	16/8/04	2/8 cloud, 5kSE wind, no rain 150C, ¼ moon	Elliott trapping / spotlighting	75 trap nights (A Elliot traps) 45 hair tube nights
	17/8/04	6/8 cloud, no wind, no rain 120C, ¼ moon	Elliott trapping / spotlighting	1.75hrs 1800-1945
	18/8/04	8/8 cloud, 5kSE wind, light rain 160C, ¼ moon	Elliott trapping / spotlighting	2hrs 1800-2000
				1.75hrs 1800-1945
	12/10/04	6/8 cloud, light NE wind, 0/4 moon, 20OC 0/8 cloud, light NE wind, 0/4 moon, 20OC	Spotlighting	75 trap nights (A & B Elliott traps)
	14/10/04	3/8 cloud, calm, 2/4 moon, 16 OC	Spotlighting	Total Trap Nights 150 Elliott
	26/7/07		Spotlighting	45 Hair tube
				1hr 1820-1720
				30min 1815-1845
				1 hr 1800-1900
Terrestrial Mammals	15/12/03	2/8-5/8 cloud, no wind, 20oC, no moon (late) 3/8 cloud, no wind, 19oC, no moon (late)	Elliott trapping / hair tubing / Cage trap Spotlighting.	1hr 2030 – 2130
	16/12/03	0/8 cloud, no wind, 23oC, no moon (late	Elliott trapping / hair tubing / Cage trap	1hr 2030 – 2130

Table 2.1 Survey effort of Conacher Environmental Group (2008c)

Fauna Group	Date	Weather Conditions	Survey Method	Survey Effort/Time (24hr)
			Spotlighting.	
	17/12/03	2/8 cloud, 5kSE wind, no rain 150C, ¼ moon	Elliott trapping / hair tubing / Cage trap	1hr 2030 - 2130
		6/8 cloud, no wind, no rain 120C, ¼ moon	Spotlighting.	75 trap nights (B Elliot)
		8/8 cloud, 5kSE wind, light rain 160C, ¼ moon		45 hair tube nights
				12 cage trap nights (Quoll traps)
	16/8/04	0/8 cloud, light NE wind, 0/4 moon, 20OC	Cage & Elliott trapping / spotlighting	1.75hrs 1800-1945
	17/8/04	6/8 cloud, light NE wind, 0/4 moon, 20OC 3/8 cloud, calm, 2/4 moon, 16 OC	Cage & Elliott trapping / spotlighting	2hrs 1800-2000
	18/8/04		Cage & Elliott trapping / spotlighting	1.75hrs 1800-1945
				75 trap nights (A & B Elliott traps)
				30 cage trap nights
				Total Trap Nights 150 Elliott
				45 Hair tube
				30 cage trap nights
	12/10/04		Spotlighting	1hr 1820-1720
	14/10/04		Spotlighting	1.5 hr 1820-1950
	26/7/07		Spotlighting	1 hr 1800-1900

2.4.2 2017 and 2018 Surveys

In addition to the surveys previously undertaken, fauna surveys of the study area and subject site were completed in 2017 and 2018 to supplement the previous field work. These included general habitat assessment, tree hollow surveys, bird surveys and incidental observations, as detailed below.

i. General Habitat Assessments

Fauna habitat assessments were undertaken within the study area by Cumberland Ecology on 8, 9 and 13 November 2017 by ecologists Heather Gosper and Alison Martin.

The fauna habitat assessments included consideration of important indicators of habitat condition and complexity including the occurrence of microhabitats such as tree hollows, Koala habitat trees, fallen logs, bush rock and wetland areas such as creeks and soaks. Structural features considered included the nature and extent of the understorey and ground stratum and extent of canopy. The survey also included an assessment of the presence of habitat features suitable for use by threatened fauna species known from the locality.

Any fauna species that were observed, heard calling, or otherwise detected on the basis of tracks or signs, were recorded and listed in the total species list for the study area.

ii. Tree Hollow Surveys

To augment tree hollow data provided across the study area by the BioBanking plots, tree hollows were individually mapped within the subject site by Cumberland Ecology on 8 and 9 November 2017, and on 8 February 2018. During each survey period, two ecologists traversed the subject site and checked all trees for potential tree hollows. Where hollows were present, the size, position and number of hollows, the species of tree with hollows and the location of the hollow-bearing tree using a hand held global positioning system (GPS) were recorded. The size of each hollow was characterised as small, medium large or extra large based on the following criteria:

- Small = 1 – 5 cm;
- Medium = 6 – 10 cm;
- Large = 11 – 20 cm; and
- Extra-large = >20 cm.

The traverses made during habitat assessments and in search of hollow trees are shown in **Figure 2.3**.

iii. Microchiropteran Bat Surveys

To provide additional data on the microchiropteran bat species likely to utilise the study area, additional bat surveys were conducted in February 2018 by Cumberland Ecology. Microchiropteran bat calls were recorded using two Anabat SD1 detectors and one Song

Meter SM2 BAT detector between the 8 November and 12 November 2017. These were placed in areas of suitable habitat in the study area (see **Figure 2.2** for the location of the bat detector units).

Bat calls were sent to Greg Ford from *Balance! Environmental* for analysis. All sequence files were analysed in AnalookW *(Corben, 2015)* while the full-spectrum (WAV) files were analysed using the *Kaleidoscope Viewer* (Wildlife Acoustics, USA). Call identification was achieved manually by comparing the AnalookW and Kaleidoscope spectrograms with those of regionally relevant reference calls and published call descriptions (Pennay *et al.*, 2004)and published distribution maps (Churchill, 2008; Van Dyck and Gynther, 2013)). Species occurrence records in the Atlas of Living Australia were also considered when determining potential candidates for call identification.

iv. Bird Surveys

To provide additional bird survey data, bird surveys were conducted in the subject site by ecologist Richard Jordan on four days between 4 February and 8 February 2018.

An initial visit to the property on Sunday 4 February established two transects to be used as the basis of the bird surveys: Transect 1 was 800 m in length and Transect 2 was 1000 m in length. Survey points were defined at 200 m intervals along both transects – four survey points in Transect 1, and five survey points in Transect 2. The locations of each transect are shown in **Figure 2.2**.

Each survey point was visited on each of the four days for a minimum of 20 minutes. All birds seen and heard from the survey point were recorded (with numbers of birds of each species), with sorties being made to identify birds within approximately 80 m of the survey point. Where the number of birds of a species was unclear, the confirmed count was recorded, followed by a + - e.g. Scaly-breasted Lorikeet 2+. Overflying birds were also recorded and counted.

The route taken each day to the survey locations was varied so that, at each survey point, there was a good spread of early and late counts to avoid the effect of 'time of day' on counts.

v. Incidental Observations

Any fauna species that were observed, heard calling, or otherwise detected on the basis of tracks or signs, were recorded and listed in the total species list for the study area.

2.5 Limitations

The study area is flat, grazed land that is partially cleared. It is therefore readily amenable to study and all parts of the site have been visited and examined for the current flora and fauna assessment.

The flora and fauna of the study area have been surveyed and reported about on a number of occasions by several different investigators dating back to 2003. As a result the flora and

fauna that occur in the study area or which have potential to occur are well known and understood.

Although only limited recent flora and fauna surveys were undertaken by Cumberland Ecology for the purposes of preparing this report, the results of the extensive survey effort undertaken by others has been taken into consideration and incorporated into this assessment. Where appropriate, a precautionary approach has been taken, and where a species has been recorded from the locality and has suitable habitat in the study area, it has been assessed as if present, even if it has not been recorded.

For these reasons it is considered that the ecological data collated and presented in this report is adequate for the analysis of the impacts of the proposed development.

2.5.1 Flora

The vascular flora of the study area and locality is well known based upon a sizeable database of past records and various published reports. The surveys by Cumberland Ecology added to the existing database of flora records and helped to provide a clear indication of the likelihood that various species occur, or are likely to occur within the study area. The data obtained from database assessment and surveys of the study area provided an appropriate level of information to support this assessment.

The weather conditions at the time of the 2017 flora surveys were generally favourable for plant growth and production of features required for identification of most species. Shrubs, herbs and creepers were readily identifiable in most instances. However, it is expected that not all flora species present would have been recorded during surveys. In particular spring flowering orchids or geophytes were not likely to be present, and some summer flowering grasses may not have had the seed heads or flowers required for identification.

Despite this, it is considered that sufficient information has been collected to assess the conservation significance of the flora, condition and viability of vegetation communities. An assessment of the likelihood of occurrence of threatened flora species recorded within the locality of the study area in the database searches was undertaken to supplement the flora survey.

2.5.2 Fauna

Limited additional fauna habitat analysis was undertaken for this assessment, which relied on database analysis, habitat assessment and historical fauna records.

A suite of fauna surveys have been conducted within the study area by Conacher Travers and the Conacher Group as listed previously. These have included general fauna surveys as well as targeted surveys for frogs, bats and Koala. The results of the previous fauna surveys have been incorporated into this assessment as appropriate, and combined with the results of the current fauna surveys it has resulted in a comprehensive assessment of the fauna values of the study area.

In general, opportunistic observations of fauna provide a “snapshot” of some of the fauna present on a site that were active during time of the surveys. The data produced by the surveys is intended to be indicative of the types of species that could occur and not an absolute census of all vertebrate fauna species within the study area. Therefore not all fauna utilising the subject site are likely to have been recorded during the current surveys or by previous targeted surveys.

In addition to the threatened species that have been verified to occur by survey results, a number of species are considered to have potential to occur based upon habitats present on site. Accordingly, a precautionary approach has been taken, and where a threatened species has been recorded from the locality and has suitable habitat in the study area, it has been assessed as if present, even if it has not been recorded. The combination of these techniques is considered appropriate for assessing the habitat values of the site for threatened fauna within the study area and for assessing the impacts of the proposed development.

Previous disturbance has simplified fauna habitats on site and significantly limits the array of fauna that are able to utilise habitats on the subject site. For this reason, and considering that a large proportion of the site will not be directly impacted by the proposal, the fauna data used in this report is considered to be adequate for the purposes of impact assessment.

Figure 2.1. Flora survey locations

Legend

- Subject Site
- Study Area

Fauna Survey Locations

- Hollow Tree Density Count
- Bird Point Survey (CE), 02/2018
- Bird Survey Transect (CE), 02/2018
- Cage Trap Transect, 08/2004
- Elliot Trap Transect, 08/2004
- Elliot Trap Transect, 12/2003
- Hair Tube Transect, 12/2003
- Anabat, 11/2017 (CE)
- Anabat, 08/2004
- Anabat, 12/2003
- Cage Trap, 12/2003
- Owl Call Playback, 08/2004
- Owl Call Playback, 10/2004
- Owl Call Playback, 12/2003
- Koala Scat Search, 10/2004
- Koala Scat Search, 12/2003

Image Source:
Image © NearMap
(02/05/2017)

Data Source:
Conacher Travers (2008)

Coordinate System: MGA Zone 56 (GDA 94)

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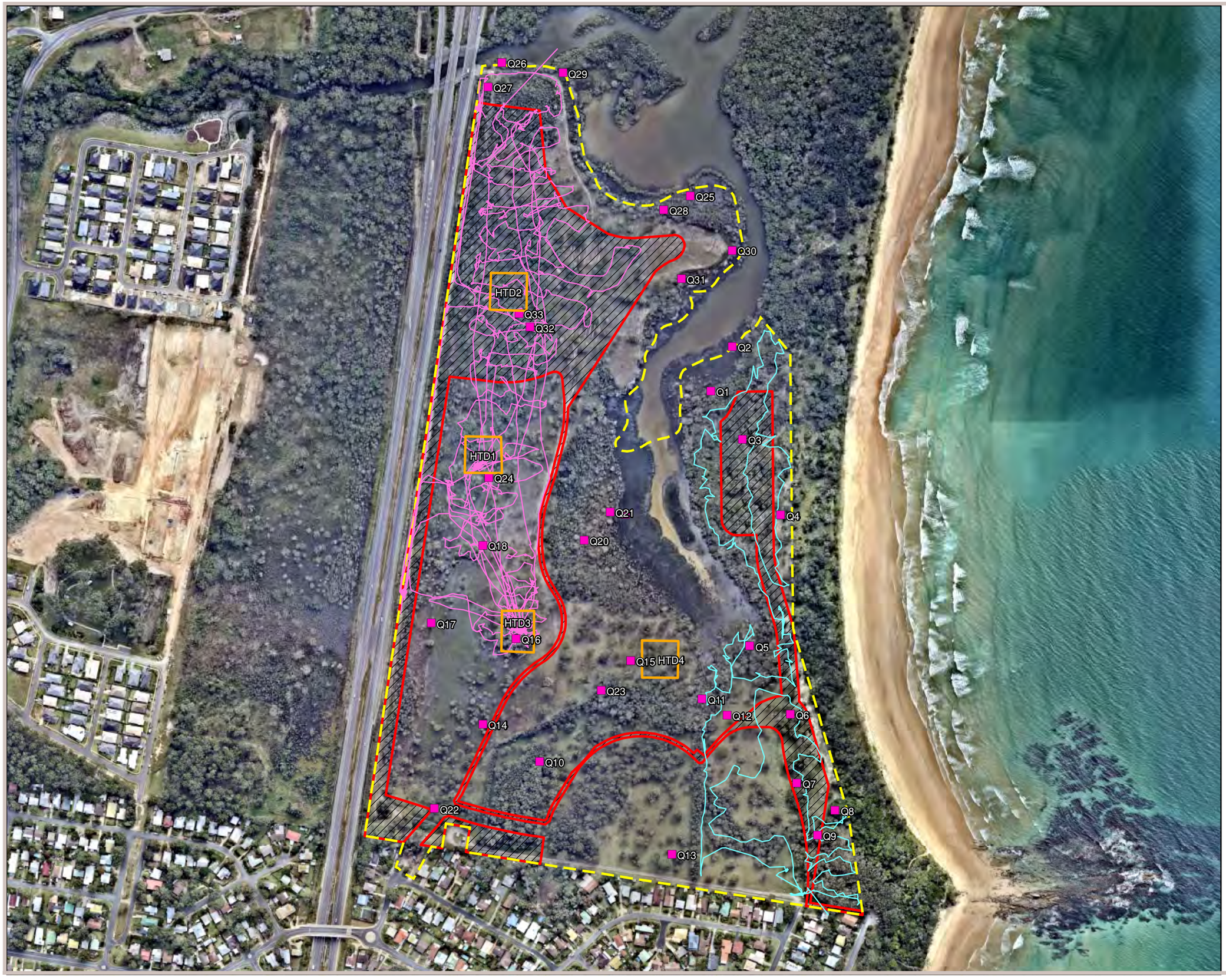
0 50 100 150 200 m

I:\...\17073\Figures\RP4\20180223\Figure 2.2. Fauna Survey Locations

Figure 2.2. Fauna survey locations



Legend

- Subject Site
- Study Area
- Conacher Tree Hollow Plots 2008

Cumberland Ecology

- Tree Hollow Mapping Traverses Nov 2017
- Tree Hollow Mapping Traverses Feb 2018
- BioBanking Plot May/June 2017

Image Source:
Image © NearMap
(02/05/2017)

Data Source:
Conacher Travers (2008)

Coordinate System: MGA Zone 56 (GDA 94)

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0 50 100 150 200 m

I:\...\17073\Figures\RP4\20180223\Figure 2.3. Tree Hollow Survey Locations

Figure 2.3. Tree hollow survey locations

Chapter 3

Results

3.1 Introduction

This chapter presents the results of the recent field surveys conducted in 2017 and 2018, as well as the key results of the previous ecological assessments that have been conducted in the study area. The synthesis of the most recent 2017 and 2018 results with the results of the many previous assessments provides a comprehensive description of the ecological values present in the study area.

3.2 Site History/Description

The native vegetation and fauna habitat prior to European occupation was likely to have been typically representative of the coastal lowlands of the NSW mid-north coast, including five broad vegetation community associations:

- Coastal Eucalypt Forests;
- Swamp Sclerophyll Forests;
- Wet/Wallum Heaths;
- Dry Coastal Heaths; and
- Sedgelands.

The majority of the study area has been significantly impacted by historical disturbances associated to land use, in particular grazing and sand mining. The subject site has been subject to clearing and grazing from the 1900s until the present time (Conacher Travers 2007a), with evidence of prior ringbarking still evident. Sand mining was undertaken on the eastern portion of the subject site in the 1970s. Developments in the vicinity of the subject site are also likely to have affected the biodiversity values of the site, including the construction of the Pacific Highway and associated infrastructure in the 1980s and construction of the Sandy Beach Development to the south of the subject site. These land uses have resulted in impacts to vegetation and establishment of weeds.

Historical disturbances have resulted in an altered condition of the vegetation present within the study area compared to likely condition pre-European occupation. This also includes

altered habitat type, extent and quality which in turn affect the biodiversity of the native fauna within the subject site.

3.3 Vegetation Communities

Seventeen (17) vegetation communities have been mapped by Cumberland Ecology as occurring within the study area. Vegetation communities were aligned with the map units identified within *Development of a Fine-scale Vegetation Map for the Coffs Harbour Local Government Area* (OEH, 2012b).

Table 3.1 lists the vegetation communities occurring within the study area and their distribution within the study area is shown in **Figure 3.1**. Summary descriptions of the communities are provided below.

Table 3.1 Vegetation communities within the study area

Vegetation Community	Area (ha)
Rainforest	
CH_RF07: Coastal Exposed Dune Littoral Rainforest	0.12
Dry Sclerophyll Forest	
CH_DOF06: Lowlands Swamp Box - Paperbark -Red Gum Dry Forest	2.16
CH_DOF06: Lowlands Swamp Box - Paperbark -Red Gum Dry Forest – Derived Open Woodland	1.09
CH_DOF08: Coastal Sand Bloodwood-Banksia Forest	1.43
Freshwater Wetlands	
CH_FW04: Coastal Wallum Baumea Sedgeland	6.46
CH_FW05: Coastal Wallum Paperbark Wet Shrubland	0.95
Forested Wetlands	
CH_FRW01: Coastal Paperbark Swamp Oak Floodplain Forest	3.81
CH_FRW02: Coastal Swamp Mahogany Forest	3.36
CH_FRW04: Coastal Paperbark Sedgeland Dominated Forest	4.89
CH_FRW04: Coastal Paperbark Sedgeland Dominated Forest – Derived Open Woodland	1.92
CH_FRW05: Coastal Paperbark Swamp Box Littoral Forest	1.88
CH_FRW09: Coastal Wallum Swamp Mahogany Siebers Paperbark Forest	11.30
CH_FRW10: Swamp Oak Forested Wetland	2.02

Table 3.1 Vegetation communities within the study area

Vegetation Community	Area (ha)
CH_FRW11: Estuarine Paperbark Twig-rush Forest	1.35
Saline Wetlands	
CH_SW01: Estuarine Mangrove Forest	0.09
CH_SW02: Estuarine Twig Rush Saltmarsh	2.73
Derived Grassland	
Derived Grasslands	3.11
Water	
Water	0.46
TOTAL	**49**

i. Coastal Exposed Dune Littoral Rainforest

Structure and Dominant Species: Littoral rainforest dominated by *Ficus rubinigosa* and *Endiandra sieberi*. Abundant vines such as *Cissus sterculiifolia* and *Flagelleria indica*. Abundant understorey shrubs such as *Syzygium oleosum* and *Acmena smithii.*

Landform/Soils: Occurs on sandy soil on the lee side of coastal sand dunes.

General Condition: Small area with some weed invasion, including garden escapes.

Photograph 3.1 Coastal Exposed Dune Littoral Rainforest

ii. Lowlands Swamp Box - Paperbark -Red Gum Dry Forest

Structure and Dominant Species: Open forest to woodland *of Eucalyptus tereticornis* and *Melaleuca quinquenervia*, with *Lophostemon suaveolens* in sub-canopy. Ground layer includes *Lomandra longifolia, Pteridium esculentum* and *Hibbertia scandens.*

Landform/Soils: Occurs on sandy loams, on slight rises on the coastal floodplain.

General Condition: Ground layer largely replaced by exotic pasture grasses.

Photograph 3.2 Lowlands Swamp Box - Paperbark -Red Gum Dry Forest

iii. Lowlands Swamp Box - Paperbark -Red Gum Dry Forest – Derived Open Woodland

Structure and Dominant Species: Open woodland of *Eucalyptus tereticornis* and *Melaleuca quinquenervia* over a ground layer of exotic grasses.

Landform/Soils: Occurs on sandy loams, on slight rises on the coastal floodplain.

General Condition: Consists of scattered trees, with ground layer largely replaced by exotic grasses.

iv. Coastal Sand Bloodwood-Banksia Forest

Structure and Dominant Species: Open forest to woodland of *Corymbia intermedia* and *Banksia integrifolia*. Mid layer includes littoral rainforest species such as *Cupaniopsis anacardiodes* and *Acronychia imperforata.*

Landform/Soils: Occurs on sand on hind-dune.

General Condition: Appears to be good condition, but has open ground layer due to grazing.

Photograph 3.3 Coastal Sand Bloodwood-Banksia Forest

v. Coastal Wallum Baumea Sedgeland

Structure and Dominant Species: Sedgeland of *Baumea* species and *Cyperus* species, with a small shrub layer of *Callistemon pachyphyllus* in some areas. *Melaleuca quinquenervia* occurs as a scattered emergent, often as a shrub or small tree. Some areas are open sedgelands devoid of trees, which may be a result of past clearing.

Landform/Soils: Occurs on waterlogged areas often with peaty soil

General Condition: Some areas in good condition. Other areas extensively cleared and grazed, resulting in reduction on sedge cover in the ground layer. Regrowth of *Melaleuca quinquenervia* is occurring.

Photograph 3.4 Coastal Wallum Baumea Sedgeland

vi. Coastal Wallum Paperbark Wet Shrubland

Structure and Dominant Species: Wallum heath containing *Allocasuarina littoralis, Notelaea ovata* and species of *Banksia, Melaleuca, Leptospermum, Leucopogon, Pultenaea* and *Hibbertia*.

Landform/Soils: Occurs on pale grey clays on the northern edge of Hearnes Lake.

General Condition: Has been extensively cleared, now restricted to a narrow strip around the northern edge of Hearnes Lake.

Photograph 3.5 Coastal Wallum Paperbark Wet Shrubland

vii. Coastal Paperbark Swamp Oak Floodplain Forest

Structure and Dominant Species: Open forest of *Melaleuca quinquenervia* and *Casuarina glauca*. *Parsonsia straminaea* climbs into the subcanopy. *Blechnum indicum* and sedges dominate the ground-layer.

Landform/Soils: Occurs on swampy areas with humic soils.

General Condition: Some areas in good condition. Other areas extensively grazed, while canopy is intact, ferns and sedges in the groundlayer have been replaced by exotic grasses.

Photograph 3.6 Coastal Paperbark Swamp Oak Floodplain Forest

viii. Coastal Swamp Mahogany Forest

Structure and Dominant Species: Open forest containing *Corymbia intermedia, Eucalyptus robusta, Eucalyptus resinifera, Melaleuca quinquenervia* and *Lophostemon suaveolens*. Mid layer includes *Eleocarpus reticulatus* and *Acronychia imperforata.*

Landform/Soils: Occurs on flat areas between the hind-dune and Hearnes Lake on sandy soils

General Condition: Generally in good condition.

Photograph 3.7 Coastal Swamp Mahogany Forest

ix. Coastal Paperbark Sedgeland Dominated Forest

Structure and Dominant Species: Open forest of *Eucalyptus tereticornis, Melaleuca quinquenervia* and *Casuarina glauca.* Ground layer contains *Gahnia clarkei, Baumea* species and other sedges.

Landform/Soils: Occurs on low-lying areas on sandy loam soils, some areas likely to undergo temporary inundation.

General Condition: Ground layer of sedges has largely be replaced by exotic pasture grasses.

Photograph 3.8 Coastal Paperbark Sedgeland Dominated Forest

x. Coastal Paperbark Sedgeland Dominated Forest – Derived Open Woodland

Structure and Dominant Species: Open woodland *of Eucalyptus tereticornis, Melaleuca quinquenervia* and *Casuarina glauca* over a ground layer of exotic grasses.

Landform/Soils: Occurs on low-lying areas on sandy loam soils, some areas likely to undergo temporary inundation.

General Condition: Consists of scattered trees, with groundlayer largely replaced by exotic grasses.

xi. Coastal Paperbark Swamp Box Littoral Forest

Structure and Dominant Species: Open forest containing *Melaleuca quinquenervia, Casuarina glauca, Lophostemon suaveolens* and *Banksia integrifolia*. Littoral rainforest species occur in the subcanopy and ocassionally enter the canopy.

Landform/Soils: Low-lying areas on sandy soil, behind sand dunes.

General Condition: Canopy intact, but groundlayer has been largely replaced by exotic grasses.

Photograph 3.9 Coastal Paperbark Swamp Box Littoral Forest

xii. Coastal Wallum Swamp Mahogany Siebers Paperbark Forest

Structure and Dominant Species: Woodland containing *Eucalyptus robusta, Melaleuca quinquenervia, Lophostemon suaveolens* and *Angophora costata*, over a subcanopy of *Melaleuca sieberi*. Ground layer includes *Ptilothrix deusta* and *Entolasia* species.

Landform/Soils: Level plains near Pacific Motorway on grey clay soils

General Condition: Some areas contain a dense shrub layer, but in other places the shrub layer has been removed, but canopy remains intact. The ground layer is still largely dominated by native grasses.

Photograph 3.10 Coastal Wallum Swamp Mahogany Siebers Paperbark Forest

xiii. Swamp Oak Forested Wetland

Structure and Dominant Species: Open forest of *Casuarina glauca* with *Parsonsia straminaea* climbing into the subcanopy. *Gahnia clarkei* is prominent in the groundlayer

Landform/Soils: Occurs adjacent to artificial drainage channels that drain into Hearnes Lake

General Condition: This community has resulted from the construction of artificial drainage channels, but condition is good overall.

Photograph 3.11 Swamp Oak Forested Wetland

xiv. Estuarine Paperbark Twig-rush Forest

Structure and Dominant Species: Tall shrubland of *Melaleuca quinquenervia* and occasionally *Casuarina glauca* over a dense ground layer of *Baumea juncea.*

Landform/Soils: Occurs on brackish humic soils around the fringes of Hearnes lake, beyond the tidal influence.

General Condition: In good condition overall, but occasionally impacted by cattle.

Photograph 3.12 Estuarine Paperbark Twig-rush Forest

xv. Estuarine Mangrove Forest

Structure and Dominant Species: Closed shrubland dominated by *Avicennia marina. Phragmites australis* also occurs as does *Baumea juncea* at the edge of the community.

Landform/Soils: Occurs in tidal areas in a narrow band around the northern shore of Hearnes Lake.

General Condition: Occurs as a very narrow fringe, but overall in good condition.

Photograph 3.13 Estuarine Mangrove Forest

xvi. Estuarine Twig Rush Saltmarsh

Structure and Dominant Species: Sedgeland almost entirely dominated by *Baumea juncea*. *Casuarina glauca* and/or *Melaleuca quinquenervia* rarely occur as emergent shrubs.

Landform/Soils: Occurs around the fringes of Hearnes lake, sometimes into water, soils are brackish humic soils.

General Condition: In good condition, but appears to have been occasionally impacted by cattle.

Photograph 3.14 Estuarine Twig Rush Saltmarsh

xvii. Derived Grasslands

Structure and Dominant Species: Derived mixed exotic/native grasslands. Typically dominated by *Paspalum* sp. but may include native grasses such as *Entolasia* sp., *Oplismenus* sp., *Sporobolus elongatus* and *Microleana stipoides.* Sparsely scattered trees of *Melaleuca quinquenervia* occasionally occur.

Landform/Soils: Clays or sand depending on location.

General Condition: Poor condition, largely dominated by exotic grasses, due to past clearing and grazing.

3.3.2 Threatened Ecological Communities

Several vegetation communities present in the study area conform to the description of TECs listed under the TSC Act and/or EPBC Act. This includes the following:

- Littoral Rainforest of the NSW North Coast, Sydney Basin and South East Corner Bioregions (Littoral Rainforest) (TSC Act Status: Endangered Ecological Community (EEC); EPBC Act Status: Critically Endangered Ecological Community (CEEC));
- Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions (Coastal Saltmarsh) (TSC Act Status: EEC; EPBC Act Status: Vulnerable Ecological Community (VEC));
- Subtropical Coastal Floodplain Forest of the NSW North Coast Bioregions (Subtropical Coastal Floodplain Forest) (TSC Act Status: EEC; EPBC Act Status: not listed);
- Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions (Swamp Sclerophyll Forest) (TSC Act Status: EEC; EPBC Act Status: not listed); and
- Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions (Swamp Oak Floodplain Forest) (TSC Act Status: EEC; EPBC Act Status: not listed).

A summary of the vegetation communities in the study area that conform to these TECs and the area of each is provided in **Table 3.2**. The distribution of each TEC in the study area is shown in **Figure 3.2**.

A detailed description of the TECs recorded within the study area is provided below.

Table 3.2 EPBC Act and TSC Act TECs in the study area

Vegetation Community	TSC Act Listed Community and Status	EPBC Act Listed Community and Status	Area (ha)
CH_RF07: Coastal Exposed Dune Littoral Rainforest	Littoral Rainforest (Endangered)	Littoral Rainforest and Coastal Vine Thickets of Eastern Australia (Critically Endangered)	0.12
CH_DOF06: Lowlands Swamp Box - Paperbark -Red Gum Dry Forest	Subtropical Coastal Floodplain Forest (Endangered)		2.16
CH_DOF06: Lowlands Swamp Box - Paperbark -Red Gum Dry Forest – Derived Open			1.09

Table 3.2 EPBC Act and TSC Act TECs in the study area

Vegetation Community	TSC Act Listed Community and Status	EPBC Act Listed Community and Status	Area (ha)
Woodland			
CH_DOF08: Coastal Sand Bloodwood-Banksia Forest			1.43
CH_FW04: Coastal Wallum Baumea Sedgeland	Swamp Sclerophyll Forest (Endangered)		6.46
CH_FW05: Coastal Wallum Paperbark Wet Shrubland	Swamp Sclerophyll Forest (Endangered)		0.95
CH_FRW01: Coastal Paperbark Swamp Oak Floodplain Forest	Swamp Sclerophyll Forest (Endangered)		3.81
CH_FRW02: Coastal Swamp Mahogany Forest	Swamp Sclerophyll Forest (Endangered)		3.36
CH_FRW04: Coastal Paperbark Sedgeland Dominated Forest	Swamp Sclerophyll Forest (Endangered)		4.89
CH_FRW04: Coastal Paperbark Sedgeland Dominated Forest – Derived Open Woodland			1.92
CH_FRW05: Coastal Paperbark Swamp Box Littoral Forest	Swamp Sclerophyll Forest (Endangered)		1.88
CH_FRW09: Coastal Wallum Swamp Mahogany Siebers Paperbark Forest	Swamp Sclerophyll Forest (Endangered)		11.30
CH_FRW10: Swamp Oak Forested Wetland	Swamp Oak Floodplain Forest (Endangered)		2.02
CH_FRW11: Estuarine Paperbark Twig-rush Forest	Swamp Sclerophyll Forest (Endangered)	Subtropical and Temperate Coastal Saltmarsh (Vulnerable)	1.35
CH_SW01: Estuarine Mangrove Forest	Coastal Saltmarsh (Endangered)		0.09
CH_SW02: Estuarine Twig Rush Saltmarsh	Coastal Saltmarsh	Subtropical and Temperate Coastal Saltmarsh (Vulnerable)	2.73
TOTAL			**45.56**

i. Littoral Rainforest

Littoral Rainforest in the study area conforms to the description of Littoral Rainforest and Coastal Vine Thickets of Eastern Australia, listed as Critically Endangered under the EPBC

Act, and as Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions, listed as Endangered under the TSC Act.

Areas of Littoral Rainforest in the study area comprise those mapped as CH_RF07 Coastal Exposed Dune Littoral Rainforest according to the Coffs Harbour Vegetation Mapping (OEH, 2012a; OEH, 2012b). A total of 0.12 ha of this community occurs in the study area (see **Figure 3.2**).

Littoral Rainforest is generally a closed forest, the structure and composition of which is strongly influenced by proximity to the ocean. The plant species in this EEC are predominantly rainforest species with evergreen mesic or coriaceous leaves {Threatened Species Scientific Committee, 2008 #6708}.

Within the study area this vegetation community consisted of a small patch (0.12 ha) dominated by a large Rusty Fig (*Ficus rubiginosa*) together with Hard Corkwood (*Endiandra sieberi*), over a diverse shrub layer of littoral rainforest species. There was also a diversity of vine species, some of which climbed into the canopy.

This community meets the criteria for listing under the EPBC Act as it meets the minimum area requirement and the minimum percentage canopy cover of rainforest species Threatened Species Scientific Committee, 2008 #6708}.

ii. Coastal Saltmarsh

Areas of Coastal Saltmarsh occur in the study area that conform to the description of TECs listed under the EPBC Act and TSC Act. Due to the differing listing criteria for EECs under the TSC Act and the EPBC Act, the areas listed under each Act respectively are not the same. A breakdown of the area of each community in the study area is presented below:

- EPBC Act listed Coastal Saltmarsh (Subtropical and Temperate Coastal Saltmarsh) – 4.07 ha;
- TSC Act listed Coastal Saltmarsh (Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions) – 2.81 ha

These are discussed in more detail below.

a. Subtropical and Temperate Coastal Saltmarsh (EPBC Act)

The EPBC Act listed Subtropical and Temperate Coastal Saltmarsh TEC is represented by two vegetation communities in the study area:

- CH_SW02 Estuarine Twig Rush Saltmarsh; and
- CH_FrW11 Estuarine Paperbark Twig Rush Forest

Subtropical and Temperate Coastal Saltmarsh is listed as Vulnerable under the EPBC Act, and as an EEC under the TSC Act (see below). Approximately 4.07 ha of this community is present in the study area (see **Figure 3.2**).

The conservation advice (Threatened Species Scientific Committee 2013) for the EPBC Act listed Subtropical and Temperate Coastal Saltmarsh states that where the ecological community intergrades with an adjacent community, such as seagrass, mangroves, paperbark (*Melaleuca* spp.) and *Casuarina* spp. swamp, or freshwater marshes, then in this ecotone region, if 50% or more of the groundcover/understorey is comprised of coastal saltmarsh vegetation it is considered to be the ecological community. Although CH_FrW11 contained emergent *Melaleuca quinquenervia* and/or *Casuarina glauca*, at most locations ≥50% of the ground cover was dominated by *Baumea juncea,* and as such this community is included in the Subtropical and Temperate Coastal Saltmarsh TEC. However CH_SW01 Estuarine Mangrove Forest contained ≤50% of the ground layer of *Baumea juncea* (the ground layer was mostly exposed mud or water), and as such has been excluded from this TEC.

b. Coastal Saltmarsh (TSC Act)

The TSC Act listed Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions is represented by two vegetation communities in the study area:

- CH_SW01 Estuarine Mangrove Forest; and
- CH_SW02 Estuarine Twig Rush Saltmarsh

Coastal Saltmarsh is listed as Endangered under the TSC Act. Approximately 2.81 ha of Coastal Saltmarsh under the TSC Act is present in the study area (see **Figure 3.2**). Note that areas of Estuarine Twig Rush Saltmarsh are also listed as an EEC under the EPBC Act (see previous section).

Twig Rush (*Baumea juncea)* is the dominant species within this community within the study area. This species is considered an upper saltmarsh species (Hughes, 2011).

While areas dominated by mangrove are not typically part of the TSC Act listed Coastal Saltmarsh EEC, occasional scattered mature Grey Mangrove (*Avicennia marina*) trees do occur through saltmarsh at some sites, and *Avicennia* seedlings may occur throughout saltmarsh. In brackish areas dense stands of tall reeds (*Phragmites australis*, *Bulboschoenus* spp., *Schoenoplectus* spp., *Typha* spp.) may occur as part of the community (Hughes 2011). Within CH_SW01 Estuarine Mangrove Forest, *Avicenna marina* occurred as a narrow fringe (typically a single row of trees) adjacent to *Baumea juncea*, often with *Phragmites australis*. As such, this community is considered to be part of the TSC Act listed Coastal Saltmarsh EEC.

iii. Subtropical Coastal Floodplain Forest

Subtropical Coastal Floodplain Forest in the study area conforms to the description of Subtropical Coastal Floodplain Forest of the NSW North Coast Bioregions, which is listed as Endangered under the TSC Act. This community is not listed under the EPBC Act.

Subtropical Coastal Floodplain Forest in the study area corresponds to the map unit CH_DOF06 Lowlands Swamp Box – Paperbark - Red Gum Dry Forest, mapped by the Coffs

Harbour Vegetation Mapping (OEH, 2012a; OEH, 2012b). At total of 1.78 ha of this community occurs in the study area (see **Figure 3.2**).

This EEC is associated with clay-loams and sandy loams, on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains. Floodplains are level landform patterns on which there may be active erosion and aggradation by channelled and overbank stream flow with an average recurrence interval of 100 years or less (NSW Scientific Committee, 2004a). As such only areas of this vegetation community below the 100 year flood level (as defined by Coffs Harbour City Council Flood Mapping) are included in this EEC.

The most widespread and abundant dominant trees in this EEC include Forest Red Gum (*Eucalyptus tereticornis*), Grey Ironbark (*E. siderophloia*), Pink Bloodwood (*Corymbia intermedia*) and, north of the Macleay floodplain Swamp Box (*Lophostemon suaveolens*) (Adam 2011b).

With the study area, Subtropical Coastal Floodplain Forest formed an open forest to woodland dominated by *Eucalyptus tereticornis*, with occasional *Melaleuca quinquenervia.*

iv. Swamp Sclerophyll Forest

Swamp Sclerophyll Forest in the study area conforms to the description of Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions, which is listed as Endangered under the TSC Act. This community is not listed under the EPBC Act. A total of 8.69 ha of this community occur in the study area (see **Figure 3.2**).

Areas of Swamp Sclerophyll Forest in the study area comprise eight vegetation communities mapped according to the Coffs Harbour Vegetation Mapping (OEH, 2012b):

- CH_FW04 Coastal Wallum Baumea Sedgeland;
- CH_FW05 Coastal Wallum Paperbark Wet Shrubland;
- CH_FrW01 Coastal Paperbark Swamp Oak Floodplain Forest;
- CH_FrW02 Coastal Swamp Mahogany Forest;
- CH_FrW04 Coastal Paperbark Sedgeland Dominated Forest;
- CH_FrW04 Coastal Paperbark Sedgeland Dominated Forest – Derived open woodland;
- CH_FrW05 Coastal Paperbark Swamp Box Littoral Forest;
- CH_FrW09 Coastal Wallum Swamp Mahogany Sieber's Paperbark Open Forest; and
- CH_FrW11 Estuarine Paperbark Twig-rush Forest.

These vegetation communities differ considerably in their structure and floristics, from *Eucalyptus robusta* and *Melaleuca quinquenervia* co-dominated forests, wallum heath/wet heath, to sedgelands with emergent *Melaleuca quinquenervia.* In nearly every community *Melaleuca quinquenervia* is present as a dominant or co-dominant species, varying in structure from a canopy tree to a shrub. According to the Final Determination (Adam 2011c), the structure of Swamp Sclerophyll Forest is typically open forest, although partial clearing may have reduced the canopy to scattered trees. In some areas the tree stratum is low and dense, so that the community takes on the structure of scrub. The community also includes some areas of tall reedland or sedgeland, where trees are very sparse or absent.

The EEC is restricted to floodplains, which are level landform patterns on which there may be active erosion and aggradation by channelled and overbank stream flow with an average recurrence interval of 100 years or less (Adam 2011c). As such only areas below the 100 flood level (as defined by Coffs Harbour City Council Flood Mapping) are included in this EEC. The soils within this EEC include humic clay loams and sandy loams, on waterlogged or periodically inundated alluvial flats and drainage lines associated with coastal floodplains (Adam 2011c). Such soils and land-forms are present within most of the communities forming this EEC.

According to the Final Determination (NSW Scientific Committee, 2004c) the most widespread and abundant dominant trees include *Eucalyptus robusta* and *Melaleuca quinquenervia*. Other trees may be scattered throughout at low abundance or may be locally common at few sites, including Willow Bottlebrush (*Callistemon salignus*), *Casuarina glauca*, Red Mahogany (*Eucalyptus resinifera* subsp. *hemilampra*), and *Lophostemon suaveolens*. A layer of small trees may be present, including Green Wattle *Acacia irrorata*, Lilly Pilly (*Acmena smithii*), Blueberry Ash (*Elaeocarpus reticulatus*), and Cheese Tree (*Glochidion ferdinandi*). Shrubs include Sydney Golden Wattle (*Acacia longifolia*), Hop Bush (*Dodonaea triquetra*), Sandpaper Fig (*Ficus coronata*) and *Melaleuca* species. Occasional vines include Common Silkpod (*Parsonsia straminea*) and Snake Vine (*Stephania japonica*). The groundcover is composed of abundant sedges, ferns, forbs, and grasses including *Gahnia clarkei*, Bracken (*Pteridium esculentum*), Blue Flax Lily (*Dianella caerulea*), Native Violet (*Viola hederacea*), Spiny-headed Mat-rush (*Lomandra longifolia*), Bordered Panic (*Entolasia marginata*) and Blady Grass (*Imperata cylindrica*). On sites downslope of lithic substrates or with soils of clay-loam texture, species such as Black She-oak (*Allocasuarina littoralis*), *Banksia oblongifolia*, Hairpin Banksia (*Banksia spinulosa* var. *collina*), and *Ptilothrix deusta* may also be present in the understorey.

The species listed above were found to be present within the study area to varying extent (refer to **Appendix A** for a full species list), indicating that much of the vegetation within the study area is consistent with this EEC.

Some areas of the subject site have undergone partial clearing, reducing the canopy to scattered trees (derived woodland). It is noted in the final determination (NSW Scientific Committee, 2004c) that partial clearing may reduce the canopy of this EEC to scattered trees and therefore it is considered that partly cleared areas of the subject site still comprise the EEC. The partly cleared areas have variable levels of weed invasion, although the majority still have over 50% native understorey cover.

v. Swamp Oak Floodplain Forest

Swamp Oak Floodplain Forest in the study area conforms to the description of Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions, which is listed as Endangered under the TSC Act. This community is not listed under the EPBC Act.

Areas of Swamp Oak Floodplain Forest in the study area comprise those mapped as CH_FRW10: Swamp Oak Forested Wetland according to the Coffs Harbour Vegetation Mapping (OEH, 2012a; OEH, 2012b). A total of 1.4 ha of this community occurs in the study area (see **Figure 3.2**).

Within the study area this vegetation community is restricted to the fringes of artificial drainage channels that drain from existing housing to Hearnes Lake. It is distinguished from other adjacent communities by the dominance of *Casuarina glauca,* with *Melaleuca quinquenervia* only occurring as isolated individuals. On the north coast of NSW, expansion of *Melaleuca quinquenervia* and *Casuarina glauca* into open floodplain swamps has been attributed to artificial drainage (NSW Scientific Committee, 2004b) and this may have occurred in the subject site since previous assessments.

This EEC is associated with humic clay loams and sandy loams, on waterlogged or periodically inundated alluvial flats and drainage lines associated with coastal floodplains. Floodplains are level landform patterns on which there may be active erosion and aggradation by channelled and overbank stream flow with an average recurrence interval of 100 years or less (NSW Scientific Committee, 2004b).As such only areas below the 100 year flood level (as defined by Coffs Harbour City Council Flood Mapping) are considered to be this EEC.

3.4 Flora Species

3.4.1 General Species

A total of 420 plant species have been recorded within the study area, including records from the 2017 field survey undertaken by Cumberland Ecology and previous surveys by others (Conacher Travers (2006b) and Conacher Environmental Group (2008c)). This includes 312 indigenous native species and 108 introduced species including garden escapes. The dominant families were Poaceae (57 species), Cyperaceae (37 species) and Myrtaceae (30 species). The full list of flora species recorded within the study area is provided in **Appendix A**.

3.4.2 Threatened Species

No threatened flora species have been recorded from the study area or subject site by Cumberland Ecology or from previous ecological assessments.

Previous targeted surveys by Conacher Environmental Group (2008) recorded *Diuris* sp. aff. *chrysantha* (North Coast) within the wider study area, and this identification was confirmed

by taxonomists at the Royal Botanic Gardens. A similar species; *Diuris sp. aff. chrysantha (Byron Bay)* is listed as Endangered under the TSC Act, however Coacher Travers were informed by the NPWS North Coast Threatened Species Unit that the this species was not the same species as *Diuris sp. aff. chrysantha (North Coast)* that was recorded from within the study area.

Database analysis indicates that at least 22 threatened flora species have been recorded from the locality. An assessment of the likelihood of occurrence of threatened flora species has been conducted and is presented in **Appendix B**. This assessment indicates that no threatened flora species are considered as having the potential to occur within the study area based on assessment of habitat, locality records and results of surveys.

3.4.3 Weeds

Eight of the exotic plant species recorded within the study area are listed as Priority Weeds under the *Biosecurity Act 2015* in the Coffs Harbour LGA. These include Giant Reed (*Arundo donax*), Groundsel Bush (*Baccharis halimifolia*), Bitou bush (*Chrysanthemoides monilifera* ssp. *rotunda*), Lantana (*Lantana camara*), Cockspur Coral Tree (*Erythrina crista-galli*), Asparagus Fern (*Asparagus aethiopicus*) and Climbing Asparagus Fern (*Asparagus plumosus*). Of the recorded weed species *Asparagus aethiopicus A. plumosus, Chrysanthemoides monilifera* ssp. *rotunda, Lantana camara, Ligustrum sinense (*Small-leaved Privet*)* and *Senecio madagascariensis* are Weeds of National Significance (WONS).

The most abundant exotic plant species are exotic grasses introduced for pasture. These mostly include *Paspalum* species (*P. conjugatum, P. distichium, P. mandiocanum* and *P. orbiculare*) as well as Signal Grass (*Urochloa decipiens*) and Buffalo Grass (*Stenotaphrum secundatum*) Overall with the exception of exotic grass species, weed abundance was low within the study area, probably due to grazing on some weed species. However a number of garden escapes were noted, particularly within the south of the study area close to existing housing. Such species included Bougainvillea (*Bougainvillea glabra*), Angel's Trumpets (*Brugmansia suaveolens*), Oleander (*Nerium oleander*), Senegal Date Palm (*Phoenix reclinata*), and Sweet Viburnum (*Viburnum odoratissimum*), in addition to other species.

3.5 Fauna Habitat

Past clearing and habitat modification on and immediately adjacent to the study area have impacted the fauna habitat values of the land. The habitats in the study area are fragmented and separated from other habitats by the Pacific Highway that forms the western site boundary. They have also been fragmented by existing residential developments to the north and south, and by Hearn Lake itself. A high proportion of the study area has been previously cleared and in such areas tree hollows are rare or absent. Older trees with hollows exist and are concentrated in the north-east and north-west of the study area. Hollows are generally of a small to medium class but would provide roosting habitat for a range of birds, bats, non-flying mammals, reptiles and amphibians.

At ground level the drier forest communities have been grazed by livestock and much of the fallen timber has been removed. Some fallen trees are present but these are sparse. There

is some potential habitat for hollow-dependent fauna, arboreal fauna and ground dwelling fauna, contained mainly in hollow-bearing trees, few fallen logs and vegetation within the study area, but very limited potential habitat for ground fauna in the subject site where cattle grazing is still ongoing.

There are numerous flowering trees, shrubs and ground cover vegetation in the study area beyond the subject site which will constitute the Regional Park that can provide potential foraging resources for nectivorous mammals and birds.

The matrix of fauna habitats within the study area provide potential foraging, shelter and breeding opportunities for a suite of fauna species. Key habitat features within the study area include:

- Riparian environments suitable for fauna species dependent on these habitats such as birds and amphibians;
- Terrestrial habitat features such as ground and shrub layer vegetation, leaf litter and coarse woody debris suitable as shelter for small terrestrial fauna species;
- Hollow-bearing trees and stags suitable as shelter and breeding habitat for a range of hollow-dependent fauna; and
- Blossom-producing trees and shrubs suitable as forage for a range of nectarivores; and
- Koala feed tree species.

Hollow-bearing trees and Koala feed trees are discussed in more detail below.

3.5.1 Hollow-bearing Trees

Cumberland Ecology intensively mapped tree hollows across the study area in November 2017 and February 2018, and individual trees were mapped using a hand held GPS. This revealed a total of 259 hollow-bearing trees in the areas surveyed. Hollows in trees and nests recorded from the study area are shown on **Figure 3.3**.

Hollows were most often recorded in Swamp Mahogany trees, followed by Broad-Leaved Paperbark, Swamp Box, and Forest Red Gum.

Tree hollow data is provided in **Appendix C**

3.5.2 Koala Habitat Assessment

The study area is located within the Coffs Harbour LGA to which SEPP44 and the Coffs Harbour KPoM applies. The Coffs Harbour KPoM maps five small areas of Secondary Koala Habitat totalling to approximately 7 ha within the subject site.

The study area contains a number of trees recognised as preferred tree species for the Koala in the Coffs Harbour LGA, including the following: Tallowwood (*Eucalyptus*

microcorys), Flooded Gum (*Eucalyptus grandis*), Blackbutt (*Eucalyptus pilularis*), Swamp Mahogany (*Eucalyptus robusta*), Forest Red Gum (*Eucalyptus tereticornis*) and Broad-leaved Paperbark (*Melaleuca quinquenervia*).

No Koalas have been recorded from the study area by Cumberland Ecology or any other ecological assessment. No evidence of useage such as scratches on trees or Koala scats was recorded during the recent surveys in November 2017 or February 2018.

Despite the presence of Koala feed trees, it is considered unlikely that a local population of the Koala would occur within the study area due to the isolation of the habitat. As noted above, the habitats within the study area are fragmented and separated from other habitats to a substantial degree by the Pacific Highway that forms the western site boundary and existing residential development.

3.6 Fauna Species

Including the results of field surveys undertaken by Cumberland Ecology during November 2017 and February 2018 with previous surveys undertaken by Conacher Travers (2006b) and Conacher Environmental Group (2008), a total of 109 vertebrate species have been recorded within the study area, including 97 birds, 15 mammals, 4 amphibians and 3 reptiles. A full list of fauna species recorded from the study area is provided in **Appendix C**.

3.6.1 Threatened Species

A total of 11 threatened fauna species have been recorded from the study area during surveys by Cumberland Ecology, Conacher Travers and Conacher Environmental Group. Furthermore, the fauna habitats within the study area provide potential foraging, shelter and breeding opportunities for a suite of threatened fauna species in addition to those species that have been recorded.

An assessment of the likelihood of occurrence in the study area of threatened fauna species recorded from the locality has been conducted and is presented in **Appendix E**. This assessment indicates that although not recorded from the study area, a further 8 threatened species have potential to occur in the study area due to the presence of suitable habitat.

Table 3.3 below lists the threatened and migratory fauna species recorded or considered to potentially occur within the study area. The locations of the threatened fauna species recorded from the study area are shown in **Figure 3.4**.

Table 3.3 Threatened fauna species recorded or considered to potentially occur within the study area

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Recorded within Study Area?
Amphibia					
Myobatrachidae	*Crinia tinnula*	Wallum Froglet	V		Yes
Aves					
Accipitridae	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	V		Yes
Accipitridae	*Pandion cristatus*	Eastern Osprey	V		Yes
Apodidae	*Hirundapus caudacutus*	White-throated Needletail		Mi	Yes
Cacatuidae	*Calyptorhynchus lathami*	Glossy Black-Cockatoo	V		Yes
Ciconiidae	*Ephippiorhynchus asiaticus*	Black-necked Stork	E		Yes
Columbidae	*Ptilinopus magnificus*	Wompoo Fruit-Dove	V		
Columbidae	*Ptilinopus regina*	Rose-crowned Fruit-Dove	V		
Laridae	*Hydroprogne caspia (syn. Sterna caspia)*	Caspian Tern		Ma, Mi	Yes
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella	V		Yes
Strigidae	*Ninox strenua*	Powerful Owl	V		
Tytonidae	*Tyto novaehollandiae*	Masked Owl	V		
Tytonidae	*Tyto tenebricosa*	Sooty Owl	V		
Mammalia					
Emballonuridae	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail-bat	V		
Molossidae	*Mormopterus norfolkensis*	Eastern Freetail-bat	V		Yes
Pteropodidae	*Pteropus poliocephalus*	Grey-headed Flying-fox	V	V	Yes
Vespertilionidae	*Miniopterus australis*	Little Bentwing-bat	V		Yes
Vespertilionidae	*Myotis macropus*	Southern Myotis	V		
Vespertilionidae	*Scoteanax rueppellii*	Greater Broad-nosed Bat	V		Yes

TSC Act Status / EPBC Act Status: V = Vulnerable, E = Endangered, CE = Critically Endangered, M = Migratory

A discussion of each of the threatened and migratory species recorded from the study area or considered to have potential to occur is provided below.

i. Wallum Froglet

The Wallum Froglet (*Crinia tinnula*) inhabits a wide range of habitats and is usually associated with acidic swamps on coastal sand plains, typically occurring in sedgelands and wet heathlands (OEH, 2017f). This species shelters under leaf litter, vegetation, other debris or in burrows of other species, with shelter sites often occurring near the edge of water (OEH, 2017f). Breeding occurs in swamps with permanent water as well as shallow ephemeral pools and drainage ditches (OEH, 2017f). The Wallum Froglet occurs along the coastal margin from Litabella National Park in south-east Queensland to Kurnell in Sydney (OEH, 2017f).

The Wallum Froglet has been recorded within the study area. Conacher Environmental Group (2008) observed the species within the Stage 4 and Stage 5 components of the proposed development as well as within the proposed addition to the Regional Park. Suitable foraging and breeding habitat occurs within the study area.

ii. White-bellied Sea-eagle

The White-bellied Sea-eagle (*Haliaeetus leucogaster*) inhabits coastal habitats, particularly those close to the sea-shore, and around terrestrial wetlands in tropical and temperate regions of mainland Australia and its offshore islands (DoE, 2014a). Habitat is characterised by the presence of large areas of open water including larger rivers, swamps, lakes and the sea, and have been recorded flying over a variety of terrestrial habitats (DoE, 2014a). This species feeds opportunistically on a variety of fish, birds, reptiles, mammals and crustaceans, and on carrion and offal (DoE, 2014a). A large nest is built from sticks and lined with leaves, grass or seaweed and may be built in a variety of sites including tall trees (especially *Eucalyptus* species), bushes, mangroves, cliffs, rocky outcrops, caves, crevices, on the ground or even on artificial structures (DoE, 2014a). The White-bellied Sea-eagle occurs along the coastline (including offshore islands) of mainland Australia and Tasmania (DoE, 2014a).

The White-bellied Sea-eagle has previously been recorded within the study area and wider locality. Most recently, this species was recorded from the study area in February 2018 from both Transect 1 and Transect 2 (see **Figure 2.2**).

This species is expected to utilise the woody vegetation within the study area as part of a much larger foraging range, including Hearns Lake. The study area also contains potential breeding habitat with sites typically located close to water and mainly in tall open forest or woodland (DoE, 2014a).

iii. Eastern Osprey

The Eastern Osprey (*Pandion cristatus*) occurs in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands (DoEE, 2017b). The species requires extensive areas of open fresh, brackish or saline water for foraging and frequent a variety of wetland habitats including inshore waters, reefs, bays, coastal cliffs, beaches, estuaries, mangrove swamps, broad rivers, reservoirs and large lakes and waterholes (DoEE, 2017b). The species feeds on dish over clear, open water (OEH, 2017d).

The Eastern Osprey builds nests in varying size and shapes, however they are generally large and are mostly composed of sticks (DoEE, 2017b). The Eastern Osprey occurs along the Australian coast line, except for Victoria and Tasmania (OEH, 2017d).

An individual Eastern Osprey was observed flying over the subject site on several occasions during surveys in 2004 (Conacher Environment Group (2008c)). A nesting pair of Eastern Osprey was also observed nesting within a dead tree approximately 125m west of the study area across the Pacific Highway during surveys conducted in August 2004 (Conacher Environment Group (2008c)). Most recently, this species was recorded from the study area in February 2018 from Transect 1 .This species is expected to utilise the woody vegetation within the study area as part of a much larger foraging range, including Hearns Lake. The study area also contains potential breeding habitat.

iv. White-throated Needletail

The White-throated Needletail (*Hirundapus caudacutus*) is a migrant to Australia in the non-breeding season (DoE, 2014b). This species is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground, occurring above a wide range of habitats (DoE, 2014b). The diet of this species includes a wide variety of insects including beetles, cicadas, flying ants, bees, wasps, flies, termites, moths, locusts and grasshoppers (DoE, 2014b). This species breeds in Asia (DoE, 2014b). The White-throated Needletail is widespread in eastern and south-eastern Australia, extending inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains (DoE, 2014b).

The White-throated Needletail has previously been recorded within the study area. This species is expected to forage aerially above the study area.

v. Glossy Black-cockatoo

The Glossy Black-cockatoo (*Calyptorhynchus lathami*) inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of She-oak occur (OEH, 2012d). This species feeds almost exclusively on the seeds of several species of She-oak (*Casuarina* and *Allocasuarina* species), shredding the cones with their large bill (OEH, 2012d). Key food species on the coast and tablelands are *Allocasuarina torulosa* (Forest Oak) and *Allocasuarina littoralis* (Black She-oak), with some *Allocasuarina distyla* taken (Scrub She-oak) (NSW Scientific Committee, 2008). Inland, its key food species include *Allocasuarina verticillata* (Drooping Sheoak) and *Casuarina cristata* (Belah), as well as *Allocasuarina inophloia* (Stringybark She-oak), *Allocasuarina diminuta*, *Allocasuarina gymnanthera*, and sometimes *Allocasuarina luehmannii* (Buloke) (NSW Scientific Committee, 2008). Nesting occurs in large hollows (26 cm wide and up to 1.4 m deep) within live or dead eucalypts, commonly in a dead spout in a living tree (NSW Scientific Committee, 2008). The Glossy Black-cockatoo occurs from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW, with a small population in the Riverina (OEH, 2012d).

The Glossy Black-cockatoo was recorded from the study area in February 2018 from Transect 1. Although not recorded previously, evidence of foraging by this species (chewed *Allocasuarina* cones) was detected within the study area during surveys by Conacher

Travers in 2005 (Conacher Environmental Group, 2008c) within the open forest of the north western portion of the study area.

Suitable foraging and breeding habitat occurs within the study area. It is expected that this species would forage across other stands of *Allocasuarinas* within the study area. Nesting habitat is present within the study area in the form of large hollows.

vi. Black-necked Stork

The Black-necked Stork (*Ephippiorhynchus asiaticus*) primarily inhabits floodplain wetlands (swamps, billabongs, watercourses and dams) of the major coastal rivers, with secondary habitat comprising minor floodplains, coastal sandplain wetlands and estuaries (OEH, 2017b). The species usually forages in water 5-30cm deep for vertebrate and invertebrate prey (OEH, 2017b). Large nests are build in tall trees close to water (OEH, 2017b). The Black-necked Stork is widespread in coastal and subcoastal northern and eastern Australia, as far south as central NSW (OEH, 2017b).

An individual Black-necked Stork was observed in December 2003 roosting and foraging just north of the subject site within the sedge lands bordering Hearnes Lake (Conacher Environment Group (2008c)). A single Black-necked Stork was also observed foraging within Hearnes Lake. No evidence of breeding by this species was detected within the subject site during surveys (Conacher Environment Group (2008c)).

vii. Caspian Tern

The Caspian Tern (*Hydroprogne caspia*) is mostly found in sheltered coastal embayments (harbours, lagoons, inlets, bays, estuaries and river deltas) and those with sandy or muddy margins are preferred (DoEE, 2018) This species usually forages in open wetlands, including lakes and rivers (DoEE, 2018). It breeds on variable types of sites including low islands, cays, spits, banks, ridges, beaches of sand or shell, terrestrial wetlands and stony or rocky islets or banks (DoEE, 2018). Within Australia, the Caspian Tern has a widespread occurrence and can be found in both coastal and inland habitat (DoEE, 2018).

The Caspian Tern has been recorded within the study area during surveys by Conacher Environmental Group (2008c). Habitat for this species is likely confined to the open water within the study area and shorelines of the lake,

viii. Wompoo Fruit-dove

The Wompoo Fruit-dove (*Ptilinopus magnificus*) occurs in, or near rainforest, low elevation moist eucalypt forest and brush box forests (DoEE, 2017c). This species is most often seen in mature forests, but also found in remnant and regenerating rainforest (DoEE, 2017c). It feeds on a diverse range of tree and vine fruits and is locally nomadic - following ripening fruit (DoEE, 2017c). The Wompoo Fruit-dove is distributed along the coast and coastal ranges from the Hunter River in NSW to Cape York Peninsula (DoEE, 2017c).

The Wompoo Fruit-dove has not been recorded within the study area. Available habitat includes littoral rainforest and mature forest in the eastern portion of the study area. This species has the potential to forage and breed within suitable habitat of the study area.

ix. Rose-crowned Fruit Dove

The Rose-crowned Fruit-dove (*Ptilinopus regina*) occur mainly in sub-tropical and dry rainforest and occasionally in moist eucalypt forest and swamp forest, where fruit is plentiful (DEC (NSW), 2017). This species feeds entirely on fruit from vines, shrubs, large trees and palms (DEC (NSW), 2017). The Rose-crowned Fruit-dove is distributed along the coast and ranges of eastern NSW and Queensland, from Newcastle to Cape York (DEC (NSW), 2017).

The Rose-crowned Fruit-dove has not been recorded within the study area. Available habitat includes littoral rainforest and mature forest in the eastern portion of the study area. This species has the potential to forage and breed within suitable habitat of the study area.

x. Varied Sittella

The Varied Sittella (*Daphoenositta chrysoptera*) inhabits eucalypt forests and woodlands, especially where rough-barked species and mature smooth-barked gums with dead branches are present, as well as mallee and *Acacia* woodland (NSW Scientific Committee, 2010). This species feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees and small branches and twigs in the tree canopy (OEH, 2012i). Nests are built from plant fibres and cobwebs in an upright tree fork high in the living tree canopy (OEH, 2012i). The Varied Sittella is distributed throughout NSW with a nearly continuous extent from the coast to the far west (NSW Scientific Committee, 2010).

The Varied Sittella has been recorded by Conacher Environmental Group (2008c) within the study area. Suitable habitat is present in the study area in forest and woodland habitats, particularly areas containing rough-barked species, such as Swamp Mahogany. Nesting habitat is also present within these areas.

xi. Powerful Owl

The Powerful Owl (*Ninox strenua*) inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest (OEH, 2013b). Optimal habitat includes a tall shrub layer and abundant hollows supporting high densities of arboreal marsupials (DEC (NSW), 2006). The main prey items of this species are medium-sized arboreal marsupials, particularly the Greater Glider, Common Ringtail Possum and Sugar Glider, with birds and flying foxes occasionally being consumed (OEH, 2013b). Roosting occurs in groves of dense mid-canopy trees or tall shrubs in sheltered gullies, typically on wide creek flats and at the heads of minor drainage lines, but also adjacent to cliff faces and below dry waterfalls (DEC (NSW), 2006). This species nests in old hollow eucalypts in unlogged, unburnt gullies and lower slopes within 100 m of streams or minor drainage lines, with hollows greater than 45 cm diameter and greater than 100 cm deep; surrounded by canopy trees and sub-canopy or understorey trees or tall shrubs (DEC (NSW), 2006). In NSW, the Powerful Owl is widely distributed throughout the eastern forests from the coast

inland to tablelands, with scattered, mostly historical records on the western slopes and plains (OEH, 2013b).

The Powerful Owl has not been recorded within the study area. Available habitat includes woody vegetation for foraging and roosting, with dense vegetation in the eastern portion of the study area comprising preferred habitat. A limited number of hollow-bearing trees may provide suitable nesting habitat for this species, however larger hollows are restricted on site.

xii. Masked Owl

The Masked Owl (*Tyto novaehollandiae*) inhabits dry eucalypt forests of the tablelands, western slopes and the undulating wet-dry forests of the coast (DEC (NSW), 2006). Optimal habitat includes an open understorey and a mosaic of sparse (grassy) and dense (shrubby) ground cover on gentle terrain (DEC (NSW), 2006). This species hunts within forests and well as along their edges (OEH, 2012g), and is a specialist predator of terrestrial mammals, particularly native rodents (DEC (NSW), 2006). The diet is supplemented by bandicoots, arboreal mammals (Sugar Glider, Common Ringtail Possum), and some birds (DEC (NSW), 2006). Roosting occurs in hollows in live or occasionally dead eucalypts; dense foliage in gullies; and caves or recesses in cliffs (DEC (NSW), 2006). This species nests in old hollow eucalypts, live or dead but commonly live, in a variety of topographic positions from gully to upper slope, with hollows greater than 40 cm wide and greater than 100 cm deep; there is no relationship with distance to streams (DEC (NSW), 2006). The Masked Owl occurs from the coast to the western plains, with records of this species throughout much of NSW, excluding the most arid north-western corner (DEC (NSW), 2006).

The Masked Owl has not been recorded within the study area. Available habitat includes the fringes of woody vegetation for foraging. A limited number of hollow-bearing trees may provide suitable nesting habitat for this species, however larger hollows are restricted on site.

xiii. Sooty Owl

The Sooty Owl (*Tyto tenebricosa*) occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests (OEH, 2017e).This species roosts by day in the hollow of a tall forest tree or in heavy vegetation; hunts by night for small ground mammals or tree-dwelling mammals (OEH, 2017e). Nesting occurs in very large tree hollows (OEH, 2017e). The Sooty Owl occurs within the easternmost one-eighth of NSW, occurring on the coast, coastal escarpment and eastern tablelands (OEH, 2017e).

The Sooty Owl has not been recorded within the study area. Available habitat is limited to littoral rainforest vegetation for foraging and roosting. However, the forested reserve to the north-east of the study area contains relatively undisturbed littoral rainforest that may support the species. Hollows suitable for breeding are unlikely to occur within the limited rainforest within the study area.

xiv. Yellow-bellied Sheathtail-bat

The Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*) inhabits a range of habitats including wet and dry sclerophyll forest, open woodland, *Acacia* shrubland, mallee, grasslands and deserts (Churchill, 2008). The species typically forages above the canopy and lower over open species and at the forest edge (Churchill, 2008). Their diet predominantly consists of beetles, but grasshoppers, crickets, leafhoppers, shield bugs, wasps and some flying ants are also consumed (Churchill, 2008). This species is known to roost in tree hollows and buildings, and in treeless areas they are known to utilise mammal burrows (OEH, 2012j). The Yellow-bellied Sheathtail-bat occurs across northern and eastern Australia (OEH, 2012j).

The Yellow-bellied Sheathtail-bat has not been recorded within the study area. Available habitat includes woody vegetation for foraging and hollow-bearing trees for roosting. This species has potential to forage and roost within the study area, however it is unknown if breeding occurs.

xv. Eastern Freetail-bat

The Eastern Freetail-bat (*Mormopterus norfolkensis*) is listed as Vulnerable under the TSC Act. It occurs in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range (OEH, 2012c). It roosts mainly in tree hollows but will also roost under bark or in man-made structures (OEH, 2012c). The Eastern Freetail-bat is found along the east coast from south Queensland to southern NSW (OEH, 2012c).

The Eastern Freetail-bat has not been recorded within the study area. Available habitat includes woody vegetation for foraging and hollow-bearing trees for roosting. This species has potential to forage and roost within the study area, however it is unknown if breeding occurs.

xvi. Little Bentwing-bat

The Little Bentwing-bat (*Miniopterus australis*) inhabits well timbered areas including rainforest, vine thicket, wet and dry sclerophyll forests, Melaleuca swamps and coastal forests (Churchill, 2008). Foraging occurs between shrub and canopy layers of densely wooded areas (Churchill, 2008). The diet of this species can include beetles, moths, flies, spiders, ants and wasps (Churchill, 2008). Few maternity sites are documented, with known sites typically occurring in limestone cave systems (Churchill, 2008). It is a cave-dwelling species with roosting occurring in caves, abandoned mines, tunnels, stormwater drains and occasionally buildings (Churchill, 2008). The Little Bentwing-bat occurs on east coast and ranges of Australia from Cape York in Queensland to Wollongong in NSW (OEH, 2012f).

The Little Bentwing-bat was recorded from the study area by Cumberland Ecology in February 2018. Available habitat includes woody vegetation for foraging and hollow-bearing trees for roosting. This species is likely to forage and roost within the study area, however it is unknown if breeding occurs.

xvii. Southern Myotis

The Southern Myotis (*Myotis macropus*) inhabits most habitat types as long as they are in proximity to streams and permanent waterways (Churchill, 2008). They are most frequently recorded at low elevations and in flat or undulating vegetated country (Churchill, 2008). This species is a fishing bat, foraging over water for small fish, prawns and aquatic insects such as water boatmen, water striders, back swimmers and whirligig beetles (Churchill, 2008). They also forage aerially for insects flying over water (Churchill, 2008). This species roosts close to water in caves, mine shafts, hollow-bearing trees, stormwater channels, buildings, under bridges and in dense foliage (OEH, 2012h). The Southern Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria and is rarely found more than 100 km inland, except along major rivers (OEH, 2012h).

The Southern Myotis has not been recorded within the study area. Available habitat includes open water for foraging and hollow-bearing trees for roosting. This species may forage and roost within the study area, particularly around Hearnes Lake. However it is unknown if breeding occurs.

xviii. Greater Broad-nosed Bat

The Greater Broad-nosed Bat (*Scoteanax rueppellii*) inhabits a variety of habitats including moist gullies in mature coastal forest, rainforest, open woodland, Melaleuca swamp woodland, wet and dry sclerophyll forests, cleared paddocks with remnant trees and tree-lines creeks in open areas (Churchill, 2008). Foraging occurs at the edge of isolated trees and forest remnants (Churchill, 2008). Their diet consists mainly of beetles with moths, ants and large flies consumed occasionally (Churchill, 2008). This species roosts in tree hollows, cracks and fissures in trucks and dead branches, under exfoliating bark, as well as the roofs of old buildings (Churchill, 2008). The Greater Broad-nosed Bat occurs mainly in the gullies and river systems that drain the Great Dividing Range, from north-eastern Victoria to the Atherton Tableland, extending to the coast over much of its range (OEH, 2012e).

The Greater Broad-nosed Bat was detected foraging within the ecotone between the drainage line and the cleared area and the open forest toward the southern end of the study area by Conacher Environment Group (2008c). Available habitat includes woody vegetation for foraging and hollow-bearing trees for roosting. This species is likely to forage and roost within the study area, however it is unknown if breeding occurs.

xix. Grey-headed Flying-fox

The Grey-headed Flying-fox (*Pteropus poliocephalus*) inhabits subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops (OEH, 2013a). The primary food source is blossom from eucalypts (genera *Eucalyptus*, *Corymbia* and *Angophora*), melaleucas and banksias, and in some areas it also utilises a wide range of rainforest fruits (DoE, 2014c). As none of the vegetation communities used by this species produces continuous foraging resources throughout the year, it has adopted complex migration traits in response to ephemeral and patchy food resources (DoE, 2014c). Roosting camps are generally located within 20 km of

a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy (OEH, 2013a). The Grey-headed Flying-fox is generally found within 200 km of the eastern coast of Australia, from Bundaberg in Queensland to Melbourne in Victoria (OEH, 2013a).

This species has been recorded by Conacher Environmental Group (2008c), seen flying over the study area in July 2007. The subject site contains suitable foraging habitat for this species and it is likely to utilise habitat in the subject site periodically as part of a much wider foraging range. No camps or roost sites are present within the study area.

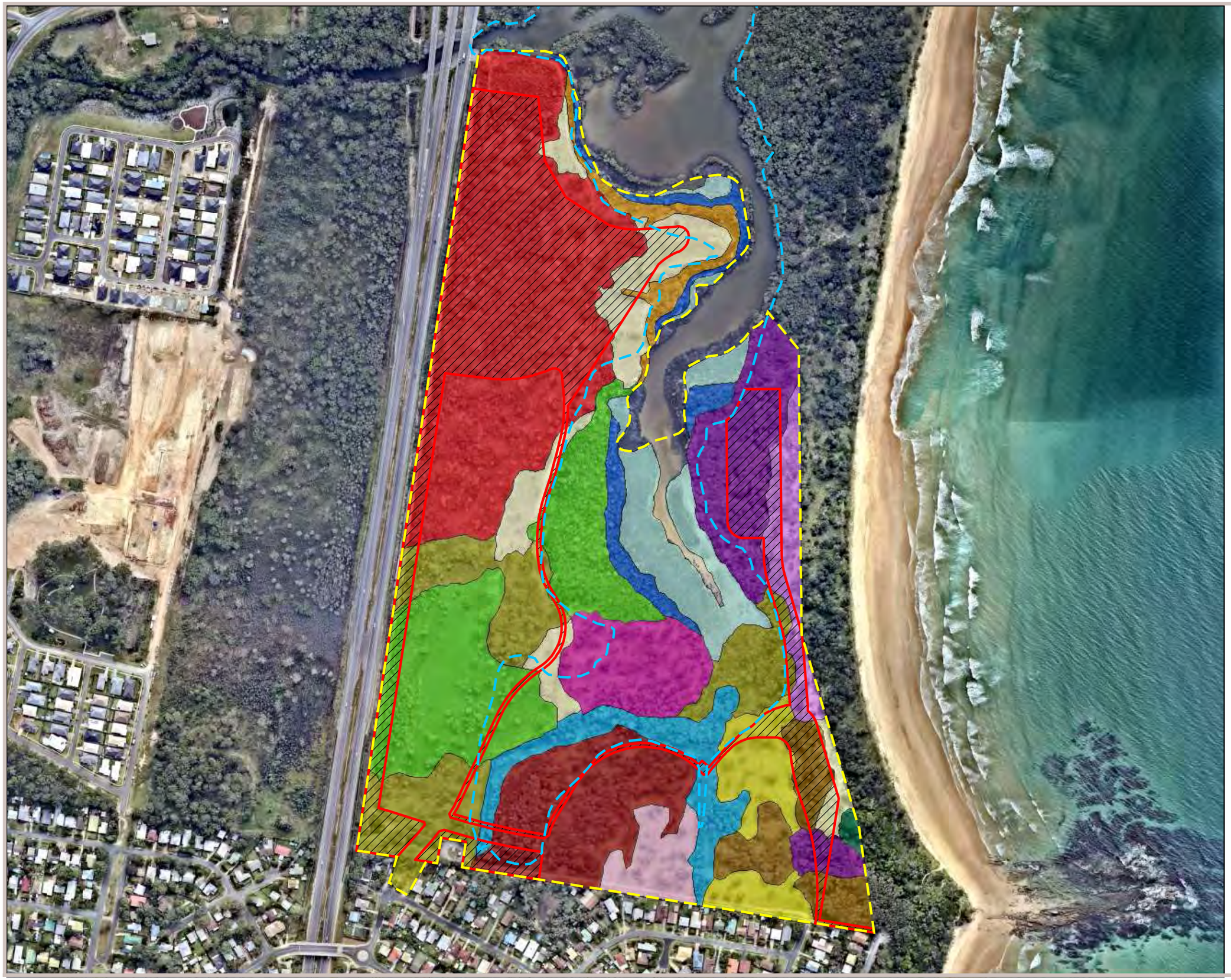

Figure 3.1. Vegetation communities within the subject site and study area

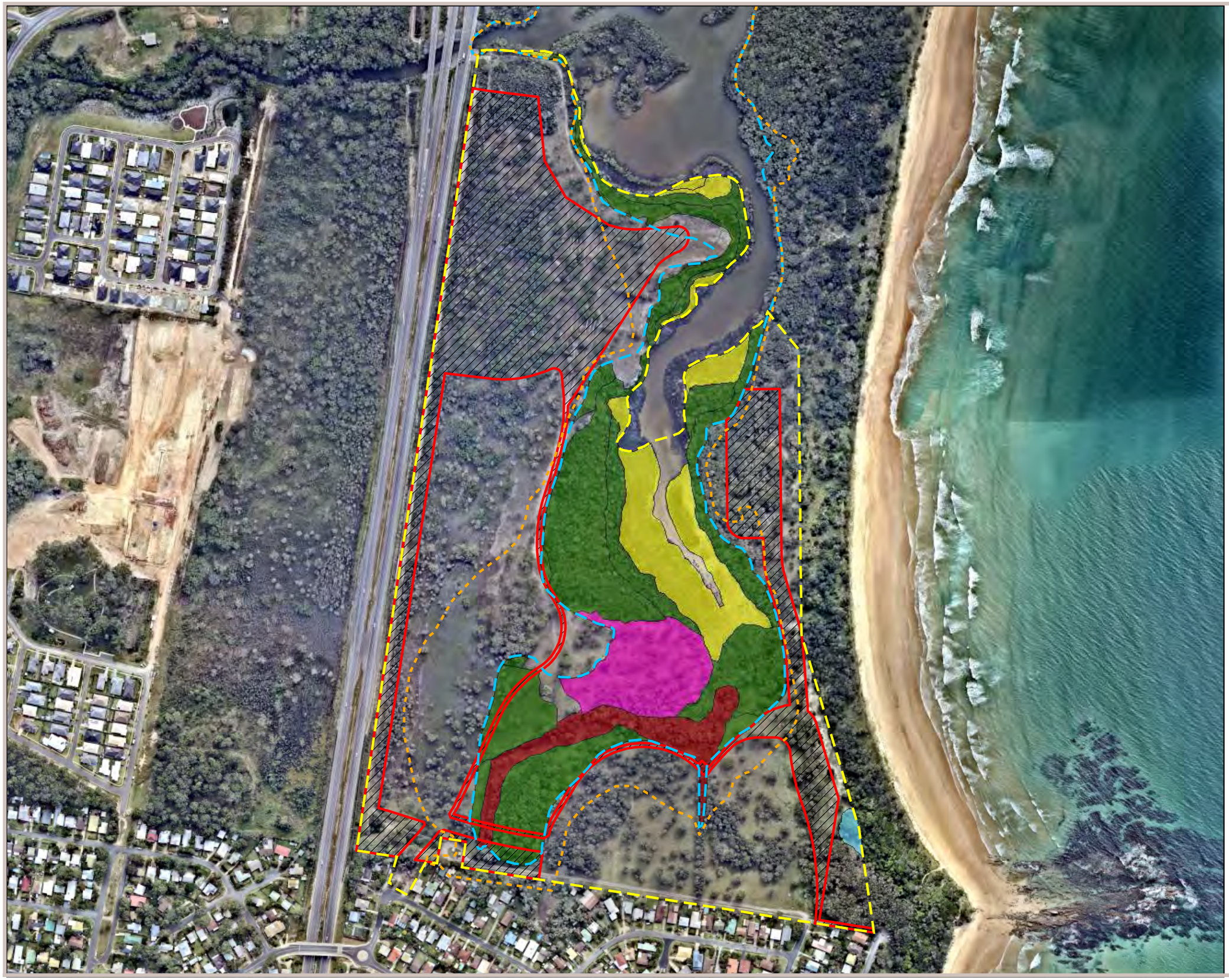

Figure 3.2. Threatened ecological communities within the subject site and study area

Figure 3.3. Hollow-bearing trees within the subject site and study area

Figure 3.4. Threatened fauna species recorded from the subject site and study area

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Chapter 4

Impact Assessment

4.1 Introduction

This chapter discusses the potential impacts of the proposed development in the subject site on the biodiversity values of the study area. Impacts are primarily related to vegetation and habitat removal, with indirect impacts such as increased edge effects and alteration to hydrological regimes, resulting from such impacts. Impacts to TECs and threatened species are also discussed within this chapter.

The impacts of vegetation removal within Stages 3, 4 and the western part of Stage 1 have been approved and offset by the provision of the on-site Conservation Area (now the Regional Park), and impacts of Stage 5 of the proposed development will be offset by the retirement of BioBanking credits within an off-site offset area.

This impact assessment considers the impacts of the project on the remaining components of the proposal, comprising Stage 2, Stage 6 and the eastern section of Stage 1 (the subject site). The subject site is approximately 12.67 ha, however only approximately 9.49 ha of native vegetation within this area will be impacted.

4.2 Direct Impacts

4.2.1 Vegetation Removal

The primary direct impact that would result from the proposed development is the clearing of native vegetation within the subject site – approximately 9.49 ha. Although the subject site is 12.67 ha in size, only 9.49 ha of this contain native vegetation. Clearing is necessary for road construction, housing construction, and bushfire protection (Asset Protection Zones).

Clearing will avoid sensitive habitats such as swamp forest and wetland communities where possible, and and will not extend into the proposed addition to the Regional Park, which is an area of approximately 20.58 ha around Hearnes Lake that will be protected and managed for conservation. This area includes the majority of the area previously included in the Conservation Area in the previous consent.

This addition to the Regional Park will include representative areas of all vegetation types that currently occur, and a number of communities, particularly wetland and floodplain communities are to be protected and conserved in their entirety.

The main impacts of vegetation removal in the subject site will be on Coatal Wallum Swamp Mahogany Siebers Paperbark Forest, Coastal Wallum Baumea Wetland, and Coastal Paperbark Swamp Box Littoral Forest (**Figure 3.1**). However, the majority of each of these communities are to be retained within the Regional Park.

Residual impacts from the clearing of native vegetation (9.49 ha) will be compensated for by the provision of offsite offsets via the purchase and retirement of ecosystem credits (see next chapter for description of offsetting).

Table 4.1 provides a summary of the areas of each vegetation community to be cleared or modified within the subject site. It also shows the proportions of each community to be retained within the Regional Park.

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Table 4.1 Summary of vegetation community areas

Code	PCT Name	EEC (TSC Act)	Study Area	Subject Site		Regional Park	
				Area	% Study Area Cleared	Area	% Study Area Retained
CH_FW04	Coastal Wallum Baumea Wetland	Swamp Sclerophyll Forest of Coastal Floodplains	6.46	0.05	0.80	2.72	42.11
CH_DOF06	Lowlands Swamp Box - Paperbark-Red Gum Dry Forest	Subtropical Coastal Floodplain Forest	2.16	0.00	0.00	2.16	100.00
CH_DOF06	Lowlands Swamp Box - Paperbark-Red Gum Dry Forest - derived open woodland	Subtropical Coastal Floodplain Forest	1.09	0.00	0.00		0.00
CH_SW01	Estuarine Mangrove Forest	Coastal Saltmarsh	0.09	0.00	0.00	0.09	100.00
CH_FRW01	Coastal Paperbark Swamp Oak Floodplain Forest	Swamp Sclerophyll Forest of Coastal Floodplains	3.81	0.31	8.03	1.13	29.54
CH_FRW04	Coastal Paperbark Sedgeland Dominated Forest	Swamp Sclerophyll Forest of Coastal Floodplains	4.89	0.57	11.76	1.31	26.76
CH_FRW04	Coastal Paperbark Sedgeland Dominated Forest - derived open woodland	Swamp Sclerophyll Forest of Coastal Floodplains	1.92	0.19	9.98	0.17	8.75
CH_FRW05	Coastal Paperbark Swamp Box Littoral Forest	Swamp Sclerophyll Forest of Coastal Floodplains	1.88	0.61	32.44	0.40	21.54
CH_DOF08	Coastal Sand Bloodwood-Banksia Forest		1.43	0.66	46.30	0.77	53.70
CH_SW02	Estuarine Twig Rush Saltmarsh	Coastal Saltmarsh	2.73	0.00	0.00	2.73	100.00
CH_FRW02	Coastal Swamp Mahogany Forest	Swamp Sclerophyll Forest of Coastal Floodplains	3.36	1.20	35.67	2.00	59.48
CH_FRW09	Coastal Wallum Swamp Mahogany Siebers Paperbark	Swamp Sclerophyll Forest	11.30	5.84	51.65	1.36	12.01

Table 4.1 Summary of vegetation community areas

Code	PCT Name	EEC (TSC Act)	Study Area	Subject Site		Regional Park	
				Area	% Study Area Cleared	Area	% Study Area Retained
	Forest	of Coastal Floodplains					
CH_FRW10	Swamp Oak Forested Wetland	Swamp Oak Forest	2.02	0.04	2.05	1.29	63.91
CH_FRW11	Estuarine Paperbark Twig-rush Forest	Swamp Sclerophyll Forest of Coastal Floodplains	1.35	0.00	0.00	1.35	100.00
CH_RF07	Coastal Exposed Dune Littoral Rainforest	Littoral Rainforest	0.12	0.00	0.11	0.12	99.89
CH_FW05	Coastal Wallum Paperbark Wet Shrubland	Swamp Sclerophyll Forest of Coastal Floodplains	0.95	0.02	1.85	0.93	98.15
N/A	Derived mixed exotic/native grassland		3.11	0.79	25.47	1.60	51.55
N/A	Open Water		0.46	0.00	0.00	0.46	100.00
TOTAL			49.11	10.28	20.94	20.58	41.90

4.2.2 Habitat Removal

In addition to the clearance of broad habitats within the subject site, a number of specific habitat features will be removed, including:

- Fallen logs, debris and leaf litter;
- Hollow-bearing trees and stags;
- Blossom-producing trees and shrubs; and
- Koala feed trees.

As the study area has previously been cleared, and as there are no controls on collection of firewood, fallen logs occur, but are not abundant. When the extension to the Regional Park is established, representative areas of forest and woodland will accumulate more logs and associated debris and this will produce improvements in habitat quality for ground dwelling fauna.

Hollow bearing trees occur in all of the forest and woodlands of the study area and some will be cleared for development (**Figure 3.3**). A high proportion of the study area has been previously cleared and in such areas tree hollows are rare or absent. Older trees with hollows exist and are concentrated in the north-east and north-west of the study area. Hollows are generally of a small to medium class but would provide roosting habitat for a range of birds, bats, non-flying mammals, reptiles and amphibians.

The highest concentrations of tree hollows occur in the north-west and north-east of the study area in the extension to the Regional Park. As forest ages in the Regional Park, in the long term tree hollows are likely to gradually increase in number and average size.

Some tree species in the study area, including Swamp Paperbark (*Melaleuca quinquenervia*) and Swamp Mahogany (*Eucalyptus robusta*) are notable for producing abundant blossoms in winter. These tree species provide high quality forage for nectarivores including some birds, flying foxes and possums and gliders. Areas of such trees will be cleared for the proposed development; however, broad areas of such trees will be conserved in the Regional Park. Moroever, parts of the Regional Park have experienced past clearing and comprise scattered trees and grassland areas. Areas of additional trees are expected to regenerate and will provide for additional forage trees within the Regional Park in the longer term.

The study area contains Koala feed trees, including two primary browse species Swamp Mahogany (*Eucalyptus robusta*) and Forest Red Gum (*Eucalyptus tereticornis*). As per the discussion about blossom producing trees, areas of Koala feed trees will be retained in the Regional Park and will be conserved long term. Regeneration of such trees will take place in the Regional Park within semi-cleared areas, as explained for blossom producing tree species. However, the study area is not known to support Koalas and it is fragmented by existing developments (Pacific Highway and residential developments) and by Hearnes Lake. Therefore it is unlikely that the Koala will recolonise the study area.

4.3 Impacts to Threatened Ecological Communities

Five TECs, namely Littoral Rainforest, Coastal Saltmarsh, Subtropical Coastal Floodplain Forest, Swamp Sclerophyll Forest and Swamp Oak Floodplain Forest, have been recorded within the study area. Only Swamp Sclerophyll Forest and Swamp Oak Floodplain Forest occur within the subject site and will be directly impacted by the proposed development. The extent of these TECs within the subject site and study area is indicated in **Table 4.2**. The extent of these TECs within the subject site and study area is shown in **Figure 4.1** and **Figure 3.2** respectively**.**. A discussion of the potential impacts to these communities is provided below.

Table 4.2 TECs within the subject site and study area

TEC/Vegetation Community	Study Area (ha)	Subject Site (ha)	% Cleared
Littoral Rainforest	0.12	0	0
Coastal Saltmarsh	2.81	0	0
Subtropical Coastal Floodplain Forest	1.78	0	0
Swamp Sclerophyll Forest	8.69	0.12	1.38
Swamp Oak Forest	1.40	0.02	1.43
Total	**14.8**	**0.14**	**0.95**

4.3.1 Littoral Rainforest

Littoral Rainforest is listed as an EEC under the TSC Act and EPBC Act. This community is a closed forest, the structure and composition of which is strongly influenced by proximity to the ocean.

Littoral Rainforest occupies approximately 0.12 ha on the southeastern extremity of the study area (**Figure 3.2**). It is located upslope on a dune approximately 50 metres from the edge of the proposed development and is part of a larger patch that extends into dune habitat to the east of the study area.

No Littoral Rainforest will be cleared for the proposed development. Furthermore, there is no direct interface between Littoral Rainforest and the subject site, which will minimise indirect impacts to the community. This community will be retained within the Regional Park and managed for conservation in perpetuity.

An Assessment of Significance for this TEC is provided in Appendix F. This concluded the project will not significantly impact upon this community.

4.3.2 Coastal Saltmarsh

Coastal Saltmarsh is listed as an EEC under the TSC Act and the EPBC Act. This community occurs in the intertidal zone on the shores of estuaries and lagoons including when they are intermittently closed along the NSW coast (OEH, 2017c).

Coastal Saltmarsh occupies approximately 2.81 ha within the study area. No saltmarsh is proposed to be cleared for the proposed development. Furthermore, there is no direct interface between Coastal Saltmarsh and the subject site, which will minimise the risks of indirect impacts to the community.

Saltmarsh only occurs within a narrow range of conditions and is dependent upon salinity and tidal influence to exist. It is sensitive to changes to the salt and nutrient composition of runoff and also to the volume of freshwater runoff from surrounding land. Currently, livestock have direct access to Hearnes Lake foreshore and saltmarsh communities and are a threat to this community due to trampling, nutrient enrichment and grazing.

Notwithstanding the above, if unmitigated, indirect impacts such as unregulated stormwater runoff from the proposed development could degrade the Coastal Saltmarsh communities around the lake. For this reason, a range of mitigation measures has been developed. A Stormwater Management Plan has been developed for the proposed development to mitigate the impacts of the proposed development on hydrological regimes (see **Chapter 5**). Furthermore, the area of Coastal Saltmarsh will be located wholly within the Regional Park, and will benefit from a range of management actions that will be undertaken to improve its condition and extent in the study area, including weed management and exclusion of livestock.

An Assessment of Significance for this TEC is provided in **Appendix F**. This concluded that with the implementation of the proposed mitigation measures the project will not significantly impact upon this community.

4.3.3 Subtropical Coastal Floodplain Forest

Subtropical Coastal Floodplain Forest is listed as an EEC under the TSC Act. This community is associated with clay-loams and sandy loams, on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains (NSW Scientific Committee, 2004a).

Subtropical Coastal Floodplain Forest occupies 1.78 ha of the study area. The quality of this community within the study area varies based upon species composition, structural formation and amount of disturbance. It is currently subject to livestock grazing and is not managed for conservation.

No area of this community is proposed to be cleared. There is no direct interface between Subtropical Coastal Floodplain Forest and the subject site, which minimised indirect impacts to the community.

As this community is dependent on particular hydrological processes, alteration to the hydrology within the study area is likely to have follow on impacts to the community. A Regional Park Management Plan and a Stormwater Management Plan have been developed for the proposed development to mitigate potential indirect impacts of the project on this forest.

An Assessment of Significance for this TEC is provided in **Appendix F**. This concluded the project will not significantly impact upon this community.

4.3.4 Swamp Sclerophyll Forest

Swamp Sclerophyll Forest is listed as an EEC under the TSC Act. This community is associated with humic clay loams and sandy loams, on waterlogged or periodically inundated alluvial flats and drainage lines associated with coastal floodplains (NSW Scientific Committee, 2004c).

Of the communities recorded within the study area, the portions of seven vegetation communities occurring below the 100 year flood line correspond to this EEC. Swamp Sclerophyll Forest occupies approximately 8.69 ha of the study area and most is within the Regional Park.

The quality of this forest community within the study area varies based upon species composition, structural formation and amount of disturbance. It is currently subject to livestock grazing and is not managed for conservation. It has also been impacted by a drainage channel cut through the southern portion of the subject site.

Approximately 0.12 ha is proposed to be cleared within the subject site, representing a loss of approximately 1.38% of the community within the study area. The remaining area of this TEC within the study area will be retained.

As a result of the proposed development, there will be interfaces between the subject site and the retained portions of Swamp Sclerophyll Forest in the Regional Park. These portions of the community have the potential to be indirectly impacted by the proposed development. Clearing of vegetation at this interface will increase edge effects on the retained portion of Swamp Sclerophyll Forest and as a result, the community may be impacted by altered microclimates, weed invasion and soil erosion. As this community is dependent on particular hydrological processes, alteration to the hydrology within the study area is likely to have follow on impacts to the community. A Stormwater Management Plan has been developed for the proposed development to mitigate the impacts of the proposed development on hydrological regimes.

An Assessment of Significance for this TEC is provided in **Appendix F**. This concluded the project will not significantly impact upon this community.

4.3.5 Swamp Oak Floodplain Forest

Swamp Oak Floodplain Forest is listed as an EEC under the TSC Act. This community is 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 (NSW Scientific Committee, 2004b).

Of the communities recorded within the study area, the portions of Swamp Oak Forested Wetland (CH_FRW10) occurring below the 100 year flood line correspond to this EEC. Swamp Oak Floodplain Forest occupies approximately 1.4 ha of the study area, most of which is in the Regional Park.

The quality of this community within the study area varies based upon species composition, structural formation and amount of disturbance. Approximately 0.02 ha is proposed to be cleared within the subject site, representing a loss of 1.43% of the community within the study area. The remaining extent within the study area will be retained.

As a result of the proposed development, there will be interfaces between the subject site and the retained portions of Swamp Oak Floodplain Forest. These portions of the community have the potential to be indirectly impacted by the proposed development. Clearing of vegetation at this interface will increase edge effects on the retained portion of Swamp Oak Floodplain Forest and as a result, the community may be impacted by altered microclimates, weed invasion and soil erosion. A Regional Park Management Plan will be prepared to provide for the long term management of this and other communities that are to be retained within the study area.

As this community is dependent on particular hydrological processes, alteration to the hydrology within the study area is likely to negatively impact the community. A Stormwater Management Plan has been developed for the proposed development to mitigate the impacts of the proposed development on hydrological regimes.

An Assessment of Significance for this TEC is provided in **Appendix F**. This concluded the project will not significantly impact upon this community.

4.4 Impacts to Flora Species

4.4.1 General

The project has the potential to result in a number of direct and indirect impacts to flora species within the study area. In addition to the direct removal and modification of vegetation within the subject site, potential indirect impacts to flora species include:

- Weed invasion;
- Run-off, erosion and sedimentation; and
- Modification of microhabitat features resulting from long and short-term edge effects (e.g. changes in light filtration).

A number of mitigation measures are proposed to minimise these impacts. These are discussed further in **Chapter 5**.

4.4.2 Threatened Species

No threatened flora species, listed under the TSC Act or EPBC Act have been recorded from the study area. Although some potential habitat for some threatened flora species occurs in the study area, there are no local records of these species and due to the high degree of disturbance in the subject site, they are not considered likely to occur. The majority of the better quality habitat for threatened flora species in the study area will be retained in the Regional Park.

Accordingly, the proposed development is therefore not considered to result in a significant impact to threatened flora species.

4.5 Impacts to Fauna Species

Several threatened fauna species have been recorded or are assumed to occur within the study area as discussed in **Section 3.6.1** and may be directly or indirectly impacted by the proposal. These include amphibians, wetland birds, raptors, and microchiropteran bats.

The proposal will remove approximately 9.49 ha of habitat in the subject site, with large areas to be retained and managed for biodiversity within the Regional Park. In addition, impacts to fauna species will be mitigated by the sourcing and retiring BioBanking credits in offsite offset sites.

The Regional Park will retain 20.58 ha of native vegetation, representing all vegetation communities (and so faunal habitats) that currently occur. Moreover, land management will change from the current livestock grazing, which degrades fauna habitats, to conservation, which will entail regeneration of fauna habitats.

The subject site is currently not managed for conservation and is grazed by livestock. Livestock have direct access to all vegetation of the site and the Hearnes Lake foreshore. Livestock grazing is a threat to the integrity of most native vegetation. There is also no active management of weeds, feral animals or firewood collection on site. Therefore, under existing land usage, there are a range of ongoing harmful impacts to flora and fauna.

The potential impacts of the project on the threatened fauna species recorded or with potential to occur are discussed in more detail in subsequent subsections. For the purposes of this assessment, fauna species with similar habitat requirements are considered together.

4.5.1 Wallum Froglet

The Wallum Froglet has been recorded within the study area. Conacher Environmental Group (2008) observed the species within the Stage 4 and Stage 5 components of the proposed development as well as within the Regional Park. Suitable foraging and breeding habitat occurs within the study area.

Approximately 9.49 ha of suitable habitat for this species will be removed within the subject site. This is considered to be a relatively small area of habitat for this species and a significant proportion of the habitat will be retained in the Regional Park. Large areas of

similar habitat occur outside the study area that is expected to remain. Furthermore, additional offsite offsets will be provided for the habitats to be removed, as outlined in Chapter 5.

An assessment of significance has been conducted for this species and is presented in Appendix F. This assessment indicates that with the implementation of the mitigation and compensation measures proposed, no significant impact is predicted to occur to the Wallum Froglet as a result of the proposed development.

4.5.2 Raptors

The Eastern Osprey and the White-bellied Sea Eagle are large raptors that forage over large bodies of water. Both the White-bellied Sea-eagle and Eastern Osprey have previously been recorded within the study area and wider locality. A nesting pair of Eastern Osprey was also observed nesting within a dead tree approximately 125m west of the study area across the Pacific Highway during surveys conducted in August 2004 (Conacher Environment Group (2008c)).

These species are likely to utilise the woody vegetation within the study area as part of a much larger foraging range, including Hearns Lake. The study area also contains potential breeding habitat.

Approximately 9.49 ha of suitable habitat for these species will be removed within the subject site. This is considered to be a relatively small area of habitat for these wide ranging species and a large proportion the habitat in the study area will be retained in the Regional Park. Large areas of similar habitat occur outside the study area that is expected to remain. Furthermore, additional offsite offsets will be provided for the habitats to be removed, as outlined in **Chapter 5**.

An assessment of significance has been conducted for these species and is presented in **Appendix F**. This assessment indicates that with the implementation of the mitigation and compensation measures proposed, no significant impact is predicted to occur to these species as a result of the proposed development.

4.5.3 Glossy-black Cockatoo

The Glossy-black Cockatoo is likely to utiise the study area on occasion as part of a larger foraging range. Evidence of foraging by this species (chewed *Allocasuarina* cones) has been detected in the open forest of the north western portion of the study area. It is likely that this species would forage across other stands of *Allocasuarinas* within the study area. Nesting habitat is present within the study area in the form of large hollows.

Approximately 0.02 ha of suitable habitat for this species will be removed within the subject site, in areas of Swamp Oak Forest. This is considered to be a relatively small area of habitat for this species and the majority of the habitat will be retained in the Regional Park. Large areas of similar habitat occur outside the study area that is expected to remain. Furthermore, additional offsite offsets will be provided for the habitats to be removed, as outlined in **Chapter 5**.

An assessment of significance has been conducted for this species and is presented in **Appendix F**. This assessment indicates that with the implementation of the mitigation and compensation measures proposed, no significant impact is predicted to occur to the Glossy-black Cockatoo as a result of the proposed development.

4.5.4 Wetland Birds

Two wetland birds, the Black-necked Stork and the Caspian Tern have been recorded from the study area(Conacher Environment Group (2008c)). Foraging habitat for these species is likely to be present in the wetlands and shoreline of Hearnes Lake.

Approximately 9.49 ha of suitable habitat for these wetland bird species will be removed within the subject site. This is considered to be a relatively small area of habitat for these species and the majority of the habitat will be retained in the Regional Park. Large areas of similar habitat occur outside the study area that is expected to remain. Furthermore, additional offsite offsets will be provided for the habitats to be removed, as outlined in **Chapter 5**.

An assessment of significance has been conducted for these species and is presented in **Appendix F**. This assessment indicates that with the implementation of the mitigation and compensation measures proposed, no significant impact is predicted to occur to the Black-necked Stork and the Caspian Tern as a result of the proposed development.

4.5.5 Fruit Doves

Two fruit doves have been recorded from the locality and have potential habitat in the study area; The Wompoo Fruit-dove and the Rose-crowned Fruit-dove. Neither species has been recorded from the study, however available habitat includes littoral rainforest in the eastern portion of the study area and they have potential to forage and breed within these parts of the study area.

No habitat for these species will be removed within the subject site, and all the rainforest habitats will be retained within the Regional Park. Large areas of similar habitat occur outside the study area that is expected to remain.

An assessment of significance has been conducted for these species and is presented in **Appendix F**. This assessment indicates that no significant impact is predicted to occur to the Wompoo Fruit-dove and the Rose-crowned Fruit-dove as a result of the proposed development.

4.5.6 Owls

Three large forest owls have been recorded from the locality and have potential to occur in the study area due to the presence of suitable habitat: the Sooty Owl, the Powerful Owl and the Masked Owl. None of these species has been recorded from the study area, however potential habitat is present in the forested reserve to the north-east of the study area that contains relatively undisturbed littoral rainforest. Although potential foraging and roosting

habitat is present, hollows suitable for breeding are unlikely to occur within the limited rainforest within the study area.

Approximately 9.49 ha of suitable habitat for these species will be removed within the subject site. This is considered to be a relatively small area of habitat for these species and the majority of the habitat will be retained in the Regional Park. Large areas of similar habitat occur outside the study area that is expected to remain. Furthermore, additional offsite offsets will be provided for the habitats to be removed, as outlined in **Chapter 5**.

An assessment of significance has been conducted for these species and is presented in **Appendix F**. This assessment indicates that with the implementation of the mitigation and compensation measures proposed, no significant impact is predicted to occur to the the Sooty Owl, the Powerful Owl and the Masked Owl as a result of the proposed development.

4.5.7 Grey-headed Flying-fox

The Grey-headed Flying-fox has been recorded flying over the study area. The subject site contains suitable foraging habitat for this species and it is likely to utilise habitat across the forested parts of the subject site periodically as part of a much wider foraging range. No camps or roost sites are present within the study area.

Approximately 9.49 ha of suitable habitat for this species will be removed within the subject site. This is considered to be a relatively small area of habitat for this species and the majority of the habitat will be retained in the Regional Park. Large areas of similar habitat occur outside the study area that is expected to remain. Furthermore, additional offsite offsets will be provided for the habitats to be removed, as outlined in **Chapter 5**.

An assessment of significance has been conducted for this species and is presented in **Appendix F**. This assessment indicates that with the implementation of the mitigation and compensation measures proposed, no significant impact is predicted to occur to the Grey-headed Flying-fox as a result of the proposed development.

4.5.8 Microchiropteran Bats

Several threatened microchiropteran bats have potential habitat in the study area: the Yellow-bellied Sheathtail-bat; Eastern Freetail-bat, Little Bentwing-bat, Southern Myotis and The Greater Broad-nosed Bat. Of these species, two have been recorded from the study area; the Greater Broad-nosed Bat, and the Eastern Free-tail Bat. Due to the potential habitat present in the study area, the remaining two (Little Bentwing-bat, Southern Myotis and Yellow-bellied Sheathtail-bat) have been assessed as occurring as a precautionary measure.

Available habitat for these species includes woody vegetation for foraging and hollow-bearing trees for roosting. Although they are likely to forage and roost within the study area, it is unknown if breeding occurs.

Approximately 9.49 ha of suitable habitat for these species will be removed within the subject site. This is considered to be a relatively small area of habitat for these species and the

majority of the habitat will be retained in the Regional Park. Large areas of similar habitat occur outside the study area that is expected to remain. Furthermore, additional offsite offsets will be provided for the habitats to be removed, as outlined in **Chapter 5**.

An assessment of significance has been conducted for these microchiropteran bat species and is presented in **Appendix F**. This assessment indicates that with the implementation of the mitigation and compensation measures proposed, no significant impact is predicted to occur to the microchiropteran bats as a result of the proposed development.

4.6 Indirect Impacts

In addition to the potential impacts to habitat, TECs and threatened fauna species, additional indirect impacts from the residential development could degrade vegetation to be retained within the Regional Park. These impacts include:

- Habitat fragmentation - affects biodiversity by reducing the amount of available habitat for some species to occupy due to increased distances between habitat patches;
- Edge effects – affects biodiversity through microclimatic changes in light, temperature, humidity and wind, which can favour a suite of different species and therefore cause significant changes to the ecology of the patch (Lindenmayer and Fischer, 2006);
- Alteration to hydrological regimes – affects biodiversity through modification of hydrology necessary for vegetation and habitat survival, such as surface water drainage patterns;
- Increased sedimentation and erosion – affects biodiversity through the smothering of vegetation, increasing turbidity of waterways and transportation of weed matter and nutrients.
- Weeds and feral animals – affects biodiversity through predation and increased competition for habitat resources.

These potential indirect impacts and appropriate mitigation measures are discussed further below. With the implementation of the proposed mitigation measures, these impacts are not considered likely to be significant.

4.6.1 Habitat Fragmentation

Fragmentation is the process where habitats that were once continuous become divided into separate fragments isolated from each other by non-forest land (Primack, 1993; Fahrig, 2003; Lindenmayer and Fischer, 2006). Habitat fragmentation affects biodiversity by reducing the amount of available habitat for some species to occupy due to increased distances between habitat patches. Plants and other sessile organisms are usually directly removed, while mobile animals (especially birds and mammals) may retreat into other remnant patches of habitat (Lindenmayer and Fischer, 2006). The displacement of mobile

fauna can reduce the survivorship of species in the case where there are limited areas of sufficiently large habitat within dispersal distance to retreat to.

The study area has already suffered clearing and habitat fragmentation. The Pacific Highway cuts habitats on site off from habitats further west. Existing residential development immediately to the south cuts off much of the habitat on site from southerly habitat areas. Furthermore, the vegetation of the subject site has been impacted by clearing for agriculture and sand mining, and for digging a channel connecting from the south to Hearnes Lake.

The main area of connection is via the vegetation retained on coastal dunes further south. Hearnes Lake forms a natural barrier to some species and beyond that to the north there exists further development (**Figure 1.1**). On the dunes and lake foreshores immediately north east of the study area there is a large area of relatively undisturbed native vegetation that habitat on site is directly connected to.

The proposed development will remove some of the more disturbed and less connected habitats from the subject site. This will add to habitat loss and fragmentation in the locality. However, across 20.58 ha of the study area native vegetation will be retained within the Regional Park. This will include connected and representative areas of all types of native vegetation that currently occur on the subject land.

4.6.2 Edge Effects

Edge effects are impacts that occur at the interface between natural habitats, especially forests and disturbed or developed land (Yahner, 1988). When an edge is created between woodland and a cleared area, changes to ecological processes within the vegetation can extend between 10 m and 100 m from the edge (Yahner, 1988). These include microclimatic changes in light, temperature, humidity and wind, which can favour a suite of different species and therefore cause significant changes to the ecology of the patch (Lindenmayer and Fischer, 2006). Edge effects can also result from the increase in noise and artificial light from the project.

The proposed development will result in edge effects where vegetation is cleared or modified adjacent to retained vegetation. Numerous edges currently exist within the study area as a result of previous clearing, current land uses and modifications to vegetation immediately surrounding the study area. Retained vegetation within the study area is proposed to be managed, which includes mitigation of impacts from edge effects.

4.6.3 Alteration to Hydrological Regimes

The native vegetation of the study area forms a mosaic of communities that are zoned in relation to topography and water availability. All native vegetation is sensitive to alterations to the quantity and quality of runoff.

'Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands' is recognised as a major factor contributing to the loss of biological diversity and ecological function in aquatic ecosystems, including floodplains (NSW Scientific Committee,

2002). Potential impacts identified within the determination of this KTP that are relevant to the Project include:

- Riparian zone degradation through altered flow patterns;
- Increased habitat for invasive species; and
- Loss or disruption of ecological function.

The modification of hydrology necessary for habitat survival, such as surface water drainage patterns, can impact the retained habitats. Changes to the hydrological regime of waterways can affect the integrity, structure and composition of habitat and thus, have secondary impacts on the species that rely on them.

When native vegetation is cleared and replaced by urban development, there is the potential for altered quantity and quality of runoff. Additional hard surfaces such as roads reduce water infiltration and direct more water into gullies and streams. Water draining from urban developments can also carry more nutrients and pollutants.

Storm water management will be crucial to manage the integrity of the vegetation to be retained within the Regional Park. For this reason a detailed Stormwater Management Plan has been prepared. This is discussed in more detail in the next chapter.

The proposed development will be located in the relatively more cleared areas of the study area that have been the most modified by past clearing. Other portions of the Regional Park have also been modified but are expected to regenerate following removal of livestock. As vegetation density increases in the Regional Park via regeneration, it will be capable of providing a more effective buffer that can absorb altered runoff before it reaches the most sensitive receiving vegetation: the wetland communities around Hearnes Lake. Therefore in addition to the measures in the Stormwater Management Plan, vegetation regeneration in the Regional Park will contribute to lessen impacts from runoff from new urban areas.

4.6.4 Sedimentation and Erosion

During the construction of the proposed project the retained vegetation can be impacted by sedimentation and erosion. Eroded sediment can smother retained vegetation if appropriate control measures are not implemented. Smothering can cause dieback of herbs and shrubs and reduce regeneration of groundcover species. Sediment and eroded material can also contain weed matter and nutrients, and movement of this material into the retained vegetation can facilitate the spread of weeds. Increased weed invasion can result in changes to community composition.

These impacts are expected to be able to be appropriately managed with the implementation of the mitigation measures outlined in **Section 5.2.5**.

4.6.5 Weeds and Feral Animals

Alterations to habitat conditions often favour introduced and/or hardy native plant and animal species that can proliferate in disturbed conditions. Such species have potential to impact

upon the original local native plant and animal species. Weeds such as exotic grasses and other introduced plants have potential to outcompete regenerating native plant species. Exotic flora species currently occur within the disturbed portions of the study area. Feral animals such as foxes, rabbits and some species of birds can also breed in the more open areas following clearance of forest and woodland. They can cause problems for native fauna species by preying upon them or by competing with them for food and resources. With the implementation of the Regional Park Management Plan, it is expected that these impacts will be able to be appropriately mitigated (see **Section 5.2.2**)

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Figure 4.1. Impacts to threatened ecological communities in the subject site

Chapter 5

Avoidance, Mitigation and Offset Measures

5.1 Avoidance Measures

A number of development designs for the study area have been proposed since the project sought concept plan approval. As there is a near continuous cover of native vegetation within the study area, any development on the land is unable to avoid impacts to flora and fauna habitats. However, some avoidance has been achieved where possible via modification of the design and location of the subject site.

Key avoidance measures undertaken during design of the proposed development specific to biodiversity values within the study area include:

- Positioning of the development within previously cleared land, thus reducing the impacts to woodland habitats; and
- Positioning of the development to avoid removal of TEC vegetation as far as practicable.

The proponent will endeavour to achieve further avoidance of biodiversity impacts beyond that described during the detailed design and construction phases of the proposed development.

5.2 Mitigation Measures

A range of mitigation measures are proposed to be implemented for the proposed development to minimise the impacts to biodiversity values relevant to the subject site. The mitigation measures developed for the proposed development are primarily related to reducing impacts to vegetation and habitat within the study area. Specific details of a number of the mitigation measures will be contained within the Regional Park Management Plan (RPMP).

5.2.1 Regional Park

One of the key mitigation measures for the project is the retention of the majority of the native vegetation in the study area within the area to be added to the Regional Park. The Regional Park comprises the majority of the extent of a previously identified Conservation Area that was a requirement of the Concept Plan Approval to address the impacts from the

approved Stage 1 (western portion), Stage 3 and Stage 4 components of the proposed development. That notwithstanding, the addition to the Regional Park is relevant to the current proposal to develop the subject site. In the context of the large areas of habitat being retained and managed for conservation in the Regional Park, the relatively small additional areas proposed to be developed in the subject site are not considered to be significant.

The Regional Park comprises a total of 20.58 ha of land which comprises the residual land within the study area outside of the subject site. The Regional Park is located on low lying vegetation surrounding Hearns Lake and it will provide a buffer between the development and Hearns Lake. This area will provide a relatively large area of wetland habitat for a wide range of fauna, in particular migratory wetland birds. The Regional Park contains all the TECs recorded from the study area, and they will be managed for conservation in perpetuity in accordance with a Regional Park Management Plan (see below).

5.2.2 Regional Park Management Plan

In order to provide a framework for the implementation of biodiversity management measures within the Regional Park, a RPMP will be developed for the proposed development. The RPMP will ensure that the proposed development's conservation objectives for the retained vegetation within the study area are met. Biodiversity management of the Regional Park is expected to result in an increase of the biodiversity values within this area. The RPMP will prescribe a range of management measures including:

- Rehabilitation of degraded areas;
- Weed control;
- Feral dog and cat control;
- Access management;
- Protection of threatened species;
- Protection of TECs;
- Creek bank erosion management; and
- Bushfire hazard management.

5.2.3 Vegetation Protection

To avoid unnecessary removal or damage to the EECs Littoral Rainforest, Costal Saltmarsh, Subtropical Coastal Floodplain, Swamp Sclerophyll Forest and Swamp Oak Floodplain Forest in the Regional Park, the clearing area should be clearly demarcated and signed, where appropriate, to ensure no vegetation beyond these boundaries is removed. Clearing works and equipment should be excluded from areas outside the clearing area. Site

inductions are to be given by the civil contractor to ensure all site workers and visitors are aware of any no-access areas.

Where possible, native canopy species should be retained when considering building envelopes as these trees will help maintain connectivity of habitat. These large trees provide foraging resources for a range of native fauna. Within the development footprint, the future resident housing envelopes will endeavour to retain existing native vegetation where possible.

5.2.4 Stormwater Management Plan

In order to mitigate the potential impacts of stormwater from the developed areas, a Stormwater Management Plan has been developed. The plan specifically addresses both stormwater runoff and quality. The stormwater discharging from the proposed development will be conveyed via roadside bioretention swales and discharged into Hearnes Lake, consistent with current stormwater disposal. A water quality system consisting of rainwater tanks, bioretention swales and gross pollutant traps has been modelled to improve water quality runoff discharging from the proposed development. Such measures are expected to successfully protect flora and fauna habitats around the lake.

5.2.5 Erosion, Sedimentation and Pollution Control

Potential impacts to flora, fauna and their habitats occurring in the construction phase that can be managed include: run-off, sedimentation, erosion and pollution. To reduce sedimentation on the construction site, erosion control measures should be implemented. This includes minimising the amount of exposed soils on the site at any given time. All soil stockpiles should be adequately covered when not in use to prevent erosion from heavy rainfall. Sediment fences should be established around the perimeter of the development area to prevent the impacts of sedimentation on the adjoining vegetation. During development, precautions should be taken to ensure that no pollution, such as petrochemical substances or water containing suspended solids, escapes the construction site. Pollution traps and efficient removal of pollution to an off-site location would help to minimise pollution impacts.

5.2.6 Pre-clearing and Clearing Surveys

Pre-clearing surveys are to be undertaken by a suitably qualified ecologist. Pre-clearing surveys will include:

- Demarcation of key habitat features as hollow-bearing trees, fallen logs, bushrock and native fauna burrows; and
- Provision of a report following the completion of a pre-clearing survey, detailing the location and type of each habitat feature.

To minimise impacts to native fauna species, clearing should be undertaken in the following two-stage process under the supervision of a suitably qualified ecologist:

- The initial phase of clearing will involve clearing around identified habitat features and leaving the features overnight;
- The second stage will involve clearing of the habitat features left overnight followed by an inspection

An ecologist should be present while clearing if required to rescue animals that may potentially be injured during the clearance operation. Provisions will be made to protect any native fauna during clearing activities by the following means:

- All persons working on the vegetation clearing will be briefed about the possible fauna present and should avoid injuring any present;
- Animals disturbed or dislodged during the clearance but not injured should be assisted to move to the adjacent bushland; and
- If animals are injured during the vegetation clearance, appropriate steps will be taken to humanely treat the animal and if required it will be taken to the nearest veterinary clinic for treatment.

5.3 Biodiversity Offsets

The majority of habitats in the study area, including the majority of TEC vegetation will be conserved within the Regional Park. The Regional Park provides for a conservation outcome that has been considered to address the impacts of Stages 1, 3 and 4 under the Concept Plan approval process. As a condition of approval for the Concept Plan, Stage 5 requires off site biodiversity offsetting.

Approximately 9.49 ha of additional native vegetation is proposed to be cleared from the subject site for the remaining Part Stage 1 and Stages 2 and 6 of the Concept Plan. This vegetation is proposed to be offset via offsite biodiversity offsetting according to the BBAM.

The quantum of offsets has been calculated via the BBAM methods and a full BBAM report has been provided within **Appendix G**. Offsets will include retirement of biodiversity credits, including the "ecosystem credits" listed in **Table 5.1** below. A total of 527 ecosystem credits will be retired to compensate for the residual impacts of the project.

Table 5.1 Ecosystem Credits to be Acquired and Retired as an Offset for Part Stage 1, and Stages 2 and 6 of the Concept Plan

Vegetation Description	EEC	Area (ha)	Ecosystem Credits
Coastal Wallum Baumea Wetland	Swamp Sclerophyll Forest of Coastal Floodplains	0.05	2
Coastal Paperbark Swamp Oak Floodplain Forest	Swamp Sclerophyll Forest of Coastal Floodplains	1.68	96.09

Table 5.1 Ecosystem Credits to be Acquired and Retired as an Offset for Part Stage 1, and Stages 2 and 6 of the Concept Plan

Vegetation Description	EEC	Area (ha)	Ecosystem Credits
Coastal Sand Bloodwood-Banksia Forest	N/A	0.66	23
Coastal Wallum Swamp Mahogany Siebers Paperbark Forest	Swamp Sclerophyll Forest of Coastal Floodplains	7.04	403
Estuarine Paperbark Twig-rush Forest	Swamp Oak Floodplain Forest	0.04	2.29
Coastal Wallum Paperbark Wet Shrubland		0.02	1
TOTAL		**9.49**	**527**

Chapter 6

Conclusion

The proposed development will occupy approximately 12.67 ha of the study area. Approximately 9.49 ha of nativevegetation will be removed, and this will mean some impacts to some TECs and threatened species.

However, recent updated vegetation mapping indicates that the majority of the vegetation in the subject site does not constitute a TEC as it is located above the 1:100 year flood level which is a key determinant of the EECs that occur in the study area (Swamp Sclerophyll Forest, Subtropical Coastal Floodplain Forest and Swamp Oak Floodplain Forest). The proposal avoids the most intact vegetation remnants and would entail retention of a large proportion of the native vegetation that currently exists within the Regional Park (20.58 ha), thus providing a substantial buffer to Hearnes Lake. The proposal also entails substantial mitigation measures including the RPMP and the Stormwater Management Plan.

An additional 9.49 ha of native vegetation in Stages 1, 2, and 6 will be impacted in addition to that approved by the Concept Plan approval. These impacts will be offset by the acquisition of offsite offsets. A total of 527 BioBanking credits will be retired to compensate for the residual impacts of the proposed development.

With the conservation and management of the majority of the high value vegetation in the study area within the Regional Park, and the acquisition of appropriate offsite offsets, no significant impact is likely to threatened flora and fauna listed either by the State TSC Act or the Commonwealth EPBC Act.

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Appendix A

Flora Species List

Table A.1 Flora species list

Family	Scientific Name	Common Name	E/N	CT 2006	CEG 2008	CE 2017
Acanthaceae	*Avicennia marina*	Grey Mangrove	N			X
Acanthaceae	*Hygrophila polysperma*	Indian Swampweed	E			X
Acanthaceae	*Pseuderanthemum variabile*	Pastel Flower	N	X	X	
Acanthaceae	*Thunbergia alata*	Black-eyed Susan	E	X		
Adoxaceae	*Viburnum odoratissimum*	Sweet Viburnum	E			X
Agavaceae	*Yucca aloifolia*	-	E	X		
Alismataceae	*Alisma plantago-aquatica*	Water Plantain	N			X
Amaranthaceae	*Alternanthera denticulata*	Lesser Joyweed	N	X	X	
Amaryllidaceae	*Crinum pedunculatum*	Swamp Lily	N	X		X
Anthericaceae	*Caesia parviflora var. parviflora*	Pale Grass Lily	N	X	X	
Anthericaceae	*Chlorophytum comosum*	Spider Plant	E	X	X	
Anthericaceae	*Thysanotus tuberosus*	Fringed Lily	N	X	X	
Anthericaceae	*Tricoryne elatior*	Yellow Rush Lily	N	X	X	
Apiaceae	*Apium prostratum var. filiforme*	Sea Celery	N			X
Apiaceae	*Centella asiatica*	Swamp Pennywort	N	X	X	X
Apiaceae	*Ciclospermum leptophyllum*	Slender Celery	E	X	X	
Apiaceae	*Foeniculum vulgare*	Fennel	E	X	X	
Apiaceae	*Hydrocotyle bonariensis*	Kurnell Curse / Pennywort	E	X	X	X
Apiaceae	*Hydrocotyle peduncularis*	Pennywort	N	X	X	
Apiaceae	*Hydrocotyle tripartita*	Pennywort	N			X
Apiaceae	*Hydrocotyle verticillata*	Shield Pennywort	N			X
Apiaceae	*Trachymene incisa subsp.incisa*	Native Parsnip	N	X		
Apocynaceae	*Asclepias curassavica*	Red-head Cotton Bush	E			X
Apocynaceae	*Gomphocarpus physocarpus*	Balloon Cotton Bush	E			X
Apocynaceae	*Marsdenia rostrata*	Milk Vine	N			X
Apocynaceae	*Nerium oleander*	Oleander Bush	E	X		
Apocynaceae	*Nerium oleander*	Oleander	E			X
Apocynaceae	*Parsonsia straminea*	Common Silkypod	N			X
Apocynaceae	*Parsonsia straminea*	Common Silkpod	N	X	X	
Apocynaceae	*Vinca major*	Blue Periwinkel	E	X		

Table A.1 Flora species list

Family	Scientific Name	Common Name	E/N	CT 2006	CEG 2008	CE 2017
Araceae	*Syngonium podophyllum*	Arrowhead Vine	E			X
Araliaceae	*Polyscias elegans*	Celery Wood	N			X
Araliaceae	*Polyscias elegans*	Celery Wood	N	X		
Araliaceae	*Polyscias sambucifolia*	Elderberry Panax	N	X	X	
Araliaceae	*Schefflera actinophylla*	Umbrella Tree	N	X		
Araucariaceae	*Araucaria cunninghamii*	Hoop Pine	N	X		X
Arecaceae	*Archontophoenix cunninghamiana*	Bangalow Palm	N	X	X	X
Arecaceae	*Phoenix reclinata*	Senegal Date Palm	E			X
Asclepidaceae	*Gomphocarpus fruiticosus*	Narrow Leaf Cotton Bush	E	X	X	
Asparagaceae	*Asparagus aethiopicus*	Asparagus Fern	E	X	X	X
Asparagaceae	*Asparagus plumosus*	Climbing Asparagus Fern	E	X		X
Asteliaceae	*Baccharis halimifolia*	Groundsel Bush	E	X	X	
Asteliaceae	*Cordyline stricta*	Narrow-leaf Palm Lily	N	X	X	
Asteliaceae	*Ageratina adenophora*	Crofton Weed	E	X		
Asteliaceae	*Ageratum houstonianum*	Blue Billygoat Weed	E			X
Asteraceae	*Ambrosia artemisiifolia*	Annual Ragweed	E	X	X	
Asteraceae	*Aster subulatus*	Wild Aster	E	X	X	X
Asteraceae	*Baccharis halimifolia*	Groundsel Bush	E			X
Asteraceae	*Bidens pilosa*	Cobbler's Pegs	E	X		X
Asteraceae	*Calyptocarpus vialis*	Creeping Cinderella Weed	E			X
Asteraceae	*Chrysanthemoides monilifera subsp. monilifera**	Bitou Bush	E	X	X	X
Asteraceae	*Cirsium vulgare*	Spear Thistle	E	X		X
Asteraceae	*Conyza albida*	Fleabane	E	X	X	
Asteraceae	*Conyza bonariensis*	Flax-leaf Fleabane	E	X	X	
Asteraceae	*Conyza canadensis*	Canadian Fleabane	E			X
Asteraceae	*Eclipta platyglossa*	-	N	X		
Asteraceae	*Gamochaeta calviceps*	Silky Cudweed	E			X
Asteraceae	*Hypochaeris radicata*	Flatweed	E	X	X	
Asteraceae	*Lagenifera stipitata*	-	N	X	X	
Asteraceae	*Lagenophora gracilis*	Slender Lagenophora	E			X

Table A.1 Flora species list

Family	Scientific Name	Common Name	E/N	CT 2006	CEG 2008	CE 2017
Asteraceae	*Leptinella longipes*	-	N	X		
Asteraceae	*Ozothamnus diosmifolius*	Ball Everlasting	N	X		
Asteraceae	*Pseudognaphalium luteoalbum*	Jersey Cudweed	N	X	X	
Asteraceae	*Senecio madagascariensis*	Fireweed	E	X		
Asteraceae	*Vernonia cinerea*	-	N	X	X	X
Asteraceae	*Vittadinia hispidula var. setosa*	-	N	X		
Baueraceae	*Bauera microphylla*	-	N	X	X	
Blechnaceae	*Blechnum cartilagineum*	Gristle Fern	N	x		
Blechnaceae	*Blechnum indicum*	Swamp Water Fern	N	X	X	X
Callitrichaceae	*Callitriche muelleri*	-	N			X
Caryophyllaceae	*Cerastium glomeratum*	Mouse-ear Chickweed	E	X		X
Caryophyllaceae	*Stellaria media*	Common Chickweed	E	X		
Casuarinaceae	*Allocasuarina littoralis*	Black She-oak	N	X	X	X
Casuarinaceae	*Casuarina glauca*	Swamp Oak	N	X	X	X
Celastraceae	*Elaeodendron australe*	Red Olive Plum	N			X
Clusiaceae	*Hypericum gramineum*	Small St Johns Wort	N	X	X	X
Commelinaceae	*Commelina cyanea*	Scurvy Weed	N	X	X	X
Convolvulaceae	*Convolvulus erubescens*	Austrialian Bindweed	N	X		
Convolvulaceae	*Dichondra repens*	Kidney Weed	N	X	X	X
Convolvulaceae	*Ipomoea cairica*	Coastal Morning Glory	E			X
Convolvulaceae	*Ipomoea cairica*	Coastal Morning Glory	E	X	X	
Convolvulaceae	*Polymeria calycina*	-	N	X	X	X
Cyatheaceae	*Cyathea cooperii*	Scaly Tree Fern	N			X
Cyperaceae	*Baumea arthrophylla*	Twig-rush	N			X
Cyperaceae	*Baumea articulata*	-	N	X		X
Cyperaceae	*Baumea juncea*	-	N	X	X	X
Cyperaceae	*Baumea rubignosa*	Twig Rush	N	X	X	X
Cyperaceae	*Baumea teretifolia*	Wrinkle-nut Twig Rush	N	X	X	
Cyperaceae	*Bolboschoenus cardwellii*	-	N			
Cyperaceae	*Carex appressa*	-	N		X	
Cyperaceae	*Carex inversa*	Knob Sedge	N			

Table A.1 Flora species list

Family	Scientific Name	Common Name	E/N	CT 2006	CEG 2008	CE 2017
Cyperaceae	*Carex maculata*	-	N			X
Cyperaceae	*Chorizandra cymbaria*	Heron Bristle Rush	N	X		X
Cyperaceae	*Chorizandra sphaerocephala*	Round-headed Bristle Rush	N	X		
Cyperaceae	*Cyperus eglobosus*	-	N	X		X
Cyperaceae	*Cyperus haspan*	-	N			X
Cyperaceae	*Cyperus odoratus*	-	N	X	X	
Cyperaceae	*Cyperus polystachyos*	-	N	X	X	X
Cyperaceae	*Cyperus sanguinolentus*	-	N	X	X	
Cyperaceae	*Cyperus sesquiflorus*	-	E	X		
Cyperaceae	*Cyperus sp.*	-	N			X
Cyperaceae	*Eleocharis equisetina*	-	N			X
Cyperaceae	*Eleocharis minuta*	-	E			X
Cyperaceae	*Eleocharis sphacelata*	Tall Spike-rush	N	X	X	
Cyperaceae	*Fimbristylis dichotoma*	Common Fringe-sedge	N	X	X	X
Cyperaceae	*Fimbristylis ferruginea*	-	N	X	X	
Cyperaceae	*Fimbristylis nutans*	Nodding Fringe-sedge	N			X
Cyperaceae	*Fimbristylis velata*	-	N	X	X	
Cyperaceae	*Fuirena ciliaris*	-	N			X
Cyperaceae	*Gahnia clarkei*	-	N			X
Cyperaceae	*Gahnia sieberiana*	Red-fruited Saw-sedge	N	X	X	X
Cyperaceae	*Lepidosperma laterale*	Variable Sword-sedge	N	X	X	X
Cyperaceae	*Lepidosperma longitudinale*	Pithy Sword Sedge	N	X		
Cyperaceae	*Leptocarpus tenax*	-	N			X
Cyperaceae	*Ptilothrix deusta*	Horned sedge	N	X	X	X
Cyperaceae	*Schoenoplectus mucronatus*	-	N	X	X	
Cyperaceae	*Schoenoplectus subulatus*	-	N			X
Cyperaceae	*Schoenus apogon*	Fluke Bog-rush	N	X		
Cyperaceae	*Schoenus brevifolius*	Zig-zag Bog-rush	N			X
Cyperaceae	*Schoenus lepidosperma subsp. pachylepis*		N	X		
Davalliaceae	*Nephrolepis cordifolia*	Fish-bone Fern	E	X		X
Dennstaedtiaceae	*Pteridium esculentum*	Bracken	N	X	X	X
Dilleniaceae	*Hibbertia aspera*	Rough Guinea Flower	N	X	X	X

Table A.1 Flora species list

Family	Scientific Name	Common Name	E/N	CT 2006	CEG 2008	CE 2017
Dilleniaceae	*Hibbertia pedunculata*	-	N	X	X	
Dilleniaceae	*Hibbertia scandens*	Climbing Guinea Flower	N			X
Dilleniaceae	*Hibbertia scandens*	Climbing Guinea-flower	N	X	X	
Dilleniaceae	*Hibbertia vestita*	Hairy Guinea Flower	N	X	X	X
Elaeocarpaceae	*Elaeocarpus reticulatus*	Blueberry Ash	N	X	X	X
Epacridaceae	*Epacris microphylla*		N	X	X	
Epacridaceae	*Epacris obtusifolia*		N	X		
Epacridaceae	*Epacris pulchella*	NSW Coral Heath	N	X	X	X
Epacridaceae	*Leucopogon lanceolatus*	Lance Beard-heath	N	X	X	X
Epacridaceae	*Leucopogon leptospermoides*		N	X	X	X
Epacridaceae	*Monotoca elliptica*	Tree Broom-heath	N	X	X	
Euphorbiaceae	*Breynia oblongifolia*	Coffee Bush	N		X	X
Euphorbiaceae	*Glochidion ferdinandii*	Cheese Tree	N	X	X	X
Euphorbiaceae	*Phyllanthus gunnii*		N		X	
Euphorbiaceae	*Phyllanthus tenellus*	Hen and Chickens	E			X
Euphorbiaceae	*Phyllanthus virgatus*		N			X
Fabaceae	*Bossiaea ensata*	-	N			X
Fabaceae: Faboideae	*Aotus ericoides*	Aotus	N		X	
Fabaceae: Faboideae	*Bauhinia variegata*	Orchid Tree	E	X		
Fabaceae: Faboideae	*Bossiaea heterophylla*	Variable Bossiaea	N		X	
Fabaceae: Faboideae	*Canavalia rosea*	Beach Bean	N	X	X	
Fabaceae: Faboideae	*Castanospermum australe*	Black Bean	N	X		
Fabaceae: Faboideae	*Desmodium gunnii*	-	N	X		
Fabaceae: Faboideae	*Desmodium nemorosum*	-	N	X	X	
Fabaceae: Faboideae	*Erythrina crista-galli*	Cockspur Coral Tree	E	X		
Fabaceae:	*Glycine clandestina*	Twining Glycine	N	X	X	X

Table A.1 Flora species list

Family	Scientific Name	Common Name	E/N	CT 2006	CEG 2008	CE 2017
Faboideae						
Fabaceae: Faboideae	*Glycine tabacina*	Twining Glycine	N	X	X	
Fabaceae: Faboideae	*Glycine tomentella*	Woolly Glycine	N	X		
Fabaceae: Faboideae	*Gompholobium pinnatum*	Pinnate Wedge-pea	N		X	X
Fabaceae: Faboideae	*Hardenbergia violacea*	Faslse Sarsaparilla	N	X	X	
Fabaceae: Faboideae	*Kennedia rubicunda*	Dusky Coral Pea	N	X	X	
Fabaceae: Faboideae	*Macroptilium lathyroides*	Phasey Bean	E			X
Fabaceae: Faboideae	*Medicago polymorpha*	Burr Medic	E	X	X	
Fabaceae: Faboideae	*Mirbelia rubiifolia*	Heathy Mirbelia	N			X
Fabaceae: Faboideae	*Phyllota phylicoides*	Heath Phyllota	N	X		
Fabaceae: Faboideae	*Pultenaea linophylla*	-	N	X		
Fabaceae: Faboideae	*Pultenaea retusa*	-	N	X	X	X
Fabaceae: Faboideae	*Pultenaea villosa*	-	N	X	X	X
Fabaceae: Faboideae	*Senna pendula var. glabra*	Winter Cassia	E			X
Flagellariaceae	*Flagellaria indica*	Supplejack	N			X
Goodeniaceae	*Dampiera stricta*	Blue Dampiera	N	X	X	X
Goodeniaceae	*Dampiera sylvestris*	Forest Dampiera	N			X
Goodeniaceae	*Goodenia bellidifolia ssp. argentea*	-	N			X
Goodeniaceae	*Goodenia hederacea var. hederacea*	Ivy-leaved Goodenia	N	X	X	
Goodeniaceae	*Goodenia ovata*	-	N	X		
Goodeniaceae	*Goodenia paniculata*	Swamp Goodenia	N	X	X	

Table A.1 Flora species list

Family	Scientific Name	Common Name	E/N	CT 2006	CEG 2008	CE 2017
Goodeniaceae	*Goodenia rotundifolia*	-	N	X		X
Goodeniaceae	*Scaveola calendulacea*	Scented Fan Flower	N	X		
Goodeniaceae	*Scaveola ramosissima*	-	N	X	X	
Goodeniaceae	*Velleia paradoxa*	Spur Velleia	N			X
Haemodoraceae	*Haemodorum planifolium*	Bloodroot	N	X	X	
Haloragaceae	*Gonocarpus micranthus subsp. ramosissimus*	Creeping Raspwort	N	X	X	X
Haloragaceae	*Gonocarpus tetragynus*	Poverty Raspwort	N	X	X	
Iridaceae	*Gladiolus sp.*	-	E	X	X	
Iridaceae	*Patersonia fragilis*	Swamp Iris	N			X
Iridaceae	*Patersonia glabrata*	Leafy Purple-flag	N	X		
Junceaceae	*Juncus cognatus*	-	E	X		
Junceaceae	*Juncus continuus*	-	N	X		X
Junceaceae	*Juncus krausii*	Sea Rush	N	X		X
Junceaceae	*Juncus mollis*	-	N	X		
Junceaceae	*Juncus polyanthemus*	Common Rush	N	X	X	
Junceaceae	*Juncus usitatus*	Common Rush	N			X
Lauraceae	*Cassytha filiformis*	-	N			X
Lauraceae	*Cassytha glabella forma glabella*	Devil's Twine	N	X	X	X
Lauraceae	*Cinnamomum camphora*	Camphor Laurel	E	X		X
Lauraceae	*Cryptocarya triplinervis*	Three-veined Cryptocarya	N	X		X
Lauraceae	*Endiandra sieberi*	Corkwood	N	X		X
Lindsaeaceae	*Lindsaea linearis*	Screw Fern	N	X	X	X
Lobeliaceae	*Lobelia alata*	-	N	X	X	
Lobeliaceae	*Lobelia stenophylla*	-	N			X
Lobeliaceae	*Pratia purpurascens*	Whiteroot	N	X	X	X
Loganiaceae	*Mitrasacme polymorpha*	Mitrewort	N	X		
Loganiaceae	*Mitrascme alsinoides*	Mitrewort	N	X		
Lomandraceae	*Lomandra filiformis var. filiformis*	Wattle Mat-rush	N	X	X	X
Lomandraceae	*Lomandra longifolia*	Spiky-headed Mat-	N	X	X	
Lomandraceae	*Lomandra multiflora*	Many-flowered Mat-rush	N	X		X

Table A.1 Flora species list

Family	Scientific Name	Common Name	E/N	CT 2006	CEG 2008	CE 2017
	subsp.multiflora					
Loranthaceae	*Amyema congener*	A mistletoe	N			X
Luzuriagaceae	*Eustrephus latifolius*	Wombat Berry	N	X	X	
Luzuriagaceae	*Geitonoplesium cymosum*	Scrambling Lily	N	X	X	X
Lythraceae	*Cuphea carthagenensis*	Columbian Waxweed	E			X
Malvaceae	*Hibiscus sp. (cultivar)*	Hibiscus	N	X		
Malvaceae	*Hibiscus syriacus*	-	E	X	X	
Malvaceae	*Malvaviscus arboreus*	Sleepy Mallow	E	X		
Malvaceae	*Sida acuta*	Spiny-head Sida	E			X
Malvaceae	*Sida rhombifolia*	Paddy's Lucerne	E	X	X	
Melanthiaceae	*Ciliva miniata*	Bush Lily	E	X		
Meliaceae	*Dysoxylum mollissimum ssp. molle*	Red Bean	N			X
Meliaceae	*Synoum glandulosum*	Scentless Rosewood	N	X	X	
Menispermiaceae	*Stephania japonica var. discolor*	Snake Vine	N	X	X	X
Menyanthaceae	*Villarsia exaltata*	-	N	X	X	
Mimosoideae	*Acacia floribunda*	Sally Wattle	N	X		
Mimosoideae	*Acacia irrorata*	Green Wattle	N			X
Mimosoideae	*Acacia longifolia var. longifolia*	Golden Wattle	N	X	X	
Mimosoideae	*Acacia longifolia var. sophorae*	Coastal Wattle	N	X	X	X
Mimosoideae	*Acacia longissima*	Narrow-leaved Wattle	N	X	X	
Mimosoideae	*Acacia myrtifolia*	Red Stem Wattle	N	X		
Mimosoideae	*Acacia saligna*	Orange Wattle	E	X		
Mimosoideae	*Acacia suaveolens*	Sweet Scented Wattle	N	X	X	X
Monimiaceae	*Wilkiea heugeliana*	Wilkiea	N	X		
Moraceae	*Ficus coronata*	Sandpaper Fig	N	X	X	X
Moraceae	*Ficus elastica*	Rubber Plant	E	X		
Moraceae	*Ficus macrophylla*	Moreton Bay Fig	N	X		
Moraceae	*Ficus rubinigosa*	Rusty Fig	N			X
Moraceae	*Maclura cochinchinensis*	Cockspur Thorn	N			X
Myoporaceae	*Myoporum acuminatum*	Mangrove Boobialla	N	X		

Table A.1 Flora species list

Family	Scientific Name	Common Name	E/N	CT 2006	CEG 2008	CE 2017
Myrsinaceae	*Rapanea howittiana*	Brush Muttonwood	N	X		
Myrsinaceae	*Rapanea variabilis*	Muttonwood	N	X	X	
Myrtaceae	*Acmena smithii 'small-leaved race*	Lillypilly	N	X	X	X
Myrtaceae	*Angophora costata*	Smooth-barked Apple	N	X	X	X
Myrtaceae	*Callistemon pachyphyllus*	Wallum Bottlebrush	N	X	X	
Myrtaceae	*Callistemon salignus*	Weeping Bottlebrush	N			X
Myrtaceae	*Callistemon sp. (cultivar)*	-	N			
Myrtaceae	*Corymbia intermedia*	Pink Bloodwood	N	X	X	X
Myrtaceae	*Eucalyptus grandis*	Flooded Gum	N	X		
Myrtaceae	*Eucalyptus microcorys*	Tallowwood	N	X		
Myrtaceae	*Eucalyptus pilularis*	Blackbutt	N	X		X
Myrtaceae	*Eucalyptus resinifera subsp. hemilampra*	Red Mahogany	N	X	X	X
Myrtaceae	*Eucalyptus robusta*	Swamp Mahogany	N	X	X	X
Myrtaceae	*Eucalyptus siderophloia*	Northern Grey Ironbark	N	X		
Myrtaceae	*Eucalyptus signata*	Scribbly Gum	N			X
Myrtaceae	*Eucalyptus tereticornis*	Forest Red Gum	N	X	X	X
Myrtaceae	*Leptospermum juniperinum*	Prickly Tea-tree	N	X	X	
Myrtaceae	*Leptospermum liversidgei*	-	N	X		
Myrtaceae	*Leptospermum polygalifolium subsp. cismontanum*	Lemon Scented Tea Tree	N	X		
Myrtaceae	*Lophostemon confertus*	Brush Box	N	X	X	
Myrtaceae	*Lophostemon suaveolens*	Swamp Turpentine	N	X	X	X
Myrtaceae	*Melaleuca nodosa*	Prickly Paperbark	N			X
Myrtaceae	*Melaleuca nodosa*	Ball Honey Myrtle	N	X	X	
Myrtaceae	*Melaleuca quinquenervia*	Broad-leaved Paperbark	N	X	X	X
Myrtaceae	*Melaleuca sieberi*	-	N	X	X	
Myrtaceae	*Melaleuca sieberii*	Sieber's Paperbark	N			X
Myrtaceae	*Melaleuca squamea*	-	N	X		
Myrtaceae	*Melaleuca thymifolia*	Thyme Honey-myrtle	N			X
Myrtaceae	*Melaleuca thymifolia*	Thyme Honey Myrtle	N	X	X	
Myrtaceae	*Syzygium australe*	Brush Cherry	N	X		

Table A.1 Flora species list

Family	Scientific Name	Common Name	E/N	CT 2006	CEG 2008	CE 2017
Myrtaceae	*Syzygium luehmannii*	Small-leaved Lilypilly	N	X		
Myrtaceae	*Syzygium oleosum*	Blue Lilly Pilly	N			X
Nyctaginaceae	*Bougainvillea sp.*	Bougainvillea	E	X	X	X
Nymphaeaceae	*Nymphaea capensis*	Cape Waterlily	E	X	X	X
Ochnaceae	*Ochna serrulata*	Mickey Mouse Plant	E	X	X	X
Oleaceae	*Ligustrum sinense*	Small-leaved Privet	E	X		
Oleaceae	*Notelaea longifolia*	Large Mock Olive	N	X	X	X
Oleaceae	*Notelaea ovata*	Mock Olive	N	X	X	X
Oleaceae	*Notelaea venosa*	Large-leaved Mock-olive	N			X
Onagraceae	*Ludwigia peploides*	Water primrose	N			X
Orchidaceae	*Cymbidium suave*	Native Cymbidium	N	X	X	
Orchidaceae	*Dipodium variegatum*	Blotched Hyacinth Orchid	N	X		
Orchidaceae	*Spiranthes sinensis subsp. australis*	Austral Ladies Tresses	N	X		
Oxalidaceae	*Oxalis corniculata*	Creeping Oxalis	E			X
Oxalidaceae	*Oxalis exilis*	-	N	X	X	
Oxalidaceae	*Oxalis latifolia*	Pink Fishtail	E	X		
Oxalidaceae	*Oxalis pes-caprae*	Soursob	E	X		X
Passifloraceae	*Passiflora edulis*	Passionfruit	N			X
Passifloraceae	*Passiflora suberosa*	Cork Passionflower	E	X	X	X
Passifloraceae	*Passiflora tarminiana*	Banana Passionfruit	E			X
Philydraceae	*Philydrum lanuginosum*	Frogsmouth	N			X
Phormiaceae	*Dianella caerulea*	Flax Lily	N	X	X	X
Phormiaceae	*Dianella congesta*	-	N	X	X	
Philydraceae	*Philydraceae*	Woolly Frogsmouth	N	X	X	
Phytolaccaceae	*Phytolacca octandra*	Inkweed	E	X		
Pittosporaceae	*Billardiera scandens var. scandens*	Apple Dumplings	N	X	X	
Pittosporaceae	*Pittosporum revolutum*	Yellow Pittosporum	N	X		
Plantaginaceae	*Plantago lanceolata*	Ribwort	E	X		
Plantaginaceae	*Veronica plebeia*	Trailing Speedwell	N			X
Poaceae	*Andropogon virginicus*	Whisky Grass	E	X		X
Poaceae	*Agrostis avenacea*	Blown Grass	N	X		

Table A.1 Flora species list

Family	Scientific Name	Common Name	E/N	CT 2006	CEG 2008	CE 2017
Poaceae	*Aristida ramosa*	-	N	X	X	
Poaceae	*Aristida sp.*	a wire-grass	N			X
Poaceae	*Aristida warburgii*	-	N	X	X	
Poaceae	*Arundo donax*	Giant Reed	E	X	X	
Poaceae	*Axonopus compressus*	Broad-leaf Carpet Grass	E			X
Poaceae	*Axonopus fissifolius*	Narrow-leaf Carpet Grass	E			X
Poaceae	*Bromus catharticus*	Prairie Grass	E	X		
Poaceae	*Capillipedium spicigerum*	Scented-top Grass	N			X
Poaceae	*Chloris gayana*	Rhodes Grass	E	X	X	
Poaceae	*Cymbopogon refractus*	Barbwire Grass	N	X	X	X
Poaceae	*Cynodon dactylon*	Common Couch	N	X	X	X
Poaceae	*Digitaria parviflora*	Small-flowered Finger Grass	N	X	X	
Poaceae	*Digitaria ramularis*	-	N	X	X	
Poaceae	*Digitaria sanguinalis*	Crab grass	E	X	X	
Poaceae	*Echinopogon caespitosus var. caespitosus*	Tufted Hedgehog Grass	N	X	X	
Poaceae	*Echinopogon ovatus*	Forest Hedgehog Grass	N	X	X	
Poaceae	*Entolasia marginata*	Bordered Panic	N	X	X	X
Poaceae	*Entolasia stricta*	Wiry Panic	N	X	X	X
Poaceae	*Eragrostis brownii*	Brown's Lovegrass	N	X	X	X
Poaceae	*Eragrostis curvula*	African Lovegrass	E	X	X	
Poaceae	*Eragrostis elongata*	Clustered Lovegrass	N	X	X	
Poaceae	*Eragrostis leptostachya*	Paddock Lovegrass	N	X	X	X
Poaceae	*Eragrostis tenuifolia*	Elastic grass	E			X
Poaceae	*Imperata cylindrica var. major*	Blady Grass	N	X	X	X
Poaceae	*Ischaemum australe*	-	N	X	X	X
Poaceae	*Ischaemum triticeum*	-	N	X	X	
Poaceae	*Leersia hexandra*	Swamp Rice-grass	N			X
Poaceae	*Microlaena stipoides var. stipoides*	Weeping Rice Grass	N	X	X	X
Poaceae	*Oplismenus aemulus*	Basket Grass	N	X	X	X
Poaceae	*Oplismenus imbecillis*	Creeping Beard Grass	N	X	X	X

Table A.1 Flora species list

Family	Scientific Name	Common Name	E/N	CT 2006	CEG 2008	CE 2017
Poaceae	*Ottochloa gracillima*	-	N			X
Poaceae	*Panicum effusum*	Hairy Panic	N			X
Poaceae	*Panicum paludosum*	Swamp Panic	N	X	X	
Poaceae	*Panicum simile*	Two Colour Panic	N	X	X	
Poaceae	*Paspalum ciliatifolium*	One-spiked Paspalum	E	X	X	
Poaceae	*Paspalum conjugatum*	Sour Grass	E			X
Poaceae	*Paspalum dilatatum*	Paspalum	E	X	X	X
Poaceae	*Paspalum mandiocanum*	Broad-leaved Paspalum	E			X
Poaceae	*Paspalum orbiculare*	Ditch Millet	E			X
Poaceae	*Paspalum urvillei*	Vasey Grass	E	X	X	
Poaceae	*Pennisetum clandestinum*	Kikuyu	E	X		
Poaceae	*Phalaris aquatica*	Phalaris	E	X	X	
Poaceae	*Phragmites australis*	Common Reed	N	X	X	X
Poaceae	*Poa labillardierei*	Tussock	N	X	X	
Poaceae	*Sacciolepis indica*	Indian Cupscale Grass	N			X
Poaceae	*Senecio madagascariensis*	Fireweed	E			X
Poaceae	*Setaria gracilis*	Slender Pigeon Grass	E	X	X	
Poaceae	*Sporobolus africanus*	Parramatta Grass	E	X	X	X
Poaceae	*Sporobolus creber*	Western Tail Grass	N	X	X	
Poaceae	*Sporobolus elongatus*	Slender Rat's Tail Grass	N	X	X	X
Poaceae	*Sporobolus virginicus*	Sand Couch	N	X	X	X
Poaceae	*Stenotaphrum secundatum*	Buffalo Grass	E	X	X	X
Poaceae	*Themeda australis*	Kangaroo Grass	N	X	X	
Poaceae	*Urochloa decipiens*	Signal Grass	E			X
Poaceae	*Zoysia macrantha*	Prickly Couch	N			X
Polygalaceae	*Comesperma defoliatum*	-	N		X	
Polygalaceae	*Comesperma ericinum*	Matchheads	N	X		
Polygalaceae	*Polygala paniculata*	Polygala	E			X
Polygonaceae	*Rumex brownii*	Swamp Dock	N	X		
Polygonaceae	*Rumex crispus*	Curled Dock	E	X		
Polypodiaceae	*Platycerium bifurcatum subsp. bifurcatum*	Elkhorn	N	X		X
Primulaceae	*Anagallis arvensis*	Scarlet Pimpernel	E	X		

Table A.1 Flora species list

Family	Scientific Name	Common Name	E/N	CT 2006	CEG 2008	CE 2017
Primulaceae	*Anagallis arvensis var. caerulea*	Blue Pimpernel	E	X		
Primulaceae	*Myrsine variabilis*	-	N			X
Primulaceae	*Samolus repens*	creeping Brookweed	N	X		
Proteaceae	*Banksia integrifolia subsp. Integrifolia*	Coast Banksia	N	X	X	X
Proteaceae	*Banksia oblongifolia*	Fern-leaf Banksia	N	X	X	X
Proteaceae	*Banksia spinulosa*	Hairpin Banksia	N	X	X	X
Proteaceae	*Grevillea sp.* (cultivar)	-	N	X		
Proteaceae	*Hakea actities*	Prickly Hakea	N			X
Proteaceae	*Hakea dactyloides*	Broad-leaved Hakea	N	X	X	
Proteaceae	*Hakea laevipes*	a Hakea	N			X
Proteaceae	*Persoonia conjuncta*	-	N	X	X	
Proteaceae	*Persoonia stradbrokensis*	-	N	X	X	X
Proteaceae	*Persoonia virgata*	-	N	X		
Ranunculaceae	*Ranunculus inundatus*	River Buttercup	N			X
Restionaceae	*Empodisma minus*	Spreading Rope-rush	N			X
Restionaceae	*Lepyrodia scariosa*	-	N	X	X	
Rosaceae	*Rubus hillii*	Molucca Bramble	N	X	X	
Rosaceae	*Rubus parvifolius*	Native Raspberry	E	X	X	X
Rubiaceae	*Morinda jasminoides*	-	N	X	X	
Rubiaceae	*Opercularia aspera*	Common Stinkweed	N	X	X	
Rubiaceae	*Opercularia diphylla*	-	N	X	X	
Rubiaceae	*Pomax umbellata*	Pomax	N	X	X	
Rubiaceae	*Psychotria loniceroides*	Hairy Psychotria	N			X
Rubiaceae	*Psychotria loniceroides*	-	N	X	X	
Rubiaceae	*Richardia brasiliensis*	White Eye	E			X
Rutaceae	*Acronychia imperforata*	Beach Acronychia	N	X	X	X
Rutaceae	*Acronychia wilcoxiana*	Silver Aspen	N			X
Rutaceae	*Boronia parviflora*	Swamp Boronia	N			X
Rutaceae	*Melicope elleryana*	Melicope	N			X
Rutaceae	*Murrayea paniculata*	Orange Jessamine	E			X
Sapindaceae	*Alectryon coriaceus*	Beach Alectryon	N	X		

Table A.1 Flora species list

Family	Scientific Name	Common Name	E/N	CT 2006	CEG 2008	CE 2017
Sapindaceae	*Alectryon coriaceus*	Beach Birds-eye	N			X
Sapindaceae	*Cupaniopsis anacardioides*	Tuckeroo	N	X	X	X
Sapindaceae	*Dodonaea triquetra*	Hop Bush	N	X	X	
Sapindaceae	*Dodonaea triquetra*	Large-leaf Hop-bush	N			X
Sapindaceae	*Guioa semiglauca*	Guioa	N	X	X	X
Schizaeaceae	*Schizaea bifida*	Forked Comb Fern	N			X
Scrophulariaceae	*Bacopa monniera*	-	N	X		
Selaginellaceae	*Selaginella uliginosa*	Swamp Selaginella	N			X
Smilacaceae	*Smilax australis*	Lawyer Vine	N	X	X	X
Smilacaceae	*Smilax glyciphylla*	Sarsaparilla	N	X	X	X
Solanaceae	*Brugmansia suaveolens*	Angels Trumpets	E			X
Solanaceae	*Duboisia myoporoides*	Corkwood	N	X	X	X
Solanaceae	*Solanum mauritianum*	Wild Tobacco	E	X		
Solanaceae	*Solanum nigrum*	Black Nightshade	E	X		X
Solanaceae	*Solanum pungetium*	Eastern Nightshade	N	X		
Solanaceae	*Solanum seafortheanum*	Brazilian Nightshade	E			X
Solanaceae	*Solanum torvum*	Devil's Fig	N			X
Stackhousiaceae	*Stackhousia nuda*	-	N	X		
Stackhousiaceae	*Stackhousia spathulata*	-	N	X	X	
Stackhousiaceae	*Stackhousia viminea*	Slender Stackhousia	N	X	X	X
Strelitziaceae	*Strelitzia nicolai*	Giant Bird of Paradise	E			X
Thelypteridaceae	*Christella dentata*	Binung	N			X
Thymelaeaceae	*Pimelea linifolia subsp. linifolia*	Slender Rice Flower	N	X	X	X
Thymelaeaceae	*Wikstroemia indica*	Tie-bush	N			X
Verbenaceae	*Bernena rigida*	Veined Verbena	E	X		
Verbenaceae	*Clerodendrum floribundum*	-	N	X	X	
Verbenaceae	*Clerodendrum tomentosum*	-	N	X		
Verbenaceae	*Lantana camara*	Lantana	E		X	X
Verbenaceae	*Verbena bonariensis*	Purpletop	E	X		
Verbenaceae	*Verbena officinalis*	Common Verbena	E	X		
Violaceae	*Viola banksii*	Native Violet	N			X
Violaceae	*Viola hederacea*	Ivy-leaved Violet	N	X	X	X

Table A.1 Flora species list

Family	Scientific Name	Common Name	E/N	CT 2006	CEG 2008	CE 2017
Vitaceae	*Cayratia clematidea*	Native Grape	N			X
Vitaceae	*Cissus antarctica*	Water Vine	N	X		X
Vitaceae	*Cissus hypoglauca*	Water Vine	N			X
Vitaceae	*Cissus sterculiifolia*	Yaroong	N			X
Xanthorrhoeaceae	*Xanthorrhoea fulva*	Grass Tree	N	X	X	X
Xyridaceae	*Xyris operculata*	-	N	X	X	

Notes: E/N Exotic/Native; E=- Exotic; N = Native;

CT 2006 = Conacher Travers (2006b) Environment Protection and Biodiversity Conservation Act (1999) Referral Form for Proposed Residential Development at Part Lot 2 DP 813954

Pacific Highway, Sandy Beach North;

CEG 2008 = CEG 2008 - Conacher Environmental Group (2008) Appendix II - Flora Quadrat Data;

CE 2017 = Cumberland Ecology (this report)

Appendix B

Assessment of the Likelihood of Occurrence of Threatened Flora in the Study Area

Table B.1 Likelihood of occurrence of threatened flora species

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
Apocynaceae	Cynanchum elegans	White-flowered Wax-flower		E	0	Recorded from rainforest gullies, scrub and scree slopes; from the Gloucester district to the Wollongong area and inland to Mt Dangar	Unlikely, no rainforest gullies, scrub and scree slopes within the subject site.
Apocynaceae	Marsdenia longiloba	Slender Marsdenia	E	V	35	Found in subtropical and warm temperate rainforest, lowland moist or open eucalypt forest adjoining rainforest and, sometimes, in areas with rock outcrops.	Unlikely, subject site does not contain subtropical and warm temperate rainforest or wet sclerophyll forest.
Apocynaceae	Parsonsia dorrigoensis	Milky Silkypod		E	0	Found in subtropical and warm-temperature rainforest, on rainforest margins, and in moist eucalypt forest up to 800 m, on brown clay soils	Unlikely, subject site does not contain subtropical and warm temperate rainforest or wet sclerophyll forest.
Casuarinaceae	Allocasuarina defungens	Dwarf Heath Casuarina		E	0	Found in coastal areas of wet to dry, dense, low, closed heathland	Unlikely as no local records, small areas of wallum heath/wet heath are present in the subject site. Species was not detected.
Euphorbiaceae	Chamaesyce (Euphorbia) psammogeton	Sand Spurge	E		2	Uncommon on sand dunes near the sea	Unlikely, subject site does not include frontal coastal dunes.
Fabaceae (Caesalpinioideae)	Senna acclinis	Rainforest Cassia	E		3	Occurs in coastal districts and adjacent tablelands from the Illawarra to Queensland. Grows on the margins of	Unlikely. Littoral rainforest is not present within the subject site. Species not detected in littoral

Table B.1 Likelihood of occurrence of threatened flora species

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						subtropical, littoral and dry rainforests.	rainforest within the study area.
Fabaceae (Faboideae)	Pultenaea maritima	Coast Headland Pea	V		7	Occurs in grasslands, shrublands and heath on exposed coastal headlands and adjoining low coastal heath	Unlikely, no coastal headlands with grasslands or shrublands within the subject site.
Fabaceae (Faboideae)	Sophora tomentosa	Silverbush	E		7	Occurs on recent sands on frontal coastal dunes. Grows on beaches and in beach forest at elevations slightly above mean sea level.	Unlikely, subject site does not include frontal coastal dunes.
Lindsaeaceae	Lindsaea incisa	Slender Screw Fern	E		20	In NSW it is known only from a few locations between Woombah and just south of Coffs Harbour. Also occurs in north and south-east Queensland. The species if found in dry eucalypt forest on sandstone and moist shrubby eucalypt forest on metasediments. It is usually found in waterlogged or poorly drained sites along creeks, where ferns, sedges and shrubs grow thickly.	Unlikely, no areas of dry forest in waterlog areas suitable within the subject site.
Orchidaceae	Cryptostylis hunteriana	Leafless Tounge Orchid		V	0	The species occurs mostly in coastal heathlands, margins of coastal swamps and sedgelands, coastal forest, dry woodland, and lowland forest. It prefers open areas in	Unlikely, although suitable habitat is present, there are no local records. Conditions at the time of survey were not suitable for

Table B.1 Likelihood of occurrence of threatened flora species

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						the understorey of forests. The soils include moist sands and moist to dry clay loam.	detection of this species.
Orchidaceae	Diuris sp. aff. chrysantha (Byron Bay)	Byron Bay Diuris	E		0	Known from a single location only, at Byron Bay in north-east NSW. Only about 20 plants have been recorded	Unlikely, plants in the subject site have been confirmed to be the similar species Diuris sp. aff. chrysantha (North Coast).
Orchidaceae	Phaius australis	Southern Swamp Orchid	E	E	1	Associated with coastal wet heath/sedgeland wetlands, swampy grassland or swampy forest and often where Broad-leaved Paperbark or Swamp Mahogany are found. Typically restricted to the swamp-forest margins, where it occurs in swamp sclerophyll forest (Broad-leaved Paperbark/Swamp Mahogany/Swamp Box), swampy rainforest (often with sclerophyll emergents), or fringing open forest.	Unlikely, suitable habitat present but heavily disturbed by grazing. Cattle are known to eat the flowering parts of orchids and severely impact on important orchid microhabitats through trampling.
Poaceae	Arthraxon hispidus	Hairy-joint Grass	V	V	0	A moisture and shade-loving grass, found in or on the edges of rainforest and in wet eucalypt forest, often near creeks or swamps.	Unlikely, as no local records. Species is threatened by overgrazing and introduction of exotic grasses such as Paspalum, threats that could have resulted in the loss of this species from the

Table B.1 Likelihood of occurrence of threatened flora species

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
							subject site.
Proteaceae	Hicksbeachia pinnatifolia	Red Boppel Nut	V	V	2	Occurs as an understorey tree in subtropical rainforest, regrowth rainforest, moist eucalypt forest and Brush Box forest	Unlikely, subject site does not contain subtropical rainforest, regrowth rainforest or wet sclerophyll forest
Proteaceae	Macadamia integrifolia	Macadamia Nut		V	0	Grows in drier types of subtropical rainforest preferring partially open areas such as rainforest edges, north from Currumbin in Qld. It is not known to occur naturally in the wild in NSW	Unlikely, no suitable rainforest habitat present.
Proteaceae	Macadamia tetraphylla	Rough-shelled Bush Nut	V	V	1	Generally occurs in subtropical rainforest and complex notophyll vineforest, at the margins of these forests and in mixed sclerophyll forest. It occurs in restricted habitat, growing on moderate to steep hillslopes on alluvial soils at well-drained sites	Unlikely - no areas of suitable rainforest habitat present.
Rutaceae	Acronychia littoralis	Scented Acronychia	E	E	0	Occurs in coastal areas (<2 km from the sea) in sub-littoral rainforest, usually in transitional zones between littoral rainforest and swamp sclerophyll forest, littoral and coastal cypress pine communities or on the	Unlikely, as no local records. Species was not detected during surveys.

Table B.1 Likelihood of occurrence of threatened flora species

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						margin of littoral forest and cleared land.	
Rutaceae	Boronia umbellata	Orara Boronia	V	V	1	Grows as an understorey shrub in and around gullies in wet open forest.	Unlikely, no areas of wet sclerophyll forest present.
Rutaceae	Zieria prostrata	Headland Zieria	E	E	28	This species has a very restricted distribution near Coffs Harbour. It is known only from four headlands along a three kilometre stretch of coastline within Moonee Beach Nature Reserve and occupies a total area of less than 1 ha. Grows mainly in exposed southerly aspects on these headlands	Unlikely, no coastal headlands within the subject site
Santalaceae	Thesium australe	Austral Toadflax	V	V	12	Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast.	Unlikely, no grasslands on coastal headlands within the subject site
Sapotaceae	Niemeyera (Amorphospermum) whitei	Rusty Plum, Plum Boxwood	V		75	Found in gully, warm temperate or littoral rainforests and the adjacent understorey of moist eucalypt forest. Occurs on poorer soils in areas below 600 metres above sea level	Unlikely. Littoral rainforest is not present within the subject site. Species not detected in littoral rainforest within the study area.
Simaroubaceae	Quassia (Samadera) sp. Moonee Creek (J. King s.n. Nov 1949)	Moonee Quassia	E	E	52	Occurs as an understorey shrub most commonly in moist shrubby open eucalypt forest on slopes or riparian rainforest	Unlikely. Suitable habitat in area of swampy open forest with a heathy understorey. However suitable

Table B.1 Likelihood of occurrence of threatened flora species

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						gullies, and occasionally in dry open forest with a heathy understorey	habitat has largely been modified by removal of the understorey for grazing. No detected during surveys.

TSC Act / EPBC Act Status: V = Vulnerable;. E = Endangered

Appendix C

Tree Hollow Data

Table C.1 Tree hollow data November 2017 (T1-T25)

Habitat Feature ID		T1	T2	T3	T4	T5	T6	T7	T8	T9, N1	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20	T21	T22	T23, N2	T24	T25
Tree Waypoint		42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66
Species		SM	SM	BLP	BLP	SM	SB	SB	SM	SM	SM	SB	BLP	SM	SM	SM	SM	BLP	SM	SM	SM	SM	BLP	SM	SM	SM
DBH (cm)		40	40	35	28	40	22	49	50	58	63	34	34	43	52	35	39	48	61	48	100	60	46	80	67	137
Spread (m)		10	10	10	5	10	0	15	10	15	15	0	10	20	12	10	10	8	20	20	10	10	6	15	22	0
Height (m)		10	10	12	8	12	12	17	20	17	17	10	12	20	20	12	15	7	12	18	17	8	10	12	20	20
Position		FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG
% Health		80	95	90	75	80	0	80	75	70	80	0	50	75	75	85	85	80	70	75	70	80	80	90	90	0
Fauna Use		No	No	No	No	No	No	No	No	Yes (1)	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes (2)	No	No
HOLLOWS																										
I Broken Trunk	S																									
	M																			1						
	L																					1				
II Branch	S	1	1		2	1	1		2	1	1			1			1	1			1		1		1	1
	M									1	1	1	1		1	1			1							1
	L																									
III Trunk	S			1	1		1	1															1	1		
	M																	1			1			1		

Table C.1 Tree hollow data November 2017 (T1-T25)

Habitat Feature ID		T1	T2	T3	T4	T5	T6	T7	T8	T9, N1	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20	T21	T22	T23, N2	T24	T25
IV Splits	L																				1					
	S																									
	M																									
V Cracked Bark	L																									
	S							1																		
	M																									
	L																									
Total no hollows		1	1	1	3	1	2	2	2	2	2	1	1	1	1	1	1	2	1	1	3	1	2	2	1	1

Table C.2 Tree hollow data November 2017 (T26-T50)

Habitat Feature ID	T26	T27	T28	T29	T30	T31	T32	T33	T34	T35	T36	T37	T38	T39	T40	T41	T42	T43	T44	T45	T46	T47	T48	T49	T50
Tree Waypoint	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91
Species	SM	SB	BLP	SB	SM	SM	BLP	BLP	SM	BLP	SM	SM	SB	SM	BLP	BLP	SM	SM	SM	BLP	SM	BLP	SM	SM	SB
DBH (cm)	51	38	45	95	46	150	45	100	60	65	55	38	57	45	58	73	65	50	57	44	50	31	63	42	45

Table C.2 Tree hollow data November 2017 (T26-T50)

Habitat Feature ID		T26	T27	T28	T29	T30	T31	T32	T33	T34	T35	T36	T37	T38	T39	T40	T41	T42	T43	T44	T45	T46	T47	T48	T49	T50
Spread (m)		7	7	8	15	7	20	10	10	15	20	10	5	10	10	5	10	8	2	10	8	10	5	15	10	2
Height (m)		15	15	12	20	12	20	10	10	15	17	16	10	17	17	12	10	15	6	15	12	18	12	15	12	8
Position		FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	18	FG	FG	FG	FG	FG
% Health		50	60	80	90	60	70	90	95	90	80	75	50	60	70	70	60	70	30	60	70	70	70	80	70	20
Fauna Use		No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
HOLLOWS																										
I Broken Trunk	S																									
	M																									
	L																									
II Branch	S		1			1	2					2	1	2			2		1	1	2	1		1		
	M						1			1		1		1		1	1	2		2						1
	L																									
III Trunk	S				1										1	1								1		
	M	1		2				1	1				1			1							1		1	
	L										1															
IV Splits	S																									
	M																									
	L																									

Table C.2 Tree hollow data November 2017 (T26-T50)

Habitat Feature ID		T26	T27	T28	T29	T30	T31	T32	T33	T34	T35	T36	T37	T38	T39	T40	T41	T42	T43	T44	T45	T46	T47	T48	T49	T50
V Cracked Bark	S																									
	M																									
	L																									
Total no hollows		1	1	2	1	1	3	1	1	1	1	3	2	3	1	3	3	2	1	3	2	1	1	2	1	1

Table C.3 Tree hollow data November 2017 (T51-T75)

Habitat Feature ID	T51	T52	T53	T54	T55	T56	T57	T58	T59	T60	T61	T62	T63	T64	T65	T66	T67, N3	T68	T69	T70	T71	T72	T73	T74	T75
Tree Waypoint	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116
Species	SB	SM	SB	BLP	BLP	SM	BLP	BLP	SB	SB	SM	SBA	SM	SB	SBA	SM	SM	BLP	RS	SM	BLP	FRG	SM	SB	FRG
DBH (cm)	90	77	80	77	64	52	27	52	22	53	45	27	127	54	35	38	33	40	13	57	34	42	41	27	45
Spread (m)	6	15	25	8	15	0	0	8	3	15	20	12	15	8	7	10	6	10	0	12	5	15	8	3	5
Height (m)	8	17	20	15	10	6	8	15	15	18	17	20	17	18	16	15	15	12	10	15	15	18	12	8	10
Position	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG	FG
% Health	60	80	85	50	70	0	0	90	70	85	85	80	80	40	70	65	90	90	0	75	60	85	70	50	35

Table C.3 Tree hollow data November 2017 (T51-T75)

Habitat Feature ID		T51	T52	T53	T54	T55	T56	T57	T58	T59	T60	T61	T62	T63	T64	T65	T66	T67, N3	T68	T69	T70	T71	T72	T73	T74	T75
Fauna Use		No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes (3)	No	No	No	No	No	No	No	No
HOLLOWS																										
I Broken Trunk	S	1																								
	M																									
	L																									
II Branch	S		1	1	1	1	1		1			1	2	1	3	2					1			1		2
	M			1	1	1	1															1			1	
	L																									
III Trunk	S	1						1			1						1	1		1			1			1
	M					2			1	1																
	L													1												
IV Splits	S																		1							
	M																									
	L																									
V Cracked Bark	S																									
	M																									
	L																									

Table C.3 Tree hollow data November 2017 (T51-T75)

Habitat Feature ID	T51	T52	T53	T54	T55	T56	T57	T58	T59	T60	T61	T62	T63	T64	T65	T66	T67, N3	T68	T69	T70	T71	T72	T73	T74	T75
Total no hollows	2	1	2	2	4	2	1	2	1	1	1	2	2	3	2	1	1	1	1	1	1	1	1	1	3

Table C.4 Tree hollow data November 2017 (T76-T89)

Habitat Feature ID	T76	T77	T78	T79	T80	N4	T81	T82	T83	T84	T85	T86	T87	T88	T89
Tree Waypoint	117	118	119	120	121	122	123	124	130	131	132	133	134	135	136
Species	FRG	FRG	SB	SB	FRG	SM	FRG	FRG		FRG	FRG	FRG	FRG	BLP	BLP
DBH (cm)	33	58	43	47	35	145	16	110		55	77	63	47	27	140
Spread (m)	10	15	15	12	10	20	3	20		10	20	15	20	10	25
Height (m)	17	15	20	20	20	20	10	18		20	20	20	25	8	25
Position	FG	FG	FG	FG	FG	FG	FG	FG		FG	FG	FG	FG	FG	FG
% Health	80	65	90	70	70	80	80	70		70	70	50	75	90	80
Fauna Use	Yes (4)	No	No	No	Yes (4)	Yes (5)	No	No		Yes (6)	Yes (4)	Yes (7)	Yes (4)	No	No
HOLLOWS I Broken	S														

Table C.4 Tree hollow data November 2017 (T76-T89)

Habitat Feature ID		T76	T77	T78	T79	T80	N4	T81	T82	T83	T84	T85	T86	T87	T88	T89
Trunk																
	M															
	L															
II Branch	S		2	1	2				3		1	3		2	1	1
	M	1							1			1	2			
	L												1	1		
III Trunk	S						1	1								1
	M					1	1						1			
	L						1									
IV Splits	S															
	M															
	L															
V Cracked Bark	S															
	M															
	L															
Total no hollows		1	2	1	2	1	3	1	4		1	4	4	3	1	2

Notes: ***Position:*** *Ridge; Slope; Gully; FG - Flat/leveled Ground;* ***Hollow size:*** *S ≤10 cm; M - 10 to 30 cm; L ≥ 30 cm;*

Tree species:

SM - Swamp Mahogany (Eucalyptus robusta)

BLP - Broad-leaved Paperbark (Melaleuca quinquenervia)
SB -Swamp Box (Lophostemon suaveolens)
SBA - Smooth-barked Apple (Angophora costata)
RS - River Sheoak (Casuarina cunninghamiana)
FRG - Forest Red Gum (Eucalyptus tereticornis)

Habitat Feature:

T - Hollow-bearing Tree

N - Nest

Fauna Use:

1 -Scaly-breasted Lorikeet Nest (Trichoglossus chlorolepidotus)

2 - 4x eggs in nest built in termite mound (Kingfisher?)
3- Nest in termite nest on tree (Kingfisher?)
4 - Scratches
5 -Twig bird's nest in branches
6 -Scaly-breasted Lorikeet nest in hollow, twig bird's nest in branches
7 -Scaly-breasted Lorikeet nest in hollow

Table C.5 Tree hollow survey February 2018 (T1-T25)

Habitat feature ID		T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20	T21	T22	T23	T24	T25
Tree waypoint		90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114
Species		MQ	MQ	MQ	MQ	MQ	MQ	MQ	MQ	MQ	MQ	MQ	MQ	MQ	MQ	MQ	MQ	MQ	MQ	MQ	MQ	MQ	MQ	ST	MQ	MQ
DBH (cm)		50	60	80	40	50	80	60	80	90	120	100	120	70	130	70	80	60	80	70	70	60	80	100	50	150
Hollows	S		1	1	1			1	1	1	1	1	2	1	1	1	1	1	1	1		1			1	
	M	1				1	1			12													1			2
	L									1			1				1			1	1			2		
	XL																									
Total no of Hollows		1	1	1	1	1	1	1	1	14	1	1	3	1	1	1	2	1	1	2	1	1	1	2	1	2

Table C.6 Tree hollow survey February 2018 (T26-T50)

Habitat feature ID		T26	T27	T28	T29	T30	T31	T32	T33	T34	T35	T36	T37	T38	T39	T40	T41	T42	T43	T44	T45	T46	T47	T48	T49	T50
Tree waypoint		115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139
Species		MQ	MQ	CM	MQ	MQ	MQ	BI	ST	MQ	CI	CI	PL	MQ	CC	ST	ET	CI	CC	ET	ST	ST	ET	ET	MQ	ST
DBH (cm)		70	100	50	60	80	50	20	50	125	105	110	50	60	75	45	135	75	25	80	90	140	150	160	150	70
Hollows	S	1	4	1	1	1		1		2	1	2	1	1	1	1		1		1			1	1	2	
	M		1				1			1									1							1
	L								1								1				6			2	1	
	X																									
	L																					1				
Total no of Hollows		1	5	1	1	1	1	1	1	3	1	2	1	1	1	1	1	1	1	1	6	1	1	3	3	1

Table C.7 Tree hollow survey February 2018 (T51-T75)

Habitat feature ID		T51	T52	T53	T54	T55	T56	T57	T58	T59	T60	T61	T62	T63	T64	T65	T66	T67	T68	T69	T70	T71	T72	T73	T74	T75
Tree waypoint		140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164
Species		CC	MQ	CC	BI	BI	BI	MQ	MQ	BI	BI	MQ	MQ	MQ	MQ	MQ	MQ	CI	MQ	CI	ST	MQ	CI	CI	ST	ST
DBH (cm)		50	85	90	105	80	95	110	100	75	115	80	70	55	80	110	100	40	120	70	60	105	40	30	20	30
Hollows	S	1	1				3		1	1	1		2	1		1	1	1	1	1				1	3	6
	M			1		1								1							1					
	L		1		1			1	1						1							1	1			

Table C.7 Tree hollow survey February 2018 (T51-T75)

Habitat feature ID		T51	T52	T53	T54	T55	T56	T57	T58	T59	T60	T61	T62	T63	T64	T65	T66	T67	T68	T69	T70	T71	T72	T73	T74	T75
	X																									
	L											1														
Total no of Hollows		1	2	1	1	1	3	1	2	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	3	6

Table C.8 Tree hollow survey February 2018 (T76-T100)

Habitat feature ID		T76	T77	T78	T79	T80	T81	T82	T83	T84	T85	T86	T87	T88	T89	T90	T91	T92	T93	T94	T95	T96	T97	T98	T99	T100
Tree waypoint		165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189
Species		CI	CI	CI	MQ	BI	CI	CI	MQ	MQ	AS	AS	AS	CI	MQ	CI	CI	MQ	MQ	ST	ST	ST	MQ	MQ	MQ	MQ
DBH (cm)		50	60	60	85	60	30	50	90	30	30	40	50	30	75	45	70	30	90	80	15	180	90	60	150	60
Hollows	S	1	3	1			1	1			1	1	2			1		1						1		
	M				1	1		2									1		1		1	1	1			1
	L				1				1	1				1	1					1			1		1	
	X																									
	L																									
Total no of Hollows		1	3	1	1	1	1	3	1	1	1	1	2	1	1	1	1	1	1	1	1	1	2	1	1	1

Table C.9 Tree hollow survey February 2018 (T101-N3)

Habitat feature ID		T101	T102	T103	T104	T105	T106	T107	T108	T109	N1	N2	N3
Tree waypoint		190	191	192	193	194	195	196	197	198	N5	N6	N7
Species		ST	BI	ST	BI	BI	BI	MQ	ST	MQ	LS	LS	MQ
DBH (cm)		75	80	90	60	90	150	70	70	40	50	60	40
Hollows	S	1			1	1			2				
	M	1	3	2									
	L		1				1	1	1	1			
	XL												
Total no of Hollows		2	4	2	1	1	1	1	3	1			

Species list

PL = Persoonia levis
MQ = Melaleuca quinquenervia
CI = Corymbia intermedia
ST = Stag
BI = Banksia integrifolia
CM = Cryptocarya microneura
CC = Casuarina cunninghamia
ET = Eucalyptus tereticornis
LS = Lephostemon suaveolens

Appendix D

Fauna Species List

Table D.1 Fauna species list

Family	Scientific Name	Common Name	Dec 2003	Mar 2004	Aug 2004	Oct 2004	Oct 2005	Jul-07	Nov-17
Amphibians									
Hylidae	*Litoria dentata*	Bleating Tree Frog				C			
Hylidae	*Litoria fallax*	Dwarf Tree Frog				C			
Myobatrachidae	*Crinia tinnula*	Wallum Froglet		O	O, P, C				
Myobatrachidae	*Crinia signifera*	Eastern Common Froglet			C				
Birds									
Acanthizidae	*Smicrornis brevirostris*	Weebill	O,C						
Acanthizidae	*Gerygone olivacea*	White-throated Gerygone	O,C			O,C			
Acanthizidae	*Acanthiza pusilla*	Brown thornbill	O,C		O,C	O,C			
Accipitridae	*Haliastur indus*	Brahminy Kite			O,C				
Accipitridae	*Haliaeetus leucogaster*	White-bellied Sea-Eagle			O,C				
Alcedinidae	*Dacelo novaeguineae*	Laughing Kookaburra	O,C		O,C	O,C			
Alcedinidae	*Todiramphus sanctus*	Sacred Kingfisher	O,C			O,C			
Anatidae	*Chenonetta jubata*	Australian Wood Duck	O,C						
Anatidae	*Anas superciliosa*	Pacific Black Duck	O,C		O				
Anatidae	*Anas gracilis*	Grey Teal	O,C						
Apodidae	*Hirundapus caudacutus*	White-throated Needletail	O						
Ardeidae	*Egretta novaelhollandiae*	White-faced Heron	O,C		O				

Table D.1 Fauna species list

Family	Scientific Name	Common Name	Dec 2003	Mar 2004	Aug 2004	Oct 2004	Oct 2005	Jul-07	Nov-17
Ardeidae	*Egretta garzetta*	Little Egret	O		O				
Ardeidae	*Ardea alba*	Great Egret	O		O	O			
Ardeidae	*Ardea ibis*	Cattle Egret	O		O	O			
Artamidae	*Artamus leucorynchus*	White-breasted Woodswallow	O,C		O,C	O,C			
Artamidae	*Cracticus torquatus*	Grey Butcherbird	O,C		O,C				
Artamidae	*Cracticus nigrogularis*	Pied Butcherbird	O,C		O,C	O,C			
Artamidae	*Gymnorhina tibicen*	Australian Magpie	O,C		O,C	O,C			
Artamidae	*Strepera graculina*	Pied Currawong	O,C		O,C	O,C			
Cacatuidae	*Calyptorhynchus funereus*	Yellow-tailed Black-Cockatoo	O,C		O,C	O,C			
Cacatuidae	*Calyptorhynchus lathami*	Glossy Black-Cockatoo					F		
Cacatuidae	*Eolophus roseicapilla*	Galah	O,C		O,C	O,C			
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	O,C		O,C	O,C			
Campephagidae	*Coracina tenuirostris*	Cicadabird	O						
Campephagidae	*Lalage sueurii*	White-winged Triller	O,C						
Charadriidae	*Vanellus miles*	Masked Lapwing	O,C		O,C				
Ciconiidae	*Ephippiorhynchus asiaticus*	Black-necked Stork	O		O				
Cisticolidae	*Cisticola exilis*	Golden-header Cisticola	O,C						

Table D.1 Fauna species list

Family	Scientific Name	Common Name	Dec 2003	Mar 2004	Aug 2004	Oct 2004	Oct 2005	Jul-07	Nov-17
Columbidae	*Columba livia*	Rock Dove	O,C		O				
Columbidae	*Streptopelia chinensis*	Spotted Turtle-Dove	O,C		O	O,C			
Columbidae	*Ocyphaps lophotes*	Crested Pigeon	O		O,C				
Columbidae	*Geopelia humeralis*	Bar-shouldered Dove	O,C		O,C	O,C			
Columbidae	*geopelia striata*	Peaceful Dove				O			
Coraciidae	*Eurystomus orientalis*	Dollarbird	O,C			O,C			
Corvidae	*Corvus coronoides*	Australian Raven	O,C		O,C	O,C			
Cuculidae	*Scythrops noaehollandiae*	Channel-billed Cuckoo	O,C						
Cuculidae	*Eudynamys scolopacea*	Common Koel	C						
Cuculidae	*Cacomantis flabelliformis*	Fan-tailed Cuckoo	O,C						
Dicruridae	*Dicrurus bracteatus*	Spangled Drongo				O,C			
Estrildidae	*Taeniopygia bichenovii*	Double-barred Finch	O,C						
Estrildidae	*Neochmia temporalis*	Red-browed Finch	O,C		O,C				
Falconidae	*Falco berigora*	Brown Falcon			O				
Hirundinidae	*Hirundo neoxena*	Welcome Swallow	O		O,C	O,C			
Laridae	*Larus novaehollandiae*	Silver Gull	O,C		O,C	O,C			
Laridae	*Sterna caspia*	Caspian Tern	O,C						
Locustellidae	*Megalurus timoriensis*	Tawny Grassbird				O,C			

Table D.1 Fauna species list

Family	Scientific Name	Common Name	Dec 2003	Mar 2004	Aug 2004	Oct 2004	Oct 2005	Jul-07	Nov-17
Maluridae	*Malurus cyaneus*	Superb Fairy-wren	O,C		O,C	O,C			
Maluridae	*Malurus lamberti*	Variegated Fairy-wren	O,C						
Meliphagidae	*Anthochaera carunculata*	Red Wattlebird	O,C		O,C	O,C			
Meliphagidae	*Anthochaera chrysoptera*	Little Wattlebird	O,C		O,C	O,C			
Meliphagidae	*Philemon corniculatus*	Noisy Friarbird	O,C		O,C	O,C			
Meliphagidae	*Entomyzon cyanotis*	Blue-faced Honeyeater	O,C		O,C	O,C			
Meliphagidae	*Manorina melanocephala*	Noisy Miner	O,C		O,C				
Meliphagidae	*Meliphaga lewinii*	Lewin's Honeyeater	O		O,C	O,C			
Meliphagidae	*Lichenostomus chrysops*	Yellow-faced Honeyeater	O,C		O,C	O,C			
Meliphagidae	*Lichmera indistincta*	Brown Honeyeater	O,C		O,C	O,C			
Meliphagidae	*Melithreptus lunatus*	White-naped honeyeater	O,C		O,C				
Meliphagidae	*Phylidonyris nigra*	White-cheeked Honeyeater	O,C		O,C	O,C			
Meliphagidae	*Acanthorhynchus tenuirostris*	Eastern Spinebill	O,C		O,C	O,C			
Meliphagidae	*Myzomela sanguinolenta*	Scarlet Honeyeater			O,C	O,C			
Meropidae	*Merops ornatus*	Rainbow Bee-eater	O,C						
Monarchidae	*Myiagra rubecula*	Leaden Flycatcher				O,C			
Monarchidae	*Grallina cyanoleuca*	Magpie-lark	O,C		O,C	O,C			
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella	O,C		O,C	O,C			

Table D.1 Fauna species list

Family	Scientific Name	Common Name	Dec 2003	Mar 2004	Aug 2004	Oct 2004	Oct 2005	Jul-07	Nov-17
Oriolidae	*Oriolus sagittatus*	Olive-backed Oriole	O,C		O,C	O,C			
Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler	O,C		O,C	O,C			
Pandionidae	*Pandion cristatus*	Osprey	O		O,C	O			
Pelecanidae	*Pelecanus conspicillatus*	Australian Pelican	O		O				
Phalacrocoracidae	*Microcarbo melanoleucos*	Little Pied Cormorant	O			O			
Phalacrocoracidae	*Phalacrocorax sulcirostris*	Little Black Cormorant	O		O				
Phalacrocoracidae	*Phalacrocorax varius*	Pied Cormorant	O		O				
Phalacrocoracidae	*Phalacrocorax carbo*	Great Cormorant			O	O			
Phasianidae	*Coturnix ypsilophora*	Brown Quail	O		O,C				
Psittacidae	*Trichoglossus haematodus*	Rainbow Lorikeet	O,C		O,C	O,C			
Psittacidae	*Trichoglossus chlorolepidotus*	Scaly-breasted Lorikeet	O,C		O,C	O,C			O, N
Psittacidae	*Platycercus eximius*	Eastern Rosella	O,C		O,C	O,C			
Psophodidae	*Psophodes olivaceus*	Eastern Whipbird	O,C		O	O			
Rallidae	*Rallus pectoralis*	Lewin's Rail				O			
Rhipiduridae	*Rhipidura albiscapa*	Grey Fantail	O,C		O,C	O,C			
Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail	O,C		O,C	O,C			
Threskiornithidae	*Threskiornis molucca*	Australian White Ibis	O		O				
Threskiornithidae	*Threskiornis spinicollis*	Straw-necked Ibis			O				

Table D.1 Fauna species list

Family	Scientific Name	Common Name		Dec 2003	Mar 2004	Aug 2004	Oct 2004	Oct 2005	Jul-07	Nov-17
Threskiornithidae	*Platalea regia*	Royal Spoonbill		O						
Reptiles										
Agamidae	*Pogona barbata*	Bearded Dragon		O,S						
Scincidae	*Lampropholis guichenoti*	Garden Skink		O,S			O,S			
Scincidae	*Tiliqua scincoides*	Eastern Blue Tongue		O,S						
Mammals										
Macropodidae	*Macropus giganteus*	Eastern Grey Kangaroo				O,SP	O,SP			
Molossidae	*Mormopterus norfolkensis*	Eastern Freetail-bat		AN						
Molossidae	*Mormopterus spp 2*	Freetail-bat		AN		AN				
Phalangeridae	*Trichosurus vulpecula*	Common Brushtail Possum		E		SP	SP			
Pteropodidae	*Pteropus poliocephalus*	Grey-headed Flying-fox	TS						O	
Pteropodidae	*Pteropus scapulatus*	Little Red Flying Fox								O
Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat		AN		AN	AN			
Vespertilionidae	*Scoteanax rueppellii*	Greater Broad-nosed Bat					AN			
Vespertilionidae	*Scotorepens spp.*	Broad-nosed Bat		AN			AN			
Vespertilionidae	*Vespadelus pumilus*	Eastern Forest Bat		AN						
Vespertilionidae	*Scotorepens orion*	Eastern Broad-nosed Bat		AN						
Equidae	*Equus caballus*	Horse		O						

Table D.1 Fauna species list

Family	Scientific Name	Common Name	Dec 2003	Mar 2004	Aug 2004	Oct 2004	Oct 2005	Jul-07	Nov-17
Bovidae	*Bos taurus*	Cow	O		O	O			
Felidae	*Felis catus*	Cat	O,SP						
Canidae	*Canis familiaris*	Dog	O		O,C	O,C			

*Data: TS – Threatened Species; * - introduced; O - Observed; C - Call Identification; E - Elliot Trap; S - Search; OP - opportunistic observation; H - Heard; F - Scats, tracks or signs found; SP - Seen during spotlighting; HT - Harp Trap; CT - recorded in camera trap; AN - call recorded in ANABAT; N- Nest observed;*

Appendix E

Threatened Fauna Likelihood of Occurrence

Table E.1 Threatened species likelihood of occurrence table

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Locality Records	Habitat Requirements	Likelihood of Occurrence
Amphibia							
Hylidae	*Litoria aurea*	Green and Golden Bell Frog	E	V		The species is found in a wide range of water bodies except fast moving streams. It commonly inhabits disturbed sites such abandoned quarries and mines, though generally breeds in habitats that include still, shallow, unpolluted water bodies, that are unshaded, contain aquatic plants are are free of Mosquito fish and other predators, with a range of diurnal shelter sites (emergent aquatic vegetation).	Unlikely. No suitable habitat for the species is present within the subject site.
Hylidae	*Litoria breviplamata*	Green Thighed Frog	V			Found in terrestrial habitats in the grassy margins of semi-permanent and permanent ponds, rainforests and moist open forests.	Unlikely. No suitable habitat for the species is present within the subject site.
Myobatrachidae	*Crinia tinnula*	Wallum Froglet	V		4	This species occurs in the coastal margin spanning from south-east Queensland to Kurnell in Sydney. They typically occurs in sedgelands and wet heathlands. They can also be found in swamp sclerophyll forests and along drainage lines within disturbed areas. They breed in swamps with permanent water, ephemeral pools and drainage ditches. The species shelter in wet	Present. Wet heathlands and swamp sclerophyll present at study site. Previously recorded within the study area in 2004.

Table E.1 Threatened species likelihood of occurrence table

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Locality Records	Habitat Requirements	Likelihood of Occurrence
						and damp locations near the water's edge.	
Myobatrachidae	*Mixophyes balbus*	Stuttering Frog	E	V		Typically found in association with permanent streams through temperate and sub-tropical rainforest, and wet sclerophyll forest. It is rarely found in dry, open, tableland, riparian vegetation, and moist gullies in dry forest.	Unlikely. No records from the locality and only a small area of suitable habitat is present within the subject site.
Myobatrachidae	*Mixophyes iteratus*	Giant Barred Frog	E	E	28	The Giant Barred Frog is found along the eastern coast and ranges of Australia from south-east Queensland to Warimoo in the Blue Mountains. The species inhabits freshwater streams in moist riparian habitats, particularly rainforests or wet sclerophyll forests. They can also occur in drier forests, degraded riparian remnants and around dams.	Unlikely. Although a moderate number of records from the locality, the subject site lacks preferred habitat for this species.
Aves							
Accipitridae	*Erythrotriorchis radiatus*	Red Goshawk		V		Species inhabits open woodland and forest, preferring a mosaic of vegetation types, a large population of birds as a source of food, and permanent water, and are often found in riparian habitats along or near watercourses or wetlands. In NSW, preferred habitats include mixed	Unlikely. No records from the locality and only a small area of suitable habitat is present within the subject site.

Table E.1 Threatened species likelihood of occurrence table

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Locality Records	Habitat Requirements	Likelihood of Occurrence
						subtropical rainforest, Melaleuca swamp forest and riparian Eucalyptus forest of coastal rivers. In winter in eastern Australia, the birds appear to move from nesting sites in the ranges to coastal plains, where they are associated with permanent wetlands.	
Accipitridae	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	V	Ma	19	The White-bellied Sea-Eagle is found in coastal habitats (especially those close to the sea-shore) and around terrestrial wetlands in tropical and temperate regions of mainland Australia and its offshore islands. The habitats occupied by the sea-eagle are characterised by the presence of large areas of open water.	Present. The species has been recorded previously within the study area in 2004. The subject site lacks large waterbodies preferred for foraging, however potential nesting habitat is present.
Accipitridae	*Lophoictinia isura*	Square-tailed Kite	V		4	Found in a variety of timbered habitats including dry woodlands and open forests. It is a specialist hunter preying on passerine birds, especially honeyeaters and targets predominately nestlings and insects occurring in the tree canopy. It nests in tree forks or on large horizontal tree limbs located mostly along or near watercourses.	Unlikely. Low number of records from the locality and only a small area of potential foraging habitat is present within the subject site.
Accipitridae	*Pandion cristatus*	Eastern Osprey	V		41	Found in littoral and coastal habitats and	Present. The subject site lacks

Table E.1 Threatened species likelihood of occurrence table

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Locality Records	Habitat Requirements	Likelihood of Occurrence
						terrestrial wetlands. They generally are found in coastal areas though will travel inland along major water courses. They visit a wide range of wetland habitats including inshore waters, reefs, bays, coastal cliffs, estuaries, mangrove swamps, broad rivers, reservoirs, large lakes, and water holes. They feed on fish over clear, open water, and nest in trees or dead trees, generally within one kilometre of the ocean.	large waterbodies preferred for foraging, however potential nesting habitat is present.
Alcedinidae	*Todiramphus chloris*	Collared Kingfisher	V		1	Found in coastal areas from northern Western Australia around to north-eastern NSW. They inhabit mangrove associations of estuaries, inlets, sheltered bays and islands and the tidal flats and littoral zone bordering mangroves. They sometimes occur in forests or woolands surrounding mangroves, and nest in tree hollows.	Unlikely. Only one record from the locality and no preferred habitat is present within the subject site.
Anatidae	*Stictonetta naevosa*	Freckled Duck	V		1	This species occurs primarily in south-eastern and south-western Australia and occurs as a vagrant elsewhere. It breeds in large, temporary swamps created during flood events in the Bulloo and Lake Eyres basins and along the Murray-	Unlikely. Only one record from the locality and no preferred habitat is present within the subject site.

Table E.1 Threatened species likelihood of occurrence table

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Locality Records	Habitat Requirements	Likelihood of Occurrence
						Darling river system. The species prefers permanent freshwater swamps and creeks heavy with shrub, sedge, and rush growth. It rests in dense cover during the day, usually in deep water and feeds at dusk and sawn on algae, seeds, and vegetative parts of aquatic sedges and grasses.	
Apodidae	*Apus pacificus*	Fork-tailed Swift		Ma, Mi	4	Species has been recorded throughout NSW, but mostly east of the Great Divide. The species is almost exclusively aerial in Australia and breeds overseas. It forages from a metre above the ground, up to hundreds of metres in altitude, and mostly occur over inland plains, though sometimes over foothills, and coastal areas.	Unlikely. Low number of records from the locality and the species is almost exclusively aerial. Species may pass overhead of the site on occasion but is unlikely to utilise habitat within the subject site.
Apodidae	*Hirundapus caudacutus*	White-throated Needletail		Mi	12	Almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Occur over most types of habitat, particularly above wooded areas including open forest and rainforest, between trees or in clearings and below the canopy.	Present. Species previously recorded; however the species is almost exclusively aerial. Species may pass overhead of the site on occasion.

Table E.1 Threatened species likelihood of occurrence table

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Locality Records	Habitat Requirements	Likelihood of Occurrence
Ardeidae	*Botaurus Poiciloptilus*	Australasian Bittern		E		Occurs in freshwater wetlands, and more rarely, estuarine wetlands. It favours wetlands with tall, dense vegetation, and forages in shallow water up to a depth of 0.3m. It nests in deep vegetative cover over shallow pools.	Unlikely. No records from the locality and no suitable habitat is present within the subject site.
Ardeidae	*Egretta sacra*	Eastern Reef Egret		Ma	7	Inhabits beaches, rocky shores, tidal rivers and inlets, mangroves and exposed coral reefs on the coasts and islands of most of Australia. They commonly occur on the Queensland coast, and are rarely observed in Victoria and Tasmania.	Unlikely, no rocky shores or mangroves in the subject site. Records show the species has been observed to the south and north coastal areas of the locality.
Ardeidae	*Ixobrychus flavicollis*	Black Bittern	V		2	Inhabits terrestrial and estuarine wetlands, generally in areas containing permanent water and dense vegetation. The species can occur in flooded grassland, woodland, rainforest, and mangroves. It feeds on frogs, reptiles, fish, and invertebrates such as snails, dragonflies, shrimp and crayfish. It roosts during the day on the ground amongst dense reeds or within trees. It nests in branches overhanging water.	Unlikely. Only two records from the locality and the subject site lacks preferred habitat.
Artamidae	*Artamus*	Dusky	V		1	In New South Wales the species is widespread	Unlikely. Only one record from

Table E.1 Threatened species likelihood of occurrence table

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Locality Records	Habitat Requirements	Likelihood of Occurrence
	cyanopterus cyanopterus	Woodswallow				from coast to inland, including the western slopes of the Great Dividing Range and farther west. The Dusky Woodswallow is found in woodlands and dry open sclerophyll forests, usually dominated by eucalypts, including mallee associations. The species primarily eats invertebrates, mainly insects, which are captured whilst hovering and sallying above the canopy or over water.	the locality and no preferred habitat is present within the subject site.
Burhinidae	*Burhinus grallarius*	Bush Stone-curlew	E		1	Lives in open forest and woodlands with a sparse, grassy ground layer, and fallen timber. It feeds on insects and small insects and vertebrates including frogs, lizards, and snakes. Nesting is undertaken in a scrape or small bare patch.	Unlikely. Only one record from the locality and no preferred habitat is present within the subject site.
Cacatuidae	*Calyptorhynchus lathami*	Glossy Black-Cockatoo	V		20	Inhabits open forest and woodlands of the coast and the Great Dividing Range up to 1000 m in which stands of she-oak species, particularly Black She-oak (Allocasuarina littoralis), Forest She-oak (A. torulosa) or Drooping She-oak (A. verticillata) occur.	Present. Previously recorded within the study area.

Table E.1 Threatened species likelihood of occurrence table

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Locality Records	Habitat Requirements	Likelihood of Occurrence
Campephagidae	*Coracina lineata*	Barred Cuckoo-shrike	V		1	Recorded in coastal eastern Australia from Cape York to Manning River, NSW. They usually occur in rainforest, eucalypt forests and woodlands, clearings in secondary growth and swamp woodlands along watercourses.	Unlikely. Only one record from the locality and only a very small area of potential habitat is present within the subject site.
Charadriidae	*Pluvialis fulva*	Pacific Golden Plover		Ma, Mi	2	Occurs in coastal habitats and occasionally around inland wetlands. Inland areas usually consist of wetlands with muddy margins and short emergent vegetation.	Unlikely. Low number of records from the locality and no suitable habitat is present within the subject site.
Ciconiidae	*Ephippiorhynchus asiaticus*	Black-necked Stork	E		22	Occurs in floodplain wetlands of major coastal rivers along with minor floodplains, coastal sandplain wetlands and estuaries. Species builds nest in high in trees close to water.	Present. Previously recorded within the study area, however the subject site lacks preferred habitat.
Climacteridae	*Climacteris picumnus victoriae*	Brown Treecreeper (eastern subspecies)	V		2	Found in eucalypt woodlands and dry open forest of the inland slopes and plains inland of the Great Dividing Range. The species favours woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species. Fallen timber is an important habitat component for foraging.	Unlikely. Only two records from the locality and no preferred habitat is present within the subject site.

Table E.1 Threatened species likelihood of occurrence table

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Locality Records	Habitat Requirements	Likelihood of Occurrence
Columbidae	*Ptilinopus magnificus*	Wompoo Fruit-Dove	V		80	Occurs in or near rainforest, low elevation moist eucalypt forest and brush box forests. Nesting often occurs in palms over water.	Potential. High number of records from the locality and preferred habitat is present in littoral rainforest.
Columbidae	*Ptilinopus regina*	Rose-crowned Fruit-Dove	V		20	Occurs primarily in sub-tropical and dry rainforest, and occasionally in moist eucalypt forest and swamp forest.	Potential. Moderate number of records from the locality and and preferred habitat is present in littoral rainforest.
Columbidae	*Ptilinopus superbus*	Superb Fruit-Dove	V		6	Inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as figs and palms. It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees.	Unlikely. Low number of records from the locality and only a small area of potential habitat is present.
Cuculidae	*Cuculus optatus*	Oriental Cuckoo		Mi		Non-breeding visitor to Australia who is a brood parasite. Usually inhabits forested areas and can be found at all levels of the canopy and at a range of elevations.	Unlikely. No records from the locality and only a small area of suitable habitat is present within the subject site.
Dasyornithidae	*Dasyornis brachypterus*	Eastern Bristlebird	E	E		Habitat for central and southern populations is characterised by dense, low vegetation including heath and open woodland with a heathy understorey. In northern NSW the habitat occurs	Unlikely. No records from the locality and no suitable habitat is present.

Table E.1 Threatened species likelihood of occurrence table

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Locality Records	Habitat Requirements	Likelihood of Occurrence
						in open forest with dense tussocky grass understorey and sparse mid-storey near rainforest ecotone; all of these vegetation types are fire prone.	
Gruidae	*Grus rubicunda*	Brolga	V		1	Brolgas are abundant in the northern tropics, and once occurred across most of the northern and central areas of Australia. They often feed in dry grassland or ploughed paddocks, but are dependent on wetlands for foraging and breeding. Nests are made with mud, grasses and sticks and located on an island or in water.	Unlikely. Only one record from the locality and minimal preferred habitat is present.
Haematopodidae	*Haematopus fuliginosus*	Sooty Oystercatcher	V		37	Favours rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries.	Unlikely. Moderate number of records from the locality, but no preferred habitat is present within the subject site.
Haematopodidae	*Haematopus longirostris*	Pied Oystercatcher	E		8	Prefers intertidal flats of inlets and bays, open beaches and sandbanks. Nests primarily on coastal or estuarine beaches.	Unlikely. Moderate number of records from the locality, but no preferred habitat is present within the subject site.
Jacanidae	*Irediparra gallinacea*	Comb-crested Jacana	V		7	The Comb-crested Jacana is found in permanent freshwater wetlands in northern and eastern	Unlikely. Moderate number of records from the locality, but no

Table E.1 Threatened species likelihood of occurrence table

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Locality Records	Habitat Requirements	Likelihood of Occurrence
						Australia, mainly in coastal and subcoastal areas.They prefer to inhabit wetlands that are slow-flowing or still and have a cover of floating vegetation.	preferred habitat is present within the subject site.
Laridae	*Gelochelidon nilotica*	Gull-billed Tern		Ma, Mi	1	Occurs in freshwater swamps, brakish and salt lakes, beaches and estuarine mudflats, floodwaters, sewage farms and irrigated croplands and grasslands.	Unlikely. Only one record from the locality and no suitable habitat is present.
Laridae	*Hydroprogne caspia (syn. Sterna caspia)*	Caspian Tern		Ma, Mi	1	Prefers sheltered coastal emabyments but is known to occur in near-coastal or inland terrestrial wetlands. Builds nests in open areas or areas with low vegetation.	Known. Previously recorded within the study area, however the subject site lacks preferred habitat.
Laridae	*Sterna hirundo*	Common Tern		Ma, Mi	1	Marine, pelagic and coastal habitats.	Unlikely. Only one record from the locality and no suitable habitat is present.
Laridae	*Sternula albifrons*	Little Tern	E	Ma, Mi	15	Occurs in sheltered coastal environments.	Unlikely. Moderate number of records from the locality, but no suitable habitat is present.
Meliphagidae	*Anthochaera phrygia*	Regent Honeyeater	CE	CE		Inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. These woodlands have	Unlikely. No records from the locality and no suitable habitat is present within the subject

Table E.1 Threatened species likelihood of occurrence table

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Locality Records	Habitat Requirements	Likelihood of Occurrence
						significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. The Regent Honeyeater is a generalist forager, which mainly feeds on the nectar from a wide range of eucalypts and mistletoes.	site.
Meliphagidae	*Grantiella picta*	Painted Honeyeater	V	V	1	Occurs in Boree, Brigalow and Box-Gum Woodlands and Box-Ironbarks. Feeds primarily on mistletoe fruit and insects.	Unlikely. No suitable habitat for the species is present within the subject site.
Monarchidae	*Myiagra cyanoleuca*	Satin Flycatcher		Mi		Inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests.	Unlikely. No records from the locality and only a small area of suitable habitat is present within the subject site.
Muscicapidae	*Monarcha melanopsis*	Black-faced Monarch		Mi		Found along the coast of eastern Australia, becoming less common further south. The Black-faced Monarch is found in rainforests, eucalypt woodlands, coastal scrub and damp gullies. It may be found in more open woodland when migrating.	Unlikely. No records from the locality and only a small area of suitable habitat is present within the subject site.
Muscicapidae	*Monarcha trivirgatus*	Spectacled Monarch		Mi		Found along the entire eastern seaboard of Australia. More often found where there is thick	Unlikely. No records from the locality and only a small area of

Table E.1 Threatened species likelihood of occurrence table

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Locality Records	Habitat Requirements	Likelihood of Occurrence
						understorey in rainforests, wet gullies, waterside vegetation and also in mangroves.	suitable habitat is present within the subject site.
Muscicapidae	*Rhipidura rufifrons*	Rufous Fantail		Mi		Found in rainforest, dense wet forests, swamp woodlands and mangroves, preferring deep shade, and is often seen close to the ground.	Unlikley. No records from the locality and only a small area of suitable habitat is present within the subject site.
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella	V		11	Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Inhabits most of mainland Australia except the treeless deserts and open grasslands.	Known. Species has been recorded within the study area previously.
Petroicidae	*Petroica boodang*	Scarlet Robin	V		1	Occurs in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and regrowth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. Habitat usually contains abundant logs and fallen timber: these are important components of its habitat. Nests are often found in a dead branch in a live tree, or	Unlikely. Only one record from the locality and only a very small area of potential habitat is present within the subject site.

Table E.1 Threatened species likelihood of occurrence table

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Locality Records	Habitat Requirements	Likelihood of Occurrence
						in a dead tree or shrub.	
Pomatostomidae	*Pomatostomus temporalis temporalis*	Grey-crowned Babbler (eastern subspecies)	V		1	Occurs in open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains. Also found in Woodlands on fertile soils in coastal regions.	Unlikely. Only one record from the locality and only a very small area of potential habitat is present within the subject site.
Psittacidae	*Glossopsitta pusilla*	Little Lorikeet	V		5	Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophoras, Melaleucas and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Also utilises isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees. Roosts in treetops, often distant from feeding areas. Nests in proximity to feeding areas if possible, most typically selecting hollows in the limb or trunk of smooth-barked Eucalypts.	Unlikely. Low number of records from the locality and only a small area of potential foraging habitat is present.
Psittacidae	*Lathamus discolor*	Swift Parrot	E	CE	2	In NSW mostly occurs on the coast and south west slopes. On the mainland they occur in areas where eucalypts are flowering profusely or	Unlikely. Only two records from the locality and only a small area of potential foraging

Table E.1 Threatened species likelihood of occurrence table

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Locality Records	Habitat Requirements	Likelihood of Occurrence
						where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Eucalyptus robusta, Corymbia maculata, C. gummifera, E. sideroxylon, and E. albens. Breeds in Tasmania in spring and summer.	habitat is present.
Rostratulidae	*Rostratula australis*	Australian Painted Snipe	E	E		Inhabits fringes of shallow inland wetlands, swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	Unlikely. No records from the locality and no preferred habitat is present within the subject site.
Scolopacidae	*Arenaria interpres*	Ruddy Turnstone		Ma, Mi	15	Occurs along the coastline and only occasionally inland.	Unlikely. No suitable habitat elements for the species are present within the subject site. The species may fly over the subject site on occasion but would not utilise the habitat within the subject site.
Scolopacidae	*Calidris canutus*	Red Knot		E		Found on the coast in sandy estuaries with tidal mudflats.	Unlikely. No records from the locality and no preferred habitat is present within the subject site.

Table E.1 Threatened species likelihood of occurrence table

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Locality Records	Habitat Requirements	Likelihood of Occurrence
Scolopacidae	*Calidris ferruginea*	Curlew Sandpiper	E	CE, Ma, Mi	2	The Curlew Sandpiper is found in coastal areas with intertidal mudflats, including estuaries, inlets and lagoons, and ponds in saltworks. The species have also occasionally been recorded inland around lakes , dams and waterholes with mud or sand present. Main requirements for feeding habitats are the presence of mudflats or shallow water up to 60mm. The Curlew Sandpiper may also forage in saltmarsh environments and flooded paddocks.	Unlikely. Only two records from the locality and no preferred habitat is present within the subject site.
Scolopacidae	*Calidris tenuirostris*	Great Knot	V	CE,Ma, Mi	1	Occurs within sheltered, coastal habitats containing large, intertidal mudflats or sandflats, including inlets, bays, harbours, estuaries and lagoons.	Unlikely. Only one record from the locality and no preferred habitat is present within the subject site.
Scolopacidae	*Gallinago hardwickii*	Latham's Snipe		Mi		Seen in small groups or singly in freshwater wetlands on or near the coast, generally among dense cover. They are found in any vegetation around wetlands, in sedges, grasses, lignum, reeds and rushes and also in saltmarsh and creek edges on migration. They also use crops and pasture.	Unlikely. No records from the locality and no preferred habitat is present within the subject site.

Table E.1 Threatened species likelihood of occurrence table

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Locality Records	Habitat Requirements	Likelihood of Occurrence
Scolopacidae	*Limosa lapponica*	Bar-tailed Godwit		Mi	3	The species inhabits estuarine mudflats, beaches and mangroves in coastal areas around Australias. They breed in August each year, after migrating from the northern Hemisphere.	Unlikely. Only three records from the locality and no suitable habitat is present within the subject site.
Scolopacidae	*Numenius madagascariensis*	Eastern Curlew		CE		Prefers sheltered coasts, especially estuaries, bays, harbours, inlets and lagoons. Also known to occur in sewage farms, wetlands and mangroves. Species roosts on sandy spits and in low Saltmarsh or mangroves.	Unlikely. Only one record from the locality and no suitable habitat is present within the subject site.
Scolopacidae	*Numenius minutus*	Little Curlew		Mi		More heavily distributed along coastal regions north of Sydney.	Unlikely. No records from the locality and no preferred habitat is present within the subject site.
Scolopacidae	*Numenius phaeopus*	Whimbrel		Ma, Mi	1	Occurs primarily in intertidal mudflats or sheltered coasts, but also occurs in sheltered coastal areas and saline or brackish lakes near the coast. Nesting usually occurs in mangroves and tall coastal trees.	Unlikely. Only one record from the locality and no suitable habitat is present within the subject site.
Scolopacidae	*Tringa incana*	Wandering Tattler		Ma, Mi	1	Uncommon in Australia, the Wandering Tattler has been observed on offshore or nearshore islands and reefs along the northern and north-	Unlikely. Only one record from the locality and no suitable habitat is present within the

Table E.1 Threatened species likelihood of occurrence table

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Locality Records	Habitat Requirements	Likelihood of Occurrence
						east coast of NT, Qld and northern NSW.	subject site.
Strigidae	*Ninox strenua*	Powerful Owl	V		3	In NSW the Powerful Owl lives in forests and woodlands occurring in the coastal, escarpment, tablelands and western slopes environments. Specific habitat requirements include eucalypt forests and woodlands on productive sites on gentle terrain; a mosaic of moist and dry types, with mesic gullies and permanent streams; presence of leafy sub canopy trees or tall shrubs for roosting; presence of large old trees to provide nest hollows. Optimal habitat includes a tall shrub layer and abundant hollows supporting high densities of arboreal marsupials.	Potential. Low number of records from the locality, but preferred habitat is present.
Threskiornithidae	*Plegadis falcinellus*	Glossy Ibis		Ma, Mi	1	Preferred foraging and breeding habitat are fresh water marshes at the edges of waterbodies. This species has low breeding site fidelity and nests in primarily in swamps.	Unlikely. Only one record from the locality and no preferred habitat is present within the subject site.
Tytonidae	*Tyto novaehollandiae*	Masked Owl	V		3	Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting. Lives in dry eucalypt forests and woodlands from sea level to 1100 m. A	Potential. Low number of records from the locality, but preferred habitat is present.

Table E.1 Threatened species likelihood of occurrence table

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Locality Records	Habitat Requirements	Likelihood of Occurrence
						forest owl, but often hunts along the edges of forests, including roadsides. The typical diet consists of tree-dwelling and ground mammals, especially rats.	
Tytonidae	*Tyto tenebricosa*	Sooty Owl	V		5	Occurs in coastal rainforest, including dry, subtropical, and temperate rainforests, and moist eucalypt forests. Utilises tall trees in heavily vegetated areas for day time resting. It hunts during the night for small ground or tree dwelling mammals such as the Common Ringtail Possum or Sugar Glider. The species requires very large tree hollows for nesting.	Potential. Low number of records from the locality, but preferred habitat is present.
Insecta							
Erebidae	*Phyllodes imperialis smithersi*	Pink Underwing Moth	E	E		Found below the altitude of 600 m in undisturbed, subtropical rainforest.	Unlikely. Not previously recorded in the locality.
Nymphalidae	*Argynnis hyperbius inconstans*	Australian Fritillary	E	CE		Occurs from south-east Queensland to north-east NSW in open swampy coastal areas, where Arrowhead Violet occurs, as this is the principle caterpillar's food plant.	Unlikely. Arrowhead Violet has not been found within the subject site.
Mammalia							
Dasyuridae	*Dasyurus*	Spotted-tailed	V	E	3	Recorded across a range of habitat types,	Unlikely. Only three records

Table E.1 Threatened species likelihood of occurrence table

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Locality Records	Habitat Requirements	Likelihood of Occurrence
	maculatus	Quoll				including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock outcrops and rocky-cliff faces as den sites.	from the locality and only a very small area of potential habitat is present within the subject site.
Dasyuridae	*Phascogale tapoatafa*	Brush-tailed Phascogale	V		1	Prefers dry sclerophyll open forest with a sparse groundcover of herbs, grasses, shrubs or leaf litter. Occasionally inhabits rainforest and heath. Nests and shelters in tree hollows.	Unlikely. Only one record from the locality and only a very small area of potential habitat is present within the subject site.
Dasyuridae	*Planigale maculata*	Common Planigale	V		1	Inhabits rainforest, eulcalypt forest, heathland, marshland, grassland and rocky areas with surface cover close to water in coastal north-eastern NSW, coastal east Queensland and Arnhem Land. They build nests that are lined with grass, eucalypt leaves or shredded bark.	Unlikely. Only one record from the locality and only a very small area of potential habitat is present within the subject site.
Emballonuridae	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail-bat	V			Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. When foraging for insects, flies high and fast over the	Potential. No records from the locality, but the species occurs in a wide range of habitats. Potential foraging and roosting

Table E.1 Threatened species likelihood of occurrence table

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Locality Records	Habitat Requirements	Likelihood of Occurrence
						forest canopy, but lower in more open country. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory.	habitat is present within the subject site.
Macropodidae	*Petrogale penicillata*	Brush-tailed Rock-wallaby	E	V		Prefers rocky habitats, including loose boulder-piles, rocky outcrops, steep rocky slopes, cliffs, gorges, and isolated rock stacks. Vegetation types associated with the species include dense forest, wet sclerophyll forest, vine thicket, dry sclerophyll forest, and open forest.	Unlikely. No records from the locality and no suitable habitat is present within the subject site.
Molossidae	*Mormopterus norfolkensis*	Eastern Freetail-bat	V		1	Found in dry sclerophyll forest, woodland, swamp forest and mangrove forests east of the Great dividing Range. Primarily roosts in tree hollows but will also utilise man-made structures.	Potential. Only one record from the locality but the species has be previously recorded within the study area and suitable habitat is present.
Muridae	*Pseudomys novaehollandiae*	New Holland Mouse		V		Occurs in open habitats (heathland, woodland and forest) with a heath understorey and vegetated sand dunes. The species prefers deep soft top soils in order to burrow.	Unlikely. No records from the locality and no preferred habitat is present within the subject site.
Petauridae	*Petaurus australis*	Yellow-bellied Glider	V		33	Occurs in tall, mature, eucalypt forest generally in areas with high rainfall and nutrient rich soils. It	Unlikely. no preferred habitat is present within the subject site.

Table E.1 Threatened species likelihood of occurrence table

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Locality Records	Habitat Requirements	Likelihood of Occurrence
						feeds primarily on plant and insect exudate, with insects providing protein. It extracts sap from trees by biting into the trunk and branches leaving distinctive 'V' shaped scars. It dens in large hollows within trees, in groups of two to six individuals.	Not previously recorded during surveys.
Petauridae	*Petaurus norfolcensis*	Squirrel Glider	V		7	Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. Widely, though sparsely, distributed in eastern Australia, from northern Queensland to western Victoria.	Unlikely. no preferred habitat is present within the subject site. Not previously recorded during surveys.
Phascolarctidae	*Phascolarctos cinereus*	Koala	V	V	27	Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred feed species. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size.	Unlikely. Only a small area of foraging habitat is present within the subject site and the species was not found in a previous targeted investigations (Conacher Environmental Group 2008).
Potoroidae	*Potorous*	Long-nosed		V		Occurs in coastal heaths and dry and wet	Unlikely. No records from the

Table E.1 Threatened species likelihood of occurrence table

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Locality Records	Habitat Requirements	Likelihood of Occurrence
	tridactylus tridactylus	Potoroo				sclerophyll forests. Species prefers areas with a dense understroey with occasional open areas.	locality and no preferred habitat is present.
Pseudocheiridae	*Petauroides volans*	Greater Glider		V		Occurs in eucalypt forests and woodlands from north-eastern Queensland to the Central Highlands of Victoria. The species has a relatively small home range which consists of numerous tree hollows.	Unlikely. Although a high number of tree hollows are present, the species has not been previously recorded in the locality.
Pteropodidae	*Pteropus poliocephalus*	Grey-headed Flying-fox	V	V	50	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.	Known. Species has been previously recorded within the study area. Habitat within the subject site is likely to be utilised as part of a broader foraging range.
Pteropodidae	*Syconycteris australis*	Common Blossom-bat	V		6	Found mainly in littoral rainforest of coastal areas of western Australia, although have been recorded in other communities, such as subtropical rainforest, wet sclerophyll forest and other coastal forests. They require a year-round supply of nectar and pollen, gathered from coastal vegetation, and occasionally riverine	Unlikely. Low number of records from the locality and no preferred habitat is present within the subject site.

Table E.1 Threatened species likelihood of occurrence table

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Locality Records	Habitat Requirements	Likelihood of Occurrence
						areas.	
Vespertilionidae	*Chalinolobus dwyeri*	Large-eared Pied Bat	V	V		The species is associated with areas dominated by sandstone escarpments; sandstone cliffs and fertile woodland valley habitat occurring in close proximity to each other is important for the species. It roosts in cliff/escarpment areas and forages in fertile forest. Roosting is predominately in arch caves with dome roofs, but has been observed in disused mines shafts, overhangs, and disused Fairy Martin nests.	Unlikely. No records from the locality and no preferred habitat is present.
Vespertilionidae	*Chalinolobus nigrogriseus*	Hoary Wattled Bat	V		1	Roosts in hollows and rock crevices in dry open eucalypt forests, favouring areas with Spotted gum, boxes, ironbarks, Red Bloodwood and Scribbly Gum. Distributed widely across northern Australia, excluding the arid interior, as far south as Port Macquarie in NSW.	Unlikely. Only one record from the locality and only a small area of potential habitat is present within the subject site.
Vespertilionidae	*Kerivoula papuensis*	Golden-tipped Bat	V		2	Found in rainforest and adjacent wet and dry sclerophyll forests. Roosting mainly in rainforest gullies on small streams, they utilise abandoned wren nests, tree trunks, tree hollows, dense foliage and epiphytes . The species is distributed	Unlikely. Low number of records from the locality and no preferred roosting habitat is present.

Table E.1 Threatened species likelihood of occurrence table

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Locality Records	Habitat Requirements	Likelihood of Occurrence
						along the east coast of Australia, from Cape York Penisula, Qld, to southern NSW.	
Vespertilionidae	*Miniopterus australis*	Little Bentwing-bat	V		11	Moist eucalypt forest, rainforest or dense coastal banksia scrub. Little Bentwing-bats roost in caves, tunnels and sometimes tree hollows during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats.	Potential. Moderate number of records from the locality and suitable foraging/roosting habitat is present.
Vespertilionidae	*Miniopterus schreibersii oceanensis*	Eastern Bentwing-bat	V		5	Forages above the canopy and eats mostly moths. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures.	Unlikely. Low number of records from the locality and no preferred roosting habitat is present.
Vespertilionidae	*Myotis macropus*	Southern Myotis	V		1	Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface.	Potential. Suitable roosting habitat is present within the subject site and suitable foraging habitat is present in the study area.
Vespertilionidae	*Scoteanax rueppellii*	Greater Broad-nosed Bat	V		3	Found mainly in the gullies and river systems that drain the Great Dividing Range. Usually roosts in tree hollows and buildings. Forages	Known. Species has been previously recorded within the subject site and suitable habitat

Table E.1 Threatened species likelihood of occurrence table

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Locality Records	Habitat Requirements	Likelihood of Occurrence
						after sunset, flying slowly and directly along creek and river corridors at an altitude of 3 - 6 m. Open woodland habitat and dry open forest suits the direct flight of this species as it searches for beetles and other large, slow-flying insects.	is present.
Reptilia							
Elapidae	*Hoplocephalus stephensii*	Stephens' Banded Snake	V		1	This species occurs in the coasts and ranges of Southern Queensland to Gosford, NSW. They inhabit rainforest and eucalypt forests and rocky areas up to 950 m in altitude.	Unlikely. Only one record from the locality and no preferred habitat is present within the subject site.

TSC Act / EPBC Act Status: E = Endangered; CE = Critically Endangered; V = Vulnerable; Ma = Marine; Mi = Migratory.

Appendix F

Section 5A Assessment (7 Part Test)

F.1 Threatened Ecological Communities

F.1.1 Littoral Rainforest

As shown in **Figure 3.2** a small area of Littoral Rainforest occurs in the southeastern corner of the study area. It is outside the footprint of the proposed development and located within the Regional Park.

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,

Not applicable.

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,

Not applicable.

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.

No area of Littoral Rainforest is proposed to be removed within the subject site. The proposed development is not considered to have an adverse effect on the extent of the community such that its local occurrence is placed at risk of extinction.

The proposed development is unlikely to substantially and adversely modify the composition of the community as it is located outside of the subject site and does not have a direct interface with the proposed development.

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, and

(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, and

(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.

Approximately 0.12 ha of Littoral Rainforest occurs within the study area. No area of Littoral Rainforest is proposed to be removed within the subject site. The retained extent of this community will be managed through the implementation of the RPMP.

As the proposed development occurs at the edge of a residential development, and adjacent to the Pacific Highway, the study area has previously been subject to fragmentation. The proposed development is not considered likely to increase fragmentation relative to current levels. Connectivity of the patches of Littoral Rainforest will be retained within the study area.

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

No critical habitat for Littoral Rainforest has been identified by OEH.

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

A recovery plan has not been prepared for Littoral Rainforest and no threat abatement plans are relevant to this community within the study area.

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 following KTPs are relevant to Littoral Rainforest occurring within the study area:

- 'Invasion of native plant communities by exotic perennial grasses' that readily invade disturbed sites and communities as they can dominate and suppress native flora species;
- 'Invasion and establishment of exotic vines and scramblers' as they can dominate and suppress native flora species; and
- 'Anthropogenic climate change' as this can reduce the geographic range of species and alter the structure and composition of communities.

Such KTPs will not be exacerbated by the proposed development. Weeds will be managed as set out in the RPMP.

Conclusion

No area of Littoral Rainforest is proposed to be removed within the subject site. The areas of this community that occur in the study area will be located in the Regional Park and will be

benefited by the implementation of the RPMP. Accordingly, the proposed development is not considered likely to have a significant impact on Littoral Rainforest.

F.1.2 Coastal Saltmarsh

As shown in **Figure 3.2** areas of Coastal Saltmarsh occur scattered along Hearnes Lake foreshore in the central and northern portions of the study area. It is outside the footprint of the proposed development and located within the Regional Park. There is potential for indirect impacts to this community via stormwater runoff, but this has been addressed within the Stormwater Management Plan.

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,

Not applicable.

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,

Not applicable.

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

(iii) 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

(iv) 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.

No area of Coastal Saltmarsh is proposed to be removed within the subject site. The proposed development is not considered to have an adverse effect on the extent of the community such that its local occurrence is placed at risk of extinction.

The proposed development is unlikely to substantially and adversely modify the composition of the community as it is located outside of the subject site and does not have a direct interface to the proposed development.

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

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

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

(vi) *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.*

A total of 2.81 ha of Coastal Saltmarsh occurs within the study area. No area of Coastal Saltmarsh is proposed to be removed within the subject site. The retained extent of this community will be conserved in the Regional Park and will be managed through the implementation of the RPMP.

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

No critical habitat for Coastal Saltmarsh has been identified by OEH.

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

A recovery plan has not been prepared for Coastal Saltmarsh and no threat abatement plans are relevant to this community within the study area.

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 following KTPs are relevant to Coastal Saltmarsh occurring within the study area:

- 'Invasion of native plant communities by exotic perennial grasses' that readily invade disturbed sites and communities as they can dominate and suppress native flora species;
- 'Invasion and establishment of exotic vines and scramblers' as they can dominate and suppress native flora species;
- 'Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands' as the quality of the habitat may decrease; and
- 'Anthropogenic climate change' as this can reduce the geographic range of species and alter the structure and composition of communities.

Such KTPs will not be exacerbated by the proposed development. Weeds will be managed as set out in the RPMP. Cessation of livestock grazing will allow for regeneration of native plant species within this community.

Conclusion

No area of Coastal Saltmarsh is proposed to be removed within the subject site. The areas of this community that occur in the study area will be located in the Regional Park and will be benefited by the implementation of the RPMP. Accordingly, the proposed development is not considered likely to have a significant impact on Coastal Saltmarsh.

F.1.3 Subtropical Coastal Floodplain Forest

As shown in **Figure 3.2** areas of Subtropical Coastal Floodplain Forest occur in the central study area. These areas are outside the footprint of the proposed development and located within the Regional Park. There is potential for indirect impacts to it via stormwater runoff, but this has been addressed within the Stormwater Management Plan.

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,

Not applicable.

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,

Not applicable.

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

(v) 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

(vi) 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.

No area of Subtropical Coastal Floodplain Forest is proposed to be removed within the subject site. The proposed development is not considered to have an adverse effect on the extent of the community such that its local occurrence is placed at risk of extinction.

The proposed development is unlikely to substantially and adversely modify the composition of the community as it is located outside of the subject site and does not have a direct interface to the proposed development.

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

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

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

(ix) 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.

A total of 3.35 ha of Subtropical Coastal Floodplain Forest occurs within the study area. No area of Subtropical Coastal Floodplain Forest is proposed to be removed, modified or fragmented within the subject site.

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

No critical habitat for Subtropical Coastal Floodplain Forest has been identified by OEH.

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

A recovery plan has not been prepared for Subtropical Coastal Floodplain Forest and no threat abatement plans are relevant to this community within the study area.

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 following KTPs are relevant to Subtropical Coastal Floodplain Forest occurring within the study area:

- 'Invasion of native plant communities by exotic perennial grasses' that readily invade disturbed sites and communities as they can dominate and suppress native flora species;
- 'Invasion and establishment of exotic vines and scramblers' as they can dominate and suppress native flora species;
- 'Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands' as the quality of the habitat may decrease; and
- 'Anthropogenic climate change' as this can reduce the geographic range of species and alter the structure and composition of communities.

As the entirety of this community is within the Regional Park, it is expected that conservation management actions via the RPMP will reduce KTPs on this community.

Conclusion

No area of Subtropical Coastal Floodplain Forest is proposed to be removed within the subject site. Given that no area of this community is proposed to be cleared and the implementation of the RPMP within the retained vegetation, the proposed development is not considered to have a significant impact on Subtropical Coastal Floodplain Forest.

F.1.4 Swamp Sclerophyll Forest

As shown in **Figure 3.2** areas of Coastal Swamp Sclerophyll Forest occur in the central and northern portions of the subject site in low lying areas. The majority is outside the footprint of the proposed development and located within the Regional Park. There is potential for indirect impacts to the retained Coastal Swamp Sclerophyll Forest via stormwater runoff, but this has been addressed within the Stormwater Management Plan.

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,

Not applicable.

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,

Not applicable.

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

(vii) 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

(viii) 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.

The proposed development will remove approximately 0.22 ha of Swamp Sclerophyll Forest from within the study area. The retained extent of this community will be managed through the implementation of the RPMP.

Within the subject site, a substantial change will occur to the composition of the community, as it will be entirely removed. There is potential for changes to species composition in the area of this community at the interface to the proposed development. These changes are expected to be localised and overall are not considered to cause a substantial change in species composition. This community is currently subject to livestock grazing and is not managed for conservation. It has also been impacted by a drainage channel cut through the southern portion of the study area.

Given the small area of this community proposed to be cleared within the study area, in conjunction with the proposed mitigation of indirect impacts, the removal and potential modification of vegetation through direct and indirect impacts is not considered to place the local occurrence of the community at risk of extinction.

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

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

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

(xii) 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.

The proposed development will remove approximately 0.12 ha of Swamp Sclerophyll Forest from within the study area. As a result of the proposed development, there will be interfaces between the subject site and the retained portions of Swamp Sclerophyll Forest. These portions of the community have the potential to be indirectly impacted by the proposed development.

As the proposed development occurs at the edge of a residential development and adjacent to the Pacific Highway, the study area has previously been subject to fragmentation. The proposed is not considered to significantly increase fragmentation of Swamp Sclerophyll Forest within the study area. This community is currently subject to livestock grazing and is not managed for conservation. It has also been impacted by a drainage channel cut through the southern portion of the study area. Connectivity with the habitats surrounding Hearnes Lake will remain.

The habitat to be cleared or modified represents a small portion of the available habitat within the study area and locality. The area of this community directly and indirectly impacted by the proposed development is not considered important for the long-term survival of the community in the locality.

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

No critical habitat for Swamp Sclerophyll Forest has been identified by OEH.

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

A recovery plan has not been prepared for Swamp Sclerophyll Forest and no threat abatement plans are relevant to this community within the study area.

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 following KTPs are relevant to Swamp Sclerophyll Forest occurring within the study area:

- 'Clearing of native vegetation' as this reduces the area habitat available for this community;
- 'Invasion of native plant communities by exotic perennial grasses' that readily invade disturbed sites and communities as they can dominate and suppress native flora species;
- 'Invasion and establishment of exotic vines and scramblers' as they can dominate and suppress native flora species;
- 'Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands' as the quality of the habitat may decrease; and
- 'Anthropogenic climate change' as this can reduce the geographic range of species and alter the structure and composition of communities.

The majority of this community is within the Regional Park. It is expected that conservation management actions via the RPMP will reduce KTPs on this community within the Regional Park. Some habitat will be cleared, as described above, and clearing is a KTP however, sustainable areas will be retained and managed for conservation, offsetting the impacts of clearing.

Conclusion

The proposed development will involve the removal of a small area of Swamp Sclerophyll Forest, and may also involve the indirect impacts to the retained portions of the community. The habitat to be cleared or modified represents a small portion of the available habitat within the study area and locality. Implementation of a RPMP will assist in the mitigation of indirect impacts to the community as well as increasing the biodiversity values of the retained extent of the community within the study area. Furthermore, impacts to this community will be offset through the sourcing of the requisite number of credits as determined by BioBanking calculations. As a result, the proposed development is not considered to have a significant impact on Swamp Sclerophyll Forest.

F.1.5 Swamp Oak Floodplain Forest

As shown in **Figure 3.2** areas of Swamp Oak Floodplain Forest occur in a strip associated with low lying land and drainage channels in the south of the subject site. The vast majority is outside the footprint of the proposed development and located within the Regional Park. There is potential for indirect impacts to it via stormwater runoff, but this has been addressed within the Stormwater Management Plan.

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,

Not applicable.

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,

Not applicable.

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

(ix) 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

(x) 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.

The proposed development will remove approximately 0.02 ha out of 1.4 ha of Swamp Oak Floodplain Forest present within the study area. The retained extent of this community will be managed through the implementation of the RPMP.

Within the subject site, a substantial change will occur to the composition of the community, as it will be entirely removed. There is potential for changes to species composition in the area of this community at the interface to the proposed development. These changes are expected to be localised and overall are not considered to cause a substantial change in species composition. This community is currently subject to livestock grazing and is not managed for conservation.

Given the small area of this community proposed to be cleared within the study area, in conjunction with the proposed mitigation of indirect impacts, the removal and potential modification of vegetation through direct and indirect impacts is not considered to place the local occurrence of the community at risk of extinction.

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

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

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

(xv) 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.

The proposed development will remove approximately 0.02 ha out of 1.40 ha of Swamp Oak Floodplain Forest present within the study area. As a result of the proposed development, there will be interfaces between the subject site and the retained portions of Swamp Oak Floodplain Forest. These portions of the community have the potential to be indirectly impacted by the proposed development.

As the proposed development occurs at the edge of a residential development and adjacent to the Pacific Highway, the study area has previously been subject to fragmentation. The proposed is not considered to significantly increase fragmentation of Swamp Oak Floodplain Forest within the study area. This community is currently subject to livestock grazing and is not managed for conservation. It has also been impacted by a drainage channel cut through the southern portion of the study area. Connectivity with the habitats surrounding Hearnes Lake will remain.

The habitat to be cleared or modified represents a very small portion of the available habitat within the study area and locality. The area of this community directly and indirectly impacted by the proposed development is not considered important for the long-term survival of the community in the locality.

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

No critical habitat for Swamp Oak Floodplain Forest has been identified by OEH.

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

A recovery plan has not been prepared for Swamp Oak Floodplain Forest and no threat abatement plans are relevant to this community within the study area.

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 following KTPs are relevant to Swamp Oak Floodplain Forest occurring within the study area:

- 'Clearing of native vegetation' as this reduces the area habitat available for this community;
- 'Invasion of native plant communities by exotic perennial grasses' that readily invade disturbed sites and communities as they can dominate and suppress native flora species;

- ‘Invasion and establishment of exotic vines and scramblers’ as they can dominate and suppress native flora species;
- ‘Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands’ as the quality of the habitat may decrease; and
- ‘Anthropogenic climate change’ as this can reduce the geographic range of species and alter the structure and composition of communities.

The majority of this community is within the Regional Park. It is expected that conservation management actions via the RPMP will reduce KTPs on this community within the Regional Park. Some habitat will be cleared, as described above, and clearing is a KTP however, sustainable areas will be retained and managed for conservation, offsetting the impacts of clearing.

Conclusion

The proposed development will involve the removal of a small area of Swamp Oak Floodplain Forest, and may also involve the indirect impacts to the retained portions of the community. The habitat to be cleared or modified represents a small portion of the available habitat within the study area and locality. Implementation of a RPMP will assist in the mitigation of indirect impacts to the community as well as increasing the biodiversity values of the retained extent of the community within the study area. Furthermore, impacts to this community will be offset through the sourcing of the requisite number of credits as determined by BioBanking calculations. As a result, the proposed development is not considered to have a significant impact on Swamp Oak Floodplain Forest.

F.2 Threatened Fauna Species

The vegetation in the study area is relatively disturbed and has been partially cleared in the past due to agriculture and sand mining. It has been partially regenerating in patches in recent years, but regeneration is hampered by livestock grazing. In the absence of ongoing management, it is expected that the fauna habitat values it contains will continue to degrade.

A large proportion of the study area is proposed to be established as a Regional Park (20.58 ha). This area contains the majority of the high quality native vegetation, as well as the areas that contain the highest densities of tree hollows. When the Regional Park is established and livestock are removed, it is expected that there will be substantially more regeneration within sparsely treed areas and limited areas of grassland. Removal of livestock will also stop sensitive wetland habitats being grazed and trampled, which will benefit some fauna species. As vegetation continues to regenerate and mature in the Regional Park, it is likely that additional tree hollows will gradually form.

Furthermore, the impacts to vegetation and therefore habitat for threatened fauna species will be offset through the BioBanking methods as outlined in **Section 5.3**.

F.2.1 Wallum Froglet

The Wallum Froglet has been previously detected in low lying areas of habitat in the study area including Coastal Wallum Baumea Wetland, Lowlands Swamp Box – Paperbark-Red Gum Dry Forest, Coastal Paperbark Swamp Paperbark Sedgeland.

Such habitats are currently grazed by livestock, and such grazing is likely to be degrading the habitat for the species. Large areas of similar habitats are present in the Regional Park, where will be managed according to the RPMP and livestock grazing will cease. Cessation of grazing is expected to benefit the habitats supporting this species, and the species itself.

The proposed development has potential to cause indirect impacts to Wallum Froglet habitat via stormwater runoff, but this has been addressed within the Stormwater Management Plan. Bioswales will line the edges of the development and will help manage runoff of water into the Regional Park.

(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

Although some impacts to the species will occur from clearing, known habitats will be retained and managed for conservation in the Regional Park. A high proportion of habitats will be conserved within the 20.58 ha area of retained vegetation and will be managed via the RPMP.

It is considered that the area of habitat for this species within the subject site constitutes only a relatively minor proportion of the total area of potential habitat for the species within the study area, and the majority will be conserved within the Regional Park. It is considered that this species will continue to occupy the Regional Park and will benefit from the conservation management actions proposed. Accordingly, the proposal is not considered likely to place a viable local population of the Wallum Froglet 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.

Not applicable.

(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.

Not applicable.

(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, and

(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, and

(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

The proposed development will occupy part of the known and potential habitat for the Wallum Froglet. Approximately 9.49 ha of habitat will be removed from the entire subject site.

The proposed development will result in a reduction in potential available habitat, but will not further fragment the habitat for the species into separate areas. Retained habitat will remain connected within the Regional Park.

The study area has undergone a long history of anthropogenic induced disturbance due to its historical land use, including grazing and clearing. Therefore, it is considered that the area to be occupied by the development footprint (i.e. the subject site) represents sub-optimal potential habitat for the species that is not important to the long-term survival of the Wallum Froglet. The Regional Park will be managed to increase its biodiversity value, which will increase its value as habitat for the Wallum Froglet.

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

No critical habitat for this species has currently been identified by the Director-General of the OEH.

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

No NSW recovery plan is available for the Wallum Froglet. A National Recovery Plan has been prepared for wallum sedgefrogs and other wallum-dependant frog species including the Wallum Froglet. The objectives of the National Recovery Plan are (Meyer *et al.*, 2006):

- 1. To identify areas of habitat critical to the survival of wallum frog species more accurately;
- 2. To protect habitat critical to wallum frog survival and important wallum frog populations from threatening processes;
- 3. To rehabilitate degraded wallum frog habitat; and

- 4. To determine population trends in areas of disturbed undisturbed and rehabilitated habitat.

The proposal is considered to be consistent with the objectives of the National Recovery Plan as the areas of highest habitat value are being managed for conservation.

(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 OEH has identified the following threats for the Wallum Froglet:

- Destruction and degradation of coastal wetlands as a result of roadworks, coastal developments and sandmining;
- Reduction of water quality and modification to acidity in coastal wetlands;
- Changes to hydrology of coastal wetlands as a result of a changing climate and/ or sea level rise;
- Nutrient enrichment and chemical run off from urban and agricultural areas and as a result of mosquito control;
- Predation of tadpoles and eggs by the Plague Minnow *Gambusia holbrooki*. While little is known of the extent of Plague Minnow predation on Wallum Froglets, it must be considered a potential threat; and
- Habitat disturbance by feral pigs

The proposal will entail some of these Key Threatening Processes (KTP) on the Wallum Froglet. It will entail limited clearing and has potential via storm water runoff to change water quantity and/or quality, which could impact the froglets. However, concurrent with such impacts and potential impacts of the development, there will be cessation of grazing, active management of storm water quality and regeneration of native vegetation within the Regional Park. This will serve to counter the impacts of KTPs on the local population of the Wallum Froglet.

Conclusion

The local population of the Wallum Froglet is likely to persist within the Regional Park and is expected to benefit from cessation of grazing and management of stormwater quality entering the Regional Park. The loss of some habitats to residential development in the subject site is likely to be counter balanced by such measures, leading to sustainable retention of the species. Additional areas of suitable habitat will be offset offsite according to the BioBanking method.

No significant impact is therefore considered likely to occur to the Wallum Froglet as a result of the proposed development.

F.2.2 Raptors

The assessment of significance presented below addresses the following species:

- White-bellied Sea-eagle; and
- Eastern Osprey.

(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

The White-bellied Sea-eagle and Eastern Osprey have been recorded within the study area. These are wide ranging species, and the local populations of these species are considered to extend far beyond the study area.

The proposed development will remove a small area of known habitat for the White-bellied Sea-eagle and Eastern Osprey within the subject site, including limited nesting habitat. These species are highly mobile and are considered likely to utilise habitat resources throughout the study area and locality. These areas will continue to provide both foraging and breeding habitat for the White-bellied Sea-eagle and Eastern Osprey. Accordingly, the proposed development is not considered to have an adverse effect on the life cycle of these species such that a viable local population is likely to be placed 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

Not applicable.

(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

Not applicable.

(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, and

(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, and

(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

The proposed development will remove approximately 9.49 ha of potential habitat for these species within the study area.

The proposed development is not considered likely to significantly increase fragmentation of habitat for these species within the study area. As the proposed development occurs at the edge of existing residential development and is bordered by the Pacific Highway, the study area has previously been subject to fragmentation. Extensive areas within the subject site have also previously been cleared of treed vegetation. Although the proposed development will increase the amount of overall fragmentation, it will not result in the isolation of important areas of habitat. Habitat connectivity will be maintained within the study area and with habitat adjoining Hearnes Lake.

The habitat to be cleared or modified represents a small portion of the available habitat within the study area and locality. The area of habitat for these species that is directly and indirectly impacted by the proposed development is not considered important for the long-term survival of these species in the locality.

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

No critical habitat for this species has been identified by OEH.

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

Recovery plans have not been developed for this species, and no threat abatement plans are considered relevant.

(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 following KTPs are relevant to this species within the study area:

- 'Clearing of native vegetation' as this reduces the area of forage and nesting habitat available for the species;
- 'Loss of hollow-bearing trees' as this reduces the abundance of nesting habitat;
- 'Removal of dead wood and dead trees' as this reduces the abundance of important nesting habitat;

- ‘Competition from feral honey bees (*Apis mellifera*)’ as they compete with native fauna for tree hollows and floral resources; and

- ‘Anthropogenic climate change’ as this can reduce the geographic range of species and alter the structure and composition of communities.

The majority of habitat for these species is within the Regional Park. It is expected that conservation management actions via the RPMP will reduce KTPs on such habitats within the Regional Park. Some habitat will be cleared, as described above, and clearing is a KTP however, sustainable areas will be retained and managed for conservation, offsetting the impacts of clearing.

Conclusion

The proposed development will involve the removal of a small area of White-bellied Sea-eagle and Eastern Osprey. The habitat to be cleared or modified represents a small portion of the available habitat within the study area and locality. Implementation of a RPMP will assist in increasing the biodiversity values of the retained habitat. Furthermore, offsite offset areas will be secured through the BioBanking scheme to compensate for any residual impact on these species. As a result, the proposed development is not considered to have a significant impact on the White-bellied Sea-eagle and Eastern Osprey.

F.2.3 Glossy Black-cockatoo

(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

The Glossy Black-cockatoo has been recorded within the study area. This is a wide ranging species that has a large home range and the local population of this species is considered to extend far beyond the study area.

The proposed development will remove a small area of known habitat for the Glossy Black-cockatoo within the subject site, including foraging and limited breeding habitat. This species is highly mobile and is considered likely to utilise habitat resources throughout the study area and locality. These areas will continue to provide foraging and breeding habitat for the Glossy Black-cockatoo. Accordingly, the proposed development is not considered to have an adverse effect on the life cycle of this species such that a viable local population is likely to be placed 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

Not applicable.

(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

Not applicable.

(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, and

(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, and

(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

The proposed development will remove approximately 0.02 ha of dry sclerophyll forest forming potential habitat for this species within the study area.

The proposed development is not considered to significantly increase fragmentation of habitat for this species within the study area. As the proposed development occurs at the edge of existing residential development and is bordered by the Pacific Highway, the study area has previously been subject to fragmentation. Extensive areas within the subject site have also previously been cleared of treed vegetation. Although the proposed development will increase the amount of overall fragmentation, it will not result in the isolation of important areas of habitat. Habitat connectivity will be maintained within the study area and with habitat adjoining Hearnes Lake.

The habitat to be cleared or modified represents a small portion of the available habitat within the study area and locality. The area of habitat for this species that is directly and indirectly impacted by the proposed development is not considered important for the long-term survival of the species in the locality.

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

No critical habitat for this species has been identified by OEH.

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

A recovery plan has not been developed for this species, and no threat abatement plans are considered relevant.

(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 following KTPs are relevant to this species within the study area:

- 'Clearing of native vegetation' as this reduces the area of forage and nesting habitat available for the species;
- 'Loss of hollow-bearing trees' as this reduces the abundance of nesting habitat;
- 'Removal of dead wood and dead trees' as this reduces the abundance of important nesting habitat;
- 'Competition from feral honey bees (*Apis mellifera*)' as they compete with native fauna for tree hollows and floral resources; and
- 'Anthropogenic climate change' as this can reduce the geographic range of species and alter the structure and composition of communities.

The majority of habitat for this species is within the Regional Park. It is expected that conservation management actions via the RPMP will reduce KTPs on such habitats within the Regional Park. Some habitat will be cleared, as described above, and clearing is a KTP however, sustainable areas will be retained and managed for conservation, offsetting the impacts of clearing.

Conclusion

The proposed development will involve the removal of a small area of Glossy Black-cockatoo habitat. The habitat to be cleared or modified represents a small portion of the available habitat within the study area and locality. Implementation of a RPMP will assist in increasing the biodiversity values of the retained habitat. Furthermore, offsite offset areas will be secured through the BioBanking scheme to compensate for any residual impact on these species. As a result, the proposed development is not considered to have a significant impact on the Glossy Black-cockatoo.

F.2.4 Wetland Birds

The assessment of significance presented below addresses the following wetland bird species:

- Black-necked Stork; and
- Caspian Tern.

(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

The Black-necked Stork and the Caspian Tern have been recorded within the study area. The local populations of these species are considered likely to use habitat that extend well beyond the study area and are not likely to be dependent on the habitats around Hearnes Lake.

The proposed development will remove a small area of known habitat for the Black-necked Stork and Caspian Tern within the subject site, including foraging habitat. These species are highly mobile and is considered likely to utilise habitat resources throughout the study area and locality. These areas will continue to provide foraging habitat for the Black-necked Stork and Caspian Tern. Accordingly, the proposed development is not considered to have an adverse effect on the life cycle of these species such that a viable local population is likely to be placed 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

Not applicable.

(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

Not applicable.

(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, and

(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, and

(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

The proposed development will remove approximately 9.49 ha of potential habitat for these species within the study area.

The proposed development is not considered to significantly increase fragmentation of habitat for these species within the study area. As the proposed development occurs at the edge of existing residential development and is bordered by the Pacific Highway, the study area has previously been subject to fragmentation. Extensive areas within the subject site have also previously been cleared of treed vegetation. Although the proposed development will increase the amount of overall fragmentation, it will not result in the isolation of important areas of habitat. Habitat connectivity will be maintained within the study area and with habitat adjoining Hearnes Lake.

The habitat to be cleared or modified represents a small portion of the available habitat within the study area and locality. The area of habitat for these species that is directly and indirectly impacted by the proposed development is not considered important for the long-term survival of the species in the locality.

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

No critical habitat for this species has been identified by OEH.

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

A recovery plan has not been developed for these species, and no threat abatement plans are considered relevant.

(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 following KTPs are relevant to these species within the study area:

- 'Clearing of native vegetation' as this reduces the area of forage and nesting habitat available for the species;
- 'Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands' as the quality of the habitat may decrease; and
- 'Anthropogenic climate change' as this can reduce the geographic range of species and alter the structure and composition of communities.

All of the habitats for these species will be retained within the Regional Park and actively managed for conservation. Such measures would address any pre-existing KTPs operating under current land management.

Conclusion

The proposed development will involve the removal of a small area of Black-necked Stork and Caspian Tern habitat. The habitat to be cleared or modified represents a small portion of the available habitat within the study area and locality. Implementation of a RPMP will

assist in increasing the biodiversity values of the retained habitat. Furthermore, offsite offset areas will be secured through the BioBanking scheme to compensate for any residual impact on these species. As a result, the proposed development is not considered to have a significant impact on the Black-necked Stork or the Caspian Tern.

F.2.5 Fruit-doves

The assessment of significance presented below addresses the following species:

- Wompoo Fruit-dove; and
- Rose-crowned Fruit-dove.

The Wompoo Fruit-dove and Rose-crowned Fruit-dove have not been recorded within the study area, however a small area of potential habiat is present, and therefore they are considered to have potential to occur and are assessed below.

(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

The Wompoo Fruit-dove and Rose-crowned Fruit-dove occur in rainforest habitats. No area of suitable habitat (Littoral Rainforest) is proposed to be removed within the subject site, and all of this kind of habitat in the study area is proposed to be conserved in the Regional Park. Accordingly, the proposed development is not considered 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.

(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

Not applicable.

(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

Not applicable.

(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, and

(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, and

(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

No area of suitable habitat (Littoral Rainforest) for these species is proposed to be removed within the subject site. There is some potential for indirect impacts of the project such as stormwater runoff to impact areas of Littoral Rainforest that will be conserved in the Regional Park. These impacts will be managed by the implementation of a Stormwater Management Plan.

The proposed development is not considered likely to significantly increase fragmentation of habitat for these species within the study area. As the proposed development occurs at the edge of existing residential development and is bordered by the Pacific Highway, the study area has previously been subject to fragmentation. Extensive areas within the subject site have also previously been cleared of treed vegetation. Although the proposed development will increase the amount of overall fragmentation, it will not result in the isolation of important areas of habitat. Habitat connectivity will be maintained within the study area and with habitat adjoining Hearnes Lake.

The area of habitat for these species that may be potentially indirectly impacted by the proposed development is not considered important for the long-term survival of these species in the locality.

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

No critical habitat for these species has been identified by OEH.

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

Recovery plans have not been developed for these species, and no threat abatement plans are considered relevant.

(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 following KTPs are relevant to these species within the study area:

- 'Clearing of native vegetation' as this reduces the area of forage and nesting habitat available for the species;

- ‘Anthropogenic climate change’ as this can reduce the geographic range of species and alter the structure and composition of communities.

All of the habitats for these species will be retained within the Regional Park and actively managed for conservation. Such measures would address any pre-existing KTPs operating under current land management.

Conclusion

No area of suitable habitat (Littoral Rainforest) for the Wompoo Fruit-dove and Rose-crowned Fruit-dove is proposed to be removed within the subject site. Implementation of a RPMP will assist in increasing the biodiversity values of the retained habitat. As a result, the proposed development is not considered to have a significant impact on the Wompoo Fruit-dove and Rose-crowned Fruit-dove.

F.2.6 Varied Sittella

(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

The Varied Sittella has been recorded within the study area. The local population of this species is considered likely to extend beyond the study area.

The proposed development will remove a small area of known habitat for the Varied Sittella within the subject site, including foraging and breeding habitat. This species is considered likely to utilise habitat resources throughout the study area and locality. These areas will continue to provide foraging and breeding habitat for the Varied Sittella. Accordingly, the proposed development is not considered to have an adverse effect on the life cycle of these species such that a viable local population is likely to be placed 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

Not applicable.

(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

Not applicable.

(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, and

(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, and

(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

The proposed development will remove approximately 0.02 ha of dry sclerophyll forest forming potential habitat for this species within the study area.

The proposed development is not considered likely to significantly increase fragmentation of habitat for this species within the study area. As the proposed development occurs at the edge of existing residential development and is bordered by the Pacific Highway, the study area has previously been subject to fragmentation. Extensive areas within the subject site have also previously been cleared of treed vegetation. Although the proposed development will increase the amount of overall fragmentation, it will not result in the isolation of important areas of habitat. Habitat connectivity will be maintained within the study area and with habitat adjoining Hearnes Lake.

The habitat to be cleared or modified represents a small portion of the available habitat within the study area and locality. The area of this habitat for this species that may be directly and indirectly impacted by the proposed development is not considered important for the long-term survival of the species in the locality.

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

No critical habitat for this species has been identified by OEH.

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

A recovery plan has not been developed for this species, and no threat abatement plans are considered relevant.

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 following KTPs are relevant to this species within the study area:

- 'Clearing of native vegetation' as this reduces the area of forage and nesting habitat available for the species;

- ‘Removal of dead wood and dead trees’ as this reduces the abundance of important ground foraging and nesting habitat; and

- ‘Anthropogenic climate change’ as this can reduce the geographic range of species and alter the structure and composition of communities.

Some habitat for this species will be cleared and clearing is a KTP for the species. However, the majority of habitat will be retained in the Regional Park and actively managed via the RPMP. The impacts of clearing small areas of suitable habitat for this species are expected to be counter balanced by regeneration of habitats in the Regional Park.

Conclusion

The proposed development will involve the removal of a small area of Varied Sittella habitat. The habitat to be cleared or modified represents a small portion of the available habitat within the study area and locality. Implementation of a RPMP will assist in increasing the biodiversity values of the retained habitat. Furthermore, offsite offset areas will be secured through the BioBanking scheme to compensate for any residual impact on these species. As a result, the proposed development is not considered to have a significant impact on the Varied Sittella.

F.2.7 Owls

The assessment of significance presented below addresses the following species:

- Powerful Owl;

- Masked Owl; and

- Sooty Owl.

The Powerful Owl, Masked Owl and Sooty Owl have not been recorded within the study area, however a small area of potential habiat is present, and therefore they are considered to have potential to occur and are assessed below.

(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

The local populations of these species are considered to extend beyond the study area. The local populations of these species have been assessed as viable.

The proposed development is will remove a small area of habitat for these forest owls within the subject site, including foraging habitat. These species are highly mobile and are considered likely to utilise habitat resources throughout the study area and locality. These areas will continue to provide both foraging and roosting habitat for these species. Accordingly, the proposed development is not considered to have an adverse effect on the life cycle of the forest owls such that a viable local population is likely to be placed 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

Not applicable.

(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

Not applicable.

(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, and

(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, and

(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

The proposed development will remove approximately 9.49 ha of potential foraging habitat for these species within the study area.

The proposed development is not considered to significantly increase fragmentation of habitat for these species within the study area. As the proposed development occurs at the edge of existing residential development and is bordered by the Pacific Highway, the study area has previously been subject to fragmentation. Extensive areas within the subject site have also previously been cleared of treed vegetation. Although the proposed development will increase the amount of overall fragmentation, it will not result in the isolation of important areas of habitat. Habitat connectivity will be maintained within the study area and with habitat adjoining Hearnes Lake.

The habitat to be cleared or modified represents a small proportion of the available habitat for these species that occurs within the study area and locality. The area of habitat for forest owls that will be directly and indirectly impacted by the proposed development is not considered important for the long-term survival of these species in the locality.

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

No critical habitat for this species has been identified by OEH.

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

The *Recovery Plan for Large Forest Owls* (DEC (NSW), 2006), which include the Powerful Owl, Masked Owl and Sooty Owl, contains a number of objectives with the overall aim to ensure that viable populations of the large forest owls continue in the wild in NSW in each region where they presently occur. Although potential habitat for these species will be removed within the subject site, the consideration of impacts to this species is consistent with the plan.

(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 following KTPs are relevant to potential habitat for this species within the study area:

- 'Clearing of native vegetation' as this reduces the area of forage habitat available for the species;
- 'Loss of hollow-bearing trees' as this reduces the abundance of nesting habitat;
- 'Removal of dead wood and dead trees' as this reduces the abundance of important nesting habitat; and
- 'Anthropogenic climate change' as this can reduce the geographic range of species and alter the structure and composition of communities.

Some forest, including forest with tree hollows will be cleared and both clearing and loss of tree hollows are threats to these species. However, the majority of the habitats for these species will be retained within the Regional Park and actively managed for conservation. Such measures would address any pre-existing KTPs operating under current land management.

Conclusion

The proposed development will involve the removal of a small area of potential habitat for forest owls. The habitat to be cleared or modified represents a small portion of the available habitat within the study area and locality. Implementation of a RPMP will assist in increasing the biodiversity values of the retained habitat. Furthermore, offsite offset areas will be secured through the BioBanking scheme to compensate for any residual impact on these species. As a result, the proposed development is not considered to have a significant impact on these nocturnal raptors.

F.2.8 Grey-headed Flying-fox

(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

The Grey-headed Flying-fox has been recorded within the study area. The local population of this species is considered to extend beyond the study area. The local population of this species has been assessed as viable.

The Grey-headed Flying-fox will primarily be impacted by the proposed development through direct removal of a small area of foraging habitat within the subject site. It is expected that this species only occasionally forages within the study area and utilises it only as part of a much larger foraging territory. Accordingly, the habitat to be impacted within the subject site is not considered important for the long-term survival of the species within the locality, and the proposed development is not considered to have an adverse effect on the life cycle of these species such that a viable local population is likely to be placed 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

Not applicable.

(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

Not applicable.

(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, and

(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, and

(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

The proposed development will remove approximately 9.49 ha of potential habitat for this species within the study area. There is potential for indirect impacts to occur to areas of retained habitat through stormwater discharge, however these will be managed appropriately through the implementation of a Stormwater Management Plan.

The proposed development is not considered likely to significantly increase fragmentation of habitat for this species within the study area. As the proposed development occurs at the edge of a residential development and adjacent to the Pacific Highway, the study area has previously been subject to fragmentation. Extensive areas within the study area have also previously been cleared of treed vegetation. Although the proposed development will increase the amount of overall fragmentation, it will not result in the isolation of important areas of habitat. Habitat connectivity will be maintained within the study area and with habitat adjoining Hearnes Lake.

The habitat to be cleared or modified represents a small portion of the available habitat within the study area and locality. The area of this habitat for this species that is directly and indirectly impacted by the proposed development is not considered important for the long-term survival of the species in the locality.

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

No critical habitat for this species has been identified by OEH.

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

A recovery plan has not been developed for this species, and no threat abatement plans are considered relevant.

(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 following KTPs are relevant to potential habitat for this species within the study area:

- 'Clearing of native vegetation' as this reduces the area of forage habitat available for the species; and
- 'Anthropogenic climate change' as this can reduce the geographic range of species and alter the structure and composition of communities.

Some forest that would be used for foraging by this species will be cleared and clearing is a KTP for this species. However, the majority of the habitat for the Grey Headed Flying-fox will be retained within the Regional Park and actively managed for conservation. Regeneration of forest and woodland in the Regional Park would address any pre-existing KTPs operating under current land management.

Conclusion

The proposed development will involve the removal of a small area of Grey-headed Flying-fox habitat. The habitat to be cleared or modified represents a small portion of the available habitat within the study area and locality. Implementation of a RPMP will assist in increasing the biodiversity values of the retained habitat. Furthermore, offsite offset areas will be secured through the BioBanking scheme to compensate for any residual impact on this species. As a result, the proposed development is not considered likely to have a significant impact on the Grey-headed Flying-fox.

F.2.9 Microchiropteran Bats

The assessment of significance presented below addresses the following species that are considered to have potential to occur:

- Yellow-bellied Sheathtail-bat;
- Eastern Freetail-bat;
- Little Bentwing-bat;
- Southern Myotis; and
- Greater Broad-nosed Bat.

The Eastern Freetail-bat and Greater Broad-nosed Bat have been recorded within the study area, and the Yellow-bellied Sheathtail-bat, Little Bentwing-bat and Southern Myotis have the potential to occur.

(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

The proposed development is will remove a small area of habitat for these microchiropteran bats within the subject site, including roosting habitat. These species are highly mobile and is considered likely to utilise habitat resources throughout the study area and locality. The areas occupied by the local populations of these species would extend beyond the boundary of the study area. These areas will continue to provide both foraging and roosting habitat for these species. Accordingly, the proposed development is not considered to have an adverse effect on the life cycle of these microchiropteran bats such that a viable local population is likely to be placed 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

Not applicable.

(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

Not applicable.

(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, and

(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, and

(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

The proposed development will remove approximately 9.49 ha of potential habitat for these species. However the majority of such habitats will be retained and managed in the Regional Park, and additional higher quality habitat occurs beyond the study area.

The proposed development would not significantly increase fragmentation of habitat for these species within the study area. As the proposed development occurs at the edge of existing residential development and is bordered by the Pacific Highway, the study area has previously been subject to fragmentation. Although the proposed development will increase the amount of overall fragmentation, it will not result in the isolation of important areas of habitat. These are aerial species that have the ability to fly over disturbed areas to access foraging resources and the project is not expected to isolate this species. Habitat connectivity will be maintained within the study area and with habitat adjoining Hearnes Lake.

The habitat to be cleared or modified represents a small portion of the available habitat within the study area and locality. The area of this habitat for these species that may be directly and indirectly impacted by the proposed development is not considered important for the long-term survival of these species in the locality.

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

No critical habitat for this species has been identified by OEH.

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

A recovery plan has not been developed for these species, and no threat abatement plans are relevant.

(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 following KTPs are relevant to potential habitat for these species within the study area:

- 'Clearing of native vegetation' as this reduces the area of forage habitat available for the species;
- 'Loss of hollow-bearing trees' as this reduces the abundance of nesting habitat;
- 'Removal of dead wood and dead trees' as this reduces the abundance of important nesting habitat; and
- 'Anthropogenic climate change' as this can reduce the geographic range of species and alter the structure and composition of communities.

Some forest, including forest with tree hollows will be cleared and both clearing and loss of tree hollows are threats to these species. However, the majority of the habitats for these species will be retained within the Regional Park and actively managed for conservation. Such measures would address any pre-existing KTPs operating under current land management.

Conclusion

The proposed development will involve the removal of a some habitat for microchiropteran bats. However, the habitat to be cleared or modified represents a small portion of the available habitat within the study area and locality. Implementation of a RPMP will assist in increasing the biodiversity values of the retained habitat. Furthermore, offsite offset areas will be secured through the BioBanking scheme to compensate for any residual impact on these species. As a result, the proposed development is not considered likely to have a significant impact on these microchiropteran bats.

Appendix G

BioBanking Assessment Report

BioBanking credit report

This report identifies the number and type of credits required at a DEVELOPMENT SITE.

Date of report: 20/02/2018 Time: 2:52:41PM Calculator version: v4.0

Development details

Proposal ID:	0057/2017/4645D
Proposal name:	17073 - Dev. Stages 2, 6 and part of Stage 1
Proposal address:	PO Box 2474 Carlingford Court NSW 2118
Proponent name:	Cumberland Ecology
Proponent address:	
Proponent phone:	0298681933
Assessor name:	David Robertson
Assessor address:	PO BOX 2474 Carlingford Court NSW 2118
Assessor phone:	02 9868 1933
Assessor accreditation:	0057

Improving or maintaining biodiversity

An application for a red flag determination is required for the following red flag areas

Red flag	Reason
Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion	Vegetation type being > 70% cleared; or it contains an endangered ecological community;
Pink Bloodwood open forest of the coastal lowlands of the NSW North Coast Bioregion	Vegetation type being > 70% cleared; or it contains an endangered ecological community;
Coastal floodplain sedgelands, rushlands, and forblands of the North Coast	Vegetation type being > 70% cleared; or it contains an endangered ecological community;
Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Vegetation type being > 70% cleared; or it contains an endangered ecological community;
Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion	Vegetation type being > 70% cleared; or it contains an endangered ecological community;
Wet heathland and shrubland of coastal lowlands of the NSW North Coast Bioregion	Vegetation type being > 70% cleared; or it contains an endangered ecological community;

The application for a red flag determination should address the criteria set out in the BioBanking Assessment Methodology. Please note that a biobanking statement cannot be issued unless the determination is approved.

Additional information required for approval:

- ☐ Change to percent cleared for a vegetation type/s
- ☐ Use of local benchmark
- ☐ Change negligible loss
- ☐ Expert report...

- [x] Request for additional gain in site value
- [ ] Predicted threatened species not on site
- [ ] Change threatened species response to gain (Tg value)

Ecosystem credits summary

Plant Community type	Area (ha)	Credits required	Red flag
Coastal floodplain sedgelands, rushlands, and forblands of the North Coast	0.05	2.00	Yes
Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	1.68	96.09	Yes
Pink Bloodwood open forest of the coastal lowlands of the NSW North Coast Bioregion	0.66	23.00	No
Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion	7.04	403.00	Yes
Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion	0.04	2.29	Yes
Wet heathland and shrubland of coastal lowlands of the NSW North Coast Bioregion	0.02	1.00	Yes
Total	9.49	527	

Credit profiles

1. Pink Bloodwood open forest of the coastal lowlands of the NSW North Coast Bioregion, (NR220)

Number of ecosystem credits created	23
IBRA sub-region	Coffs Coast & Escarpment

Offset options - vegetation types

Pink Bloodwood open forest of the coastal lowlands of the NSW North Coast Bioregion, (NR220)

Blackbutt - Needlebark Stringybark shrubby open forest on coastal sands of the NSW North Coast Bioregion, (NR116)

Coast Cypress Pine shrubby open forest of the NSW North Coast Bioregion, (NR148)

Scribbly Gum - Needlebark Stringybark heathy open forest of coastal lowlands of the northern NSW North Coast Bioregion, (NR227)

Offset options - CMA sub-regions

Coffs Coast & Escarpment

and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

2. Wet heathland and shrubland of coastal lowlands of the NSW North Coast Bioregion, (NR278)

Number of ecosystem credits created	1
IBRA sub-region	Coffs Coast & Escarpment

Offset options - vegetation types

Wet heathland and shrubland of coastal lowlands of the NSW North Coast Bioregion, (NR278)

Offset options - CMA sub-regions

Coffs Coast & Escarpment

and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

3. Coastal floodplain sedgelands, rushlands, and forblands of the North Coast, (NR149)

Number of ecosystem credits created	2
IBRA sub-region	Coffs Coast & Escarpment

Offset options - vegetation types

Coastal floodplain sedgelands, rushlands, and forblands of the North Coast, (NR149)

Offset options - CMA sub-regions

Coffs Coast & Escarpment

and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

4. Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion, (NR217)

Number of ecosystem credits created	96
IBRA sub-region	Coffs Coast & Escarpment

Offset options - vegetation types

Offset options - CMA sub-regions

Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion, (NR217) Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion, (NR254)	Coffs Coast & Escarpment and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

5. Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion, (NR254)

Number of ecosystem credits created	403
IBRA sub-region	Coffs Coast & Escarpment

Offset options - vegetation types	Offset options - CMA sub-regions
Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion, (NR254) Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion, (NR217)	Coffs Coast & Escarpment and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

6. Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion, (NR255)

Number of ecosystem credits created	2
IBRA sub-region	Coffs Coast & Escarpment

Offset options - vegetation types	Offset options - CMA sub-regions
Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion, (NR255)	Coffs Coast & Escarpment and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

Species credits summary

Appendix D

BUSHFIRE ASSESSMENT

Kleinfelder Australia Pty Ltd
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Cardiff, NSW 2285
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www.kleinfelder.com/australia

12 February 2018

Elite Constructions NSW Pty Ltd
C/- ADW Johnson
Hunter Office
7/335 Hillsborough Road,
Warners Bay NSW 2282
Attn: Brett Stein

Subject: **Bushfire Assessment Review and Consultation – Identify constraints and provide addendum letter for Sandy Beach development proposal**

Kleinfelder have been engaged to provide bushfire consulting services to support an application to amend the Concept Approval for proposed residential development within Lot 22 DP 1070182 and Lots 497 and 498 DP 227298, at Sandy Beach, Coffs Harbour.

The bushfire services include:

- Review existing bushfire threat assessment (Conacher 2008)
- Consideration of updated vegetation mapping (Cumberland Ecology 2017) and comparison against existing Conacher bushfire threat assessment and the vegetation classification system in AS3959-2009
- Identification of where development meets (and does not meet) acceptable performance criteria (as per NSW RFS Planning for bushfire protection 2006 and AS3959-2009)
- Propose alternate solution(s) where development does not meet acceptable solutions for the performance criteria.

1. BUSHFIRE ASSESSMENT REVIEW

In 2008 Conacher Environmental group prepared the Bushfire Threat Assessment for the subdivision proposal. The 2008 assessment was prepared on the current NSW RFS guidelines (PBP 2006), and is still relevant with regards to Aims and Objectives and performance criteria for residential subdivisions. However, guidelines and standards have developed over the period of this original assessment, and any new development will new approvals will need to demonstrate acceptable performance with current standards.

1.1 ACCESS DESIGN

Section 3.3 of the Conacher 2008 assessment recognises 3 points of access: 1 direct to Pacific Highway (west) and 2 linking with Sandy Beach urban development (Pine Crescent and Ti Tree Road). However, the Pacific Highway upgrades have all but excluded the potential for the entry point direct to the Pacific Highway.

The consequence of this amendment has repercussions for the Western Precinct on the new Concept plan, with regards to access performance criteria. The Western Precinct could now be a peninsula development accessed, by one road in/out, extending up to 1000m from the nearest through road. This exceeds acceptable solutions for Public Roads and Property Access, as at least one alternative property access road is required for individual dwellings or groups of dwellings that are located more than 200m from a public through road.

In addition to the Western Precinct access amendment, the Eastern Precinct was not adequately assessed in 2008. The Eastern Precinct is essentially a peninsula development access by one road in/out, extending up to 400m from the nearest through road. This also exceeds acceptable solutions for Public Roads and Property Access (at least one alternative property access road is required for individual dwellings or groups of dwellings that are located more than 200m from a public through road).

The water supplies can be extended onto the proposed development and this concept would deemed acceptable solution (meeting AS 3959-2009).

The environmental and cultural elements of the Conacher 2008 assessment have remained relatively consistent, and these matters are being confirmed via Cumberland Ecology.

1.2 AS3959 UPDATE

The Australian Standard (AS3959) for Constructions of buildings in Bushfire Prone Areas was updated in 2009 (AS3959-2009) superseding the 1999 version (AS3959-1999). A major amendment was the definition of Building Construction Levels, which changed from Level of construction (Level 1-2-3 and Flame Zone), to Bushfire Attack Levels (BALs Low-12.5-19-29-40 and FZ).

The Conacher report refers to Levels 1-2-3, and the amended Concept approval needs to refer to BALs (AS3959-2009).

1.3 PBP UPDATE

The AS3959-2009 and PBP 2006 did not adequately support development proposals, and in 2010, the NSW RFS released a PBP (PBP 2010) update specific for Appendix 3 (Site Bush Fire Attack Assessment). This update references the conversion of vegetation classifications to AS3959-2009 (AUSLIG 1990). These vegetation classifications and subsequent fuel loading varies from the PBP 2006 guidelines (see table from PBP 2010 Appendix 3 below).

Table A3.5.1 – Conversion of vegetation classification from David Keith's *Ocean Shores to Desert Dunes* (used in PBP) to the AUSLIG Pictorial Analysis in AS3959-2009. This conversion is based on what is considered the best representation of similar bush fire behavior potential.

David Keith's *Ocean Shores to Desert Dunes*	AUSLIG (1990) Pictorial Analysis (AS3959-2009)
Forests (Wet & Dry Sclerophyll)	*Forest*
Pine Plantations	
Forested Wetlands	
Woodlands (Grassy, Semi-Arid)	*Woodland*
Tall Heath (Scrub)	*Scrub*
Freshwater Wetlands	
Short Heath (Open Scrub)	*Shrubland*
Arid Shrubland	*Mallee/Mulga*
Alpine Complex (Sedgelands)	*Tussock Moorland*
Rainforest	*Rainforest*
Grassland	*Grassland*

Interestingly, the PBP 2010 Appendix 3 references BAL40 as a deemed-to-satisfy (DTS) outcome (where the building is exposed to a radiant heat flux of less than or equal to 40 kW/m^2 (BAL-40), yet the performance criteria for a residential subdivision (Section 4.1.3 PBP 2006) states a 29 kW/m^2 (BAL-29) as the acceptable solution. *For the purpose of this addendum, the proponent will demonstrate that all dwellings within the amended Concept Plan can achieve a BAL29 rating (i.e. APZ distances will be suitable for BAL29 as per AS3959-2009 – Table 2.4.3).*

2. APZ PERFORMANCE

The Conacher 2008 assessment identified complex land constraints and vegetation structures and subsequently the subdivision layout plan had been assessed based on 3 precincts:

1. Western Precinct – adjoining the Pacific Highway
2. Eastern Precinct – a small separated precinct north from the southern precinct and
3. Southern Precinct – adjoining the developed Sandy Beach urban area.

These Australian Standard and PBP guideline amendments have changed the vegetation classifications relevant to the Concept Approval and as a result, The Conacher APZ recommendations are considered out of date and need to be updated to reflect the current assessment outcomes.

Recommendation 1: The 2008 APZ assessment needs to be updated to reflect the changes to AS3959-2009 and PBP 2010. New APZ will apply to the amended Concept Plan for the development.

Recommendation 1:

The following tables (KLF 1, 2 and 3) have been prepared consistent with the Conacher precinct tables (Conacher tables 2.1, 2.1 and 2.3). The KLF tables demonstrate the APZ requirement to achieve a Bushfire Safety Authority (BFSA) for the subdivision development.

2.1 KLEINFELDER UPDATE APZ TABLES PER PRECINCT

Table KLF 1 Bushfire Attack Assessment Western Precinct					
Direction	Vegetation Conacher 2008	Vegetation Cumberland 2017	Vegetation KLF 2018 AS3959	Slope AS3959	APZ to BAL 29 AS3959
North	Forest and Woodland	Coastal Wallum Swamp Mahogany Siebers Paperbark Forest	Forest	0°	21m
South	Woodland and Short Heath	Coastal Paperbark Sedgeland dominated Forest	Non vegetated	0-5°	N/A
East	Forested Wetland, Woodland, Tall Heath and Short Heath	Coastal Wallum Baumea Wetland, Coastal Wallum Swamp Mahogany Siebers Paperbark Forest, Coastal Paperbark Sedgeland dominated Forest.	Forest	0-5°	27m
West	Managed Land	N/A	Managed Land Pacific Motorway	0-5°	N/A

Table KLF 2 Bushfire Attack Assessment Eastern Precinct					
Direction	Vegetation Conacher 2008	Vegetation Cumberland 2017	Vegetation KLF 2018 AS3959	Slope AS3959	APZ to BAL 29 AS3959
North	Tall Heath and Freshwater Wetlands	Coastal Swamp Mahogany Forest	Forest	0-5°	27m
South	Tall Heath and Freshwater Wetlands	Coastal Swamp Mahogany Forest	Forest	0°	21m
East	Tall Heath	Coastal Sand Bloodwood Banksia Forest	Scrub	0°	13m
West	Tall Heath and Freshwater Wetlands	Coastal Swamp Mahogany Forest, Swamp Oak Forested Wetland, Estuarine Paperbark Twig-rush Forest	Forest	0-5°	27m

Table KLF 3 Bushfire Attack Assessment Southern Precinct					
Direction	Vegetation Conacher 2008	Vegetation Cumberland 2017	Vegetation KLF 2018 AS3959	Slope AS3959	APZ to BAL 29 AS3959
North	Forested Wetlands and Woodland	Coastal Wallum Baumea Wetland, Swamp Oak Forested Wetland, Coastal paperbark Sedgeland dominated Forest (derived open woodland)	Forest	0-5°	27m
South	Managed Land	N/A	N/A	0°	N/A
South East	Woodland	Coastal Paperbark Sedgeland dominated Forest	Rainforest	0°	9m
East	Tall Heath	Coastal exposed dune Littoral Rainforest, Coastal Swamp Mahogany Forest, Coastal Paperbark Swamp Box Littoral Forest	Scrub	0°	13m
West	Forested Wetland and Woodland	Coastal Paperbark Sedgeland dominated Forest	Forest	0°	21m

ACCESS PERFORMANCE

Western Precinct Access

Recommendation 2: To provide a suitable alternate access egress to the Western Precinct.

The Conacher 2008 assessment identified 3 access/entry points within the Western Precinct of the Proposal. With these access provisions, the original subdivision could meet the acceptable solutions as detailed in PBP 2006 Section 4.1.3.

The Pacific Highway upgrades have eliminated the potential to access/egress the Western Precinct direct onto Pacific Highway (i.e. alternate access/egress to the north), and therefore the amended Concept design for the Western Precinct includes an alternate access/egress route.

The Western Precinct is constrained by Pacific Highway and the proposed Regional Park (including EEC vegetation, and Hearns Lake wetlands). The only access to the Western Precinct is from the south.

The amended Concept design provides 2 alternate access point to the south, via a permanent public road extending from the Pine Crescent access point west through the Community Lot and linking with the perimeter road. This design will avoid a 'pinch point' or cross road intersection which has risk of being made impassable if the intersection is blocked during an emergency (e.g. vehicle accident).

The subdivision design also offers 2 routes of access/egress from the northern most extent, specifically being the parallel perimeter roads (western road adjacent to Pacific Highway and 100m to the eastern perimeter road)

Eastern Precinct Access

Recommendation 3: To provide a suitable alternate access egress to Eastern Precinct.

Recommendation 4: Provide additional solution mitigate risk: provide ring fire trail with a reticulated water supply.

Recommendation 5: Increase APZ and Construction levels to provide a higher level of passive protection than minimum.

Recommendation 3:

The Eastern Precinct has 9 proposed dwellings, on a peninsula that has one access point to the south. The amended Concept Plan provides for a 6.5m wide road within a 23.5m wide Community Association Lot 1, and ends in a 12m diameter turning circle, approximately 400m from the nearest through road. The original and current amended Concept does not meet the acceptable solutions for Public or Property access performance criteria, and a recommended alternate solution is required to address this situation.

The only option for an alternate access/egress is to construct an additional emergency access track within the 23.5m wide Community Lot. This would be a 4m wide gravel track with 1m wide cleared shoulders, and maintained on the western portion of the 23.5m wide Community Lot, whereby offering some defendable setback from direct fire outputs. This solution carries risk with regards to road closures (due to the narrow road reserve and long lineal extension,

an event such as bushfire impact has potential to cut both public access and emergency access simultaneously). Therefore further alternate solutions have been proposed;

Recommendation 4:

The Eastern Precinct APZ (surrounding the 9 proposed Lots) provides sufficient area to construct a suitable perimeter fire trail. Such a trail could be 6m wide gravel path, providing excellent access and suitable containment for a back burn if required. The perimeter fire trail should be supported by a reticulated or ring water mains and fire hydrants. Such an alternate solution is considered as an active protection measure, and although not a preferred bushfire protection measure, it would increase the bushfire preparedness for the Eastern Precinct.

Recommendation 5:

The design has scope to provide additional passive protection through higher construction levels. The proposed setbacks achieved in the Eastern Precinct equate to BAL29 construction requirements. It is proposed that the dwellings be constructed to BAL40 standards, offering a higher level of resilience to fire, and be less reliant on attending fire fighters during a fire event. This would also reduce the traffic loading during an emergency.

SUMMARY

This letter provides a review and assessment of the bushfire protection measures and a set of recommendations to update and provide alternate solutions.

The alternate solution package for the Eastern Precinct should be considered based on merits, and needs to be discussed with and approved by the NSW RFS.

Yours sincerely
Dan Pedersen - BSc, EngTech GIFireE

BPAD Bushfire Planning & Design Accredited Practitioner Level 3

BPD-PA-16293
Kleinfelder Australia Pty Ltd

Appendix E

OWNERS CONSENT

Carolyn McNally

Secretary
Department of Planning and Environment

GPO Box 39

Sydney NSW 2001

Application for Modification of Concept Plan Approval No. 05_0083 pursuant to section 75W of *Environmental Planning & Assessment Act 1979*
Land: Lot 22 DP 1070182 and Lots 497 and 498 DP 227298, Pacific Highway and Pine Crescent, Sandy Beach, Coffs Harbour

Elite Constructions NSW Pty Ltd gives consent for ADW Johnson to lodge a s 75W application to modify the Concept Plan Approval to add additional residential land to the approval.

Yours sincerely

Mohammed Morad
Director